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ALASKA GROUNDFISH FISHERIES

FINAL PROGRAMMATIC SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME VI: APPENDIX A (CHAPTER 4 FIGURES AND TABLES CONTINUED) TO APPENDIX F-5









United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service Alaska Region

June 2004

Alaska Groundfish Fisheries

Final Programmatic Supplemental Environmental Impact Statement

Executive Summary

Volume I

Chapter 1 – Purpose and Need
Chapter 2 – The Programmatic Alternatives
Chapter 3 – Affected Environment

Volume II

Chapter 4 – Environmental and Economic Consequences

Volume III

Chapter 4 – Environmental and Economic Consequences (continued)

Volume IV

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Alaska Groundfish Fisheries
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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ABC	Acceptable Biological Catch
ACC	Alaska Coastal Current
AD	Automatic Differentiation
ADCED	Alaska Department of Community and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AEB	Aleutians East Borough
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
AKAPAI	Alaska Peninsula and Aleutian Islands
AKKO	Alaska Kodiak Region
AKR	Alaska Region
AKSC	Southcentral Alaska
AKSE	Southeast Alaska
ANCSA	Alaska Native Claims Settlement Act
ANHSC	Alaska Native Harbor Seal Commission
AP	Advisory Panel
APA	Administrative Procedure Act
APAI-SP	Alaska Peninsula and Aleutian Islands Shore Plant
APEC	Asia Pacific Economic Cooperation
APICDA	Aleutian Pribilof Island Community Development Association
A-R-S-O	Atka Mackerel-Rockfish-Sablefish and Other Groundfish Species
AYK	Arctic-Yukon-Kuskokwim
B	Biomass Proxy Value
BBEDC	Bristol Bay Economic Development Corporation
BiOp	Biological Opinion
BRD	Biological Research Division
BSAI	Bering Sea and Aleutian Islands
BSP	Bering Sea Pollock
BSP-SP	Bering Sea Pollock Shore Plant
BTLC	Bird Treatment and Learning Center
CS-	Conditionally Significant Adverse
CS+	Conditionally Significant Beneficial
CAFF	Conservation of Arctic Flora and Fauna
CAR	Comment Analysis Report
CBSFA	Central Bering Sea Fishermen's Association
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
CDQ	Community Development Quota
CEQ	Council on Environmental Quality
CFEC	Commercial Fisheries Entry Commission
CFIVSA	Commercial Fishing Industry Vessel Safety Act
CFR	Code of Federal Regulations
CFZ	Contiguous Fishing Zone

ACRONYMS AND ABBREVIATIONS (Cont.)

CG	Central Gulf of Alaska
CH	Critical Habitat
CIMMC	Cook Inlet Marine Mammal Commission
cm	Centimeter
cm/sec	Centimeters per Second
CMSA	Consolidated Metropolitan Statistical Area
COAR	Commercial Operations Annual Report
CP	Catcher Processor
CPUE	Catch-Per-Unit-Effort
CV	Catcher Vessel
CVM	Contingent Valuation Method
CVRF	Coastal Villages Region Fund
CWT	Coded Wire Tag
CZMA	Coastal Zone Management Act
°C	Degrees Celsius
DAH	Domestic Annual Harvest
DAP	Domestic Annual Processing
DCED	Alaska Department of Community and Economic Development
DCPL	Daily Cumulative Production Logbook
DDT	*Para*-dichlorodiphenyltrichloroethane
DFA	Directed Fishing Allowance
DNA	Deoxyribonucleic Acid
DOC	Department of Commerce
DPS	Distinct Population Segment
DSR	Demersal Shelf Rockfish
E	East
EA	Environmental Assessment
EAI	Eastern Aleutian Islands
EA/RIR	Environmental Assessment and Regulatory Impact Review
EBS	Eastern Bering Sea
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFP	Exempted Fishing Permit
EG	Eastern Gulf of Alaska
EIS	Environmental Impact Statement
EIT	Echo-Integrated-Trawl
EJ	Environmental Justice
ENSO	El Niño - Southern Oscillation
EO	Executive Order
EPA	Environmental Protection Agency
EPAP	Ecosystem Principles Advisory Panel
EPIRB	Emergency Position Indicating Radio Beacons
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
EVOS	*Exxon Valdez* Oil Spill
F	Fishing Mortality Rate
FAO	Food and Agriculture Organization

FEIS	Final Environmental Impact Statement
FEP	Fisheries Ecosystem Plan
FGCV	Fixed Gear Catcher Vessel
FIM	Fisheries Industry Model
FLAT	Flatfish
FLP	Floating Inshore Processor
FMP	Fishery Management Plan
FMU	Fisheries Management Unit
FOCI	Fisheries Oceanography Coordinated Investigation
FPA	Federal Power Act
FR	Federal Register
FRFA	Final Regulatory Flexibility Analysis
ft	Feet/Foot
FT-CP	Fillet Trawl Catcher Processor
FTE	Full-Time Equivalent
FWCA	Fish and Wildlife Coordination Act
FY	Fiscal Year
G&H	Gut-and-Head
GEF	Global Environmental Facility
GFOP	Groundfish Observer Program
GHL	Guideline Harvest Level
GLM	Generalized Linear Model
GOA	Gulf of Alaska
H&L	Hook-and-Line
HACCP	Hazard Analysis and Critical Control Point
HAPC	Habitat Area of Particular Concern
HT-CP	Head-and-Gut Trawl Catcher Processor
HMAP	Halibut Mortality Avoidance Program
I	Insignificant
IAI	Impact Assessment, Incorporated
ID	Identification
IFQ	Individual Fishing Quota
IMALF	Incidental Mortality of Albatross in Longline Fisheries
INPFC	International North Pacific Fisheries Commission
IPHC	International Pacific Halibut Commission
IRFA	Initial Regulatory Flexibility Analysis
IR/IU	Improved Retention/Improved Utilization
ISO	International Organization for Standardization
ISWG	Interagency Seabird Working Group
IUNC	International Union for Conservation of Nature
IWC	International Whaling Commission
JV	Joint Venture
JVP	Joint Venture Processor
kg	Kilogram
KIB	Kodiak Island Borough
km	Kilometer

ACRONYMS AND ABBREVIATIONS (Cont.)

km^2	Square Kilometers
K-SP	Kodiak Shore Plant
L-CP	Longline Catcher Processor
LCV	Longline Catcher Vessel
LL	Lower Limit
LLP	License Limitation Program
LOA	Length Overall
LP	Linear Programming Constrained Optimization Algorithm
m	Meter
MARPOL	International Convention for the Prevention of Pollution from Ships
mb	Millibar
MCA	Marine Conservation Alliance
mi^2	Square Miles
µM	Micrometer
M	Mortality
mm	Millimeter
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MRA	Maximum Retainable Amount
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
mt	Metric Ton
N	North
NAS SF	National Academy of Sciences Policy Recommendations for Sustainable Fisheries
NEPA	National Environmental Policy Act
NFS	Northwest Food Strategies
NFWF	National Fish and Wildlife Foundation
NIOSH	National Institute for Occupational Safety and Health
nm	Nautical Mile
nm^2	Square Nautical Miles
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NORPAC	NOAA Fisheries Observer Database
NPAFC	North Pacific Anadromous Fish Commission
NPFMC	North Pacific Fishery Management Council
NPFVOA	North Pacific Fishing Vessel Owner's Association
NPI	North Pacific Index
NPO	North Pacific Ocean
NPOA	National Plan of Action
NPRB	North Pacific Research Board
NRC	National Research Council
NS&T	National Status and Trends Program
NSEDC	Norton Sound Economic Development Corporation

ACRONYMS AND ABBREVIATIONS (Cont.)

NSG	National Standard Guidelines
NTE	Not To Exceed
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OFL	Overfishing Level
OMB	Office of Management and Budget
OPA	Oil Pollution Act
ORCO	Oregon Coast
OSCURS	Ocean Surface Current Simulations
OY	Optimum Yield
PA	Preferred Alternative
PBR	Potential Biological Removal
PCB	Polychlorinated Biphenyl
PCC	Pollock Conservation Cooperative
PCOD	Pacific Cod
P-CP	Pot Catcher Processor
PCV	Pot Catcher Vessel
PFMC	Pacific Fishery Management Council
PICES	North Pacific Marine Science Organization
PLCK	Pollock
POP	Pacific Ocean Perch
PRA	Paperwork Reduction Act
PRD	Protected Resources Division
PRR	Product Recovery Rate
PSC	Prohibited Species Catch
PSG	Pacific Seabird Group
PSMFC	Pacific States Marine Fisheries Commission
PSR	Pelagic Shelf Rockfish
psu	Practical Salinity Unit
PWS	Prince William Sound
QA	Qualitative Analysis
RACE	Resource Assessment and Conservation Engineering
RD	Regional Direction
RFA	Regulatory Flexibility Act
RFMC	Regional Fishery Management Council
RIR	Regulatory Impact Review
ROD	Record of Decision
RPA	Reasonable and Prudent Alternative
RPN	Relative Population Number
RPW	Relative Population Weight
R/V	Research Vessel
S-	Significantly Adverse
S+	Significantly Beneficial
SAFE	Stock Assessment and Fishery Evaluation
SC-SP	Southcentral Alaska Shore Plant
SEBSCC	Southeast Bering Sea Carrying Capacity
SEIS	Supplemental Environmental Impact Statement

ACRONYMS AND ABBREVIATIONS (Cont.)

SEO	Southeast Outside
SE-SP	Southeast Alaska Shore Plant
SFA	Sustainable Fisheries Act
SIAWG	Seabird Inter-Agency Working Group
SoC	Secretary of Commerce
SP	Shore Plant
SPELR	Shoreside Processor Electronic Logbook Report
SPR	Spawning Biomass Per-Recruit
SSC	Scientific and Statistical Committee
SSL	Steller Sea Lion
ST-CP	Surimi Trawl Catcher Processor
STWG	Seabird Technical Working Group
TAC	Total Allowable Catch
TALFF	Total Allowable Level of Foreign Fishing
TCV	Trawl Catcher Vessel
U	Unknown
UL	Upper Limit
U.S.	United States
USGS	U.S. Geological Survey
U.S.S.R.	Union of Soviet Socialist Republics (Soviet Union)
USC	United States Code
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS/BRD	U.S. Geological Survey/Biological Resource Division
VDE	Voluntary Dockside Examination
VIP	Vessel Incentive Program
VMP	Vessel Monitoring Program
VMS	Vessel Monitoring System
W	West
WAIW	Washington Inland Waters
WG	Western Gulf of Alaska
WPR	Weekly Production Report
WSGP	Washington Sea Grant Program
YDFDA	Yukon Delta Fisheries Development Association

GLOSSARY

abiotic: not living.

acceptable biological catch (ABC): the range of allowable catch for a species or species group set by a scientific calculation of the sustainable harvest level of a fishery; a target reference point that management aims to achieve.

advection: horizontal or vertical movement of a mass of fluid, i.e. air or ocean current.

advisory panel (AP): a group of people appointed by a fisheries management agency to review information and give advice. Members are usually not scientists, but most are familiar with the fishing industry or a particular fishery.

alcids: small birds that fly with rapid wing beats and use their wings to swim underwater.

Alaska Coastal Current: a persistent flow of buoyant water circumscribing the inner shelf of the Gulf of Alaska shelf over 2000 km from its origin in the southeastern Gulf of Alaska to where it enters the Bering Sea in the southwestern gulf.

Alaska Current: the shallow, highly variable, eastern limb of the counterclockwise-flowing subpolar gyre in the North Pacific

Alaska Stream: the steady, swift current that flows westward approximately 150 km from the coast and reaches to the ocean floor.

albedo: the fraction of light radiation that is reflected by a body, as the moon or a cloud.

alkanes: any of numerous saturated, non-aromatic hydrocarbons; any of a series of open-chain hydrocarbons such as methane and butane.

American Fisheries Act (AFA): enacted 1998, this act requires the determination of whether vessels of 100 feet or greater in registered length comply with the new ownership, control and financing requirements imposed, thereby demonstrating eligibility to receive a fishing endorsement.

amphipods: small crustaceans with flat bodies.

anadromous: fish that migrate from saltwater to fresh water to spawn.

anal fin: the fin that lies behind the anus, usually on the back half of the fish.

annelids: long, segmented invertebrates that have a coelom. (e.g., earthworms, various marine worms, and leeches).

anomalous: inconsistent with or deviating from what is usual, normal, or expected.

anoxic: oxygen deficient.

anthropogenic: of or relating to the study of the origins and development of human beings.

anthozoans: sessile marine coelenterates including solitary and colonial polyps; the medusoid phase is entirely suppressed.

apex feeders: those who feed at the top of the food chain.

appendicularia: free-swimming tadpole-shaped tunicate resembling larvae of other tunicates.

aromatic hydrocarbons: a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances.

arthropods: invertebrate animals such as crabs that have segmented bodies and jointed appendages, and an exoskeleton.

austral winter: winter in the southern hemisphere.

avian: pertaining to or characteristic of birds.

avifauna: the birds of a region or environment.

B: see *biomass*.

B_0: biomass at the starting point of a population at its original or pristine level.

B_{MSY}: the average biomass that would be achieved if fishing continued at a constant fishing mortality rate resulting in the maximum sustainable yield.

barnacle: a marine crustacean with feathery appendages for gathering food, free-swimming as larvae but permanently fixed (as to rocks, boat hulls, etc.) as an adult.

baroclinic: a state in which water surfaces of equal density are influenced by those of equal pressure.

barotropic: a water state in which surfaces of pressure and density coincide at all levels; depth-independent circulation due to changes in surface elevation.

basal metabolic rate: the rate at which heat is given off by an organism at complete rest.

bathyal: refers to organisms or phenomena at depths between 200 & 4000 meters, on the sea bottom; often coincident with the continental slope.

Bathylagidae: Family of fishes in the Class: Actinopterygii; distribution includes the Atlantic, Indian and Pacific Oceans. Physical characteristics include: Adipose fin may be present or absent.

bathylagids: deep-sea smelts.

bathymetric: water depth measurement.

benthic: portion of the marine environment inhabited by marine organisms that live permanently in or on the bottom.

benthic substrate: the base on which an organism lives.

benthypelagic: suspended in the water column near the bottom.

benthos: organisms that live on or in the bottom of a body of water.

Bering Sea Gyre: a barotropic, counterclockwise gyre of the Aleutian Basin.

Bering Slope Current: a counter-clockwise flow with an eastern boundary current at the shelf edge

biennial: occurring every second year.

bioaccumulation: an increase in the concentration of a chemical in a biological organism over time, compared to the chemical's concentration in the environment.

biogenic: produced by living organisms.

biomarker: a distinctive usually biochemical indicator of a biological or geochemical process or event.

biomass (*B*): amount of living matter per unit of water surface or volume expressed in unit weight .

biota: all the plant and animal life of a particular region.

biotic: living or related to living units.

biphenyls: a white crystalline hydrocarbon used especially as a heat-transfer medium ($C_6H_5 \cdot C_6H_5$.)

bivalve: having a shell composed of two valves.

boreal: of or located in northern regions.

brash ice: floating ice found between the year's first ice floes and made up of fragments from other ice forms.

bryozoan: one of a phylum of minute, mostly colonial aquatic animals, with body walls often hardened by calcium carbonate and growing attached to aquatic plants, rocks and other firm surfaces.

butyltins: organic tin compounds in either single, double, or triple forms and used to inhibit the growth of unwanted organism such as bacteria, algae, and barnacles.

bycatch: harvested species other than that for which the fishing gear was set. Also called *incidental catch*, bycatch is sometimes kept for sale (does not include fish released alive under a recreational catch-and-release program).

°C: degrees Celsius.

calanoid (e.g., copepod): large copepod easily recognized by its longer-than-body antennae.

California Current: the eastern limb of the clockwise flowing subtropical gyre in the North Pacific.

cannibalistic: the eating of the flesh of an animal by another animal of the same kind.

caprellid: a species of amphipods commonly known as skeleton shrimp.

carapace: a bony case or shield covering the back or part of the back of an animal as a turtle or crab.

caridean: a group belonging to the crustaceans, commonly known as shrimp.

carrion: dead flesh that is unfit for food.

cartilaginous: composed of cartilage.

catch: the total number or poundage of fish captured from an area over some period of time, including fish that are caught but released or discarded instead of being landed.

catch per unit of effort (CPUE): the quantity of fish caught with one standard unit of fishing effort; e.g. the combination of gear type, gear size, and length of time gear is used. Also used as a measurement of relative abundance for a particular fish.

caudal: at the hind or tail end of the body.

caudal fin: the terminal fin, or tail, of a fish.

caveat: an explanation to prevent misinterpretation.

central Pacific Gyre: this gyre is bordered by the southern flowing, cold water California current which runs into the western moving, warm water North Equatorial Current. The North Equatorial Current moves north with the Philippines Current and then northeast into the Kuroshio Current. West winds push the North Pacific current east where it divides at the North American continental plate to form the Alaska Current to the north (part of the North Pacific gyre) and the California Current to the south. This is a clockwise moving gyre.

cessation: end, cease, stop.

cetaceans: aquatic, mostly marine, mammals including whales, dolphins, porpoises, and others that have a torpedo shaped, nearly hairless body, paddle-shaped forelimbs, no hind limbs, one or two nares opening externally at the top of the head, and a flat tail for locomotion.

chaetognath: small free-swimming marine worms with movable curved chaetae on either side of the mouth.

chlordane: a highly chlorinated viscous volatile liquid insecticide ($C_{10}H_6Cl_8$).

chrysene: one of the polycyclic aromatic hydrocarbon compounds formed when gasoline, garbage, or any animal or plant material burns. Usually found in smoke and soot, this chemical combines with dust particles in the air and is carried into water and soil and onto crops.

circumpolar: constantly visible above the horizon.

cladoceran: minute chiefly freshwater branchiopod crustaceans that includes the water fleas.

coastal lowland: a narrow strip of relatively low ground between the sea and the cliffs leading to the plateau with a climate wetter than that of the plateau; with fewer temperature extremes it is more subject to fog.

GLOSSARY (Cont.)

coastal runoff: land-based pollution, i.e., chemicals and other contaminants that make their way into coastal waters.

coccolithophorid: the unicellular marine plant plankton with a calcareous skeleton that form the base of the food chain.

community development quota (CDQ): a federal fisheries program that involves coalitions of communities who have formed six regional organizations. The program allocates a portion of the Bering Sea and Aleutian Island harvest amounts to groups.

concomitant: accompanying, especially in a subordinate or incidental way.

congener: a member of the same taxonomic genus as another plant or animal; something resembling another in nature or action.

continental shelf: a shallow submarine plain of varying width forming a border to a continent and typically ending in a steep slope to the ocean floor.

continental slope: the usually steep slope from a continental shelf to the ocean floor.

control rule: describes a variable over which management has some direct control as a function of some other variable(s) related to the status of the stock.

copepods: a group of small crustaceans, some free-swimming and some parasitic on fish gills or skin.

cottid: member of the family Cottidae, which includes sculpin and bullhead.

covariance: the expected value of the product of the deviations of two random variables from their respective means.

crangonid shrimp: commonly called bay shrimp; there are three species in the Family Crangonidae.

critical habitat: a specific area that is necessary for preservation of a threatened or endangered species that may require special protection or management.

crustacean: a group of freshwater and saltwater animals having no backbone, with jointed legs and a hard shell made of chitin.

ctenophore: marine animals superficially resembling jellyfishes but having biradial symmetry and swimming by means of eight meridional bands of transverse ciliated plates.

cumacea: an order of marine crustacea, mostly of small size.

cycloalkanes: alkanes in which at least one of the continuous carbon chains is linked back on to itself in the form of a ring.

davit: a crane that projects over the side of a ship or hatchway and is used for boats, anchors, or cargo.

decapod: crustaceans with five pairs of thoracic appendages one or more of which are modified into pincers, with stalked eyes, and with the head and thorax fused into a cephalothorax and covered by a carapace; cephalopod mollusks with 10 arms.

deep water basin: a collection of water so deep that surface waves are little affected by the ocean bottom; generally characterized as water deeper than one-half the surface wavelength.

demersal: living near the bottom of a water body.

density-dependent mortality: increased risk of death associated with increased population density.

denticulate: fine toothed or serrated.

depredation: to lay waste; to plunder.

depth strata: (also known as depth zone) any of one of the four oceanic environments: the littoral, neritic, bathyal and abyssal zones.

detritus: loose material (organic particles) resulting from disintegration.

diatoms: minute planktonic unicellular or colonial algae with silicified skeletons.

dibenzothiophenes: a polynuclear aromatic hydrocarbon; an environmental hazard.

dinoflagellate: chiefly marine phytoplanktonic, usually solitary unicellular flagellates that include luminescent forms and forms that cause red tide.

diurnal: having a daily cycle; occurring in the daytime.

domestic annual harvest (DAH): the domestic annual fishing capacity, modified by other factors (such as economic factors), which will determine estimates of what fishing fleets will harvest.

domestic annual processing (DAP): the amount that will be domestically processed, based not only on physical capacity but on a demonstrated intent and the effects of domestic harvesting, markets, and other fisheries.

donut hole: an area which encompasses approximately 48,000 square miles and comprises 19 percent of the Aleutian Basin or 10 percent of the entire Bering Sea area where the stocks being fished are suspected to straddle or move back and forth across the open area and an area of regulated national jurisdiction.

dorsal: the back of the body.

dorsal fin rays: cartilaginous structures within the dorsal fin.

downwelling: a circulation pattern in which warmer surface waters move down in the water column.

echinoderms: marine animals including starfishes, sea urchins, and related forms.

Echiuroid worm: marine worms that have sensitive but non-retractable proboscis above the mouth.

GLOSSARY (Cont.)

ecosystem: the community of living creatures occurring in an environment.

El Niño Southern Oscillation: an interannual disturbance of the climate system characterized by a periodic weakening of the tradewinds and warming of the surface layers in the equatorial Pacific Ocean every 4 to 7 years.

embayment: a small bay or semi-enclosed coastal water body whose opening to a larger water body is restricted.

endemic: native to a particular country; characteristic of or prevalent in a particular environment.

endocrine system: the system of glands/organs capable of secreting hormones which provide communication in the body

epibenthic: living on the surface of bottom sediments in a water body.

epifauna: invertebrates living on to of the sediment of the seafloor.

epipelagic: the zone of the ocean into which enough light penetrates for photosynthesis.

errantiate: form of the word "errant" meaning to move or wander, usually an irregular motion.

escarpment: a long cliff or steep slope separating two comparatively level or more gently sloping surfaces and resulting from erosion or faulting.

estuary(ies): a water passage where the tide meets a river current.

eunicid: a family belonging the to the Polychaetes, characterized by having up to five antennae and pincher-like jaw maxilla.

euphausiid: small, pelagic, shrimp-like crustaceans, e.g., krill.

euphotic: constituting the upper layers of a body of water where sufficient light penetrates to permit green plant growth.

ex-vessel: activities that occur when a commercial fishing boat lands or unloads a catch.

exclusive economic zone (EEZ): a zone under national jurisdiction (up to 200-nautical miles wide) within which the coastal State has the right to explore, and the responsibility to conserve and manage, the living and non-living resources.

exogenous: due to external causes; not arising within the organism.

extrapolate: to infer (values of a variable in an unobserved interval) from values within an already observed interval.

extrude: to force out.

F_{MSY}: a continuous fishing mortality rate that results in the maximum sustainable yield.

$F_{\%SPR}$: the fishing mortality rate associated with a stable spawning per recruit level equal to X% of the spawning per recruit level at equilibrium when no fishing has occurred.

faunal: being animal life.

fecundity: the measure of the egg-producing ability of a fish..

filter feeder: an animal that obtains food by filtering organic matter or minute organisms from a current of water passing through some part of its system.

fishery: as defined by the Magnuson-Stevens Fishery and Conservation Act, a fishery is one or more stocks of fish that can be treated as a unit for purposes of conservation and management and that are identified on the basis of geographic, scientific, technical, recreational, or economic characteristics.

fishery management plan (FMP): a plan developed by a regional fishery management council, or by the U.S. Secretary of Commerce, to manage a fishery resource to achieve specified management goals.

fishing mortality rate (F): a measurement of the rate of removal of fish from a population by fishing. Expressed as either "annual" or "instantaneous rates;" annual mortality if the percentage of fish dying in one year while instantaneous mortality is the percentage of fish dying at any one time.

fjord: a narrow inlet between cliffs or steep slopes.

fledge: to rear until ready for flight or independent activity.

foraminiferan: marine protozoans usually having calcareous shells that are perforated with minute holes for protrusion of slender locomotors or food gatherers.

forage fish: any fish eaten by larger predatory fish, seabirds, or marine mammals, usually swimming in large schools.

fossil fuel: a fuel (as coal, oil, or natural gas) that is formed in the earth from plant or animal remains.

fry: recently hatched or juvenile fish.

gadoid fish: resembling or related to the cods.

gammarid: a family belonging to the amphipods

gastropods: a large group of mollusks including the snails.

genus (plural, genera): a class or group marked by common characteristics.

gladius: the internal shell, or pen, of cephalopods like squid.

glaucous: of a pale yellow-green or a light bluish-gray or bluish-white color.

gorgonian: an anthozoan with a horny and branching axial skeleton.

gradient: the rate of regular or graded ascent or descent; part sloping upward or downward; change in the value of a quantity (temperature, pressure, or concentration) with change in a given variable.

greenhouse gases: gases that contribute to the greenhouse effect by trapping heat within the earth's atmosphere. The chief greenhouse gases are carbon dioxide and water vapor. Other potentially important trace gases are chlorofluorocarbons, methane, ozone, and nitrous oxide.

gregarious: tending to associate with others of one's kind.

groundfish: a species or group of fish that lives most of its life on or near the sea bottom.

guild: a group of species that utilize the same kinds of resources, such as food, nesting sites, or places to live, in a similar manner.

guild diversity: the variation in the number of species that share a common food source.

gyre: a giant circular oceanic surface current.

halocline: a usually vertical gradient in salinity.

harpacticoid copepods: minute crustaceans, often long and cylindrical in shape.

harvest: the total number or poundage of fish caught and kept from an area over a period of time.

holoplanktonic: living in the water column.

harpacticoid: a family belonging to the copepods.

haulout: a resting place.

hydroacoustic: sound waves bounced off the ocean floor.

hydrocarbon: an organic compound containing only carbon and hydrogen and often occurring in petroleum, natural gas, coal, and bitumens.

hydroid: of or relating to a hydrozoan; especially resembling a typical hydra.

hyperiid: a family belonging to the amphipods.

ichthyoplankton: fish eggs or larvae.

incidental catch: see *bycatch*.

indigenous: having originated or naturally occurring in a particular region or environment.

individual fishing quota (IFQ): a federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person.

infauna: invertebrates living in the sediment of the seafloor.

inflow: the flowing in [of air].

in situ: in the natural or original position or place.

instantaneous mortality: see *natural mortality*.

intertidal: relating to or being the part of the littoral zone above low-tide mark.

intra-annual: occurring during or within a year time span.

invertebrate: any animal lacking a spinal column.

isobath: a line of a map passing through all points of equal depth below water.

isomer: one of two or more compounds or ions that contain the same number of atoms of the same elements but differ in structural arrangement and properties.

isopod: a small crustacean with attached eyes and a body composed of seven free thoracic segments each bearing a pair of similar legs.

isotope: two or more species of atoms in a chemical element with the same atomic number and nearly identical chemical behavior but with differing atomic masses and different physical properties.

juvenile: a young fish or animal that has not reached sexual maturity.

kamaboke: white fish filleted and pounded into a paste.

Kamchatka Current: a current which brings water southward from the Bering Sea, where it is associated with the quasi-permanent anticyclonic eddies found close to the western shore.

kinetic energy: energy associated with motion.

kirimi: a fish processing style in which the head and tail are taken off and the guts are left in the fish.

landings: the number or poundage of fish unloaded at a dock by commercial fishermen or brought to shore by recreational fishermen for personal use.

larvaceans: small transparent animals found in marine plankton, e.g., tunicates

License Limitation Program (LLP): a limited access program intended to limit participation in the groundfish fisheries in the Gulf of Alaska and the Bering Sea and Aleutian Islands federal management areas and Bering Sea and Aleutian Islands crab fisheries based on past documented harvests made by each fishermen.

limit reference points: limits (e.g., OFL, MFMT) established by management to be avoided, constrains harvests so that the stock remains within safe biological limits.

littoral: of, relating to, or situated or growing on or near a shore. Or, a coastal region, especially the shore zone between high and low watermarks.

M: see *natural mortality*.

macrofauna: small to moderate sized invertebrates living on and in bottom sediments.

macrozooplankton: large, thick, or exceptionally prominent animal life of the plankton.

Magnuson-Stevens Fishery Conservation and Management Act: a federal law that created the regional councils and is the federal government's bases of fisheries management in the EEZ (U.S. Public Law 94-265, as amended through October 11, 1996).

marine mammal: animals that live in marine waters and breathe air directly, i.e., sea lions, porpoises, whales, and seals.

maximum fishing mortality threshold (MFMT): standard determination criteria for determining if overfishing is occurring within a stock; equivalent to OFL in the BSAI and GOA FMPs.

maximum sustainable yield (MSY): the largest average catch or yield that can continuously be taken from a stock under average environmental conditions.

medusae: jellyfish.

meiofauna: benthic animals that can fit a mesh size of 1 millimeter and be retained on a mesh size of 42 micrometers.

Meridional thermal gradient: the vertical (north-south) flow of water of which the surface is made up of warm waters underlain by deep cold waters.

mesopelagic region: relating to oceanic depths from about 600 feet to 3000 feet (200 to 1000 meters).

metabolite: substances which are required as basic raw materials for vital processes, such as glucose in respiration and other metabolic pathways.

meteorological regime: circulation air mass.

metric ton: 2,204.62 pounds.

microflora: minute plants not seeable with the naked eye.

micronekton: microscopic free-swimming aquatic animals that move independent of wave and current action.

millimeter (mm): ½5 of an inch.

milt: the sperm-containing fluid of a male fish.

minimum stock size threshold (MSST):a standard determination criteria used for determining when a stock is in a overfished condition; usually measured in terms of spawning biomass.

mollusk: an invertebrate animal with a soft unsegmented body usually with one or two hard shells made of calcium carbonate.

molt: to periodically shed hair, feathers, shell, horns, or other outer layer.

morphological: an organisms form and structure.

MSY control rule: a harvest strategy that results in a long-term average catch approximating MSY, enables the use of proxies.

multispecies perspective: a management theory that recognizes the interactions between organisms, for example: predator-prey relationships.

munid crabs: crustaceans belonging to the Family Galathoidae.

myctophids: members of the Family Myctophidae.

Myctophidae: deep sea fishes comprising the lantern fishes.

mysids: small, shrimp-like marine crustaceans, the females of which carry their eggs in a pouch beneath the thorax.

naphthalene: a crystalline aromatic hydrocarbon ($C_{10}H_8$) usually obtained by distillation of coal tar and used especially in organic synthesis.

natal area: area associated with birth.

National Standard Guidelines: seven FMP guidelines and standards required by MSFCMA to identify the nation's interest in fish management.

natural mortality rate (*M*): a measurement of fish deaths from all causes other than fishing such as predation, disease, starvation, and pollution.

nauplius (plural, nauplii): a crustacean larva usually in the first stage after leaving the egg and with three pairs of appendages, a median eye, and little or no segmentation.

nautical mile: 6,076.115 feet or 1,852 meters.

near-shore eddy(ies): inshore waters that run contrary to the current.

Near Strait Inflow: the primary source of inflow in the Bering Sea.

necropsy: an examination of an organism after death to determine the cause of death or the character and extent of changes caused by disease.

necrotic: localized death of living tissue.

nematode: elongated cylindrical worms parasitic in animals or plants or free-living in soil or water.

neoplasia: formation of tumors

neritic: region of shallow water adjoining the seacoast.

nocturnal: active at night.

nodal: being or located at or near a node. In a tide area, the point about which the tide oscillates and where there is little or no rise and fall of the tide.

Nor'eastern: a trawl constructed with polyethylene mesh and outfitted with other types of footropes for the Gulf of Alaska, the Aleutian Islands, and the Pacific West Coast shelf surveys, has a 27.2 meter headrope, and a 37.4 meter footrope; the body is 127 millimeter stretched mesh and the codend is 89 millimeter stretched mesh with a 32 millimeter stretched mesh codend liner; floats along the headrope hold the net open vertically.

North Pacific Index: the area-weighted sea level pressure over the North Pacific in the region 30°N to 65°N, 160°E to 140°W.

nuclide: species of atom characterized by the constitution of its nucleus and hence by the number of protons, the number of neutrons, and the energy content.

σ_t: a measure of the density of water, at its current pressure, if it were raised to the surface.

Ocean Current simulations model: ocean simulations models may input climate data, ocean circulation, sea-ice, temperature gradient, nutrient gradient, anthropogenic events and large climatic events (e.g. ENSO) among other information to better understand how the ocean works and predict weather events and possible human impacts on ocean systems (among other uses).

oceanographic: pertaining to the ocean.

offal: the waste or by-product of a process; debris, garbage, etc.

oikopleura: a small pelagic tunicate at the basis of the chordate phylum; larvaceans.

ommatidia: the structural elements forming the compound eye of arthropods, insects, etc.

omnivorous: feeding on both animals and vegetables.

ontogeny: the development or course of development of an individual organism.

onuphid: beachworm; a member of the family Onuphidae

optimum yield (OY): the harvest level for a species that achieves the greatest overall benefits, including economic, social, and biological considerations.

ostracods: very small, active, mostly freshwater crustaceans that have the body enclosed in a bivalve shell, the body segmentation hidden, the abdomen rudimentary, and only seven pairs of appendages.

overfished: a stock or stock complex whose size is sufficiently small that a change in management practices is required in order to achieve an appropriate level and rate of rebuilding; a stock is determined to be overfished when it is below the minimum stock size threshold.

overfishing: a rate or level of fishing greater than that which will meet the management goal and that jeopardizes the capacity of a fishery to produce the largest average catch or yield that can continuously be taken under average environmental conditions on a continuing basis.

overfishing level (OFL): a fishing rate that reduces the level of spawning biomass per recruit to some percentage of its original, pristine level; a limit reference point that management seeks to avoid.

overwintering: surviving the winter.

ovoviviparous: producing eggs that develop within the maternal body and hatch within or hatch immediately after being pushed out from the parent.

Pacific decadal oscillations: an El Niño-like pattern (see previous) of Pacific climate variability and persisting for 20 to 30 years with climatic fingerprints most visible in the North Pacific/North American sector.

panmictic: mating randomly.

parturition: the action of giving birth to offspring.

pelagic: refers to fish and animals who live in the open sea, away from the sea bottom.

per capita: per unit of population.

perylene: an organic molecule consisting of 20 carbon atoms and 12 hydrogen atoms arranged as five benzene-like rings connected to each other in a plane.

phenanthrenes: a crystalline aromatic hydrocarbon ($C_{14}H_{10}$) of coal tar isomeric with anthracene.

phyla: primary division of the animal kingdom.

phytoplankton: planktonic plant life.

pinniped: an aquatic carnivorous animal with all four limbs modified into flippers.

piscivorous: feeding on fishes.

planktivorus: feeding on plankton.

plankton: the passively floating or weak swimming animal and plant life of a body of water.

planktonic: of or relating to plankton

pleuronectid: pertaining to the flounder family.

polychaete: chiefly marine annelid worms, i.e., clam worms, usually with paired segmental appendages, separate sexes, and a free-swimming trochophore larva.

polychlorinated: PCB - any of several compounds that are produced by replacing hydrogen atoms in biphenyl with chlorine, have various industrial applications, and are poisonous environmental pollutants which tend to accumulate in animal tissues.

polycyclic: having more than one cyclic component, i.e. having two or more rings in the molecule.

polynias: see polynyas.

polynya(s): open water in sea ice.

population: fish of the same species inhabiting a specified area grouped together for management purposes.

predation: the act of preying or plundering; a mode of life in which food is primarily obtained by the killing and consuming of animals.

pre-neoplastic: pre-malignant.

probability density function: a statistical distribution; used in deriving overfishing limits and acceptable biological catch.

procellarid: one of a family of oceanic birds (Procellarid[ae]) including the petrels, fulmars, and shearwaters.

procellariiformes: tube-nosed swimmers, fulmars and albatrosses.

prohibited species catch (PSC): in applicable Bycatch Limitation Zones of the Bering Sea subarea - limits specified for red king crab, Chionoecetes bairdi Tanner crab, and C. opilio crab; throughout the BSAI - limits specified for Pacific halibut and Pacific herring. Regulations authorize the apportionment of each limit into allowances for specified fishery categories. Seven-and-a-half percent of each limit specified for halibut, crab, and salmon is reserved as a quota for use by the CDQ program.

protease: any of numerous enzymes that hydrolyze proteins.

protobranch: a gill structure occurring in bivalves in which gills are small and leaf like with the unmodified appearance occurring in primitive groups.

protozoan: minute cell-less or one-celled animals that often have complex life cycles and frequently are serious parasites to humans and other animals.

protracted spawning: a longer spawning period.

proxy: a substitution; something that is authorized to act in place of another.

pterpods: small mollusks that expand the front lobes of the foot into thin wing-like organs with which they swim.

pyrogenic: caused by or generating heat.

pteropod: holoplanktonic molluscs belonging to the orders of Thecosomata and Gymnosomata. The species have in common that the original foot has developed into a pair of 'wings' (parapodia), increasing the animals' buoyancy and locomotion capacity.

pycnocline: a layer in the water column separating two areas of different density.

quota: the maximum number of fish that can be legally landed in a time period.

radiolarian: spherical marine protozoans having radiating threadlike protrusions for locomotion or food gathering and often a siliceous skeleton of spicules.

radionuclide: a radioactive nuclide.

rebuilding plan: a plan that is designed to recover stocks when they are overfished.

recruit: an individual fish that has moved into a certain class, such as the spawning class or fishing-size class.

recruitment: a measure of the weight or number of fish that can enter a defined portion of stock, such as the fishable stock or the spawning stock, during some time period.

reef: a chain of rocks or coral or a ridge of sand at or near the surface of water or within a depth of 20 meters from the surface..

reference points: limits or values that are used to guide management decisions.

regime shift: a transition from one climactic state to another within a period substantially shorter than the lengths of the individual epochs of each of the two climatic states.

regulatory impact review (RIR): the part of a federal fishery management plan that describes the impacts resulting from the plan.

rip (also tide rip): agitation of water caused by the meeting of currents or by a rapid current setting over an irregular bottom. Termed tide rip when a tidal current is involved.

risk averse: avoiding risk.

roe: the eggs of a fish especially when still enclosed in the ovarian membrane.

rookery: the nest, haunt, or breeding ground of a colony, especially of gregarious birds or mammals.

salpa: a transparent barrel-shaped or fusiform free-swimming tunicate that is abundant in warm seas.

satiation: full or excessive satisfaction.

seamount: elevation rising 1000 meters or more from the sea floor and of limited extent across the summit.

sediment: matter that settles to the bottom; material deposited by water, wind, or glaciers.

serpulid: a small marine annelid worm which build limey tubes on stones and seaweed and extends a crown of tentacles to feed.

semidemersal: semi-bottom-dwelling.

sessile: permanently attached at the base or foot.

sideboard measures: constraints imposed on a directed fishery that restrict its participation in other directed fisheries.

sill fjord: natural rock barriers occurring at the mouth of a fjord and delineating the extent of the progress of the glacier that carved the fjord.

siphonophores: compound free-swimming or floating pelagic hydrozoans that are mostly delicate, transparent, and colored and have specialized zooids.

spatial dispersion: a movement over space or area.

spawning per recruit (SPR): amount of spawning biomass at a instantaneous fishing mortality rate, influenced by other values including growth, maturity, natural mortality and partial recruitment.

spermatheca: a sac for sperm storage in the female reproductive tract of many lower animals.

spermatophore: a capsule, packet, or mass enclosing spermatozoa extruded by the male and conveyed to the female in insemination.

standard determination criteria: criteria (e.g., MSST, MFMT) used to determine if a stock is in a overfished state, according to the National Standard Guidelines.

stalked ascidians: sea tulips.

steranes: organic molecules with 26 to 30 carbon atoms arranged in four rings.

stock or stock complex: a grouping of fish usually based on genetic relationship, geographic distribution, and movement patterns.

stock assessment: a means of estimating fish numbers and predicting how fish populations will respond to harvesting.

Stock Assessment and Fishery Evaluation Report (SAFE): a report that provides a summary of the most recent biological condition of a stock of fish as well as the economic and social condition of the recreational fishermen, commercial fishermen, and seafood processors who use the fish. It is used to determine harvest levels.

stratum: a sheet like mass of sedimentary rock or earth of one kind lying between beds of other kinds; a region of the sea or atmosphere that is analogous to a stratum of the earth.

subarctic: characteristic of, or being regions immediately outside of the arctic circle or regions similar to these in climate or conditions of life.

Subarctic Current: the current which flows eastward from the western Rim of the Pacific Ocean.

sublittoral: benthic region extending from mean low water to a depth of about 200 meters or to the edge of the continental shelf. Situated, occurring, or formed on the aquatic side of a shoreline or littoral zone.

subtidal: the zone that is permanently flooded by tidal water.

surimi: fish product made from inexpensive whitefish and often processed to resemble more expensive seafood (i.e., crabmeat).

Sustainable Fisheries Act (SFA): an amendment to the Magnuson-Stevens Fishery Conservation and Management Act which includes numerous provisions requiring science, management, and conservation action by NMFS.

target reference points: limits and benchmarks (e.g., ABC) to be achieved, but not exceeded, by management.

taxa: a category or group of related organisms.

taxonomic: classification of plants and animals according to their presumed natural relationships.

telemetry: the science of automatic data measurement and transmission of data.

teleost: a group consisting of fishes with bony skeletons and rayed fins.

temperate: marked by moderation; not extreme or excessive.

terrestrial: of or related to earth and its inhabitants.

terrigenous: relating to oceanic sediment derived directly from destruction of surface rock.

thermal stratification: horizontal layers of differing densities produced in a lake by temperature changes at different depths.

thermocline: the region in a thermally stratified body of water which separates warmer oxygen-rich surface water from colder oxygen-poor deep water and in which temperature decreases rapidly with depth.

thermoregulation: the maintenance or regulation of temperature, i.e., body temperature.

tide rip: see *rip*.

Tier: each stock or stock complex is categorized into a certain "tier" or level based on the amount of information available for the given stock or stock complex. From these tiers, certain limits are derived using mathematical equations.

tintinnid: marine plankton

topography: the configuration of an earth surface including its relief and the position of its natural and man-made features.

total allowable catch (TAC): the annual recommended catch for a species or species group. Set from the range of acceptable allowable catch.

Total Allowable Level of Foreign Fishing (TALFF): that portion of the optimum yield which will not be harvested by domestic vessels. The foreign allowable catch is determined by deducting the expected domestic annual harvest and reserve from the optimum yield (TALFF = OY- [DAH + reserve]).

triennial: occurring every three years.

triterpanes: pentacyclic biological marker hydrocarbons containing between 27 and 35 carbon atoms.

trophic: ecology of or involving the feeding habits or food relationship of different organisms in a food chain.

trophic level: a group of organisms that occupy the same position in a food chain.

trophic guild: a group of species which use similar resources (e.g. insectivorous birds are a trophic guild of birds that eat insects).

tunicate: marine chordate animals with a thick secreted covering layer, a greatly reduced nervous system, a heart able to reverse the direction of blood flow, and only in the larval stage a notochord.

turrid: a family of snails, now reclassified into several subfamilies.

ubiquitous: existing everywhere at the same time; constantly encountered.

μM: micrograms per liter.

uncertainty: a lack of perfect knowledge. Rosenberg and Restrepo (1994) identify five types of uncertainty: 1) measurement error, 2) process error, 3) model error, 4) estimation error, and 5) implementation error.

GLOSSARY (Cont.)

upwelling: the process by which water rises from a deeper to a shallower depth, usually as a result of offshore surface water flow; it is most prominent where persistent wind blows parallels to a coastline so that the resultant Ekman transport moves surface water away from the coast..

uterine cannibalism: while still in the mother's reproductive tract, the first hatchling eats either younger `hatchlings or unfertilized eggs to get nourishment.

vertebrate: having a spinal column.

vestigial: sign or evidence of some past thing.

viviparous: producing living young rather than eggs.

voracious: having a ravenous appetite.

vorticity: a swirling motion.

West Wind Drift: (also known as Antarctic Circumpolar Current) the ocean current from west to east through all the oceans around the Antarctic continent.

wind-stress curl: the plot of the energy transferred from the wind to the sea surface.

year-class: the fished spawned and hatched in a given year; a "generation" of fish.

young-of-the-year: fish or animals born in the past year, which have not yet reached one year of age.

zooplankton: plankton composed of animals.

Chapter 4 (continued)
Tables

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Table 4.7-1. Target species direct/indirect and cumulative effects significance ratings under Fishery Management Plans 3.1 and 3.2.

Direct/indirect effects	Effect	Pollock, Pacific cod, sablefish		BSAI Atka mackerel		GOA Atka mackerel		BSAI flatfish*		BSAI other flatfish		GOA flatfish*		GOA arrowtooth flounder		BSAI and GOA POP		GOA thornyhead rockfish		BSAI rockfish*		GOA rockfish*		GOA northern rockfish	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
Mortality	DI	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Change in biomass	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Spatial/ temporal concentration of catch - change in genetic structure	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Spatial/ temporal concentration of catch - change in reproductive success	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Change in prey availability	DI	I	I	I	I	I	I	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Change in habitat	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I

Notes: *BSAI flatfish - BSAI yellowfin sole, BSAI flathead sole, BSAI rock sole, BSAI arrowtooth flounder, BSAI Greenland turbot and BSAI Alaska plaice
*GOA flatfish - GOA shallow water flatfish, GOA flathead sole, GOA deep water flatfish and GOA rex sole
*BSAI rockfish - BSAI northern rockfish, BSAI shortraker/rougheye rockfish and BSAI other rockfish
*GOA rockfish - GOA shortraker/rougheye rockfish, GOA slope rockfish, GOA pelagic shelf rockfish and GOA demersal shelf rockfish
AI - Aleutian Islands
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
DI - direct/indirect effect
EBS - Eastern Bering Sea
GOA - Gulf of Alaska
I - insignificant
POP - Pacific ocean perch
U - unknown
Please refer to Table 4.1-1 for the significance criteria for target species.

Table 4.7-2 Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under Fishery Management Plans 3.1 and 3.2.

Direct/indirect effects	Effect	Pacific halibut		BSAI chinook and other salmon		GOA chinook		Other salmon		Pacific herring		Crab								Other species		Forage species		Non-specified species	
												BSAI crab*		GOA crab*		GOA red king		BSAI and GOA golden king						Grenadier	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
Mortality	DI	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	U	U	U	U	I	I	U	U
	CE	I	I	CS-	CS-	CS-	CS-	I	I	I	I	U	U	U	U	U	U	U	U	U	U	I	I	U	U
Change in biomass level	DI	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	I	I	U	U	I	I	U	U	U	U	U	U	U	U
	CE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in reproductive success	DI	I	I	U	U	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	CE	I	I	CS-	CS-	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in prey availability	DI	I	I	U	U	U	U	U	U	I	I	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
Change in habitat	DI	NA	NA	NA	NA	NA	NA	NA	NA	I	I	I	I	U	U	I	I	U	U	U	U	U	U	NA	NA
	CE	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Change in genetic structure	DI	NA	NA	U	U	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U
	CE	NA	NA	U	U	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U

Notes: *BSAI crab - BSAI bairdi Tanner, BSAI opilio Tanner, BSAI red king and BSAI blue king
*GOA crab - GOA bairdi Tanner and GOA blue king
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
CS- - conditionally significant negative/adverse
DI - direct/indirect effect
GOA - Gulf of Alaska
I - insignificant
NA - not applicable
U - unknown
Please refer to Table 4.1-1 for the significance criteria for Pacific halibut, Pacific herring, other species, forage fish species and non-specified species.
Please refer to Table 4.1-2 for the significance criteria for crab.
Please refer to Table 4.1-3 for the significance criteria for salmon.

Table 4.7-3. Habitat direct/indirect and cumulative effects significance ratings under Fishery Management Plans 3.1 and 3.2.

Direct/indirect effects	Effect	Bering Sea	Aleutian Islands	Gulf of Alaska	Bering Sea	Aleutian Islands	Gulf of Alaska
		3.1			3.2		
Changes to living habitat Direct mortality of benthic organisms	DI	I	I	I	I	S+	CS-
	CE	CS-	CS-	CS-	CS+/CS-	CS+/CS-	CS+/CS-
Changes to benthic community structure	DI	I	I	I	CS+	S+	I
	CE	CS-	CS-	CS-	CS+/CS-	CS+/CS-	CS+/CS-
Changes in distribution of fishing effort Geographic diversity of management measures	DI	I	I	I	S+	S+	I
	CE	CS-	CS-	CS-	CS+/CS-	CS+/CS-	CS+/CS-

Notes: CE - cumulative effect
CS- -conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
S- - significantly adverse
S+ - significantly beneficial
Refer to Table 4.1-4 for habitat significance criteria.

Table 4.7-4. Seabirds direct/indirect and cumulative effects significance ratings under Fishery Management Plans 3.1 and 3.2.

Direct/indirect effects	Effect	Short-tailed albatross		Other albatross		Shearwaters		Northern fulmar		Species of management concern*				Other piscivorous species*		Other planktivorous species*		Steller's eiders		Spectacled eiders	
										Red-legged kittiwakes		Murrelets									
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
Mortality (incidental take)	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NE	I
	CE	CS-	CS-	S-	S-	CS-	CS-	I	I	CS-	CS-	S-	S-	I	I	I	I	S-	S-	NE	S-
Availability of food	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NE	I
	CE	I	I	I	I	I	I	I	I	U	U	U	U	I	I	I	I	I	I	NE	I
Benthic habitat	DI	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	I	I	I	I	NE	NE	I	I	NE	I
	CE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	I	I	I	I	NE	NE	U	U	NE	U

Notes: *Other albatross and shearwaters - laysan and black-footed albatross,sooty and short-tailed shearwaters
*Other piscivorous species - alcids (except auklets), gulls, jaegers, terns, and cormorants
*Other planktivorous species - auklets and storm-petrels
*Species of management concern - red-legged kittiwake, marbled murrelet, and Kittlitz's murrelet
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
NE - no effect
S- - significantly adverse
U - unknown

Table 4.7-5. Marine mammals direct/indirect and cumulative effects significance ratings under Fishery Management Plans 3.1 and 3.2.

Direct/indirect effects	Effect	W. Steller sea lion		E. Steller sea lion		Northern fur seal		Harbor seal		Killer whale (transients)		Other pinnipeds *		Other toothed whales*		Baleen whales*		Sea otters	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
Mortality (incidental take and entanglement)	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	S-	S-	I	I	I	I	I	I	I	I	I	I	I	I	CS-[3]	CS-[3]	CS-	CS-
										S-[5]	S-[5]					I[4]	I[4]	I[6]	I[6]
Prey availability	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
												U[2]	U[2]						
	CE	CS-	CS-	I	I	CS-	CS-	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Spatial/temporal concentration of fisheries	DI	I	CS+	I	I	I	CS+	I	CS+	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS+	I	I	CS-	CS+	CS-	CS+	I	I	I	I	I	I	I	I	I	I
Disturbance	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Notes: [1] - Spotted, ringed, bearded and ribbon seals
[2] - Northern elephant seal
[3] - Fin, humpback and northern right whales
[4] - Minke, gray, bowhead, sei, and blue whales
[5] - The exception to this finding is the AT1 transient group in Prince William Sound. The cumulative effect of mortality for this group is significant adverse due to the past external events of the Exxon Valdez Oil Spill and subsequent decline.
[6] - Southcentral and southeast stocks are stable or increasing and the cumulative effect of mortality is not expected to effect stocks at the population-level.
*Baleen whales - blue whale, fin whale, sei whale, minke whale, humpback whale, gray whale, northern right whale, bowhead whale.
*Other Pinnipeds - Pacific walrus, spotted seal, bearded seal, ringed seal, ribbon seal, elephant seal
*Other Toothed Whales - sperm whales, beaked whales, white sided dolphin, beluga whale, harbor porpoise, Dall's porpoise.
CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
E - eastern population
I - insignificant
S- - significantly adverse
W - western population
U - unknown
Please refer to Table 4.1-6 for the significant criteria for marine mammals.

Table 4.7-6. Socioeconomics direct/indirect and cumulative effects significance ratings under Fishery Management Plans 3.1 and 3.2.

Harvesting and processing sectors

Direct/indirect effects	Effect	Catcher vessels		Catcher processors		Inshore processors and motherships	
		3.1	3.2	3.1	3.2	3.1	3.2
Groundfish landings by species group	DI	I/S+	I/S+/S-	I/S+	I/S+/S-	I/S+	I/S+/S-
	CE	I	I	I	I	I	I
Groundfish ex-vessel value	DI	I	I	NA	NA	NA	NA
	CE	I	I	NA	NA	NA	NA
Groundfish gross product value	DI	NA	NA	I	I	I	I/S-
	CE	NA	NA	I	I	I	I
Employment	DI	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Payments to labor	DI	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Product quality and product utilization rate	DI	NA	NA	CS+	S+/S-	CS+	S+/S-
	CE	NA	NA	CS+	S+/S-	CS+	S+/S-
Excess capacity	DI	CS+	S+	CS+	S+	CS+	S+
	CE	CS+	S+	CS+	S+	CS+	S+
Average costs	DI	CS+	S+/S-	CS+	S+/S-	CS+	S+/S-
	CE	CS+	S+/S-	CS+	S+/S-	CS+	S+/S-
Fishing vessel safety	DI	CS+	S+/S-	CS+	S+/S-	CS+	S+/S-
	CE	CS+	S+/S-	CS+	S+/S-	CS+	S+/S-

Bering Sea and Aleutian Islands and Gulf of Alaska regions

Direct/indirect effects	Effect	Alaska Peninsula and Aleutian Islands		Kodiak Island		Southcentral Alaska		Southeast Alaska		Washington inland waters		Oregon coast	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
In-region processing	DI	I	I	I	I	S+	I	I	S-	I	I	I	I
	CE	I	CS-	I	CS-	I	I	I	CS-	I	I	I	I
Regionally owned at-sea processors	DI	I	I	I	I	S+	I	S+	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I
Extra-regional deliveries of regionally owned catcher vessels	DI	I	S-	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	I	I	I	I	I	I	I	I	I	I
In-regional deliveries of regionally owned catcher vessels	DI	I	S-	I	I	S+	I	I	S-	I	I	I	I
	CE	CS-	CS-	I	I	I	I	I	CS-	I	I	I	I
Total direct, indirect, and induced labor income and full-time equivalents	DI	I	I	I	I	S+	I	I	S-	I	I	I	I
	CE	CS-	CS-	I	I	S+	I	I	S-	I	I	I	I

Table 4.7-6 (cont.). Socioeconomics direct/indirect and cumulative effects significance ratings under Fishery Management Plans 3.1 and 3.2.

Community Development Quota (CDQ) programs and Subsistence

Effect	Community Development Quota (CDQ) programs	
	3.1	3.2
DI	I	I
CE	I	I

Direct/indirect effects	Effect	Subsistence	
		3.1	3.2
Subsistence use of groundfish	DI	I	I
	CE	I	I
Subsistence use of western Alaska salmon and bycatch	DI	I	I
	CE	I	I
Subsistence use of Steller sea lions	DI	I	I
	CE	I	I
Indirect subsistence use: income and joint	DI	I	I
	CE	I	I

Environmental Justice

Effect	Alaska Peninsula and Aleutian Islands		Kodiak Island		Southcentral Alaska		Southeast Alaska		Washington inland waters		Oregon coast	
FMP	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
DI	I	CS-	I	I	I	I	I	I	I	I	I	I
CE	I	CS-	I	I	I	I	I	I	I	I	I	I

Market channels and non-consumptive and non-use benefits (the value of the Bering Sea and Aleutian Islands and Gulf of Alaska ecosystems)

Direct/indirect effects	Effect	Market channels	
		3.1	3.2
Benefits to U.S. consumers	DI	I	I
	CE	I	I

Direct/indirect effects	Effect	Non-consumptive and non-use benefits	
		3.1	3.2
Benefits derived from marine ecosystems and associated species	DI	I	S+
	CE	I	S+

Notes: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g. fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgement of the socioeconomic analysts.

CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
NA - not applicable
S+ - significantly beneficial
S- - significantly adverse
U - Unknown

Table 4.7-7 **Ecosystem direct/indirect and cumulative effects significance ratings under Fishery Management Plans 3.1 and 3.2.**

Direct/indirect effects	Effect	Ecosystem	
		3.1	3.2
Change in pelagic forage availability	DI	I	I
	CE	CS-	CS-
Spatial and temporal concentration of fishery impact on forage	DI	I	CS+/I
	CE	CS-	CS-
Removal of top predators	DI	I/U	I/U
	CE	CS-	CS-
Introduction of non-native species	DI	I	I
	CE	CS-	CS-
Energy removal	DI	I	I
	CE	I	I
Energy redirection	DI	I	I
	CE	I	I
Change in species diversity	DI	I/U	I/U
	CE	CS-	CS-
Change in functional (trophic) diversity	DI	I	I
	CE	CS-	CS-
Change in functional (structural habitat) diversity	DI	I	S+
	CE	CS-	CS+
Change in genetic diversity	DI	I/U	I/U
	CE	I	I

Notes: CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
S- - significantly adverse
S+ - significantly beneficial
U - unknown
Please refer to Table 4.1-7 for the ecosystem significance criteria.

Table 4.8-1. Target species direct/indirect and cumulative effects significance ratings under Fishery Management Plans 4.1 and 4.2.

Direct/indirect effects	Effect	EBS walleye pollock		GOA walleye pollock		BSAI Pacific cod		GOA Pacific cod		Sablefish		BSAI Atka mackerel		GOA Atka mackerel		BSAI flatfish*		GOA flatfish*		BSAI POP		GOA POP		GOA thornyhead rockfish		BSAI rockfish*		GOA other rockfish*		GOA rockfish*	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
Mortality	DI	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Change in biomass	DI	I	S+	I	I	S+	S+	I	S+	S+	S+	S+	S+	U	U	I	I	I	I	S+	S+	I	I	I	I	I	I	I	I	I	I
	CE	I	S+	I	I	S+	S+	I	S+	S+	S+	S+	S+	U	U	I	I	I	I	S+	S+	I	I	I	I	I	I	I	I	I	I
Spatial/temporal concentration of catch - change in genetic structure	DI	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Spatial/temporal concentration of catch - change in reproductive success	DI	I	I	I	I	I	I	I	I	I	I	S+	S+	U	U	I	I	I	I	S+	S+	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	S+	S+	U	U	I	I	I	I	S+	S+	I	I	I	I	I	I	I	I	I	I
Change in prey availability	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I
Change in habitat	DI	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Notes: *BSAI flatfish - BSAI yellowfin sole, BSAI flathead sole, BSAI rock sole, BSAI arrowtooth flounder, BSAI Greenland turbot, BSAI Alaska plaice, and BSAI other flatfish
*GOA flatfish - GOA shallow water flatfish, GOA arrowtooth flounder, GOA flathead sole, GOA deep water flatfish and GOA rex sole
*BSAI rockfish - BSAI northern rockfish, BSAI shortraker/rougheye rockfish and BSAI other rockfish
*GOA rockfish - GOA northern rockfish, GOA shortraker/rougheye rockfish, GOA pelagic shelf rockfish and GOA demersal shelf rockfish
*GOA other rockfish - GOA slope rockfish, GOA pelagic shelf rockfish
AI - Aleutian Islands
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
DI - direct/indirect effect
EBS - eastern Bering Sea
GOA - Gulf of Alaska
I - insignificant
S+ - significantly beneficial
POP - Pacific Ocean perch
U - unknown
Please refer to Table 4.1-1 for the significance criteria for target species.

Table 4.8-2. Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under Fishery Management Plans 4.1 and 4.2.

Direct/indirect effects	Effect	Pacific halibut		BSAI chinook and other salmon		GOA chinook		Other salmon		Pacific herring		Crab								Other species		Forage fish		Non-specified species	
												BSAI crab*		GOA crab*		GOA red king		BSAI and GOA golden king						Grenadier	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
Mortality	**DI**	I	I	CS+	CS+	CS+	CS+	CS+	CS+	I	I	CS+	CS+	U	U	CS+	CS+	U	U	U	U	I	I	U	U
	CE	I	I	CS+	CS+	CS+	CS+	CS+	CS+	I	I	U	U	U	U	U	U	U	U	U	U	I	I	U	U
Change in biomass level	**DI**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CS+	CS+	U	U	CS+	CS+	U	U	U	U	U	U	U	U
	CE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in reproductive success	**DI**	I	I	CS+	CS+	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	CE	I	I	CS+	CS+	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in prey availability	**DI**	I	I	U	U	U	U	U	U	I	I	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
Change in habitat	**DI**	NA	NA	NA	NA	NA	NA	NA	NA	I	I	CS+	CS+	U	U	CS+	CS+	U	U	U	U	U	U	NA	NA
	CE	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Change in genetic structure	**DI**	NA	NA	U	U	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U
	CE	NA	NA	U	U	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U

Notes: *BSAI crab - BSAI bairdi Tanner, BSAI opilio Tanner, BSAI red king and BSAI blue king
*GOA crab - GOA bairdi Tanner and GOA blue king
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
CS- - conditionally significant negative/adverse
CS+ - conditionally significant positive/beneficial
DI - direct/indirect effect
GOA - Gulf of Alaska
I - insignificant
NA - not applicable
U - unknown
Please refer to Table 4.1-1 for the significance criteria for Pacific halibut, Pacific herring, other species, forage fish species and non-specified species.

Table 4.8-3 Habitat direct/indirect and cumulative effects significance ratings under Fishery Management Plans 4.1 and 4.2.

Direct/indirect effects	Effect	Bering Sea	Aleutian Islands	Gulf of Alaska	Bering Sea	Aleutian Islands	Gulf of Alaska
		4.1			4.2		
Changes to living habitat Direct mortality of benthic organisms	DI	S+	S+	S+	S+	S+	S+
	CE	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-
Changes to benthic community structure	DI	S+	S+	S+	S+	S+	S+
	CE	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-
Changes in distribution of fishing effort Geographic diversity of management measures	DI	S+	S+	S+	S+	S+	S+
	CE	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-	CS+/CS-

Notes: CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
NE - no effect
S- - significantly adverse
S+ - significantly beneficial
Refer to Table 4.1-4 for habitat significance criteria.
Please refer to Table 4.1-2 for the significance criteria for crab.
Please refer to Table 4.1-3 for the significance criteria for salmon.

Table 4.8-4. Seabirds direct/indirect and cumulative effects significance ratings under Fishery Management Plans 4.1 and 4.2.

Direct/indirect effects	Effect	Short-tailed albatross		Other albatross		Shearwaters*		Northern fulmar		Species of management concern*		Other piscivorous species*		Other planktivorous species*		Steller's eiders		Spectacled eiders	
										Red-legged Kittiwakes	Murrelets								
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
Mortality (incidental take)	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NE	I	NE
	CE	CS-	CS-	S-	S-	CS	CS	I	I	CS-	S-	I	I	I	I	S-	NE	S-	NE
Availability of food	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NE	I	NE
	CE	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	NE	I	NE
Benthic habitat	DI	NE	NE	NE	NE	NE	NE	NE	NE	I	I	I	I	NE	NE	U	NE	U	NE
	CE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	I	I	NE	NE	U	NE	U	NE

Notes: *Other albatross and shearwaters - Laysan and black-footed albatross,sooty and short-tailed shearwaters
*Other piscivorous species - alcids (except auklets), gulls, jaegers, terns, and cormorants
*Other planktivorous species - auklets and storm-petrels
*Species of management concern - red-legged kittiwake, marbled murrelet, and Kittlitz's murrelet
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
NE - no effect
S- - significant adverse
U - unknown
Please refer to Table 4.1-5 for the significance criteria for seabirds.

Table 4.8-5. Marine mammals direct/indirect and cumulative effects significance ratings under Fishery Management Plans 4.1 and 4.2.

Direct/indirect effects	Effect	W Steller sea lion		E Steller sea lion		Northern fur seal		Harbor seal		Killer whale (transients)		Other pinnipeds*		Other toothed whales*		Baleen whales*		Sea otters	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
Mortality (incidental take and entanglement)	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	S-	S-	I	I	I	I	I	I	I S-[5]	I S-[5]	I	I	I	I	CS-[3] I[4]	CS-[3] I[4]	CS- 1[6]	CS- 1[6]
Prey availability	DI	S+	S+	S+	S+	CS+	CS+	S+	S+	I	I	I U[7]	I U[7]	I	I	I	I	I	I
	CE	S+	S+	I	I	CS+	CS+	S+	S+	I	I	I	I	I	I	I	I	I	I
Spatial/temporal concentration of fisheries	DI	S+	S+	I	I	S+	S+	S+	S+	I	I	I	I	I	I	I	I	I	I
	CE	CS+	CS+	I	I	S+	S+	S+	S+	I	I	I	I	I	I	I	I	I	I
Disturbance	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Notes: [1] - Spotted, ringed, bearded and ribbon seals
[2] - Walrus and elephant seal
[3] - Fin, humpback and northern right whales
[4] - Minke, gray, bowhead, sei and blue whales
[5] - The exception to this finding is the AT1 transient group in Prince William Sound. The cumulative effect of mortality for this group is significant adverse due to the past external events of the Exxon Valdez Oil Spill and subsequent decline.
[6] - Southcentral and southeast stocks are stable or increasing and the cumulative effect of mortality is not expected to effect stocks at the population-level.
[7] - Northern elephant seals
*Baleen whales - blue whale, fin whale, sei whale, minke whale, humpback whale, gray whale, northern right whale, bowhead whale.
*Other pinnipeds - Pacific walrus, spotted seal, bearded seal, ringed seal, ribbon seal, elephant seal
*Other toothed whales - sperm whales, beaked whales, white sided dolphin, beluga whale, harbor porpoise, Dall's porpoise.
CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
E - eastern stock
I - insignificant
S- - significantly adverse
S+ - significantly beneficial
W - western stock
U - unknown
Please refer to Table 4.1-6 for the significant criteria for marine mammals.

Table 4.8-6. Socioeconomics direct/indirect and cumulative effects significance ratings under Fishery Management Plans 4.1 and 4.2.

Harvesting and processing sectors

Direct/indirect effects	Effect	Catcher vessels		Catcher processors		Inshore processors and motherships	
		4.1	4.2	4.1	4.2	4.1	4.2
Groundfish landings by species group	DI	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Groundfish ex-vessel value	DI	S-	S-	NA	NA	NA	NA
	CE	S-	S-	NA	NA	NA	NA
Groundfish gross product value	DI	NA	NA	S-	S-	S-	S-
	CE	NA	NA	S-	S-	S-	S-
Employment	DI	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Payments to labor	DI	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Product quality and product utilization rate	DI	NA	NA	CS+/CS-	S-	S-/CS+	S-
	CE	NA	NA	CS+/CS-	S-	S-/CS+	S-
Excess capacity	DI	S-	S-	S-	S-	S-/I	S-
	CE	S-	S-	S-	S-	S-	S-
Average costs	DI	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Fishing vessel safety	DI	S-	S+	S-	S+	NA	NA
	CE	S-	S+	S-	S+	NA	NA

Bering Sea and Aleutian Islands and Gulf of Alaska regions

Direct/indirect effects	Effect	Alaska Peninsula and Aleutian Islands		Kodiak Island		Southcentral Alaska		Southeast Alaska		Washington inland waters		Oregon coast	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
In-region processing	DI	S-	S-	S-	S-	CS-	S-	CS-	S-	I	S-	I	I
	CE	CS-	S-	CS-	S-	CS-	I	CS-	S-	I	I	I	I
Regionally owned at-sea processors	DI	I	S-	S-	S-	S-	S-	S-	S-	S-	S-	I	I
	CE	CS-	S-	CS-	S-	I	I	CS-	S-	I	I	I	I
Extra-regional deliveries of regionally owned catcher vessels	DI	S-	S-	S-	S-	S-	S-	S-	S-	S-	S-	S-	S-
	CE	CS-	SI	CS-	S-	I	I	CS-	S-	I	I	I	I
In-regional deliveries of regionally owned catcher vessels	DI	CS-	S-	CS-	S-	CS-	S-	CS-	S-	CS-	S-	I	I
	CE	CS-	S-	CS-	S-	I	I	CS-	S-	I	I	I	I
Total direct, indirect, and induced labor income and full-time equivalents (FTEs)	DI	S-	S-	S-	S-	S-	S-	S-	S-	S-	S-	S-	S-
	CE	CS-	S-	CS-	S-	I	I	CS-	S-	I	I	I	I

Table 4.8-6 (cont.). Socioeconomics direct/indirect and cumulative effects significance ratings under Fishery Management Plans 4.1 and 4.2.

Community Development Quota (CDQ) programs and Subsistence

Effect	Community Development Quota (CDQ) programs	
	4.1	4.2
DI	S-	S-
CE	S-	S-

Direct/indirect effects	Effect	Subsistence	
		4.1	4.2
Subsistence use of groundfish	DI	I	I
	CE	I	I
Subsistence use of western Alaska salmon and bycatch	DI	I	CS+
	CE	I	CS+
Subsistence use of Steller sea lions	DI	CS+	CS+
	CE	CS+	CS+
Indirect subsistence use: income and joint	DI	S-	S-
	CE	S-	S-

Environmental Justice

Effect	Alaska Peninsula and Aleutian Islands		Kodiak Island		Southcentral Alaska		Southeast Alaska		Washington inland waters		Oregon coast	
FMP	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
DI	S-	S-	I/S-	S-	I	I	I	I	I/S-	S-	I	I
CE	S-	S-	I/S-	S-	I	I	I	I	I/S-	S-	I	I

Market channels and non-consumptive and non-use benefits (the value of the Bering Sea and Aleutian Islands and Gulf of Alaska ecosystems)

Direct/indirect effects	Effect	Market channels	
		4.1	4.2
Benefits to U.S. consumers	DI	I	CS-
	CE	I	S-

Direct/indirect effects	Effect	Non-consumptive and non-use benefits	
		4.1	4.2
Benefits derived from marine ecosystems and associated species	DI	S+	S+
	CE	CS+	CS+

Notes: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g. fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgement of the socioeconomic analysts.

CE - cumulative effect
CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
NA - not applicable
S+ - significantly beneficial
S- - significantly adverse
U - Unknown

Table 4.8-7 Ecosystem direct/indirect and cumulative effects significance ratings under Fishery Management Plans 4.1 and 4.2.

Direct/indirect effects	Effect	Ecosystem	
		4.1	4.2
Change in pelagic forage availability	DI	S+/ CS+/ I	S+/ CS+/ I
	CE	CS+	CS+
Spatial and temporal concentration of fishery impact on forage	DI	S+/ CS+/ I	S+/ CS+/ I
	CE	CS+	CS+
Removal of top predators	DI	S+	S+
	CE	CS+	CS+
Introduction of non-native species	DI	CS+	CS+
	CE	CS+	CS+
Energy removal	DI	CS+	CS+
	CE	CS+	CS+
Energy redirection	DI	CS+	CS+
	CE	CS+	CS+
Change in species diversity	DI	S+	S+
	CE	CS+	CS+
Change in functional (trophic) diversity	DI	S+	S+
	CE	CS+	CS+
Change in functional (structural habitat) diversity	DI	S+	S+
	CE	CS+	CS+
Change in genetic diversity	DI	I/ U	I/ U
	CE	I	I

Notes: CE - cumulative effect
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
S+ - significantly beneficial
U - unknown
Please refer to Table 4.1-7 for the ecosystem significance criteria.

Table 4.9-1. Target species direct/indirect and cumulative effects significance ratings under Preferred Alternative PA.1 and PA.2.

Direct/indirect effects	Effect	Pollock, Pacific Cod, Sablefish		BSAI Atka Mackerel		GOA Atka Mackerel		BSAI Flatfish*		BSAI Other Flatfish		GOA Flatfish*		GOA Arrowtooth Flounder		BSAI and GOA POP		GOA Thornyhead Rockfish		BSAI Rockfish*		GOA Rockfish*		GOA Northern Rockfish	
		PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2
Mortality	DI	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Change in Biomass	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Spatial/ Temporal Concentration of Catch - change in genetic structure	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Spatial/ Temporal Concentration of Catch - change in reproductive success	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Change in prey availability	DI	I	I	I	I	I	I	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Change in Habitat	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I

Notes: *BSAI flatfish - BSAI yellowfin sole, BSAI flathead sole, BSAI rock sole, BSAI arrowtooth flounder, BSAI Greenland turbot and BSAI Alaska plaice
*GOA flatfish - GOA shallow water flatfish, GOA flathead sole, GOA deep water flatfish and GOA rex sole
*BSAI rockfish - BSAI northern rockfish, BSAI shortraker/rougheye rockfish and BSAI other rockfish
*GOA rockfish - GOA shortraker/rougheye rockfish, GOA slope rockfish, GOA pelagic shelf rockfish and GOA demersal shelf rockfish
AI - Aleutian Islands
PA - Preferred Alternative
BSAI - Bering Sea and Aleutian Islands
POP - Pacific Ocean perch
CE - cumulative effect
U - unknown
DI - direct/indirect effect
EBS - eastern Bering Sea
GOA - Gulf of Alaska
I - insignificant
Please refer to Table 4.1-1 for the significance criteria for target species.

Table 4.9-2. Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under Preferred Alternative PA.1 and PA.2.

Direct/ indirect effects	Effect	Pacific halibut		BSAI chinook and other salmon		GOA chinook		Other salmon		Pacific herring		Crab								Other species		Forage fish		Non-specified species	
												BSAI crab*		GOA crab*		Red king GOA		BSAI and GOA golden king						Grenadier	
		PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2
Mortality	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	U	U	U	U	I	I	U	U
	CE	I	I	CS-	CS-	CS-	CS-	I	I	I	I	U	U	U	U	U	U	U	U	U	U	I	I	U	U
Change in biomass level	**DI**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	I	I	U	U	I	I	U	U	U	U	U	U	U	U
	CE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in reproductive success	**DI**	I	I	U	U	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	CE	I	I	CS-	CS-	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in prey availability	**DI**	I	I	U	U	U	U	U	U	I	I	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
Change in habitat	**DI**	NA	NA	NA	NA	NA	NA	NA	NA	I	I	I	I	U	U	I	I	U	U	U	U	U	U	NA	NA
	CE	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Change in genetic structure	**DI**	NA	NA	U	U	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U
	CE	NA	NA	U	U	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U

Notes: *BSAI crab - BSAI bairdi Tanner, BSAI opilio Tanner, BSAI red king and BSAI blue king
*GOA crab - GOA bairdi Tanner and GOA blue king
BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
CE - cumulative effect
I - insignificant
CS- - conditionally significant adverse
NA - not applicable
CS+ - conditionally significant beneficial
DI - direct/indirect effect
PA - Preferred Alternative
U - unknown
Please refer to Table 4.1-1 for the significance criteria for Pacific halibut, Pacific herring, other species, forage fish species and non-specified species.
Please refer to Table 4.1-2 for the significance criteria for crab.
Please refer to Table 4.1-3 for the significance criteria for salmon.

Table 4.9-3 Habitat direct/indirect and cumulative effects significance ratings under Preferred Alternative PA.1 and PA.2.

Direct/indirect effects	Effect	Bering Sea	Aleutian Islands	Gulf of Alaska	Bering Sea	Aleutian Islands	Gulf of Alaska
		PA.1			PA.2		
Changes to living habitat	DI	I	I	I	I	S+	CS-
Direct mortality of benthic organisms	CE	CS-	CS-	CS-	CS-/CS+	CS-/CS+	CS-/CS+
Changes to benthic community structure	DI	I	I	I	CS+	S+	I
	CE	CS-	CS-	CS-	CS-/CS+	CS-/CS+	CS-/CS+
Changes in distribution of fishing effort	DI	I	I	I	S+	S+	I
Geographic diversity of management measures	CE	CS-	CS-	CS-	CS-/CS+	CS-/CS+	CS-/CS+

Notes: CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
PA - Preferred Altermative
S+ - significantly beneficial
Refer to Table 4.1-4 for habitat significance criteria.

Table 4.9-4 Seabirds direct/indirect and cumulative effects significance ratings under Preferred Alternative PA.1 and PA.2.

Direct/indirect effects	Effect	Short-tailed albatross		Other albatross		Shearwaters		Northern fulmar		Species of management concern				Other piscivorous species		Other planktivorous species		Steller's eiders		Spectacled eider	
										Red-legged kittiwakes		Murrelets									
		PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2
Mortality (incidental take)	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NE	NE
	CE	CS-	CS-	S-	S-	CS-	CS-	I	I	CS-	CS-	S-	S-	I	I	I	I	S-	S-	NE	NE
Availability of food	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	NE	NE
	CE	I	I	I	I	I	I	I	I	U	U	U	U	I	I	I	I	I	I	NE	NE
Benthic habitat	DI	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	I	I	I	I	NE	NE	I	I	NE	NE
	CE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	I	I	I	I	NE	NE	U	U	NE	NE

Notes: *Other albatross and shearwaters - Laysan and black-footed albatross,sooty and short-tailed shearwaters
*Other piscivorous species - alcids (except auklets), gulls, jaegers, terns, and cormorants
*Other planktivorous species - auklets and storm-petrels
*Species of management concern - red-legged kittiwake, marbled murrelet, and Kittlitz's murrelet
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
NE - no effect
PA - Preferred Alternative
S- - significantly adverse
U - unknown
Please refer to Table 4.1-5 for the significance criteria for seabirds.

Table 4.9-5. Marine mammals direct/indirect and cumulative effects significance ratings under Preferred Alternative PA.1 and PA.2.

Direct/indirect effects	Effect	W Steller sea lion		E Steller sea lion		Northern fur seal		Harbor seal		Killer whale (transients)		Other pinnipeds *		Other toothed whales*		Baleen whales*		Sea otters	
		PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2
Mortality (incidental take and entanglement)	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	S-	S-	I	I	I	I	I	I	I	I	I	I	I	I	CS-[2]	CS-[2]	CS-	CS-
										S-[4]	S-[4]					I[3]	I[3]	1[5]	1[5]
Prey availability	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
												U[1]	U[1]						
	CE	CS-	CS-	I	I	CS-	CS-	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Spatial/temporal concentration of fisheries	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	I	I	CS-	CS-	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Disturbance	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Notes: [1] - Northern elephant seals

[2] -Fin, humpback and northern right whales

[3] -Minke, gray, bowhead, sei, and blue whales

[4] -The exception to this finding is the AT1 transient group in Prince William Sound. The cumulative effect of mortality for this group is significant adverse due to the past external events of the Exxon Valdez Oil Spill and subsequent decline.

[5] -Southcentral and southeast stocks are stable or increasing and the cumulative effect of mortality is not expected to effect stocks at the population-level.

*Baleen whales - blue whale, fin whale, sei whale, minke whale, humpback whale, gray whale, northern right whale, bowhead whale.

*Other pinnipeds - Pacific walrus, spotted seal, bearded seal, ringed seal, ribbon seal, elephant seal

*Other toothed whales - sperm whales, beaked whales, white sided dolphin, beluga whale, harbor porpoise, Dall's porpoise.

CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
E - eastern stock
I - insignificant
PA - Preferred Alternative
S- - significantly adverse
W - western stock
U - unknown

Please refer to Table 4.1-6 for the significant criteria for marine mammals.

Table 4.9-6. Socioeconomics direct/indirect and cumulative effects significance ratings under Preferred Alternative PA.1 and PA.2.

Harvesting and processing sectors

Direct/indirect effects	Effect	Catcher vessels		Catcher processors		Inshore processors and motherships	
		PA.1	PA.2	PA.1	PA.2	PA.1	PA.2
Groundfish landings by species group	DI	I/S+	I/S+/S-	I/S+	I/S+/S-	I/S+	I/S+/S-
	CE	I	I	I	I	I	I
Groundfish ex-vessel value	DI	I	I/S-	NA	NA	NA	NA
	CE	I	I	NA	NA	NA	NA
Groundfish gross product value	DI	NA	NA	I	I	I	I/S-
	CE	NA	NA	I	I	I	I
Employment	DI	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Payments to labor	DI	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Product quality and product utilization rate	DI	NA	NA	CS+	CS-/S+	CS+	CS-/S+
	CE	NA	NA	CS+	S+/S-	CS+	S+/S-
Excess capacity	DI	CS+	S+	CS+	S+	CS+	S+
	CE	CS+	S+	CS+	S+	CS+	S+
Average costs	DI	CS+	CS+/S-	CS+	CS-/S+	CS+	CS-/S+
	CE	CS+	S+/S-	CS+	S+/S-	CS+	S+/S-
Fishing vessel safety	DI	CS+	CS+/S-	CS+	CS-/S+	NA	NA
	CE	CS+	S+/S-	CS+	S+/S-	NA	NA

Bering Sea and Aleutian Islands and Gulf of Alaska regions

Direct/indirect effects	Effect	Alaska Peninsula and Aleutian Islands		Kodiak Island		Southcentral Alaska		Southeast Alaska		Washington inland waters		Oregon coast	
		PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2
In-region processing	DI	I	I	I	I	S+	I	I	S-	I	I	I	I
	CE	I/CS-	I	I	I	I	I	I	S-	I	I	I	I
Regionally owned at-sea processors	DI	I	I	S+	I	S+	I	S+	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I
Extra-regional deliveries of regionally owned catcher vessels	DI	I	S-	I	I	I	I	I	S-	I	I	I	I
	CE	CS-	CS-	I	I	I	I	I	CS-	I	I	I	I
In-regional deliveries of regionally owned catcher vessels	DI	I	S-	I	I	S+	I	I	S-	I	I	I	I
	CE	CS-	CS-	I	I	I	I	I	CS-	I	I	I	I
Total direct, indirect, and induced labor income and full-time equivalents (FTEs)	DI	I	I	I	I	S+	I	I	S-	I	I	I	I
	CE	CS-	CS-	I	I	I	I	I	CS-	I	I	I	I

Table 4.9-6 (cont.). **Socioeconomics direct/indirect and cumulative effects significance ratings under Preferred Alternative PA.1 and PA.2.**

Community Development Quota (CDQ) programs and Subsistence

Effect	Community Development Quota (CDQ) programs	
	PA.1	PA.2
DI	I	I
CE	I	I

Direct/indirect effects	Effect	Subsistence	
		PA.1	PA.2
Subsistence use of groundfish	DI	I	I
	CE	I	I
Subsistence use of western Alaska salmon and bycatch	DI	I	I
	CE	I	I
Subsistence use of Steller sea lions	DI	I	I
	CE	I	I
Indirect subsistence use: income and joint	DI	I	I
	CE	I	I

Environmental Justice

Effect	Alaska Peninsula and Aleutian Islands		Kodiak Island		Southcentral Alaska		Southeast Alaska		Washington inland waters		Oregon coast	
FMP	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2	PA.1	PA.2
DI	I	CS-	I	I	I	I	I	I	I	I	I	I
CE	I	CS-	I	I	I	I	I	I	I	I	I	I

Market channels and non-consumptive and non-use benefits (the value of the Bering Sea and Aleutian Islands and Gulf of Alaska ecosystems)

Direct/indirect effects	Effect	Market channels	
		PA.1	PA.2
Benefits to U.S. consumers	DI	I	I
	CE	I	I

Direct/indirect effects	Effect	Non-consumptive and non-use benefits	
		PA.1	PA.2
Benefits derived from marine ecosystems and associated species	DI	I	S+
	CE	I	S+

Notes: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g. fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgement of the socioeconomic analysts.

CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
NA - not applicable
S+ - significantly beneficial
S- - significantly adverse
U - Unknown

Table 4.9-7. Ecosystem direct/indirect and cumulative effects significance ratings under Preferred Alternative PA.1 and PA.2.

Direct/indirect effects	Effect	Ecosystem	
		PA.1	PA.2
Change in pelagic forage availability	DI	I	I
	CE	CS-	CS-
Spatial and temporal concentration of fishery impact on forage	DI	I	CS+/ I
	CE	CS-	CS-
Removal of top predators	DI	I/ U	I/ U
	CE	CS-	CS-
Introduction of non-native species	DI	I	I
	CE	CS-	CS-
Energy removal	DI	I	I
	CE	I	I
Energy redirection	DI	I	I
	CE	I	I
Change in species diversity	DI	I/ U	I/ U
	CE	CS-	CS-
Change in functional (trophic) diversity	DI	I	I
	CE	CS-	CS-
Change in functional (structural habitat) diversity	DI	I	S+
	CE	CS-	CS+
Change in genetic diversity	DI	I/ U	I/ U
	CE	I	I

Notes: CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
PA - Preferred Alternative
S- - significantly adverse
S+ - significantly beneficial
U - unknown
Please refer to Table 4.1-7 for the ecosystem significance criteria.

Table 4.10-1. Elements of the analytical framework that are exclusively dealt with in the fishery management plan component qualitative assessment papers.

Fishery Management Plan (FMP) component qualitative assessment paper	Analytical framework elements discussed exclusively in the qualitative assessment papers
Total allowable catch (TAC)-setting process	• description of the current harvest strategy • discussion of the impacts of TAC management measures under the alternatives • discussion of F_{40} review recommendations • implications of incorporating ecosystem considerations in the TAC-setting process
Spatial and temporal management of TAC	• discussion of potential objectives and criteria that could be used to allocate TAC in space and time • implications of distributing TAC on smaller spatial scales
Marine protected areas (MPAs) and essential fish habitat (EFH)	• discussion of goals, objectives and criteria that could be used to develop an MPA program methodology
Steller sea lion measures	• discussion of management measures that could modify or extend the 2002 Steller sea lion closures based on newly available data
Bycatch and incidental catch restrictions	• discussion of incentive programs for incidental catch and bycatch reduction
Seabird measures	• discussion of impacts of seabird protection measures • discussion of United States (U.S.) Fish and Wildlife Service consultation and cooperation for Endangered Species Act-listed and other seabird protection measures
Gear restrictions and allocations	• implications of repealing closure areas • implications of restricting fishing to areas of historic concentration
Overcapacity	• range and implications of management measures that can be used to deal with overcapacity (including individual fishing quotas, cooperatives, and vessel and effort-based limitation programs)
Alaska native issues	• implications of incorporating traditional knowledge into fishery management • discussion of measures to increase participation and consultation
Observer program	• implications of repealing the observer program • implications of changing the level of observer coverage over the alternatives • implications of addressing the conflict of interest in the funding mechanism • implications of developing uncertainty estimates other efforts to improve observer data
Data and reporting requirements	• description of current catch accounting and reporting requirements • implications of expanding the collection and verification of economic data • implications of changing vessel monitoring system or at-sea scales requirements

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Table 4.10-2b. Comparison of example Fishery Management Plans by resource category: the Preferred Alternative PA.1 and PA.2.

	Preferred Alternative (PA)	
	PA.1	PA.2
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Target Species		
• 38 target species groups (stocks or stock complexes) were analyzed; 34 are considered here and 4 (Bering Sea and Aleutian Islands [BSAI] squid, BSAI other species, Gulf of Alaska [GOA] skates and GOA other species) are considered in the squid and other species table. • 19 of the stocks or stock complexes have age-structured models and are analyzed in Tiers 1-3; 13 are managed in Tiers 4-5; and 2 are managed in Tier 6 (for further detail on the tier system, see Appendix F-1). • Stocks in Tiers 1-3: Eastern Bering Sea (EBS) and GOA Walleye Pollock, BSAI and GOA Pacific cod, BSAI/GOA sablefish, BSAI Atka mackerel, BSAI yellowfin sole, BSAI rock sole, BSAI and GOA flathead sole, BSAI and GOA arrowtooth flounder, BSAI Greenland turbot, BSAI Alaska plaice, BSAI and GOA Pacific ocean perch, BSAI and GOA northern rockfish, GOA dusky rockfish. • Stocks in Tiers 4-6: Aleutian Islands and Bogoslof pollock, GOA Atka mackerel, GOA shallow water flatfish complex, GOA Dover sole, GOA deep water flatfish complex (Greenland turbot and deep-sea sole), BSAI other flatfish, GOA rex sole, BSAI and GOA shortraker/rougheye rockfish, BSAI other rockfish, GOA other slope rockfish, GOA pelagic shelf rockfish, GOA demersal shelf rockfish, GOA thornyhead rockfish. • Unknown is rated for stocks for which existing survey methodology is unable assess the appropriate life history parameters (i.e., natural mortality and maturity schedule), reliable species-level identification in the catch, and a reliable biomass estimate. **EXTERNALS:** • Several stocks may be externally impacted by the halibut fishery (landed fish are accounted for, but there are no observers so how much discarded is unknown). • All stocks are potentially affected by a regime shift, however the directional impact cannot be predicted.		
Mortality	• As with Alternative 1, overfishing is not expected to occur under this alternative; management of stocks does not allow the fishing mortality rate to exceed the overfishing level	
	• Catch is expected to be similar to Fishery Management Plan (FMPs) 1 and 3.1 for most species. • The BSAI optimal yield (OY) cap and prohibited species act (PSC) caps are constraints to the expansion of the fishery. • Harvest control rules used to maintain spawning biomass with the potential to produce sustained yields on a continuing basis will reduce the total allowable catch (TAC) for GOA pollock, and BSAI and GOA Pacific cod. • North Pacific Fishing Management Council (NPFMC) would review cumulative impacts of opening the Aleutian Islands pollock fishery.	• Catch is expected to be similar to or less than FMPs 1 and 3.1 due to the BSAI OY cap, the uncertainty correction factor, and PSC caps, which are constraints to the expansion of the fishery. • Criteria for breaking sharks and skates from the "other species" group and criteria to bring non-specified species into a management group may constrain the fisheries under this FMP. • Development of criteria for "splitting and lumping" of stock complexes could benefit species that may be fished disproportionately compared to other species in the same complex. • Expansion and improvement of the observer program may benefit stock complex species (i.e., flatfish and rockfish species).

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Target Species (cont.)		
Biomass	• For all 19 age-structured stocks whose biomass is known, the comparison of the impacts to the baseline case is similar to that in FMP 1. • Tier 4, 5, 6 stocks remain unknown.	
		• Collection of biological information necessary to determine spawning stock biomass estimates for species in Tiers 4-5 would improve. • Expansion and improvement of the observer program may benefit stock complex species (i.e., flatfish and rockfish species).
Spatial/temporal concentration of catch, prey availability, habitat suitability	• For all age-structured stocks, the comparison of the impacts to the baseline case is similar to that in FMP 1, existing closures would remain • Time and area restrictions on harvest (the same as FMPs 1 and 3.1) help to diffuse impacts of spatial and temporal concentration of catch. • Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of minimum stock size threshold (MSST) and/or life history parameters. • Essential fish habitat (EFH) and habitat area of particular concern (HAPC) identification and designation would continue (same as FMPs 1 and 3.1).	• For all age-structured stocks, the comparison of the impacts to the baseline case is similar to that in FMP 3.2; closures would be similar to those described under FMP 3.2. • PSC limits and inseason hotspot bycatch closures along with 0-20% of the BSAI and GOA established as marine protected areas (MPAs) and no-take reserves could restrict the fishery spatially and temporally. • Rationalization of the fisheries could slow the pace of the fisheries and spread catch out over time. • Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters. • EFH and HAPC mitigation measures would be implemented as necessary and could improve habitat suitability for all species. • The pollock bottom trawl closure would be expanded throughout the GOA which may reduce adverse impacts to habitat of some target species.

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Prohibited species		
• All species within this category are managed by other agencies (federal management is deferred); management plans incorporate bycatch mortality in the groundfish fisheries. • PSC limits exist for halibut in the GOA and halibut, herring, salmon and crab in the BSAI; PSC limits are apportioned by area, gear type, and season. • Herring limits are variable based on biomass; halibut limits are stairstepped; crab limits are variable based on biomass with upper and lower caps; salmon limits incorporate fixed caps. • Comprehensive rationalization of the fisheries is expected to reduce incidental catch and bycatch of prohibited species under the PA. **EXTERNALS:** • Halibut, salmon, herring and crab stocks are all affected by state commercial, recreational (for salmon in the GOA) and subsistence fisheries. • Herring stocks are more vulnerable to marine pollution as they are nearshore spawners; lingering effects from Exxon Valdez oil spill (EVOS) in the GOA may still exist. • State hatchery programs exist for salmon stocks in the GOA; land management practices may impact freshwater spawning habitat for salmon. • Some crab stocks in BSAI and GOA are overfished; rebuilding plans are either in effect or under development for specific BSAI stocks. • All prohibited species stocks are potentially affected by regime shifts, however the directional impact cannot be predicted.		
Pacific halibut	• If changes to the baseline condition of the stock occur, quotas set by the International Pacific Halibut Commission (IPHC) for the directed fishery will be adjusted accordingly and account for all removals of halibut by other fisheries. • Harvest practices under this alternative are expected to have insignificant impacts on prey availability and reproductive success of halibut.	
Pacific salmon or steelhead trout	• Projected groundfish bycatch under this alternative is not expected to significantly impact BSAI and GOA salmon stocks. • Reproductive/recruitment success and stock composition are unknown and it is unclear if these stocks would be significantly affected by changes to bycatch resulting from this alternative. • Potential competition for prey with groundfish fisheries is unknown due to lack of bycatch composition information. • No direct interaction between groundfish fisheries and freshwater salmon spawning habitat occurs. • Potential changes to genetic structure of salmon populations are unknown due to lack of bycatch and stock composition data.	
Pacific herring	• Groundfish bycatch removals are expected to have insignificant impacts on mortality and reproductive success of herring. • Harvest practices under the PA are expected to have insignificant impacts on prey availability for herring. • Changes to herring habitat due to groundfish fishery management are considered insignificant under the PA; lingering contamination from EVOS in the GOA on certain herring habitat exists, but effects are unknown.	
Crab (opilio Tanner, other Tanner, red, blue and golden king)	• Under PA.1 and PA.2, bycatch of crab may decrease and additional protection measures could enhance habitat and possible recovery of depressed stocks, but population-level effects to crab populations in BSAI as a whole cannot be determined. • Potential impacts of harvest practices under this alternative on crab prey availability and reproductive success are unknown in BSAI and GOA. • Proposed protection measures could enhance recovery and sustainability of crab habitat, but potential population-level effects that may result in GOA and BSAI crab stocks are unknown.	

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Other Species and Squid		
• BSAI management categories are 'Squid' and 'Other species' (latter includes skates, sharks, sculpin and octopi); GOA management category is 'Other species' that includes squid, skates, sharks, sculpin and octopi. • Species are managed as a Tier 6 complex in the BSAI; in GOA, 5% of the sum of all ABCs = TAC. • Comprehensive rationalization of the fisheries is expected to reduce incidental catch and bycatch of prohibited species under the PA. **EXTERNAL:** • Human controlled and climatic effects may also be impacting the other species complex; information is lacking on the current status of stocks and significance of potential effects cannot be determined.		
Other species and squid	• No comparative baseline has been established for these species, the potential impacts of the PA, as with Alternative 1, are unable to be determined.	
Forage fish species		
• Management category includes Osmeridae, Myctophidae, Bathylagidae, Ammodytidae, Trichontidae, Pholidae, Stichaeidae, Gonostomatidae, and Euphausiacae. • Special management where not allowed to keep more than 2% of the landed catch. • Comprehensive rationalization of the fisheries is expected to reduce incidental catch and bycatch of prohibited species under the PA. **EXTERNALS:** • Forage fish are more likely to be sensitive to marine pollution as they utilize inshore areas for spawning or foraging that are likely to be more impacted by oil spills than other areas. • All stocks are potentially affected by regime shifts; however, the directional impact cannot be predicted for most species.		
Forage fish species	• Insignificant fishing mortality because the level of catch is very small. • PSC limits and the OY caps that restrict the target fisheries would likely reduce forage fish mortality. • Fishery independent surveys for forage fish have not been implemented therefore biomass estimates remain uncertain, however preliminary estimates for ecosystem models suggest that standing stocks of forage fish are stable. • No comparative baseline exists to determine prey availability, habitat suitability and spatial temporal catch distribution impacts.	

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	PA.2
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Non-specified species		
• This category consists of many species, this document only discusses impacts to grenadier; grenadier make up the largest proportion of non-specified species bycatch. • Coral is included in this category, but impacts are discussed under the habitat section of this document (Section 4.9.6). **EXTERNAL:** • Human controlled and climatic effects may also be influencing non-specified species; information is lacking on the current status of stocks and significance of potential effects cannot be determined.		
Grenadiers	• No comparative baseline has been established for these species, the potential impacts of the PA, as with Alternative 1, are unable to be determined.	
Habitat		
• Careful placement of closures is needed for habitat to benefit: majority of closures in lightly fished/unfished areas to avoid and minimize future impacts; minimal small closures within heavily fished areas primarily to provide impact diversity and determine closure mitigation efficacy, and to reduce the changes of unintended consequences. • The potential effects of the groundfish fisheries used to compare the alternatives were the mortality of and damage to living habitat, changes to benthic community diversity, and changes to the geographic diversity of impacts and protection. • Specific impacts are very difficult to predict. Evaluation of effects requires detailed information on the distribution and abundance of habitat types, the life history of living habitat, habitat recovery rates, and the natural disturbance regime. This information is generally incomplete. • Qualitative judgements as to the significance of effects were made after considering information on: 1) bycatch of living habitat derived from the multi-species projection model; 2) the results of a habitat impacts model for estimates of the equilibrium levels of living habitat in fishable and currently fished areas; 3) estimates of the amount of area by habitat type and geographic zone closed year round to bottom trawling for all species; and 4) evaluation of the spatial distribution of bottom trawl closures relative to fishing intensity and habitat types. • This analysis does not include impacts of the alternatives on non-living habitat.		

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Habitat (cont.)		
Direct mortality of benthic organisms: impact to habitat features	• BS: insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered. AI: insignificant relative to baseline; as with FMP 1, conditionally significantly adverse when cumulative impacts are considered. • GOA: insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered.	• BS: insignificant/conditionally significant beneficial, closed areas are lightly fished, not much effort diverted, one would expect only slight decrease in impact from this closure distribution. Reduction in acceptable biological catch (ABCs) may provide benefit. Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significantly beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas. • AI: significantlyly beneficial, closures often bisect fishing concentrations which is good strategy; reduction in ABCs, due to $F_{60\%}$ for rockfish and implementation of uncertainty correction, should provide benefit. Depending on location and size of closures, could provide beneficial mitigation for the adverse baseline condition that results from cumulative historical impacts. • GOA: significantly adverse/insignificant, many closures encompass high fishing concentrations, resulting in much higher effort in current lightly fished areas. Reduction in ABCs may not compensate for probable increase in effort/catch. Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significantly beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas.
Benthic community structure: benthic community diversity	• BS, AI, GOA: insignificant change relative to baseline; conditionally significant adverse, when historical fishing considered along with continued fishing at FMP 1 levels. Closure areas are mostly in one habitat type.	• BS: conditionally significantly beneficial, may be some gain in diversity by closing lightly fished areas and effort reduction due to any reduction in catch. Could be conditionally significantly adverse or beneficial in the cumulative case, depending on placement of closures and ability to mitigate historical impacts. • AI: significantly beneficial - see BS above. • GOA: insignificant, transferring impact from already heavily impacted area to lightly impacted area may not provide gain in overall diversity. Could be conditionally significant adverse or beneficial in the cumulative case, depending on placement of closures and ability to mitigate historical impacts.

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Habitat (cont.)		
Benthic community structure: geographic diversity of impacts and protection	• BS: insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. • AI: insignificant relative to baseline, when cumulative impacts considered, conditionally significant adverse as very little closure area, restricted to small radius around (SSL) habitat haulouts. • GOA: insignificant relative to baseline, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types.	• BS: significantly beneficial, one closure boundary bisects a high F concentration providing diversity. Could be significantly improved with smaller closure areas strategically located. Could be conditionally significant adverse or beneficial when considered with cumulative impacts. • AI: significantly beneficial, some closure areas bisect high F clusters. Closures placed somewhat randomly along the AI. Could be conditionally significant adverse or beneficial when considered with cumulative impacts. • GOA: insignificant, closures encompass habitat units and high F clusters, leaving little contrast or diversity in impact levels within habitat. Could be significantly improved with smaller closure areas strategically located. Could be conditionally significant adverse or beneficial when considered with cumulative impacts.
Seabirds		
• The potential effects of the groundfish fishery that were used to compare the alternatives included incidental take in fishing gear and vessel strikes, changes in prey availability and offal, and changes in benthic habitat that affect the food web. • Significance criteria were based on whether the proposed action would be likely to result in population level effects, which are defined as changes in the population trend outside the range of natural fluctuations. Although the number of individual seabirds that would be expected to be taken under the alternative FMPs varies considerably, this difference may not be discernible by looking at a shared rating. • Except for the supplemental food provided by the fisheries in the form of offal, the effects of the fisheries are all considered adverse to individual birds. Low levels of incidental take are better for conservation purposes than high levels of take, but no amount of incidental take can be considered beneficial to a seabird population. The significance ratings for incidental take are therefore only insignificant or adverse. **EXTERNAL:** • Potential effects that are the result of vessel traffic rather than fishing effort, such as oil spills, plastic pollution, and introduction of nest predators. • Similar effects from other United States (U.S). and foreign fisheries, subsistence and commercial harvests. • Pollution from marine and terrestrial sources, conservation efforts for particular species and seabirds in general, and natural events such as climate and oceanographic fluctuations.	
Incidental take	• Incidental take of albatross, fulmars, shearwaters, and gulls substantially reduced from baseline levels due to new mitigation measures on longline fleet. • Potential new mitigation measures for trawl fleet likely to reduce collisions of albatross, shearwaters, and fulmars with trawl third wires. • PA.2 includes research to develop mitigation measures that reduce incidental take of non-ESA-listed species in longline and trawl gear.	
Risk to Endangered Species Act (ESA)-listed species	• Risk of exceeding ESA threshold for mortality of short-tailed albatross reduced from baseline level due to longline and potential trawl mitigation measures.	
Population-level effects	• Groundfish fishery is not expected to have population level effects on any species through mortality, changes in food availability, or benthic habitat.	

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Seabirds (cont.)		
Cumulative effects	• Conditionally significant adverse for short-tailed albatross for mortality, with a potential catastrophic contribution from volcanic eruptions on Torishima Island. • Significantly adverse for Laysan and black-footed albatross for mortality, mostly in foreign longline fisheries. • Conditionally significant adverse for both shearwaters for mortality, with major contributions from harvest on breeding grounds in southern hemisphere. • Conditionally significant adverse for red-legged kittiwakes because of concentrated population distribution and declining population on Pribilof colony. Mechanisms for decline under investigation. • Significantly adverse for marbled and Kittlitz's murrelets because of substantial population declines with major contributions of mortality from coastal net fisheries. • Insignificant for all other species for mortality, prey availability, and benthic habitat. • Significantly adverse for Steller's eiders because of decreased adult survival; potential contributions from oil pollution, hunting, and climate change.	
Marine Mammals		
• Marine mammal species groups were aggregated in this comparison table to combine marine mammal species which are consumers of groundfish (with the exception of the western population of SSLs which was separated from this group) and marine mammal species that do not consume groundfish of commercial size as a primary component of their diet as the effects are similar within the alternatives for all of the species included in each of these categories. • Species in the groundfish consuming category include the eastern population of SSLs, harbor seals, and northern fur seals. Species groups in the non-groundfish consuming category include transient killer whales, other pinnipeds, other toothed whales, baleen whales and sea otters. • As defined here, "effects" refers to effects expected to occur at the population level.		
Western population of SSLs: incidental take / entanglement in marine debris	• The groundfish fishery does not result in increased levels of incidental takes such that population level effects would occur and is determined to be insignificant to the western population of SSLs. • Cumulatively, significantly adverse population level effects are expected on western SSLs due to additional external effects including subsistence harvest, takes in state and other fisheries, and marine pollution. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western population of SSL recovery and survival in the wild.	
Western population of SSLs: harvest of prey species	• The groundfish fishery is determined to be insignificant to SSLs under this FMP scenario. • Cumulatively, significantly adverse population level effects are expected on the western population of SSLs due to additional external effects including state and other fisheries, harvest of prey in the past, and marine pollution. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock ofSSL recovery and survival in the wild.	

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Marine Mammals (cont.)		
Western population of SSLs: spatial/ temporal concentration	• Measures to decrease competition between SSLs and fisheries by dispersing the fisheries over time and space have been retained under this FMP; additional effects to marine mammals that consume groundfish are not expected under this FMP. • Cumulatively, with past and external effects, significantly adverse effects on SSLs may still occur due to state and other fisheries. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of SSL recovery and survival in the wild.	• Measures to decrease competition between SSLs and fisheries by dispersing the fisheries over time and space have been retained under this FMP and these measure would be modified as additional scientific information becomes available ; additional effects to marine mammals that consume groundfish are not expected under this FMP. • Cumulatively, with past and external effects, significantly adverse effects on SSLs may still occur due to State and other fisheries; they are not expected to appreciably reduce the likelihood of western population of SSL recovery and survival in the wild.
Western population of SSLs: disturbance	• This groundfish fishery is insignificant in regarding disturbance of SSLs. • Cumulatively, the level of disturbance is determined to be insignificant.	
Groundfish consumers: incidental take/ entanglement in marine debris	• The groundfish fishery does not result in increased levels of incidental take such that population level effects would occur and is determined to be insignificant to marine mammals. • Cumulatively, conditionally significant adverse effects are expected for northern fur seals and harbor seals due to their past and present population declines; effects on the eastern population of SSLs will be insignificant.	
Groundfish consumers: harvest of prey species	• The groundfish fishery is determined to be insignificant to these marine mammals under this FMP scenario. • Cumulatively, the combined effects of internal and external mortality is insignificant as it is below the PBR for both harbor seals and northern fur seals.	
Groundfish consumers: spatial/temporal concentration	• Under PA.1, spatial and temporal concentrations of the groundfish fishery does not substantially depart from the baseline and is considered insignificant. • SSL protective measures that disperse the fisheries over time and space have been retained under this FMP; these protective measures provide benefits to other marine mammals that consume groundfish, and the impact of the groundfish fishery is expected to be insignificant to species in this category. • The combination of past and external effects, significantly adverse effects may still occur to northern fur seals and harbor seals due to their past and present population declines although effects are expected to be insignificant to the eastern stock of SSLs	• Under PA.2, spatial and temporal concentrations of the groundfish fishery does not substantially depart from the baseline and is considered insignificant. • SSL protective measures that disperse the fisheries over time and space have been retained under this FMP, and would be modified as additional scientific information becomes available; these protective measures provide benefits to other marine mammals that consume groundfish and the impact of the groundfish fishery is expected to be insignificant to species in this category. • The combination of past and external effects, significantly adverse effects may still occur due to their past and present population declines although effects are expected to be insignificant to the eastern population of SSLs.
Groundfish consumers: disturbance	• This groundfish fishery is insignificant regarding disturbance to these marine mammal species • The level of disturbance from internal and external sources is not considered to affect harbor seals or northern fur seals at the population level and is therefore considered insignificant.	

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Marine Mammals (cont.)		
Non-groundfish consumers: incidental take/entanglement in marine debris	• The groundfish fishery under this FMP does not result in increased levels of incidental take such that population level effects would occur and is determined to be insignificant to marine mammals that do not consume groundfish. • Cumulatively, the effect of incidental take and entanglement was determined to be insignificant for almost all species within this group. For some species in the 'other pinniped' group, spotted, ringed, bearded and ribbon seal, conditionally significantly adverse effects could occur due to high subsistence harvest level without an accurate population size for these species. For sea otters and endangered fin, humpback and northern right whales, conditionally significant adverse effects could occur due to historical declines or endangered status as well as potential effects on recovery. Groundfish fisheries' contribution to any of these cumulative effects is very low. • Mortality for incidental take and entanglement are insignificant to endangered blue, bowhead, and sei whales and ESA-listed minke and gray whales as population-level effects are not anticipated.	
Non-groundfish consumers: Harvest of prey species	• The groundfish fishery is determined to be insignificant to these marine mammals for prey availability under this FMP. • Cumulatively, effect on availability of prey is insignificant at the population level for all of these species primarily due to limited prey overlap with species caught by the groundfish fisheries.	
Non-groundfish consumers: spatial/temporal concentration	• SSL protection measures disperse the fisheries over time and space and have been retained under this FMP; these protective measures provide benefits to other marine mammals; the groundfish fishery is expected to be insignificant to species in this category. • Cumulatively, the spatial and temporal concentration of fisheries harvest is similar to the baseline and found to be insignificant for all species in this group.	
Non-groundfish consumers: disturbance	• This impacts of disturbance by the groundfish fishery of these marine mammal species is insignificant. • Cumulatively, disturbance is found to be insignificant for all species in this group as there is no change from the baseline level of disturbance.	

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	PA.2
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Socioeconomic		
Assessment of socioeconomic impacts considers important factors including: • Impacts on harvesting and processing sectors, including: 1) catcher vessels (CVs); 2) catcher processors (CPs); and 3) inshore processors and motherships; using catches of all groundfish species, groundfish ex-vessel value and product value, groundfish employment and payments to labor, excess capacity, product quality, product utilization rates, average costs, and fishing vessels safety as variables. • Impacts of groundfish alternatives on other non-groundfish directed commercial fisheries, such as halibut, salmon, crab and herring. • Regional impacts, on 6 regions (Alaska Peninsula and Aleutian Islands [AKAPAI], Kodiak Island [AKKO], Alaska southcentral [AKSC], southeast Alaska [AKSE], Oregon coast [ORCO], Washington inland waters [WAIW]), using processing, harvesting, payments to labor, and employment variables. • CDQ-related impacts, including changes to the CDQ program and changes to the CDQ species TACs. • Subsistence-related impacts on groundfish, SSL and salmon subsistence, as well as opportunities for practicing subsistence. • Environmental justice impacts resulting from changes in fishing activity, or impacts to the CDQ program or subsistence • Impacts on consumer benefits (U.S. consumers of groundfish products). • Impacts on benefits from marine ecosystems (other than those benefits related to commercial groundfish fisheries) including non-market (existence value and option value, etc.) and other uses of the ecosystem such as recreational fishing or tourism. **Significance Thresholds:** • In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20% or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20%, the change is not considered to be significant. • The same threshold is roughly used to assess changes in qualitative indicators (e.g., fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgment of the socioeconomic analysts.		
Harvesting and processing sectors: excess capacity, product quality and utilization, costs, vessel safety	• PA.1 is expected to result in a conditionally significant increase in product quality, product utilization rates and fishing vessel safety and a conditionally significant decrease in excess capacity and average costs for all harvesting and processing sectors, depending on the extent to which additional fisheries are rationalized.	• As the result of comprehensive rationalization of the fisheries, PA.2 is expected to result in a significant decrease in excess capacity in the harvesting and processing sectors. • Rationalization is expected to result in a significant increase in product quality and a significant decrease in average costs and increase in fishing vessel safety. If additional area closures are established, they are predicted to result in a conditionally significant decrease in product quality and fishing vessel safety and conditionally significant increase in average costs.
Harvesting and processing sectors: catch, value, employment and income	• Under PA.1, projected changes in groundfish harvests are insignificant, except Pacific cod, sablefish and rock fish catch increases significantly due to a TAC increase.	• Under PA.2, Pacific cod catch increases significantly due to a TAC increase and catches of sablefish and rockfish decrease significantly because of a more conservative TAC.

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Socioeconomics (cont.)		
Harvesting and processing sectors: catch, value, employment and income (cont.)	• Changes in total groundfish ex-vessel value, product value, employment, and payments to labor are insignificant. • The total ex-vessel value of groundfish landed by catcher vessels and the total groundfish product value of catcher processors and inshore processors/motherships are expected to increase but not significantly. • Increased Pacific cod harvests by smaller trawl catcher vessels and pot catcher vessels account for much of the increase in groundfish ex-vessel value. • Increased Pacific cod harvests by head-and-gut trawl catcher processors, longline catcher processors and pot catcher processors account for much of the increase in product value for catcher processors. • Increased deliveries of Pacific cod to BS pollock shore plants, AKAPAI shore plants, AKKO shore plants, and floating inshore processors account for much of the increase in groundfish product value for inshore processors.	
		• Longline vessels are expected to experience a significant reduction in ex-vessel value due to the decrease in the catch of sablefish and rockfish. • Decreased deliveries of rockfish and sablefish will have a significant negative impact on the product value of AKSE shore plants and AKSC shore plants.
Effects on other commercial fisheries (halibut, salmon, crab, and herring)	• Effects on prohibited species harvested in other commercial fisheries (salmon, crab, and herring) are expected to be insignificant, resulting in insignificant cumulative effects on these commercial fisheries.	• Reductions in bycatch of prohibited species by 10 to 20%, while not having a significant effect on status those stocks, would have some beneficial effects on availability to the commercial halibut fishery. • Cumulative effects of reduced bycatch on salmon, herring, and commercial fisheries are expected to be insignificant.
CDQ program and region	• Under the PA, the CDQ program would continue to operate as it does under base case conditions and no significant impacts are foreseen.	
Subsistence	• Under PA.1 and PA.2, no significant changes to the subsistence use of groundfish or SSLs are predicted. • Salmon bycatch would potentially be decreased but the impacts of this reduction on subsistence salmon fishing are unknown. • Catcher vessel activity increases are not predicted to result in significant beneficial impacts to indirect subsistence opportunities.	

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Socioeconomic (cont.)		
Regional impacts	• Change is insignificant for all harvester, processor, income, and employment variables in all regions, with the following exceptions: in the AKSC region, change in all variables listed is beneficial and significant (aside from extra-regional deliveries by catcher vessels, which is insignificant), and in the case of regionally owned catcher processors in both the AKKO and AKSE regions, where impacts are beneficial and significant (although these are relatively small sectors).	• For all regions except AKAPAI and AKSE, change is insignificant for all processor, harvester, income, and employment variables. • Within the AKAPAI region, in-region deliveries by regionally owned CVs decline significantly, but this is a small sector. • In the AKSE region, change to regionally owned at-sea processors is insignificant, but in-region processing, extra- and in-region catcher vessel deliveries, and total direct, indirect, and induced labor income and full time equivalent (FTEs) all decline significantly from baseline conditions.
	• Impacts to coastal Alaska communities, particularly in the AKAPAI and AKKO regions, resulting from consolidation (for direct fishery sectors) and other changes accompanying the change from a race-for-fish to a rationalized fishery (especially for support service sectors) would be conditionally significant. This would be driven by yet-to-be-designed consolidation restrictions and community protection features of the alternative.	
		• Additionally, Alaska coastal communities with small vessel fleets would experience conditionally significant impacts from the expansion of MPA set-asides; level of impact would be conditional based on the efficacy of features designed to respect traditional fishing grounds and maintain open area access for coastal communities.
Environmental justice issues	• Under PA.1, no significant environmental justice impacts are predicted from changes in direct fishery activity in any of the regions. • No environmental justice concerns associated with either the CDQ program or subsistence activities are predicted.	• Under PA.2, environmental justice impacts to the catcher vessel fleet in the AKAPAI region would be conditionally significant depending upon the specific design of MPA and rationalization features of this alternative. • No other changes in direct fishery sector activity are predicted to result in environmental justice impacts due to the demographics of the specific sectors. • No environmental justice concerns associated with either the CDQ program or subsistence activities are predicted.
Consumer benefits	• Changes in benefits to U.S. consumers of groundfish products would be insignificant.	
Benefits from marine ecosystems (other than those benefits related to commercial groundfish fisheries)	• PA.1 is predicted to have no significant effects relative to the comparative baseline on the level of benefits the BS and GOA marine ecosystems and associated species provide.	• PA.2 is predicted to have a conditionally significant positive impact on the levels of some of the benefits these ecosystems and associated species generate. Positive effects depend primarily on the extent to which additional area closures to protect habitat are implemented.

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Ecosystem (cont.)		
Assessment of ecosystem impacts considers important factors influencing: • **Predator/prey relationships**: 1) pelagic forage availability because pelagic forage form the central part of BSAI and GOA food webs, channeling energy from the bottom of the food web to the many species at the top that rely on pelagic forage; 2) spatial/temporal concentration of fishery removals of forage have the potential to affect top predators such as marine mammals and seabirds that make feeding forays from land; and 3) Top predators receive energy from lower trophic levels and provide energy storage and stabilization effects on marine food webs, their removal may increase variability and instability in the ecosystem. • **Energy removal and re-direction** by fisheries could affect total ecosystem production levels and characteristics that influence energy cycling. • **Diversity** of various ecosystem characteristics such as species diversity, functional diversity, and genetic diversity helps maintain stability in ecosystem functioning and provide a kind of ecological "insurance" to protect ecosystem functioning. • **Significance thresholds** for ecosystem effects relate fishing induced changes that are sufficient to bring any population below minimum biologically acceptable limits (MSST for target species, status listing of others) or to prevent a population that is already below a limit from recovering. Some ecosystem level thresholds are defined as changes in system level characteristics that are outside the range of natural variability. • In cases where thresholds cannot be defined quantitatively, indicators of change are used to determine direction and magnitude of the fishing effect. Some indicators include population trends of indicator species relative to fishing effects, degree of fishery concentration, trophic level of the catch, total catch, bycatch, discards, and offal production levels, bottom gear effort, amount and location of area closures. Indicator species include a variety of target and nontarget forage species, target, nontarget and PSC species that are top predators, scavenger species, and HAPC biota (organisms that form structural bottom habitat: corals, seapens/whips, sponges, and anemones). • See Section 4.1 for details on the significance thresholds for ecosystem effects and quantitative indicators used in the analysis.		
Predator/ prey relationships: change in pelagic forage availability	• Spatial and temporal concentration of fishing effort on forage species does not change significantly from the baseline. • External effects such as the herring fishery, subsistence removals, oil spills/contamination, and climate variability could result in significant adverse impacts on forage availability.	• Area closures in this alternative have the potential to reduce the spatial/temporal concentration of fisheries in foraging areas of Steller sea lions, northern fur seals, and harbor seals, making target species prey more available to these mammals. • External effects such as herring fisheries, subsistence fishing, petroleum contamination, and climate change could offset this conditionally beneficial effect.
Predator/ prey relationships: spatial/temporal concentration of forage	• There are no significant impacts to most top predator populations in PA.1 and PA.2. • There are unknown impacts on shark species due to uncertainty regarding abundance. • Conditionally significant adverse impacts could occur from external factors such as subsistence harvest of mammals, international longline bycatch of seabirds, petroleum contamination, and climate regime shifts.	
Predator/ prey relationships: removal of top predators	• The potential for non-native species introductions via ballast water exchange or hull-fouling organism release from fishing vessels is insignificant relative to the baseline.	
Energy removal	• Total groundfish fishery catches are estimated to remove less than one percent of the total system energy. • Energy removals from other fisheries are not likely to significantly increase this level outside the range of natural variability.	

Table 4.10-2b (cont.). Comparison of example Fishery Management Plans by resource category: the Preferred Alternative.

	Preferred Alternative (PA)	
	PA.1	**PA.2**
	A detailed summary of the Preferred Alternative can be found in Section 4.9.11	
Socioeconomic (cont.)		
Energy redirection	• Discards, offal, or gear-related mortality from groundfish fisheries do not appear to produce significant impacts to BSAI and GOA ecosystems via redirection.	
Species diversity	• Catch amounts of target species, prohibited species, seabirds, and marine mammals are insufficient to bring these species below minimum population thresholds. • It is unknown whether bycatch amounts of species with vulnerable life history characteristics lacking species-level biomass estimates (e.g., skates, sharks, and grenadiers) would result in significant population-level effects.	
Functional (trophic) diversity	• Trophic diversity does not appear to be impacted by groundfish fisheries based on qualitative analysis of diversity changes relative to fishery removals and bottom effort changes that might disturb benthic trophic guilds. • Introductions of Atlantic salmon or other exotic species, subsistence harvest of marine mammals, and future climatic regime shifts could significantly alter trophic guild diversity beyond the range of natural variability.	
Functional (structural habitat) diversity	• Living organisms, such as corals, seapens/ whips, sponges, and anemones, provide structural habitat for other marine life. Bottom gear damage from groundfish fisheries could potentially cause adverse impacts to this guild of organisms. • The additive effects of the scallop fishery, petroleum contamination in areas of bottom habitat, and climatic regime shifts could combine to cause significant adverse impacts.	• The area closures proposed in PA.2 are designed with coral in mind and may provide protection for the broad spatial distribution of corals in the Aleutian Islands, in particular. • Effects of groundfish fisheries on structural habitat diversity are insignificant. • The additive effects of other factors such as scallop dredging, petroleum contamination of bottom habitat, and/or climatic regime shift, could result in potentially significant impacts.
Genetic diversity	• Effects on genetic diversity through heavy exploitation of spawning aggregations or systematic targeting of older age classes is insignificant for most species in this alternative, although the impacts on some species remains unknown. • Release of farm-raised salmon, exotic species introductions, and subsistence harvests of local marine mammal stocks could potentially result in significant adverse impacts.	

Table 4.10-3. Comparative summary of the philosophy, assumptions, plan of action and goals of the policy statements.
NOTE: Language taken from text of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative (PA)
Philosophy	Management process will be adaptive to new information and reactive to new environmental issues.	Establishes a more aggressive harvest strategy, goal would be to maximize biological and economic yield from the resource.	Additional conservation and management measures will be taken as necessary to respond to social, economic or conservation needs, or if scientific evidence indicates that the fishery is negatively impacting the environment.	Extremely precautionary approach to managing fisheries under scientific uncertainty in which the burden of proof is shifted to the user of the resource.	Forward looking conservation measures that address differing levels of uncertainty; precautionary approach that applies judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future as well as current generations.
Assumptions	Based on the assumption that fishing does produce some adverse impact to the environment.	Based on the assumption that fishing does not have an adverse impact on the environment except in specific cases as noted.	Recognizes need to balance many competing uses of marine resources and different social and economic goals for fishery management.	Based on the assumption that fishing does produce adverse impacts on the environment, but due to lack of information and uncertainty, we know little about these impacts.	Recognizes that potential changes in productivity may be caused by fluctuations in natural oceanographic conditions, fisheries, and other, non-fishing activities, and intends to continue to take appropriate measures to insure the continued sustainability of the managed species.
Plan of action	As adverse impacts become known, mitigation measures are developed and Fishery Management Plan (FMP) amendments are implemented; goals will be addressed through existing institutions and processes.		Will utilize and improve upon existing processes to involve a broad range of the public in decisionmaking.	Strategy will result in changes that will significantly curtail the groundfish fisheries until more is knows about impacts; once more is known, initial measures will be modified or relaxed.	Will utilize and improve upon existing open and transparent process to involve the public in decisionmaking; will review, modify, eliminate, or consider new issues as appropriate to best carry out the goals and objectives; objectives will be reviewed annually, and the Programmatic Supplemental Environmental Impact Statement (PSEIS) will be used as a planning document.

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative (PA)
Prevent overfishing					
Harvest strategy	• Conservative harvest levels for single species fisheries.		• Conservative harvest levels for multispecies and single species fisheries. • Evaluate F_{40} and implement improvements.	• Transition from single-species to ecosystem-oriented management of fishing activities. • Establish a program to maintain ecological relationships among exploited, dependent and related species as well as ecosystem processes that sustain them.	• Conservative harvest levels for multispecies and single species fisheries and specify optimal yield (OY). • Scientific review of F_{40} and adopt improvements as appropriate.
OY	• Specify OY as a range with the cap at 2 million (mill) metric tons (mt) in the Bering Sea and Aleutian Islands (BSAI), 0.8 mill mt in the Gulf of Alaska (GOA).	• Specify OY as a range. • Set OY cap at the sum of overfishing levels (OFLs) or acceptable biological catch (ABCs) for each species.	• Specify OY as a range or a formula.		• Specify OY as a range with the cap at 2 mill mt in BSAI (as stated in current law), 0.8 mill mt in GOA.
Other			• Improve biological information necessary to determine minimum stock size threshold (MSSTs) particularly for Tier 4 species.	• Close a percentage of known target stock spawning area.	• Improve the management of species through species categories
Promote sustainable fisheries and communities[1]					
Benefit to the nation					• Provide for OY in terms of providing the greatest overall benefit to the nation with particular reference to food production.
Stability					• Avoid significant disruption of existing social and economic structures.

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative (PA)
Promote sustainable fisheries and communities[1] (cont.)					
Equity					• Promote fair and equitable allocation of identified available resources.
Safety					• Promote increased safety at sea.
Preserve food web					
Ecosystem considerations	• Incorporate ecosystem considerations into fishery management decisions. • Consider the impact of fishing on predator-prey and other ecological relationships.	(none)	• Incorporate ecosystem considerations into fishery management decisions.	• Address the impact of fishing on predator-prey and other important ecological relationships. • Conserve native species and biological diversity.	• Incorporate ecosystem considerations into fishery management decisions as appropriate.
Fishing levels	• Limit harvest of forage species.		• Improve procedure to account for uncertainty and ecosystem factors in ABCs.	• Reduce ABCs/set highly precautionary fishing levels to account for uncertainty and ecological considerations.	• Improve procedure to account for uncertainty and ecosystem factors in ABCs. • Limit harvest of forage species.
Research			• Develop indices of ecosystem health as targets for management. • Initiate research program to identify the habitat needs of the significant food web.	• Develop and implement a fishery ecosystem plan.	• Develop indices of ecosystem health as targets for management.
Manage incidental catch, and reduce bycatch and waste[2]					
Level	• Current bycatch and incidental catch management program. • Require full utilization of target species.		• Continue and improve bycatch and incidental catch program. • Develop incentive programs for bycatch and incidental catch reduction. • Develop management measures that encourage gear or techniques that reduce discards.	• Reduce bycatch, incidental catch and prohibited species catch (PSC). • Phase out fisheries with >25% bycatch or incidental catch.	• Continue and improve bycatch and incidental catch program. • Develop incentive programs for bycatch reduction. • Develop management measures that encourage gear or techniques that reduce bycatch which includes economic discards. • Reduce waste to biologically and socially acceptable levels

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative (PA)
Manage incidental catch, and reduce bycatch and waste[2] (cont.)					
Closures	• Manage bycatch and incidental catch through seasonal total allow able catch (TAC) distribution and geographic gear restrictions. • Respond to population and decline by area, gear and seasonal closures.	• Manage incidental catch and bycatch through gear closure areas.			• Manage bycatch and incidental catch through seasonal TAC distribution and geographic gear restrictions.
PSC	• Control PSC through limits.	• Monitor PSC bycatch and adjust or eliminate limits.		• Establish GOA PSC limits for salmon, crab and herring.	• Control PSC through limits or other appropriate measures.
TAC	• Account for bycatch mortality in TAC accounting.			• Include mortality in TAC accounting and improve accuracy of mortality including unobserved.	• Account for bycatch mortality in TAC accounting.
Non-target species			• Encourage research on population estimates for non-target species w ith a view to setting bycatch limits.	• Set stringent bycatch limits for vulnerable non-target species.	• Encourage research on population estimates for non-target species w ith a view to setting bycatch limits.
Avoid impacts to seabirds and marine mammals					
Seabirds	• Protect Endangered Species Act (ESA)-listed and other seabird species.	• Maintain protection measures for ESA-listed species.	• Protect ESA-listed and other seabirds. • Joint research program to establish population estimates for all seabird species.	• Set protection measures for all seabirds and develop methods to reduce the incidental take levels. • Joint research program to establish population estimates for all seabird species, and modify protection measures as appropriate.	• Protect ESA-listed and, if appropriate and practicable, other seabird species.

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative (PA)
Avoid impacts to seabirds and marine mammals (cont.)					
Marine mammals	• Maintain protection measures to avoid jeopardy to ESA-listed Steller sea lions.	• Maintain protection measures to avoid jeopardy to ESA-listed Steller sea lions.	• Maintain or adjust protection measures for ESA-listed Steller sea lions. • Review status of other marine mammal and fishery interactions and develop appropriate measures.	• Increase Steller sea lion protection measures by further restricting gear in critical habitat and setting more conservative harvest levels for prey base species.	• Protect ESA-listed and, if appropriate and practicable, other marine mammal species • Maintain or adjust protection measures for ESA-listed Steller sea lions. • Review status of endangered and threatened marine mammal and fishery interactions and develop appropriate measures.
Reduce and avoid impacts to habitat					
Closures	• Close important habitat to all fishing in response to new scientific information. • Evaluate candidate areas for Marine Protected Areas (MPAs).	• Evaluate candidate areas for MPAs.	• Develop goals and criteria to evaluate the efficacy MPAs, consider implementation.	• Establish 20-50% of area as no-take marine reserves. • Prohibit trawling where fishery can be prosecuted with other gear types, and establish trawl closure areas.	• Review and evaluate efficacy of existing habitat protection measures for managed species. • Develop a MPA policy in coordination with national and state policies. • Develop goals and criteria to evaluate the efficacy MPAs, implement if and where appropriate.
Essential fish habitat (EFH)		• Identify EFH and determine appropriate habitat measures.	• Identify EFH and habitat areas of particular concern (HAPC).	• Protect habitat including EFH, HAPC, ESA critical habitat, etc.	• Identify EFH and HAPC pursuant to MSA rules. • Mitigate fishery impacts as necessary and practicable to continue the sustainability of managed species.
Research	• Implement research to evaluate impacts of trawl gear on habitat.	• Implement research to evaluate impacts of trawl gear on habitat.	• Implement research to evaluate impacts of all gear on habitat. • Develop regional baseline habitat. information and mapping.	• Manage adaptively, using large no take areas as experimental controls to facilitate learning.	• Encourage development of regional baseline habitat information and mapping.
Promote equitable and efficient use of fishery resources[3]					
	• Provide economic and community stability through maintaining allocation percentages.		• Provide economic and community stability through fair allocation of fishery resources.	• Consider non-consumptive values.	• Provide economic and community stability through fair allocation of fishery resources.

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative (PA)
Promote equitable and efficient use of fishery resources[3](cont.)					
Excess capacity	• Reduce excess capacity, overcapitalization and the adverse effects of the race for fish.	• Maintain American Fisheries Act (AFA) and community development quota (CDQ) as authorized by the Magnuson-Stevens Fishery Conservation and Management Act (MSA).	• Maintain License Limitation Program (LLP) and reduce capacity and other adverse effects of the race for fish by extending rights-based management to some or all fisheries. • Periodically evaluate the effectiveness of rationalization.	• Reduce excess capacity, employ equitable allocative or cooperative programs to end the race for fish, reduce waste, increase safety and promote stability and benefits to communities.	• Maintain LLP and modify as necessary. • Decrease excess capacity and overcapitalization by eliminating latent licences and extending rights-based management to some or all fisheries. • Periodically evaluate the effectiveness of rationalization.
Efficiency					• Increase the efficient use of fishery resources taking into account the interest of harvesters, processors, and communities.
Increase Alaska native consultation					
Traditional knowledge	• Continue incorporating traditional knowledge into fisheries management.	• Continue incorporating traditional knowledge into fisheries management.	• Continue incorporating traditional knowledge into fisheries management, increase traditional knowledge data collection.	• Utilize traditional knowledge, including monitoring and data gathering, through co-management and cooperative research programs.	• Continue incorporating local and Traditional Knowledge into fisheries management, increase local and Traditional Knowledge data collection.
Consultation	• Continue Alaska Native consultation and participation in fisheries management.	• Continue Alaska Native consultation and participation in fisheries management.	• Increase Alaska Native consultation and participation in fisheries management.	• Increase participation of and consultation with Alaska Native subsistence users.	• Increase Alaska Native consultation and participation in fisheries management.
Improve data quality, monitoring and enforcement[4]					
Observer program	• Continue Observer Program for catch estimates.	• Consider repealing the Observer Program.	• Increase the utility of observer data. • Improve the Observer Program, including the funding mechanism.	• Increase the precision of observer data through increased coverage and enhanced sampling protocols, address the funding issue.	• Increase the utility of observer data. • Improve the Observer Program, including the funding mechanism.
Reporting	• Continue industry reporting, and efforts to improve economic impact assessments.	• Continue industry reporting, and efforts to improve economic impact assessments.	• Increase data and reporting requirements in order to improve economic impact assessments.		• Increase data and reporting requirements in order to improve economic impact costs and benefits.

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative (PA)
Improve data quality, monitoring and enforcement[4] (cont.)					
Technology	• Increase quality of monitoring data through technology.		• Increase quality of monitoring data through technology.	• Improve enforcement and inseason management through technology.	• Increase quality of monitoring data through technology.
Research			• Establish a baseline ecosystem monitoring program. • Adopt recommended research plan in the PSEIS. • Cooperate with research institutions to identify research priorities.	• Establish a baseline monitoring program, use to improve the Fishery Ecosystem Plan. • Adopt recommended research plan in the PSEIS.	• Establish a baseline ecosystem monitoring program. • Cooperate with research institutions to identify research needs and develop programs.
Enforcement					• Promote enhanced enforceability. • Cooperate, consult, coordinate with federal and state agencies and organizations for conservation, sustainability, management and enforcement.

Notes: [1]This heading was added to the PA by the NPFMC.
[2]In Alternatives 1 - 4, this heading is: Reduce and Avoid Bycatch.
[3]In Alternatives 1 - 4, this heading is: Allocation.
[4]In Alternatives 1 - 4, this heading is: Data Quality, Monitoring and Enforcement.

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Table 4.11-1. Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
Magnuson-Stevens Act (MSA) National Standards	**Standard 1 -** Prevent overfishing while achieving on a continuing basis optimum yield.	Perhaps. Acknowledges that optimal yield (OY) will be defined based on consideration of all ecosystem needs and that management will continue to be adaptive and risk-averse. Have learned that there exist different interpretations of the meaning of "optimum". Minimum stock size thresholds (MSSTs) are specified in the Stock Assessment and Fishery Evaluations (SAFEs) not Fishery Management Plans (FMPs) and although operationally MSSTs are taken into account in the management of the fisheries, this may not satisfy the MSA requirement to specify MSSTs in FMPs and the National Standard Guidelines for determining whether a stock is currently overfished or approaching an overfished definition. [Objectives 1, 2, and 3]	Perhaps. Goals include maximizing biological and economic yield while preventing overfishing. Programmatic Supplemental Environmental Impact Statement (PSEIS) says that risks of overfishing go up the closer you get to overfishing level (OFL) due to uncertainty. MSSTs are specified in the SAFEs not FMPs and although operationally MSSTs are taken into account in the management of the fisheries, this may not satisfy the MSA requirement to specify the MSSTs in FMPs National Standard Guidelines for determining whether a stock is currently overfished or approaching an overfished definition. [Objectives 1 and 2]	Yes. Policy seeks to provide sound conservation of living marine resources, provide socially and economically viable fisheries and fishing communities, minimize threats to listed species, and maintain a healthy habitat. [Objectives 1, 2, 3, 4, 5, 6, and 7]	Yes. Policy would substantially reduce harvests and may even temporarily suspend commercial groundfish fishing. Policy shifts burden of proof and gives decreased emphasis in addressing industry and community concerns. [Objectives 1, 2, 3, and 6]	Yes. Policy seeks to provide sound conservation of living marine resources, provide socially and economically viable fisheries and fishing communities, minimize threats to listed species, and maintain a healthy habitat. [Objectives 1, 2, 3, 4, 5, 10, and 11]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
MSA National Standards (cont.)	**Standard 2 -** Based on the best scientific info available.	Yes. Have learned that most consider the best scientific information available as the most recent. That may not be the case in all instances.	Yes. Goals include maximizing biological and economic yield while preventing overfishing. [Objectives 1 and 2]	Yes. Policy seeks to balance goals of MSA based on best scientific information available. [Objectives 3, 4, 6, 8, 11, 14, 16, 18, 19, 23, 25, 26, 27, 28, 30, 32, 33, 34]	Yes. Policy requires that scientific evidence be obtained that can conclusively prove that fishing has no significant adverse impacts to the marine ecosystem. [Objectives 13, 15, 17, 19, 22, 24, 26, 27]	Yes. Policy seeks to balance goals of MSA based on best scientific information available. The PA also includes a recognition that adaptive management requires regular and periodic review; objectives will be reviewed annually to determine progress and incorporate best scientific information. [Objectives 3, 4, 5, 10, 11, 13, 14, 16, 17, 19, 24, 26, 29, 33, 35, 36, 38, 39, 40, 41, 42, 43]
	Standard 3 - Individual stock shall be managed as a unit throughout its range, and interrelated stocks shall be managed in close coordination.	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [Objectives 1, 4, 5, 6, 9, 10, 12, 15]	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [Objective 1]	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [Objectives 4 and 32]	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [Objectives 1 and 26]	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [Objectives 1, 5, 16, 42, 45]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
MSA National Standards (cont)	**Standard 4** - Measures shall not discriminate between residents of different states; allocation shall be fair and equitable to all fishermen, shall promote conservation, and not allow anyone to acquire an excessive share.	Yes. Considerable effort has been devotes to ensure that groundfish measures do not discriminate among residents. Have learned that almost all actions can result in allocative effects, leading to controversy. [Objective 19]	Yes. Shares same problems as Alternative 1.	Yes. Policy recognizes the need to balance many competing uses and to improve public involvement. [Objectives 21 and 27]	Yes. Decisions will involve the public but decrease emphasis on economic and community concerns. Equitable allocative or cooperative programs will be developed. [Objectives 20 and 23]	Yes. Policy recognizes the need to balance many competing uses and to improve public involvement. [Objectives 6, 7, 8, 9, 31, 34, 37]
	Standard 5 - Measures shall consider efficiency in use of fishery resources, except no measures shall have economic allocation as its sole purpose.	Yes. Economic efficiency a primary objective behind reducing overcapacity. Have m also learned that introducing inefficiencies can serve as economic incentives to modify fishing behavior. [Objective 18]	Yes. Maintain existing individual fishing quota (IFQ) and Limited License Program (LLP) programs. [Objectives 10]	Yes. Expand rights-based management to other groundfish fisheries and communities. [Objectives 22, 23]	Yes. Decisions will involve the public but decrease emphasis on economic and community concerns. Equitable allocative or cooperative programs will be developed. [Objectives 20 and 21]	Yes. Expand rights-based management to other groundfish fisheries and communities. [Objectives 6, 32, 33, 34]
	Standard 6 - Allow for variations and contingencies in fisheries, fishery resources and catches.	Yes. FMPs would retain flexibility and continue risk-averse harvest strategy. [Objective 3, 8, 12, 22]	Yes. OY would continue to be stated as a range. [Objectives 2, 3, 13]	Yes. Adaptive management and frameworked measures provide flexibility. [Objectives 2, 3, 9, 28]	Yes. FMPs will be adaptive but guided by strict interpretation of the precautionary principle. [Objectives 3, 7, 15, 17, 25]	Yes. Adaptive management and frameworked measures provide flexibility. [Objectives 3, 4, 7, 9, 14, 17, 23, 26, 33, 38, 41]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
MSA National Standards (cont)	**Standard 7** - Where practicable minimize costs and avoid unnecessary duplication.	Yes. Record keeping and reporting requirements aim to avoid unnecessary duplication; electronic reporting reduces cost to industry. Technological advances will reduce costs. [Objective 24]	Yes. Policy assumes that fishing has no, or few, adverse environmental effects. Consider repealing the Observer Program to reduce costs. [Objective 15]	Yes. Policy will require expanded research and data collection, increased analysis of fishery effects, and potential expansion of marine protected areas (MPAs) that will result in increased management and enforcement costs. [Objectives 31 and 34]	Yes. Policy will require expanded research and data collection, increased analysis of fishery effects, and potential expansion of MPAs and No-Take Reserves that will result in increased management and enforcement costs. [Objective 25]	Yes. Policy will require expanded research and data collection, increased analysis of fishery effects, and potential expansion of marine protected areas (MPAs) that will result in increased management and enforcement costs. The PA goes further in seeking funds for observer program and research and to reduce costs of recordkeeping and enforcement through technological improvements. [Objectives 41, 43 and 45]
	Standard 8 - Measures shall take into account the importance of fishery resources to fishing communities to provide for sustained participation and to minimize adverse economic impacts where practicable.	Yes. Inshore and offshore allocations, seasonal allocations, and community development quota (CDQ) program are examples of actions to promote economic stability. [Objective 19]	Yes. Although a more aggressive harvest policy could result in changes in gear and community share of total allowable catch (TAC). Higher exploitation could provide short-term economic benefits at the risk of long-term sustainability. [Objective 10]	Yes. Policy seeks to provide socially and economically viable fisheries and fishing communities. [Objectives 21, 26, 27, 30]	Yes, but industry and community considerations are given less emphasis in decision making in favor of ecosystem considerations. [Objectives 20 and 23]	Yes. Policy seeks to provide socially and economically viable fisheries and fishing communities. [Objectives 6, 7, 8, 31, 34, 36, 40]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
	Standard 9 - Minimize bycatch or where unavoidable, minimize mortality of bycatch to the extent practicable.	Yes. Bycatch limits, caps, and other economic incentives are used to reduce bycatch and waste. [Objectives 5, 7, 8, 9, 10, 11, 12, 18]	Perhaps. Bycatch would continue to be monitored and prohibited species catch (PSC) limits adjusted as necessary. PSC limits not needed would be eliminated. Depending on applications of the policy, bycatch measures may not necessarily satisfy the requirements of this standard. [Objectives 3 and 4]	Yes. Existing bycatch measures would continue and be expanded as appropriate to further reduce bycatch and waste. [Objectives 9, 10, 11, 12, 22]	Yes. Policy would expand and reduce bycatch limits and phase out fisheries with high bycatch rates. [Objectives 4, 7, 8, 9, 10, 11, 16]	Yes. Existing bycatch measures would continue and be expanded as appropriate to further reduce bycatch and waste. [Objectives 12, 14, 15, 16, 17, 18, 19, 20, 21, 32]
MSA National Standards (cont)	**Standard 10** - Promote safety of human life at sea, to the extent practicable.	Yes. Selection of season dates and IFQ program are examples where actions were taken to reduce risk to human life among other objectives. [Objective 18]	Yes, although a more aggressive harvest policy combined with possible relaxation of overcapacity measures could result in increased risk to fishermen and vessels. [Objective 10]	Yes. A more precautionary management policy would promote human safety at sea by improving public involvement in decision making. [Objective 22]	Yes. An extremely precautionary management policy would promote human safety at sea by involving and being responsive to the public. Indirectly, risk to human safety will occur through decreased harvest opportunities. [Objective 20]	Yes. A more precautionary management policy would promote human safety at sea by improving public involvement in decision making. [Objective 9 and 32]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
MSA essential fish habitat (EFH)	Agency/Council shall consult/comment on any action that may adversely affect the habitat, including EFH, of any anadromous fishery resource, and Secretary of Commerce (SOC) will recommend measures to conserve such habitat.	Yes. EFH explicitly incorporated into policy with a commitment to research and the development of mitigations measures as determined necessary. [Objectives 15, 16, 17]	Yes. Research would continue on the effects of fishing on EFH and mitigation measures taken as appropriate. [Objectives 8 and 9]	Yes. Policy seeks to maintain and protect EFH and will consider implementation of a MPA program to mitigate adverse effects and protect important HAPC. [Objectives 17, 18, 19, 20]	Yes. Policy seeks to protect EFH and habitat area of particular concern (HAPC) through implementation of MPA program that includes No-Take Reserves. [Objectives 15, 16, 17, 18, 19]	Yes. Policy seeks to maintain and protect EFH and will consider implementation of a MPA program to mitigate adverse effects and protect important HAPC. [Objectives 26, 27, 28, 29, 30]
Endangered Species Act (ESA)	To provide for the protection and conservation of endangered and threatened species. To avoid jeopardy and adverse modification to critical habitat.	Yes. Protection to threatened and endangered species is explicitly incorporated into policy with a commitment to modify its FMPs as new scientific evidence becomes available. [Objectives 10, 13 and 14]	Yes. Protection to threatened and endangered species is explicitly incorporated into policy. [Objectives 3, 6 and 7]	Yes. Protection to threatened and endangered species is explicitly incorporated into policy with a commitment to modify its FMPs as new scientific evidence becomes available. [Objectives 9, 11, 13, 14, and 15]	Yes. Protection to threatened and endangered species is explicitly incorporated into policy with a commitment to expand research and monitoring programs. [Objectives 7, 8, 10, 12, 13, 14, 18]	Yes. Protection to threatened and endangered species is explicitly incorporated into policy with a commitment to modify its FMPs as new scientific evidence becomes available. [Objectives 16, 19, 20, 21, 22, 23, 24, 25]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
Marine Mammal Protection Act (MMPA)	Protect marine mammals and their habitats from the adverse effects of man's actions. If the incidental take of marine mammals is found to in a significant adverse impact, the responsible federal agency must consult with the North Pacific Fishery Management Council (NPFMC) and develop emergency measures to limit that take.	While not explicitly referring to MMPA, policy statement sets as a goal the compliance with other applicable federal law and the minimization of fishing impacts on the environment. [Objective 14]	While not explicitly referring to MMPA, policy includes objectives aimed at protecting marine mammals and their habitats. [Objective 14]	Yes. Policy statement sets as a goal the periodic review of marine mammal populations and fishing interactions and to develop fishery management measures as necessary. [Objectives 15 and 16]	While not explicitly referring to MMPA, policy includes objectives aimed at protecting marine mammals and their habitats. [Objectives 14, 18 and 23]	Yes. Policy statement sets as a goal the periodic review of marine mammal populations and fishing interactions and to develop fishery management measures as necessary. [Objective 24 and 25]
Executive order (EO) 12898 environmental justice	Each federal agency must make achieving environmental justice a part of its mission.	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision making process. [Objectives 20 and 21]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision making process. [Objectives 11 and 12]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision making process. [Objectives 25, 26, 27]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision making process. [Objectives 22 and 23]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision making process. [Objectives 6, 8, 35, 36, 37]
EO 12866 regulatory planning and review	Each agency must prepare a regulatory impact review to evaluate the costs and benefits of intended regulations.	Yes. Regulatory impact reviews (RIRs) are routinely prepared for all regulatory packages as part of the National Environmental Policy Act (NEPA) analysis and initial regulatory flexibility analysis (IRFA).	Yes. RIRs will continue to be included in all regulatory packages as part of the NEPA analysis and IRFA.	Yes. RIRs will continue to be included in all regulatory packages as part of the NEPA analysis and IRFA.	Yes. RIRs will continue to be included in all regulatory packages as part of the NEPA analysis and IRFA.	Yes. RIRs will continue to be included in all regulatory packages as part of the NEPA analysis and IRFA.

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
EO 13084 government to government coordination	Federal agencies must establish a process to permit Indian tribal governments to provide meaningful and timely input in the development of regulatory practices that affect their communities.	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision-making process. Agency does consult with Alaska tribal governments on fishery issues that are found to adversely affect their communities. [Objectives 21]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision-making process. [Objective 12]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision-making process. [Objective 27]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision-making process. [Objectives 22 and 23]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decision-making process. [Objectives 37 and 45]
EO 13158 MPAs	Strengthen the management, protection, and conservation of existing MPAs; develop a scientifically based, comprehensive national system of MPAs; develop new or expanded MPAs, and avoid causing harm to MPAs through federal actions.	Yes. EFH explicitly incorporated into policy with a commitment to research and the development of mitigations measures as determined necessary. [Objectives 15, 16, 17]	Yes. Research would continue on the effects of fishing on EFH and mitigation measures taken as appropriate. [Objectives 8 and 9]	Yes. Policy seeks to maintain and protect EFH and will consider implementation of a MPA program to mitigate adverse effects and protect important HAPC. MPA program would review and certify existing areas and consider additional use of MPAs and No-Take Reserves [Objectives 17, 19, 20]	Yes. Policy seeks to protect EFH and HAPC through implementation of MPA program that greatly expands use of No-Take Reserves. [Objectives 2, 15, 16, 17, 18]	Yes. Policy seeks to maintain and protect EFH and will consider implementation of a MPA program to mitigate adverse effects and protect important HAPC. MPA program would review and certify existing areas and consider additional use of MPAs and No-Take Reserves [Objectives 26, 27, 28, 30]

Notes: Brackets [ ] cite the management approach and objectives of a specific alternative that meet the requirement listed.
The Management Approach for each alternative meets all of these requirements and is therefore not listed separately in each cell.

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal law	Requirement	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
EO 13158 MPAs	Strengthen the management, protection, and conservation of existing MPAs; develop a scientifically based, comprehensive national system of MPAs; develop new or expanded MPAs, and avoid causing harm to MPAs through federal actions.	Yes. EFH explicitly incorporated into policy with a commitment to research and the development of mitigations measures as determined necessary. [Objectives 15, 16, 17]	Yes. Research would continue on the effects of fishing on EFH and mitigation measures taken as appropriate. [Objectives 8 and 9]	Yes. Policy seeks to maintain and protect EFH and will consider implementation of a MPA program to mitigate adverse effects and protect important HAPC. MPA program would review and certify existing areas and consider additional use of MPAs and No-Take Reserves [Objectives 17, 19, 20]	Yes. Policy seeks to protect EFH and HAPC through implementation of MPA program that greatly expands use of No-Take Reserves. [Objectives 2, 15, 16, 17, 18]	Yes. Policy seeks to maintain and protect EFH and will consider implementation of a MPA program to mitigate adverse effects and protect important HAPC. MPA program would review and certify existing areas and consider additional use of MPAs and No-Take Reserves [Objectives 26, 27, 28, 30]

Notes: Brackets [ ] cite the management approach and objectives of a specific alternative that meet the requirement listed.
The Management Approach for each alternative meets all of these requirements and is therefore not listed separately in each cell.

Table 4.11-2. Comparison of policy-level impacts of the alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
NOTE: The implication of a split color rating is that major components within the category will undergo a different impact under the alternative in question. To the extent possible, the rationale is explained in the bullets beneath.					
What is the impact of the policy on the sustainability of target stocks (preventing overfishing)?	• Successful at preventing overfishing of target stocks, ensures sustainable fishery. • No incentive to research those stocks on which impacts of fishing are unknown; possible to overharvest a vulnerable member of a stock complex.	• Maximizes economic yield while preventing overfishing of target stocks, but not effective at preventing stocks from becoming overfished. • Increases the chance of unintentionally overfishing a stock.	• Prevents overfishing of target stocks through precautionary harvest policies. • Acceleration of efforts to identify methods for reducing the number of stocks where the status relative to an overfished condition is unknown.	• Establishes a very conservative harvest policy which is likely to prevent stocks from becoming overfished. • Protects most vulnerable species of a complex, but the resulting management would be difficult to implement.	• Prevents overfishing of target stocks through precautionary harvest policies. • Acceleration of efforts to improve the current harvest strategy.
What is the impact of the policy on the sustainability of fisheries and communities?	• Continues to provide economic and community stability within the current system while adapting management programs when the need arises. • Some fisheries and communities are stressed due to negative effects of the race for fish.	• Long-term sustainability of fisheries and communities may be problematic if scenarios depicted in 2.1 are implemented; in the short-run fisheries and communities will likely see improved economic conditions. • If less aggressive actions are pursued, likely to be no better or worse than Alternative 1.	• Rationalization of fisheries holds the promise of improved fishery and community sustainability. • Extensive area closures associated with more aggressive ecosystem-based management may reduce small-boat and Alaska community involvement in fisheries.	• Extensive total allowable catch (TAC) reductions and area closures reduce viability of fisheries and fishery dependent communities. • Some fisheries may survive if assumptions of impacts are correct.	• Rationalization of fisheries holds the promise of improved fishery and community sustainability. • Incorporation of community protection elements into rationalization and ecosystem-based management programs are likely to ensure coastal community stability.
What is the impact of the policy on the stability of the food web and community structures (preserving the food web)?	• Likely effective in protecting food web components that are more well-studied than others and those that are at critical population thresholds. • Uncertain whether sufficient protection is provided to others for which less-complete information is available.	• High potential to create adverse food web impacts through its lack of precaution for many food web components, which leaves no room for uncertainty.	• Many improvements provide additional protection against uncertainty in order to achieve the goal of preserving the food web. • If implemented, this strategy is likely to provide protection to a broad range of food web components.	• Very successful in meeting the goal of preserving the food web, by providing large buffers against scientific uncertainty about ecosystem impacts. • Achieves protection of virtually all food web components and thus ecosystem function.	• Many improvements provide additional protection against uncertainty in order to achieve the goal of preserving the food web. • If implemented, this strategy is likely to provide protection to a broad range of food web components.
What is the impact of the policy on bycatch (discards) and incidental catch?	• Effective at limiting incidental catch of non-target species and reducing of bycatch. • Insufficient reporting of individual species catch, and catch in shallow water environments.	• May not be consistent with the goal of reducing and avoiding bycatch through developing practical measures that minimize bycatch.	• Likely successful at reducing prohibited species catch. • Reductions likely to be achieved through incentives for more efficient use of fishery resources under cooperatives, comprehensive rationalization of fisheries or other bycatch incentive programs.	• Bycatch and incidental catch reduction policies are effective. • Achieved through extreme reductions in target groundfish catch and strong bycatch and incidental catch limits.	• Likely successful at reducing prohibited species catch. • Reductions likely to be achieved through incentives for more efficient use of fishery resources under cooperatives, comprehensive rationalization of fisheries or other bycatch incentive programs.
What is the impact of the policy on seabird and marine mammal interactions?	• Effective at providing protection to Endangered Species Act (ESA)-listed seabirds and marine mammals. • No objectives for protecting non-listed species.	• Retains protection measures for ESA-listed species, but does not go beyond ESA-required measures. • High potential to increase fishery interactions with seabirds and marine mammals which may result in adverse impacts to those species.	• Goal of minimizing human-caused threats to protected species is largely met. • Likely to provide increased protection to marine mammals and seabirds.	• Very successful at avoiding impacts to seabirds and marine mammals. • Specific objectives to protect all seabirds from fishing interactions, and extend protection measures for Steller sea lion critical habitat and prey base.	• Effective at providing protection to ESA-listed seabirds and marine mammals. • May provide increased protection to seabirds and marine mammals if appropriate and practicable.

Key:
- Adverse impact; may include adverse conclusions that are based on assumptions.
- High potential for adverse impacts if any assumptions used to manage the resource are wrong.
- Potentially beneficial impact; assumptions used to manage the resource incorporate some precaution.
- Beneficial impact; assumptions used to manage the resource incorporate a high level of precaution.

Table 4.11-2 (cont.). Comparison of policy-level impacts of the alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PA
What is the impact of the policy on protecting marine habitat?	• Likely effective in protecting habitat components that are more well studied than others; uncertain whether sufficient protection provided to habitat components for which there is less complete information. • Concerns exist with continued reduction of long-lived slow growing benthic habitat species and reduced levels of benthic organisms in areas of high fishing intensity.	• Increased impacts to habitat because of less precautionary management measures. • Potential changes may result in adverse impacts that may be hard to reverse, especially for long-lived, slow recovering living habitats.	• Potential to reduce and avoid future impacts to habitat by careful placement of closures. • A careful strategy can minimize geographic redistribution and increases in effort, and thus reduce chances of unintended consequences.	• Combination of highly precautionary measures associated with increasing marine reserves and other closure areas will likely achieve protection of, and avoidance of impacts to, habitat. • A careful strategy can minimize geographic redistribution and increases in effort, and thus reduce chances of unintended consequences.	• Potential to reduce and avoid future impacts to habitat by careful placement of closures. • A careful strategy can minimize geographic redistribution and increases in effort, and thus reduce chances of unintended consequences.
What is the impact of the policy on the value of marine resources (commercial and non-commercial)?	• Continues to generate substantial producer and consumer benefits in the United States (U.S.), while adapting management programs when the need arises. • Continues policies that have generated environmental concerns tending to keep recreation, tourism and non-market values low.	• Potential to increase allowable catches is expected to significantly increase revenues, but would also increase operating costs. • Non-market, recreational, and tourism values are expected to decline because of the reduced emphasis on these benefits.	• Increased social and economic benefits through the elimination of the race-for-fish while also emphasizing the long-term economic value of the fishery. • Promotes ecosystem based management and is likely to increase non-commercial values assigned to the ecosystem.	• Results in substantial reductions in allowable catches and could also result in the closure of large portions of traditional fishing areas, could jeopardize the continued viability of coastal communities. • Goals of incorporating and enhancing non-consumptive use values are met.	• Increased social and economic benefits through the elimination of the race-for-fish while also emphasizing the long-term economic value of the fishery. • Considers ecosystem-based management and is unlikely to decrease non-commercial values assigned to the ecosystem.
What is the impact of the policy on Alaska Native participation in fishery management, and their traditional ways of life?	• Alaska Native consultation and participation in fishery management, and subsistence, would continue to comply with federal law.	• Alaska Native consultation and participation in fishery management, and subsistence, would continue to comply with federal law. • Increased fishing effort would result in increased economic benefits to fishery participants (particularly community development quota [CDQ]), but potentially increased salmon bycatch.	• Increase current participation and consultation in fishery management by expanding informal and formal consultation and traditional knowledge (TK) data collection. • Rationalization and additional area closures may benefit subsistence by reducing salmon bycatch.	• Directly involves Alaska Natives in fishery management through the development of co-management or cooperative research programs. • Other goals, that greatly reduce or eliminate commercial fishing, would adversely impact Native communities.	• Increase current participation and consultation in fishery management by expanding informal and formal consultation and local and Traditional Knowledge data collection. • Rationalization and additional area closures may benefit subsistence by reducing salmon bycatch.
What is the impact of the policy on data quality, monitoring, research, and enforcement requirements?	• Data collection program will continue to meet minimum acceptable standards. • Aspects of the program, such as non-random coverage in the 30% component of the fleet, could be improved.	• Maintains a minimum level of data collection to meet conservation requirements. • Consideration to repeal the Observer Program may compromise management on the best science available.	• Likely to be effective at reducing uncertainty through data collection measures, such as improved observer catch monitoring data of target and non-target species, and expanded economic reporting data.	• Expands research and monitoring programs to fill critical data gaps that may result in the modification of restrictive conservation and management measures. • Expansion of observer program coverage would result in more complete fishery data, particularly on vessels <125 ft length overall (LOA).	• Likely to be effective at reducing uncertainty through improved data collection and monitoring, promotes research to fill data gaps. • Explicitly promotes enforceability.

Key:
- Adverse impact; may include adverse conclusions that are based on assumptions.
- High potential for adverse impacts if any assumptions used to manage the resource are wrong.
- Potentially beneficial impact; assumptions used to manage the resource incorporate some precaution.
- Beneficial impact; assumptions used to manage the resource incorporate a high level of precaution.

Chapter 5
Tables

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Table 5.2-1. Changes in the specific management measures in the alternatives.

Comparative baseline	Suggested management measure changes in Alternatives (Alts) 1, 2, 3, 4, and the Preferred Alternative					
		Alt 1	Alt 2	Alt 3	Alt 4	PA
Control the harvest level by setting total allowable catches (TACs)	- reduce TACs			✓	✓	✓
	- specify TACs for different areas or seasons than currently specified				✓	
	- establish TACs for new species groups			✓	✓	✓
	- set all TACs equal to overfishing levels (OFLs)		✓			
	- adjust Bering Sea and Aleutian Islands (BSAI) optimum yield (OY) cap		✓	✓	✓	
	- remove groundfish bycatch and incidental catch restrictions		✓			
Prohibited species catch (PSC) limits in the BSAI and Gulf of Alaska (GOA)	- remove all PSC limits		✓			
	- reduce PSC limits			✓	✓	✓
	- establish additional PSC limits in the GOA			✓	✓	✓
Time or area closures to protect marine mammals, groundfish target species, non-target species, or habitat	- repeal closures		✓			
	- more time or area closures			✓	✓	✓
Bycatch (discard) management program	- reduce bycatch rates			✓	✓	✓
	- initiate bycatch incentive programs			✓		✓
	- more rigorous retention and utilization standards	✓			✓	✓
Gear restrictions and gear modifications	- relaxing of gear modifications		✓			
	- more gear modification requirements	✓		✓	✓	✓
	- increase in gear restrictions			✓		✓
Rights-based management in certain fisheries	- increased use of rights-based fishing systems			✓		✓
North Pacific Groundfish Observer Program	- revise coverage levels			✓	✓	✓
	- collect new data, develop uncertainty estimates			✓	✓	✓
	- repeal the observer program except for monitoring American Fisheries Act (AFA)		✓			
Data and reporting requirements	- collect new data			✓		✓
	- improve access to existing data			✓		✓
Require use of monitoring equipment	- extend mandatory use of vessel monitoring system (VMS)			✓	✓	
	- require motion-compensated scales in all fisheries				✓	
	- repeal at-sea weighing of catch		✓			

Table 5.2-2. Significance evaluation of the management and enforcement of the Alternatives.

Management and enforcement complexity	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Preferred Alternative
Managing harvest within specified catch limits (total allowable catch and prohibited species catch)	SAME	INCREASE	INCREASE	INCREASE	INCREASE
Monitoring and enforcing compliance with area closures (including seasonal, gear, directed fishery)	SAME	DECREASE	INCREASE	INCREASE	INCREASE
Monitoring and enforcing compliance with bycatch (discard) reduction standards	SAME	DECREASE	INCREASE	INCREASE	INCREASE
Managing and enforcing gear modifications requirements and gear restrictions	SAME	SAME	SAME	INCREASE	INCREASE
Management complexity due to rights-based management programs	SAME	DECREASE	INCREASE	SAME	INCREASE
Managing observer programs and data collection	SAME	DECREASE	INCREASE	INCREASE	INCREASE
SIGNIFICANCE EVALUATION:** Does the alternative significantly affect management and enforcement complexity? (adverse = more complex beneficial = less complex)	Insignificant	Significantly beneficial	Significantly adverse	Significantly adverse	Significantly adverse

Notes: **See Section 5.2.3 for definitions of significance.

APPENDIX B

History of Alaska Groundfish Fisheries and Management Practices

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ACRONYMS AND ABBREVIATIONS

ABCs	acceptable biological catch
AD	automatic differentiation
ADF&G	Alaska Department of Fish & Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
APA	Administrative Procedure Act
B	current stock size
BiOp	Biological Opinion
BSAI	Bering Sea and Aleutian Islands
CDQ	community development quota
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFZ	contiguous fishery zone
COAR	commercial operator's annual report
CSFR	continental shelf fishery resources
CZMA	Coastal Zone Management Act
DAH	domestic annual harvest
EA	environmental assessment
EBS	Eastern Bering Sea
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EIS	environmental impact statement
EO	Executive Order
ESA	Endangered Species Act
F	fishing mortality rate
ft	feet or foot
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FRFA	Final Regulatory Flexibility Analysis
GHL	guideline harvest level
GOA	Gulf of Alaska
ICB	information collection budget
IFQ	individual fishing quota
INPFC	International North Pacific Fisheries Commission
IPHC	International Pacific Halibut Commission
IRFA	Initial Regulatory Flexibility Analysis
IR/IU	improved retention/improved utilization
kg	kilogram
km	kilometer
LLP	License Limitation Program
LOA	length overall

m	meter
M	mortality rate
MFMT	maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MPAs	Marine Protected Areas
MSA	Magnuson-Stevens Act
MSST	minimum stock size threshold
MSY	maximum sustainable yield
mt	metric tons
mt/m^3	metric tons per cubic meter
NEPA	National Environmental Policy Act
nm	nautical mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NOA	Notice of Availability
NPFMC	North Pacific Fisheries Management Council
OFL	overfishing level
OMB	Office of Management and Budget
ORR	Other Red Rockfish
OTC	official total catch
OY	optimum yield
pdf	probability density function
PRA	Paperwork Reduction Act of 1995
PSC	prohibited species catch
PSQ	prohibited species quota
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation
SCA	Steller Sea Lion Conservation Area
SCNO	sharpchin/northern
SEIS	Supplemental Environmental Impact Statement
SFA	Sustainable Fisheries Act of 1996
South Korea	Republic of Korea
SRRE	shortraker/rougheye
SSC	Science And Statistical Committee
TAC	total allowable catch
TALFF	total allowable level of foreign fishing
USFWS	U.S. Fish And Wildlife Service
U.S.	United States
U.S.S.R.	United Soviet Socialist Republic
VMP	Vessel Monitoring Program
VMS	Vessel Monitoring System
WPR	weekly production reports

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Section 1 Groundfish Fisheries and Management Prior to 1976

1.1 Alaska Native Subsistence Fisheries

Subsistence use of fish for food and trade existed before the first Asian and European explorers arrived on the shores of Alaska. These Native subsistence fisheries have traditionally focused on nearshore species such as salmon, herring, shellfish (molluscan and crustacean), and a few demersal or groundfish species such as cod, halibut, and rockfish. Subsistence fisheries account for small amounts of fish relative to the commercial fisheries, and they continue at the present time (North Pacific Fishery Management Council [NPFMC] 1979).

1.2 Early United States Domestic Fisheries

The commercial potential of the abundant Alaska salmon resource was not realized until the 1860s, when a technique for large-scale canning of salmon was developed. The first salmon cannery on the Pacific Coast opened in California in 1864, and salmon canneries were built in Alaska for the first time in 1878 (Cooley 1963).

The first commercial venture for Bering Sea groundfish occurred when a single schooner fished for Pacific cod in 1864. The Pacific cod fishery was conducted on a regular basis by 1882. The Bering Sea Pacific cod fishery reached its peak in during World War I when demand was high. This Bering Sea domestic fishery began declining after 1920 and continued until 1950 when economic conditions due to a decline in demand for Pacific cod caused the fishery to halt (NPFMC 1981).

Although Pacific cod fishermen reported that halibut were present in the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) in the 1800s, the fishery did not develop in Alaska until after World War I (NPFMC 1981 and 1978). Market demand for halibut grew as technology developed to ice and preserve halibut long enough to make it to markers in the East and Midwest. Increased demand inspired fishermen to explore for larger halibut resources farther north. Small, infrequent landings of Bering Sea and GOA were made by United States of America (U.S.) vessels from the mid-1920s through the early-1950s. Domestic catches were being landed annually by the mid-1950s in the Bering Sea and GOA (NPFMC 1981 and 1978). Between 65 and 80 percent of the total domestic halibut landed annually from 1955 to 1975 came from the GOA (NPFMC 1978).

A sablefish fishery began around 1906 in the GOA inside waters, and was relatively unimportant until about 1935 when catch began to increase. The peak GOA harvest occurred in 1946 (approximately 2,800 metric tons [mt]). Since the inception of the GOA sablefish fishery, demand rather than stock size has dictated catch level. Harvest levels were high in the mid-1940s because of demand from vitamin manufacturing companies. Harvest levels began to decline after 1945 due to a corresponding expanded market for vitamins from other sources (NPFMC 1978).

A GOA bait fishery developed in response to the early Alaska halibut and crab fisheries. The bait fishery mainly occurred from Prince William Sound west to the Aleutians, with approximately two-thirds of the catch landed in Kodiak. The bait fish catch was typically taken as bycatch in the Kodiak shrimp fishery, and consisted largely of pollock, Pacific cod, and various flounder species. Vessels fishing for halibut would catch and retain Pacific cod for bait. In addition, crab vessels would trawl for bait (NPFMC 1978).

A small GOA domestic fishery for flounders and pollock started in 1976. In addition, small catches of rockfish were caught in the GOA halibut and sablefish fisheries (Browning 1980).

1.3 Foreign Distant Water Fisheries

Nationals from foreign countries have conducted groundfish fisheries in Alaskan waters: Japan (BSAI and GOA), the former United Soviet Socialist Republic (U.S.S.R.) (BSAI and GOA), Canada (BSAI and GOA), the Republic of Korea (BSAI and GOA), Taiwan (BSAI and GOA), Poland (BSAI and GOA), East Germany, and Bulgaria (NPFMC 1981 and NPFMC 1978). No catch statistics were provided until 1964, however, when the Soviet Union began to provide these data to the Food and Agricultural Organization of the United Nations. Obtaining accurate fishing mortality data was a general problem of the foreign distant water fisheries off Alaska.

1.3.1 Japanese Fisheries

The first Japanese expansion beyond Japanese coastal waters was to Sakhalin Island for salmon in the late 1700s. Later, as a result of Commodore Matthew Perry's success in 1854 to conclude an agreement with Japan to open its ports to American whaling vessels, a similar treaty between Japan and the Czar of Russia allowed joint occupation of Sakhalin Island, which lead to significant expansion of the Japanese salmon fishery along the Russian coast. In 1875, Japan gained access to the Kuril Islands in exchange for renouncing its rights to Sakhalin. Thirty years later, the 1905 Treaty of Portsmouth returned Sakhalin to Japan and provided a basis for further extension of Japanese fisheries in the Sea of Okhostk and the western Bering Sea. Japan's ability to catch and process fish from this northern area increased fivefold during the decade leading to the Russian Revolution but subsequent skirmishes with the Soviets caused Japanese fishermen to develop other distant water fisheries in the Yellow Sea and East China Sea during the 1920s. With this experience, Japanese fishermen initiated exploratory fishing in the eastern Bering Sea in 1930 (Miles *et al.* 1982).

Japanese exploratory fishing led to a groundfish meal fishery in 1933. Pollock was the principal species targeted for this reduction fishery. The fishery continued to operate through 1987 when declining fish meal prices caused the fishery to terminate (NPFMC 1981). From 1940 to 1941, Japanese trawlers fished for yellowfin sole in the eastern Bering Sea to supply a frozen food-fish market (Chitwood 1969 and BSAI FMP 1979). Early Japanese distant water fisheries in the eastern Bering Sea likely could have continued annually but for the hostilities of World War II.

Japan undertook major fleet rebuilding efforts after World War II to stimulate the economy, and to provide a protein source for the people. Most of the larger Japanese fishing vessels had been destroyed by the U.S. Navy during the war. Smaller vessels in the coastal fleet were inadequate for supplying sufficient food immediately after the war. Moreover, the Allied occupation of Japan severely limited expansion of Japanese fisheries. When these restrictions were liberalized in 1952, Japanese fisheries expansions to the north and west soon experienced conflict with Korean, Soviet, and Chinese fisheries (Miles *et al.* 1982). The Japanese post-war fishery had resumed in the BSAI by 1954 (NPFMC 1981). The primary technological achievements that allowed for early Japanese success was the use of mothership fleets, in which trawlers delivered catches to a factory ship, and the use of surimi processing technology (Fishery Agency of Japan 1976). This permitted use of an abundant pollock resource that was largely ignored by the U.S. and other countries due to its low value.

BSAI

The post-war Japanese fishery developed into four principal components: the mothership fishery, trawl fishery, longline-gillnet fishery, and the landbased trawl fishery. In the Bering Sea, the mothership fishery accounted for the largest share of the catch (NPFMC 1981). These fisheries are described below.

Mothership Fishery

From 1954 - 1957, the mothership fishery was relatively small consisting of two to four 8,000 gross ton freezer motherships with trawlers as catcher boats. The fleets typically operated between August to October off Bristol Bay targeting flounders, primarily yellowfin sole (NPFMC 1981).

From 1958 to 1963, the mothership fishery expanded throughout the Bering Sea. The flounder freezing fleet continued to fish for yellow fin sole. The longline-gillnet mothership operation was developed during this time period. A fleet consisted of 5,000 to 10,000 gross ton mothership accompanied by trawlers and Danish seiner that also fished with longlines and gillnets. The longline-gillnet mothership fleet fished for halibut, sablefish, herring, and Pacific ocean perch for freezing along the continental slope off Cape Navarin (Chitwood 1969 and NPFMC 1981). In the early 1960s, the mothership fleets expanded their area of operations to include the continental slope between the Pribilof Islands and Cape Navarin and Bowers Banks off the Aleutian Islands (NPFMC 1981). Fish meal operations were initiated during this time period utilizing 9,000 gross ton motherships with Danish seiners and pair trawlers as catcher boats. The fish meal fleet processed flounders in the eastern Bering Sea from April to September (NPFMC 1981). Also in 1963, after a 10-year ban on Japanese fishing for Pacific halibut east of 175°W was relaxed, a fleet of 5 Japanese motherships and 66 longline catcher vessels commenced fishing for halibut.

With decline in abundance of yellowfin sole in the early 1960s and the development of on-boards processing techniques for surimi, the main focus of the Japanese fisheries shifted to pollock. Fish meal and frozen products became by-products of pollock operations. The Japanese pollock fishery operated from mid-April through December and led to the largest Japanese groundfish fishery: by the early 1970s it peaked at 1.6 million mt (Fishery Agency of Japan 1976). The mother ship fleets fished for pollock along the outer continental slope and upper slope stretching from Cape Sarichef in the eastern Aleutian Islands to Cape Navarin. Most of this area is within the current U.S. Exclusive Economic Zone (EEZ). The flounder fishery became a winter fishery from 1969 to 1970, generally lasting from October to March, with winter fishing grounds north of Unimak Island and occasionally west and east of the Pribilof Islands (NPFMC 1981).

Trawl Fishery

The trawl fishery consisted of independent factory trawlers larger than 500 tons that both fished and processed their own catch into either surimi or frozen product. From 1954 - 1959, approximately one to three independent trawlers fished in the eastern Bering Sea for yellowfin sole. By 1960, trawlers began exploiting halibut, sablefish, Pacific ocean perch, and other species for freezing along the continental slope in the central and northern Bering Sea and in Aleutian Island waters. In 1967, the number of licenses for independent trawlers was increased resulting in a independent fleet composed of larger trawlers equipped with surimi machinery. The main effort of the independent trawlers switched to pollock in the eastern Bering Sea with the number of vessels generally increased form a low in mid-winter to a peak in summer. In the Aleutian Islands, the independent trawlers targeted Pacific ocean perch and to a lesser degree pollock and

other groundfish species. Maximum fishing effort was concentrated along the shelf edge in the central and western part of the chain in summer and early fall. By 1970, approximately 80 percent of the total groundfish catch in the independent trawl fishery was pollock (NPFMC 1981).

Longline-Gillnet Fishery

The longline-gillnet fishery consisted of independent vessels that when filled with fresh or frozen fish would return to Japan. From 1963 to 1966 approximately 18 vessels fished for herring and sablefish in the eastern Bering Sea and along the Aleutian Islands. This was a sporadic fishery with only a few vessels fishing each year through 1972 (NPFMC 1981).

Landbased Trawl Fishery

The landbased trawl fishery was conducted by independent 100 to 350 ton Danish seiners and stern trawlers that were prohibited by regulation from transshipping their catch in offshore waters, and therefore return to Japan when storage capacity was filled.

GOA

In 1960, several small trawlers were diverted from the Japanese fleet in the Bering Sea to carry out exploratory fishing operations in the GOA. Exploratory fishing probes continued through 1962. In 1963, the Japanese initiated a trawl fishery for groundfish in the GOA (Chitwood 1969 and NPFMC 1978). The GOA fishery developed into two major components: trawl fishery and longline fishery. The Japanese GOA fishery was less extensive than the fishery in the Bering Sea from the standpoint of catch volumes. From 1970 to 1974, Japans total GOA groundfish harvest averaged 99, 000 mt compared to 1,706,000 mt in the Bering Sea (NPFMC 1978).

Trawl Fishery

The GOA Japanese trawl fishery primarily targeted Pacific ocean perch, although substantial amounts of other groundfish were taken. The majority of the Japanese Pacific ocean perch catch was obtained from the Kodiak, Yakutat, and southeastern GOA areas starting in 1968. There was major upgrading of the Japanese fishing fleet over the years in terms of vessel size, horsepower, fishing gear efficiency, navigation equipment, and fish-finding devices. The average size of factory trawlers increased from around 1,500 to 2,500 gross tons between 1967 and 1975 (NPFMC 1978).

Longline Fishery

The GOA Japanese longline fishery initially used bottom gillnets, but these were soon replaced with longlines and occasionally traps. Over time the average size of vessels in the sablefish fishery increased from about 350 to approximately 500 gross tons (NPFMC 1978).

1.3.2 Early Russian and Soviet Fisheries

The earliest Russian explorers sought fur-bearing animals rather than fish. The first small-scale fishing enterprise began in 1785 at the Karluk River on Kodiak Island to provide dried salmon to Russian fur traders. In the early 1800s, the Russian American Company shipped small quantities of salted salmon to St. Petersburg, Russia.

Like Japan, the Soviet Union undertook a major rebuilding effort after losing much of its fishing fleet in World War II. Unlike Japan, however, the Soviet Union had little prewar experience with distant water fisheries. Their fisheries expansion effort substantially accelerated in 1955. Most Soviet fishing vessels at that time were built in East Germany and Poland and sent to the Soviet Union as war compensation (Kravanja 1976). The Soviets adopted existing fishing technology developed in other countries, most notably the stern factory trawler (a British invention), which allowed the use of much larger trawl nets than those used on traditional side trawlers. The strategy of deploying fleets of such trawlers that work together with support vessels, including processor, cargo, and provisioning vessels, was mainly a Soviet achievement (Pruter 1976). The decision to speed the building of these distant water fishing fleets was made by the highest levels of U.S.S.R. government in 1956. By 1975, the Soviet fishing fleet was the largest in the world, consisting of over 5,400 distant water vessels and accounting for at least half of the world's total gross tonnage of such vessels (Pruter 1976). The total Soviet catch in 1975 (of all aquatic organisms including plants, fish, and marine mammals) was 10.3 mt; six times the amount it harvested in 1950, and exceeded only by Japan.

BSAI

The Soviets began commercial fishing operations off Alaska in the eastern Bering Sea in 1959. By late 1963, as many as 100 fishing and support vessels from the Soviet Union were operating off Alaska at any given time year-round (Chitwood 1969). Three major fisheries developed in the BSAI: a flounder fishery in the southeastern Bering Sea, a rockfish fishery primarily in the Aleutian Islands, and a pollock fishery along the outer continental shelf from Unimak Pass to northwest of the Pribilof Islands (NPFMC 1981).

Flounder Fishery

Throughout its history, the Soviet flounder fishery was a winter operation typically extending from November to April, peaking in February or March. The primary target was yellowfin sole, and to a lesser extent other flounders such as rock sole, flathead sole, Alaska plaice, starry flounder, and arrowtooth flounder. From 1959 to 1963, the flounder fleet was comprised of approximately 30 trawlers supported by a factory ship and refrigerated transport vessels. Effort was increased over the next two years with the number of increasing from 40 trawlers in 1964 to 50 to 60 trawlers in 1965. The number of flounder fishery trawlers peaked from 1966 to 1968, reaching 70 - 100. The Soviet effort for flounders began declining in 1969. The number of trawlers during peak flounder fishing months was between 50 and 80 from 1969 to 1972. This decline was presumably due to the lower abundance of yellowfin sole. In 1972, the reported Soviet flounder catch was 13,000 mt, a decline compared to 70,000 mt report in the three previous years. The flounder fishery failed to develop in 1973 when effort was limited to a two-week by four trawlers. The Soviets did not resume the flounder fishery after 1973 (NPFMC 1981).

Rockfish Fishery

The Soviet rockfish fishery (Pacific ocean perch and other rockfish) began in 1960 along the edge of the continental shelf in the eastern and central Bering Sea. In subsequent years the fishery concentration of effort was shifted to the Aleutian Islands and the GOA, with directed effort in the Bering Sea eventually being eliminated. Rockfish catches were headed, eviscerated, frozen, and transported via refrigerated vessels to the Soviet Union. The early Aleutian Island fishery years were the most productive with reported catches of 61, 000 mt in 1964 and 71,000 mt in 1965. Although the catch volume increased in 1965, catch per trawler declined requiring increased search time for Pacific ocean perch concentrations. Fishing effort was sporadic in 1966 presumably due to the reduced abundance of rockfish. The level of effort continued to decrease over time with relatively few vessels targeting Pacific ocean perch in the Aleutian Islands (NPFMC 1981).

Pollock Fishery

In 1967, a Soviet fishery was established for sablefish and large flounders (arrowtooth and Greenland turbot) north of the eastern Aleutian Islands (Dutch Harbor area). This fishery eventually developed into the Soviet pollock fishery. Initially fishing was at depths of about 550 to 730 m on the deep-water plateau. In 1968, the fishing area was extended north along the edge of the continental shelf to the central Bering Sea targeting sablefish and arrowtooth flounder north of Dutch Harbor and pollock, cod, rockfish, and various flatfish farther north. The Soviets continued to fish predominantly two areas, the first immediately north of the eastern Aleutian Islands and the second northwest of the Pribilof Islands. The emphasis of the fishery shifted to pollock in 1971, with catches increasing from approximately 36,000 mt in 1970 to 234,000 mt in 1971. The pollock fishery catch peaked in 1974 with a reported total catch of 310,000 mt (NPFMC 1981).

GOA

By 1962, Soviet trawling operations had expanded into the GOA. The Soviet GOA fishery was a classic example of pulse fishing where massive fishing effort of local stocks generates an early buildup in catches, followed by declining yields when abundance falls off, and a shift of effort to other species or different fishing grounds. Pacific ocean perch was initially the principal target species. With the decline of Pacific ocean perch stocks in the late 1960s and early 1970s, the Soviet fisheries shifted to less exploited fish such as pollock, Atka mackerel, and flounder. The relative importance of the GOA Soviet groundfish fishery compared with the Soviet fisheries in the Bering Sea and Washington-California area diminished over time. From 1962 to 1965, when Pacific ocean perch were still present in large concentrations, the GOA catch comprised approximately 60 percent of the total Soviet groundfish harvest (excluding herring) from all Pacific waters off the U.S. and Canada. From 1970 to 1974, the comparable figure was less than 9 percent of total groundfish harvest despite Soviet efforts to maintain their catches by diverting to other target species (NPFMC 1981).

1.3.3 Canadian Fisheries

Small and infrequent halibut landings were made by Canadian vessels in the Bering Sea between 1928 and 1950, but catches were not landed every year until the mid-1950s. The number of Canadian vessels fishing for halibut increased throughout the mid-1960s and then steadily declined until 1970 in the Bering Sea (NPFMC 1981). Canadian halibut fisheries expanded from the coastal waters of British Columbia into the Gulf of Alaska after World War I. The largest proportion of the total halibut landed annually by both U.S.

and Canadian vessels from 1955 through 1975, between 65 and 80 percent, came from the GOA (GOA FMP 1978).

1.3.4 Distant Water Fisheries of Other Nations

The Republic of Korea (South Korea) lost substantial fishing capacity during World War II but delayed rebuilding and expanding into distant water fisheries due to the outbreak of the Korean War in 1950. In 1966, a South Korean vessel from the Pusan National Fisheries College conducted exploratory fishing off Alaska (Chitwood 1969), and vessels from that country began a pollock fishery in the eastern Bering Sea in 1968 (Miles *et al.* 1982).

Neither North Korea nor China developed significant distant water fisheries in areas off Alaska before 1976. Taiwan began fishing for sablefish and pollock off Alaska in 1970. Poland, East Germany, and Bulgaria, late arrivals in the distant water fisheries off Alaska, were also unsuccessful at developing significant fisheries in Alaskan waters (Miles *et al.* 1982).

1.3.5 Foreign Distant Water Fisheries Summary

The cumulative catch of groundfish by all nations during the period 1954–1974 was estimated to be over 22 million mt, of which Japan accounted for over 15 million mt, 67 percent; the Soviet Union nearly 6 million mt, 25 percent; and the U.S. about 1.5 million mt; 6 percent (Pruter 1976). The remainder was accounted for by fisheries from other nations, such as South Korea, Poland, East Germany, West Germany, Taiwan, and Canada. Catch statistics reveal the growth and magnitude of the foreign groundfish harvest off Alaska during the late 1950s through the early 1970s. Of particular note were the high catches of yellowfin sole in the Bering Sea, which peaked in 1962, and high catches of slope rockfish (e.g., Pacific ocean perch) in the GOA during the period 1963–1968. Both of these stocks were overfished, and while yellowfin sole is believed to have recovered, the slope rockfish stocks are still rebuilding.

While the groundfish species targeted by Japan, the Soviet Union, and other foreign fisheries off Alaska during this pre-EEZ period were not significant traditional fisheries for Alaska's fishermen, the effect on domestic fisheries was fourfold.

1. Inadequate catch statistics prevented U.S. scientists from determining whether distant water fisheries were causing overfishing of target stocks.

2. Bycatch of salmon, halibut, and crab in the distant water fisheries likely had a significant negative effect on harvests of these species by Alaskan fishermen.

3. A wide variety of gear types were used by foreign fleets; gear included variously configured benthic trawls, tangle nets (essentially large mesh trawls used to capture crabs), hook-and-longline gear, and a variety of pots. Such gear was used with little concern for its effects on fish habitat or for gear conflicts with American fishermen.

4. The development and support of the foreign distant water fisheries off Alaska, as a matter of government policy by the participating nations, amounted to subsidies to which U.S. fishermen had relatively little ability to respond in kind. The result was effective preemption of the groundfish fisheries by the foreign distant water fisheries until 1977.

1.4 Fisheries Management Prior to 1976

The Tlingits in southeast Alaska had a complex system of owning fishing rights (Rogers 1960).

Almost immediately after Alaska was purchased from Russia, it became obvious that some form of government intervention was required to ensure conservation of fishery resources and equitable distribution of their benefits. The following year, in 1868, the U.S. Treasury Department began to send agents to Alaska to protect fur seals and to administer a lease to the Alaska Commercial Co. to harvest seals in the Pribilof Islands. As the Alaska salmon industry developed, government agents also collected taxes on processed salmon products (Fredin 1987).

In 1870, the federal government became more directly involved in fishery conservation when Congress allocated funds to investigate declining fisheries off New England. In 1871, Congress created the first federal fisheries agency, the U.S. Commission of Fish and Fisheries. The Commission's primary duty was to determine whether and to what extent marine food fishes (i.e., commercial species) had declined in abundance, and to report to Congress necessary remedial measures (Bowen 1970). Although neither fishery regulation nor fish propagation were in the Commission's charter, it recommended that state governments do the former, while the Commission conduct the latter. The fish culture work was directed primarily at northeastern marine and Great Lakes fisheries. In 1903, the Commission became the Bureau of Fisheries of the Department of Commerce and Labor. Among its duties was the responsibility to carry out the U.S. Treasury's fishery work in Alaska (Fredin 1987). Ten years later, in 1913, the department was split into the separate Departments of Commerce and Labor; the Bureau of Fisheries was lodged in the Department of Commerce.

In 1904, Theodore Roosevelt ordered the Commission to investigate the Alaska salmon fishery and recommend laws and regulations. This investigation called attention to the inadequacy of existing conservation measures. Although limiting the number of canneries was mentioned as desirable, more emphasis was given to the need for government hatcheries "to maintain the supply of fish...without curtailing production" because restrictive regulations would be unpopular with the cannery owners and difficult to enforce (Cooley 1963). Although concern over the conservation of salmon continued to be raised throughout the early 1900s, Congress expressly denied the Alaska territorial government authority to regulate fisheries, arguably due to the political influence of cannery owners who resided in states with elected congressional representatives in Washington, D.C. In 1922, two "fishery reserves" were established in which the Secretary of Commerce was authorized to issue a limited number of cannery permits. Soon after, however, Congress passed "An Act for the Protection of the Fisheries of Alaska" (the White Act), which was signed by President Calvin Coolidge in 1924. As a compromise law, the White Act averted the "reservation" system, but also declared congressional intent that not less than 50 percent of the salmon should be allowed to escape the fishery. The Act also gave the Secretary of Commerce broad powers to regulate fisheries in Alaska's territorial waters (Cooley 1963). Although salmon fisheries were the focus of the few fishery management regulations in existence during the early 1900s, two provisions that applied to groundfish were 1) a prohibition against wanton waste, and 2) an annual report to the Department of Commerce and Labor by any person engaged in catching or processing fish products (Fredin 1987). This early history of the Alaska salmon industry is important because the salmon canneries evolved into present-day groundfish processors.

Meanwhile, management of the Pacific halibut fishery took on an early international aspect. As fishermen from Canada and the U.S. conducted this fishery from northern California through Alaska shortly before World War I, fishery officials, fishermen, and dealers from both countries began to express concern about increasing amounts of gear and decreasing catch per unit of gear. Around 1913, Canadian and U.S. officials began to discuss the possibility of an international research and management agency and on March 2, 1923, the two nations ratified a halibut conservation treaty (Browning 1980). It established a four-person International Fisheries Commission, with limited regulatory powers and a principal charge to conduct research. The new Commission imposed an annual closure of the fishery from November 16 to February 15 to protect spawning halibut (Browning 1980). The treaty was renegotiated in 1930 and again in 1937 to enhance the Commission's regulatory power, and in 1953 a treaty revision changed the name to the International Pacific Halibut Commission (IPHC).

1.4.1 Post World War II Fisheries and Their Management

World War II marked a major turning point in the character of fisheries off Alaska. While the pre-war period can be characterized by a fisheries development trend from relatively small-scale fisheries to organized commercial exploitation, the post-war period by comparison was a virtual revolution in the expansion of distant water fisheries and large industrial-scale operations. In the three decades from the end of World War II to the advent of EEZ management under the Magnuson-Stevens Act (MSA), the harvest of all fisheries in the North Pacific (the area north of 30°N from Asia to North America, including the BSAI) increased from 8 million mt to 20 million mt. The greatest increases during this period came from catches of groundfish and crab in the BSAI and GOA: groundfish catches grew from relatively insignificant levels to exceed 2 million mt per year in the early 1970s (Miles *et al.* 1982).

These changes resulted from technological developments and changes in marketing and some nations' fishery policies. Advances in science and technology in developed nations sowed the seeds of conflict for exploiting living marine resources and challenged the traditional international convention of freedom of the high seas generally accepted since the late eighteenth century. The freedom of the seas convention was based on three related assumptions: 1) that waters of the high seas were not susceptible to effective occupation, 2) that the resources of the seas were inexhaustible, and 3) that any specific use of the seas would not impair or impose costs on other uses (Koers 1973). Events immediately preceding and during World War II demonstrated the error of these assumptions. For example, in 1983, Bracken provides evidence of a 55 percent decline in the catch per unit effort of sablefish and a decline in average weight from 8 pounds to 6.5 pounds off Alaska between 1937 and 1944. By the mid-1900s, such experiences from fisheries indicated the frailty of the second assumption, and the war itself demonstrated the relative utility of the first and third assumptions. To obviate the claims of other nations in the high seas adjacent to U.S. coasts, the Truman Proclamation of 1945 asserted the nation's right to adopt conservation measures in these areas and to require foreign nations to comply with those measures (Koers 1973). This unilateral claim was not effectively exercised with regard to fisheries resources until the MSA was implemented in 1977.

The complexity of the fishery management regime for groundfish fisheries grew in rough proportion to the impact of those fisheries on groundfish and related stocks. Before 1959, federal regulations focused on restricting trawl fishing gear. In 1948, minimum mesh sizes were set (5 inches in the bag; 6 inches in the wings), chain "ticklers" were prohibited, trawling was prohibited in areas of small halibut (areas closed to halibut fishing by the IPHC), and logs of fishing operations were required. In 1945 and 1946, in response to a decline in sablefish off southeastern Alaska (Section 1.3), fishing for that species was prohibited before

March 15 and after November 30. In 1947, that open season was further restricted to between May 1 and November 30 (Fredin 1987).

Until 1959, all regulations affecting the groundfish fishery off Alaska were implemented by the Bureau of Commercial Fisheries. With Alaska's 1959 achievement of statehood, state regulations began to be applied inside the 3-mile-wide territorial sea. These regulations primarily implemented licensing and reporting requirements, but they also limited the type of gear that could be used at certain times and in certain areas. For example, purse seines and pot gear were excluded in certain areas of the GOA at specified times. Off southeastern Alaska, a catch quota was established for sablefish in certain districts and time periods (NMFS 1976).

Some conservation and management measures were also implemented independently by Japan. In 1959, Japan closed an area off the north side of the Aleutian Peninsula to trawling by its groundfish vessels to prevent gear conflict with its crab fishery in that area (Fredin 1987). Although this action was taken to reduce internal conflicts, it may have had salutary effects on fish habitat. Japan also instituted an early limited access system, primarily to avoid conflicts among its many mothership and trawler fleets. In 1963, Japan limited the number of licenses issued to vessels and restricted their area of operation to ease Canadian and U.S. concerns about the impact of Japanese trawl fisheries on halibut resources. By 1967, Japan had designated the areas of operation and limited the numbers of licensed vessels in all of its groundfish fisheries in the BSAI and GOA (Fredin 1987).

Other than the limited regulations imposed by the State of Alaska, the U.S. had virtually no authority to impose restrictions beyond its territorial sea. Notwithstanding the Truman Proclamation of 1945, the U.S. did not extend its jurisdiction over fisheries beyond its 3-mile-wide territorial limit until 1966, when enactment of Public Law 89-658 extended U.S. exclusive jurisdiction of the over fisheries from 3 miles to 12 miles offshore (Miles *et al.* 1982). Although the establishment of the 9-mile contiguous fishery zone (CFZ) under this law was a forerunner to the ultimate fisheries jurisdiction claim of 200 miles ten years later, it was relatively ineffective in controlling the growth of foreign fishing capacity and groundfish harvests off the coast of Alaska. For these purposes, the U.S. relied primarily on multilateral and bilateral international agreements.

1.4.2 Multilateral Agreements

The U.S. became party to several multilateral agreements during the 1950s, but only one, the International North Pacific Fisheries Commission (INPFC), had any effect on the groundfish fisheries of the Bering Sea and GOA (Koers 1973, Miles *et al.* 1982). The INPFC involved Canada, Japan, and the U.S. in an agreement primarily to abstain from fishing on certain stocks of fish. Initially, administering the "abstention provisions" was the INPFC's most important function (Koers 1973). Under these provisions, Japan agreed to abstain from fishing for salmon, herring, and halibut of American origin or found off the coast of North America, and Canada agreed to abstain from fishing for salmon originating in U.S. rivers. The INPFC was responsible for determining whether these stocks continued to qualify for abstention and whether new stocks met criteria for abstention by one or two member nations (Koers 1973). Lacking substantial scientific information on the western migration of North American salmon, the INPFC determined that Japan would abstain from fishing for these species east of 175°W. Subsequently, knowledge was gained that North American salmon migrate west of that line and Asian salmon migrate east of that line. Japan began to lose interest in revising the abstention line in favor of Canada and the U.S. In addition, despite its responsibility to allocate catch, the

INPFC did not have a research staff, and relied instead on the fisheries data and research contributed by member governments (Miles *et al.* 1982).

This reliance on other governments' data and attendant controversy of allocating salmon, halibut, and herring based on the abstention provisions severely limited the INPFC's attention to groundfish fisheries. It virtually ignored groundfish until 1961, when the U.S. raised concern regarding Japan's large-scale groundfish fisheries in the eastern Bering Sea. In 1967, the INPFC agreed to undertake joint study of groundfish other than halibut in the northeast Pacific Ocean, and in 1968, Pacific ocean perch was the first groundfish resource assessed. The sablefish resource came under INPFC scrutiny in 1971, and a study of halibut bycatch by Japanese groundfish trawlers was initiated in 1972 (Fredin 1987). No conservation and management recommendations resulted from these studies and among other factors, the large-scale entry into the Bering Sea fisheries of non-member nations, namely the Soviet Union and South Korea, eventually eroded the INPFC's ability to act as a force in international management of these fisheries.

1.4.3 Bilateral Agreements

More success on reaching international agreement on fishery management, albeit still limited, was realized through separate agreements between the U.S. and the foreign nations with distant water fisheries off Alaska. Bilateral agreements were designed to treat five major problem areas: 1) gear conflicts, 2) access to areas subject to national jurisdiction, 3) allocation of stocks, 4) research activities and data sharing, and 5) visits aboard fishing vessels (Miles *et al.* 1982). Bilateral agreements that pertained to groundfish fisheries off Alaska were concluded between the U.S. and four other nations before 1976. Most of these agreements involved the two principal nations with distant water fisheries off Alaska, the Soviet Union and Japan, but the mid-1970s also saw agreements concluded with the South Korea and Poland. The first of these agreements were negotiated in 1964 between the U.S. and the Soviet Union and the U.S. and Japan. All of these agreements were of relatively short duration and renegotiated frequently to respond to changing conditions in the fisheries.

The first U.S.-U.S.S.R. bilateral agreement, signed in December 1964, established six areas off Kodiak Island that would be closed to Soviet trawls from July through October. The Kodiak King Crab Gear Area Agreement was designed primarily to reduce gear conflicts between the U.S. king crab fishery and Soviet trawlers in these areas off the south and western shores of Kodiak Island. The agreement was effective for three years and was extended in December 1967 without change through mid-February 1969 (Fredin 1987). In addition to resolving a gear conflict problem this agreement also addressed a crab resource allocation issue between the U.S. and the Soviet Union. The Soviet distant water fishery had conducted a king crab fishery off Alaska in the early 1960s, taking as many as 3.4 million crabs in 1961 (Naab 1971). Essentially, under this agreement, the crab resource off Kodiak Island was allocated away from Soviet fishermen, although they were permitted to continue their crab fishery in the eastern Bering Sea.

The establishment of the CFZ in 1966 gave the U.S. an important new tool in negotiating future bilateral agreements. This was reflected in the CFZ agreement between the U.S. and the Soviet Union in February 1967. The 1967 CFZ accord allowed limited Soviet fishing within the 9-mile-wide CFZ in areas off the Aleutian Islands little used by U.S. fishermen and vessel support activity in certain areas within the CFZ in return for a ban on Soviet trawling in two large areas of international waters in the GOA during the first 15 days of the Pacific halibut fishing season set by the IPHC (Fredin 1987). Again, the objective of this agreement was to reduce gear conflicts between Soviet trawlers and U.S. fixed-gear fishermen, this time

longline or setline gear used in the halibut fishery. The original 1967 CFZ accord was for one year but was later extended for another year. In 1969, it was modified and extended for two additional years, then modified again in 1971 (Naab 1971). The latest modifications introduced more measures to protect conflicts with other fisheries important to U.S. fishermen, namely king and Tanner crab, shrimp, and scallop fisheries, in addition to the halibut fishery off Alaska (Fredin 1987).

Bilateral agreements between the U.S. and Japan were very similar in scope to those between the U.S. and the Soviet Union in that they focused on reducing conflict between U.S. fixed-gear fisheries for crab and halibut and Japanese fisheries. The first U.S.–Japan bilateral agreements concluded in 1964, established an area in the eastern Bering Sea adjacent to the north side of Unimak Island that was closed to Japanese king crab fishing. The intent of this action was to reduce conflict between U.S. crab fishermen using pot gear and Japanese fishermen using tangle-net gear. In addition, the agreement set an annual Japanese production quota of 235,000 cases of canned king crab meat (Naab 1971). Based on one case containing 48 half-pound cans, this was equivalent to 5,640,000 pounds of crab meat. This agreement remained in effect through 1966. In 1966, the agreement was renegotiated to extend it for another two years, but the production quota was reduced to 185,000 cases annually. Renegotiation again in 1968, for another two years, further reduced the annual production quota to 85,000 cases of king crab meats, stipulated a new catch limit of 16 million Tanner crabs, and increased the size of the crab pot protection zone (Naab 1971). This crab pot sanctuary was part of a larger area that was already closed to Japanese trawling by unilateral action of Japan.

In May 1967, the U.S. and Japan negotiated another two-year CFZ accord similar to that previously negotiated with the Soviet Union. This agreement a) closed the same six areas off Kodiak to Japanese fishing that were closed to Soviet fishing in 1964, and b) closed the same international waters in the GOA to Japanese fishing during the first 15 days of the halibut season that were closed to Soviet vessels in 1967. A third provision of the 1967 U.S.–Japan agreement was to close to Japanese fishing vessels an area outside the CFZ south of Unimak Island. In return, Japan was allowed to fish for crab within the CFZ around the Pribilof Islands, for other species (e.g., groundfish) with certain exceptions within the CFZ along the Aleutian Islands, and for whales within the CFZ off Alaska (except for an area in the GOA) and to conduct loading and support activities within the CFZ in certain areas in the GOA. This agreement was modified in December 1970 (Fredin 1987).

The two bilateral agreements—U. S.-U.S.S.R., and U.S.-Japan—may have had marginal benefits at best for the groundfish resources in the agreed-upon closure areas. In negotiating these agreements during the 1960s and early 1970s, U.S. policy matters focused on protecting the interests of traditional U.S. domestic fisheries (e.g., salmon, shellfish, and halibut). In spite of the historic U.S. fisheries for Pacific cod and sablefish, the groundfish resources off Alaska apparently were not perceived as traditional enough or sufficiently important to U.S. domestic fisheries to warrant specific protection under the bilateral agreements. This situation changed in the early 1970s when U.S. sanctions of the growing Japanese and Soviet distant water fisheries for groundfish became difficult to maintain. For example, the total harvest of pollock in the eastern Bering Sea between 1964 and 1971, practically all of which was taken by either Japanese or Soviet vessels, increased from 175,000 tons to 1.7 million tons. Also during this period, catches of some groundfish stocks, such as Pacific ocean perch and yellowfin sole, were decreasing as fishing effort was increasing (Fredin 1987). By 1971, roughly 1,300 fishing vessels were operating in the high seas fisheries off Alaska (Naab 1971).

This increased distant water fishing effort stimulated public concerns in Alaska. Concern lead to discussions in Congress and other venues regarding the efficacy of the CFZ and the need to further extend U.S. jurisdiction over fisheries to 200 miles (Commerce Committee 1976). It was against this backdrop that U.S. negotiations with Japan in December of 1972, and with the Soviet Union in February 1973, for the first time included in the renegotiated CFZ agreements measures aimed directly at conservation of groundfish stocks. These measures were specific annual catch quotas in 1973 and 1974 for groundfish (pollock, Pacific ocean perch, and sablefish) harvests by Japanese and (flatfish) harvests by Soviet fisheries in addition to the season and area restrictions previously developed to protect the traditional domestic fisheries. These quotas reflected increased interest worldwide for extending coastal state jurisdiction over fisheries. As conservation measures, they were good first steps; however, they were initially set at levels about equal to recent years' average annual catches (Fredin 1987). While the growth of Japanese and Soviet distant water fisheries were held in check by these measures, these fisheries also were not severely constrained.

The final round of bilateral agreements with Japan and the Soviet Union was concluded in December 1974 with Japan, and in July 1975 with the Soviet Union. These agreements included more groundfish catch limits for the respective Japanese and Soviet fleets, with a slight decrease in the 1975-1976 annual pollock allocation to the Japanese mothership and trawl fisheries in the eastern Bering Sea.

The groundfish catch quotas negotiated for Japan and the Soviet Union were based almost entirely on analyses and data provided by Japan. Little or no data provided by the Soviet Union was useful for stock assessment purposes (Fredin 1987). Of less significance were bilateral agreements between the U.S. and South Korea in 1972, and the U.S. and Poland in 1975. Under these agreements South Korea agreed not to fish for salmon or halibut east of 175°W in the BSAI and the GOA (Fredin 1987). In return, South Korea was granted fishery support operations in specified areas within the CFZ. Poland likewise agreed not to conduct specialized fisheries for rockfish, sablefish, flatfish, anchovies, Pacific mackerel, herring, or shrimp in 1976 (NMFS 1976).

A notable weakness of the bilateral agreements was that the authority to enforce their provisions (i.e., time and area closures, catch quotas, etc.) generally was left to the affected nation. This generated public doubt about whether strict compliance with the provisions was being observed. In one U.S.–U.S.S.R. bilateral agreement, however, arrangements were made for visits by representatives of fishermen' organizations of the two states to the others' fishing vessels operating in the northeastern Pacific. While these visits did not constitute an official appraisal of compliance, they were important for maintaining confidence in the utility of the bilateral agreement (Miles *et al.* 1982). Another view that led fishery managers and the general public to lose faith in the ability of bilateral agreements to conserve and manage high seas fishery resources in the North Pacific was expressed by Hiroshi Kasahara in 1973:

> *"While the present international fishery management regime consists of a complex network of ad hoc arrangements, some of the largest high seas fisheries in the area which have real or potential international implications are not covered by any of the existing agreements ...Thus, in spite of the various specific agreements for fisheries in the North Pacific, well over 90 percent of the total catch comes from fisheries currently not subject to international regulation. This by itself may not be considered a serious defect . . . [however, a] real problem is the lack of mechanisms for monitoring the status of these fisheries and resources on which they are based, to predict international management problems likely to arise, and to accommodate consultations to resolve them in a timely fashion (Kasahara 1973)."*

1.5 State of the Fisheries in 1976

When the MSA was passed in 1976, groundfish fisheries were, for all practical purposes, totally foreign. Most measures were designed to lessen their impact on domestic halibut and crab fisheries. Bureau of Commercial Fisheries reports indicate that, combined, Japan, the Soviet Union, South Korea, and Taiwan landed over 1.64 million mt. The total number of foreign vessels ranged from 138 in January to 759 in June. More than 300 vessels were present each month from April to September. Japan deployed from 64 to 616 vessels, the Soviets 42 to 147, South Korea 1 to 57, and Taiwan up to 4 vessels. Japan dominated the fisheries, landing 71 percent of the total foreign catch, the Soviets 21 percent, South Korea 7 percent, and Taiwan 1 percent. United States commercial fisheries were limited mainly to red king crab in the GOA and herring, salmon, and halibut eastern Bering Sea in coastal waters. Other than sablefish and small amounts of Pacific cod, very little groundfish was taken off southeastern Alaska. The IPHC had banned all but longline gear for halibut as early as 1944.

Some areas around the Pribilof Islands were closed to prevent foreign fishing marine debris and netting from harming fur seals. In the U.S., the short-tailed albatross had been declared endangered in 1970 under the Endangered Species Act (ESA), though no protective measures had been enacted in the fisheries.

Section 2 Groundfish Fisheries Management Post-1976

All bilateral agreements had to be brought into conformance with the purposes and provisions of the MSA. Following its implementation on March 1, 1977, foreign fishing could be conducted in the new 200-nautical-mile (nm) Fishery Conservation Zone (later changed to the EEZ) only pursuant to an international treaty or a governing international fishery agreement. Governing agreements were completed with Taiwan and the Soviet Union in 1976 and with Japan, South Korea, and Poland in 1977. While these agreements allowed access to the EEZ, all foreign nations had to fish under the rules of preliminary fishery management plans (FMPs) that applied only to foreign fisheries.

Foreign fisheries off Alaska were initially managed under four FMPs, all published in the Federal Register (FR) in February 1977:

1. Trawl fisheries and herring gillnet fishery of the eastern Bering Sea and northeast Pacific.

2. Trawl fishery of the GOA.

3. Sablefish fishery of the eastern Bering Sea and northeast Pacific.

4. Snail fishery of the eastern Bering Sea.

The snail fishery was a very small Japanese fishery consisting of 21 vessels that used longline with pots along the Bering Sea shelf edge northwest of the Pribilof Islands in the mid-1970s. Snails, subsequently, were incorporated as an "unallocated species" in the 1981 BSAI groundfish plan and will not be discussed further in this section.

The balance of specificity between FMPs and their implementing regulations has changed over time. Early FMPs contained very specific management measures and harvest levels that could only be changed through a lengthy plan amendment process, which could require 18 to 24 months from problem identification to a change in management. Under the plan amendment process, changes in harvest limits often lagged behind changes in stock abundance. In addition, federal regulations often lagged behind changes in regulations for adjacent state waters, causing conflicts and confusion where stocks had to be managed as a unit throughout their range.

The description of evolution of the FMPs and their regulations that follows will emphasize five issue areas: 1) target species protection, 2) bycatch control, 3) the social and economic well-being of domestic resource users, 4) marine mammal and seabird protection, and 5) habitat protection. Table 2-1 provides an overview of major management changes. Figure 2-1 shows changes in the balance of domestic, joint venture, and foreign harvests over time.

2.1 1977 Preliminary Groundfish Fishery Management Plans

In the BSAI, optimum yields (OYs) were established for nine species or species groups: pollock, yellowfin sole, other flounders, Pacific ocean perch, sablefish, Pacific cod, herring, squid, and other species. Fishing allocations were granted to Japan, the Soviet Union, South Korea, Taiwan, and Poland. Management measures were designed to arrest the decline in abundance of overfished stocks and allow them to rebuild. For the first time in foreign fisheries off Alaska, the entire region could be closed to all fishing by a nation that had harvested its allocation of any species. This measure had never been accepted in former bilaterals. Additionally, trawling in certain areas was prohibited from December 1 to May 31 to protect spawning concentrations of pollock and flounders. Foreign vessels were required to report catch and effort, monthly and annually, and provide check-in and check-out reports by radio. All vessels were required to provide accommodations for an observer at no cost to the U.S.

The FMPs also significantly restricted the impact of foreign fisheries on domestic fisheries for halibut, crab, shrimp, and salmon. In the Bering Sea, for example, the demise of the halibut resource had been well documented over the previous ten years with combined U.S., Canadian, and Japanese setline catches in the Bering Sea; falling from a high of over 14,000 mt in 1962 to around 300 mt or less in 1973-1975 (BSAI FMP). Though it was caused partially by the directed setline fishery, it was aggravated by the enormous incidental catch of juvenile halibut by Japanese and Soviet trawlers. Japan had agreed under the bilaterals to not retain halibut caught in trawls east of 175°W except in INPFC Area D, where they were retained for a short period in the spring. The Soviets had never agreed to refrain from fishing halibut, but maintained that their vessels did not target halibut or take any as bycatch. Few observers were allowed on Soviet vessels under the bilaterals, and the Soviets were well-known for under-reporting their catches of target species and, presumably, bycatch as well.

Regional restrictions in the BSAI FMP included a ban on retention of salmon, halibut, and crabs, and no fishing at all for shrimp, which earlier had been fished nearly to extinction by foreign fleets. Foreign fishing was not allowed within 12 nm, except at certain times of the year in parts of the Aleutian Islands. Specifically to protect juvenile halibut, no trawling was allowed from December 1 through May 31 in a large area north of the Aleutian Islands and east of 170°W, which later would be called the Winter Halibut Savings Area (Figure 2-2); and in an area just south of the Pribilof Islands known as the Misty Moon Grounds. The Misty Moon Grounds was a holdover from the bilaterals, wherein foreign vessels were not allowed to trawl for seven days surrounding the U.S. and Canada halibut fishery each spring to reduce gear conflicts and disturbance to prime halibut fishing grounds. Further, the Bristol Bay Pot Sanctuary, north of the Alaska Peninsula running from the eastern boundary of the Winter Halibut Savings Area east to 160°W, was closed to trawling all year. These closures provided protection for juvenile halibut over an area of about 41,413 square nm, and a distance of about 420 nm along the northern coast of the Aleutian Islands and Alaska Peninsula. The Bristol Bay Pot Sanctuary's other main purpose was to prevent conflicts between foreign mobile trawl gear and U.S. crab pots.

Table 2-1. Brief history of fisheries management measures.

Target species	Bycatch controls	Socioeconomic benefits	Marine mammals/seabirds	Habitat
Bilaterals: pre-1977 (foreign fisheries only)				
• Foreign fishing catch quotas for eastern Bering Sea (BS) pollock/flatfish and Gulf of Alaska (GOA) Pacific Ocean perch/sablefish-self-monitored.	• Time/area closures to reduce halibut and crab bycatch. • No halibut retention in trawls. • Limited monitoring of bycatch of halibut.	• Foreign fishing time/area closures to reduce conflict with domestic fisheries for halibut and crab.	• Foreign fishing closures to protect Pribilof fur seals. • Short-tailed albatross designated endangered, 1970.	N/A.
Preliminary management plans: 1977 (foreign fisheries only)				
• Total allowable catches (TACs) and TAC-related closures in Bering Sea and Aleutian Islands (BSAI) and GOA. • Monthly/annual catch reports. • Observers. • Trawl area closures to protect spawning pollock and flounders.	• Time/area closures expanded. • No retention of halibut, crab, salmon, shrimp. • Bristol Bay Pot Sanctuary closed to trawling all year. • No herring fisheries east of 168°West (W) in BS. • Extensive trawl closures in GOA to protect halibut.	• Foreign fishing time/area closures to reduce conflict with domestic fisheries for halibut and crab.	• Recognition of direct/indirect effects of fisheries on marine mammals and seabirds.	N/A.
First fishery management plans: 1979–1982 (mainly foreign fisheries)				
1979–<u>GOA</u> Species optimum yields (OYs)/three areas: • 20 percent reserve. • OY closures. • Catch monitoring/ reporting/ observers (foreign vessels only). 1982–<u>BSAI</u> Species OYs/two areas: • Four species categories. • Objective: rebuild depleted stocks. • Monitoring/ observers (foreign vessels only). • 5 percent or 500 metric tons (mt) reserve. • TAC closures.	<u>GOA</u> Objective: Protect halibut • No retention of prohibited species catch (PSC) species. • Bottom trawl restrictions. • Domestic halibut PSC for part of year. • Expanded time/area closures. <u>BSAI</u> Objective: Rebuild halibut • Expanded time/area closures. • PSCs in separate category. • No closures for United States (U.S.) fishermen. • Foreign longline depth restrictions to protect halibut.	<u>GOA</u> • Domestic priority to groundfish. • Year-round closures to foreign fishing inside 12 miles. • three closures off southeast Alaska. • Davidson Bank closed. <u>BSAI</u> Objective: Develop U.S. fisheries • Time/area closures in Bristol Bay Pot Sanctuary, Petrel Bank, and other areas to prevent gear conflicts and grounds preemption.	• Descriptions of marine mammal and seabird issues in Fishery Management Plans.	Descriptions of habitat.

Table 2-1 (cont.). Brief history of fisheries management measures.

Target species	Bycatch controls	Socioeconomic benefits	Marine mammals/seabirds	Habitat
1983–1985 (mainly foreign and joint venture fisheries)				
Expanded catch reporting requirements for domestic vessels: • OY range in BSAI. • Annual stock assessment document in BSAI. • Directed Fishing Standards. • Species categories in BSAI/GOA. • Western and Central GOA. combined for pollock. • GOA pollock TAC reduced in response to scientific advice.	GOA • Cod total allowable level of foreign fishing (TALFF) in GOA allocated to foreign longliners to reduce trawl bycatch. • Foreigners must report bycatch. • Biodegradable panels in sablefish pots. • Southeast (east of 140°W) closed to all foreign fishing to protect halibut . • Halibut PSC raised for U.S. fishermen, but pelagic trawls exempted. • Foreigners must use off-bottom trawls all year. • Joint ventures have observers on foreign processors. • Major PSC framework in GOA. BSAI: • Chinook salmon PSC. • Also PSC on halibut, crab. • Foreign trawl restrictions in Petrel Bank. • Major policy statement for U.S. fisheries to control their bycatch.	GOA • Kodiak Gear Area closed to foreign trawls to protect. crab fishermen and gear • U.S. trawls and pots banned in eastern GOA for sablefish. • Magnuson-Stevens Act priority allocations to U.S. fishermen.	BSAI • Overall OY set low to help marine mammals and seabirds. • North Pacific Fishery Management Council (NPFMC) votes later to keep 2 million mt cap.	NPFMC prohibits discard of net and debris.

Table 2-1 (cont.). Brief history of fisheries management measures.

Target species	Bycatch controls	Socioeconomic benefits	Marine mammals/seabirds	Habitat
1986–1990 (Mainly Joint Venture and Domestic Fisheries)				
GOA • OY Range. • Reporting requirements for U.S. catcher processors. • Shelikof District to protect pollock. • Comprehensive observer program (BSAI/GOA). BSAI • Revised definitions of acceptable biological catch (ABC), threshold, overfishing definitions. • Ban pollock roe stripping (BSAI and GOA).	GOA • Type I–III closures off Kodiak. • Framework PSC in GOA. • Observer program. • 2,000 mt PSC halibut for U.S. trawlers; 750 mt for longliners. • Ban pollock roe stripping. • Maximum retainable bycatches introduced. • Full utilization policy. • Apportion halibut PSC by quarter. • Halibut excluder devices and biodegradable panels on sablefish pots. BSAI • First total closures to U.S. trawling. • Observer program. • PSC limits for halibut, crab, herring. • PSC closures. • Season delays to protect halibut. • Seasonal PSC allocations.	• Foreign fisheries end in economic exclusion zone (EEZ). • Joint ventures peak in 1987 and rapidly decline.	• NPFMC votes against raising 2 million mt OY cap in BSAI. • Walrus Island closure. • Steller sea lions listed as threatened. • Initial sea lion protections implemented. • National Marine Fisheries Service (NMFS or National Oceanic and Atmospheric Administration [NOAA] Fisheries) begins monitoring seabirds and fishing interactions.	• NOAA Fisheries policy added to Fishery Management Plan (FMP). • NPFMC approves habitat policy and committee. • Bottom trawl closures.

Table 2-1 (cont.). Brief history of fisheries management measures.

Target species	Bycatch controls	Socioeconomic benefits	Marine mammals/seabirds	Habitat
1991–1995 (Fully Domestic Fisheries)				
• New overfishing definitions. • Bogoslof District established. • Pacific ocean perch rebuilding plan. • Aleutian Islands District for Atka mackerel. • Sablefish/Halibut individual fishing quotas (IFQs).	• Biodegradable panels on all pots. • Refined pelagic trawl definition. • Hotspot authority. • Herring PSC revised. • Experimental fishing permits. • Seasonal delays to reduce bycatch. • Vessel incentive program (VIP) program. • Careful release program. • Halibut PSC based on mortality. • Salmon donation program. • Seine/gillnet ban for groundfish. • Chum salmon PSC. • Minimum mesh size in trawls. • Expanded Bering Sea closures. • Pribilof closure.	• Pollock/cod inshore-offshore. • Community development quotas (CDQs). • IFQs. • Pribilof closure. • Moratorium.	• Spectacled eider listed. • Observers on crab vessels receive seabird identification training. • Rookery/haulout closures. • Pollock allocation by area and season. • GOA pollock set low to help sea lions. • Sea lion recovery plan. • Aleutian Islands subarea – Atka mackerel. • Sea lion critical habitat designated. • Pribilof closure.	• Pribilof closure.
1996–2000+ (Fully Domestic Fisheries)				

• GOA Pacific ocean perch rebuilding plan revised.
• Overfishing definitions revised twice.
	• Red king crab PSC revised.
	• Closed nearshore areas.
	• Halibut donation program.
	• Opilio Tanner crab PSCs.
	• Bairdi Tanner crab PSCs.
	• Improved retention/utilization program.
	• Bottom trawl ban for pollock.
	• Chinook PSCs enacted and then reduced.
	• Halibut mortality avoidance pilot program.
	• Full retention of demersal shelf rockfish.
	• Forage fish ban.
		• Inshore-offshore allocations extended.
		• Atka mackerel jig allocation.
		• CDQ.
		• Moratorium.
		• License Limitation Program.
		• Cod allocations by gear type.
			• Seabird avoidance measures.
			• Take limits on short-tailed albatross.
			• More sea lion critical habitat designated.
			• Forage fish ban.
			• Extensive sea lion protective measures.
				• Essential fish habitat (EFH) guidelines.
				• EFH descriptions in FMPs.
				• Sitka Pinnacle closure.
				• Habitat area of particular concern (HAPC), Part I: no commercial fishing for sponges and corals HAPC
				  • Part II: Stakeholder process begins.
				  • Non-pelagic trawl closures.

Source: NOAA Fisheries

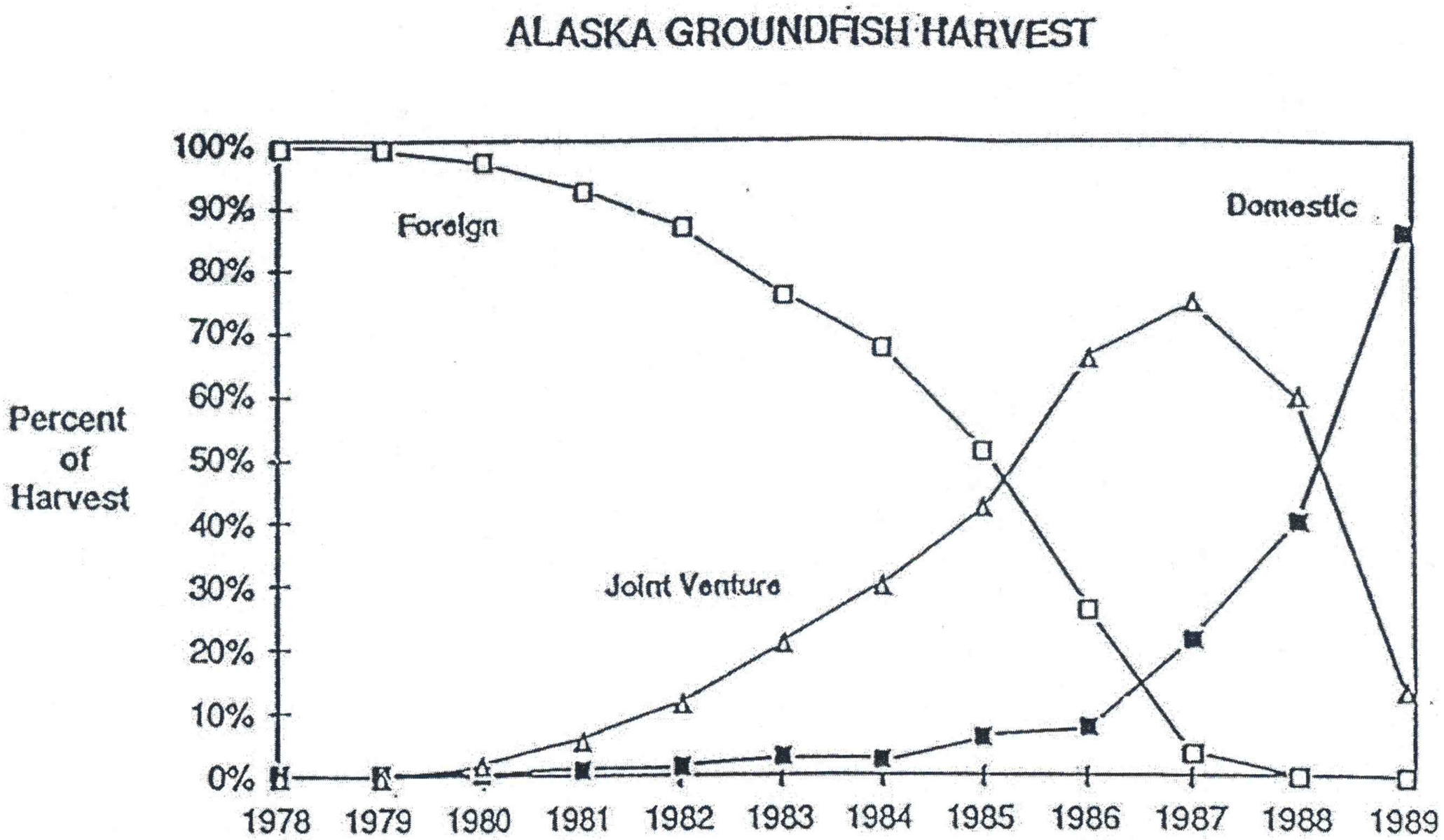


Figure 2-1. **Shows changes in the balance of domestic, joint venture, and foreign harvests over time.**

To prevent overexploitation of specific herring stocks important to the well-being of Native fishermen and villages, no herring fishing was allowed east of 168°W and north of 58°N. Concerns were also raised about bycatch of chinook salmon, mainly around Unimak Island, but no specific measures were placed in the FMP other than a prohibition on salmon retention in the trawl fisheries. Further, the FMP noted that impacts on marine mammals included 1) direct impacts from trawl netting, plastic wrapping bands, and other debris around their necks or bodies and 2) indirect impacts of the fisheries competing for some of the same species of fish and shellfish used as food by the northern fur seal and other marine mammals.

In 1977, GOA fisheries were also mostly foreign, although there were domestic fisheries for sablefish mainly off southeastern Alaska and emerging interest in other groundfish species, particularly off Kodiak Island. The GOA groundfish FMP set foreign catch quotas for pollock, rockfish, flounders, Pacific cod, Atka mackerel, and other species, and set aside amounts of most species for the developing U.S. fishery. U.S. management policy for the GOA, as stated in the FMP, was to 1) ensure adequate potential for development of new U.S. fisheries, 2) protect the halibut resource so it could rebuild to provide maximum sustainable yield (MSY), and 3) allow for foreign fisheries, consistent with the other two objectives. Like the BSAI FMP, the GOA FMP had similar provisions regarding the closure of foreign fisheries on quota attainment, and identical provisions for reporting, monitoring, and observer requirements.

Bycatch protections in the GOA FMP included prohibitions on retention of halibut, salmon, shrimp, herring, and creatures of the continental shelf such as crab (this category was termed Continental Shelf Fishery Resources or CSFR in the FMP). No trawling was allowed within 12 nm (except at 169°–170°W) to prevent gear conflicts and catch of inshore species. Six Kodiak Island Gear Areas were closed to foreign fishing from August 10 through May 31 to prevent conflicts with U.S. crab pots and halibut setlines. To protect emergent domestic fisheries in Dutch Harbor and Sand Point, no trawling at all was allowed in the Davidson Bank area. Other areas were closed throughout the GOA to reduce halibut bycatch. Three additional areas were closed around Kodiak Island within five days of the halibut fishery so the grounds would be undisturbed and gear conflicts with U.S. fishermen would be reduced. A rule change to the FMP in April 1978 further restricted foreign fishing by limiting the cod fishery west of 157°W and inside the 500-m isobath to longlines to reduce bycatch of other species and prevent gear conflicts during the halibut season.

The sablefish FMP regulated foreign setline fisheries from southeastern Alaska down the Pacific coast off Washington and Oregon. Foreign fisheries for GOA sablefish were prosecuted by longliners from Japan, South Korea, and Taiwan. The FMP established sablefish total allowable catches (TACs) for the BSAI, GOA, and Pacific coast. All were allocated to foreign fisheries or total allowable level of foreign fishing (TALFF) in the BSAI. In the GOA, TALFF was 19,500 mt and Domestic Annual Harvest (DAH) was 2,500 mt. There was no TALFF farther south off the Pacific coast. There were no time area restrictions in the Bering Sea, but there were various year-round and temporary closures in the Aleutian Islands. In the GOA, the foreign setline fishery had to stay outside the 500-m depth contour to reduce gear conflicts with domestic fishermen. Also, a limit was placed on the number of vessel-days a nation could fish. Sablefish management measures were merged into the groundfish FMPs, beginning with the GOA, in 1978.

While there were no direct measures controlling the impacts of the fisheries on marine mammals and seabirds, other than restrictions on operating too close to the Pribilof Islands, each of the groundfish FMPs recognized and discussed direct and indirect affects of fishing on marine mammals and seabirds.

In summary, the FMPs continued and enhanced provisions of the bilaterals. In many respects, they established the fundamental philosophy for managing the fisheries in future years as they became completely Americanized in the late 1980s. Harvest limits were set for each main species, and fishing ceased when the limit was reached. Catch reporting and observers were required. Time-area closures and non-retention of prohibited species, such as salmon, halibut, crab, and shrimp, were the main approaches to protecting non-groundfish species that were important target species for domestic fisheries. Time-area closures were also used to protect domestic fishermen from grounds preemption and gear conflicts caused by mobile foreign trawl gear.

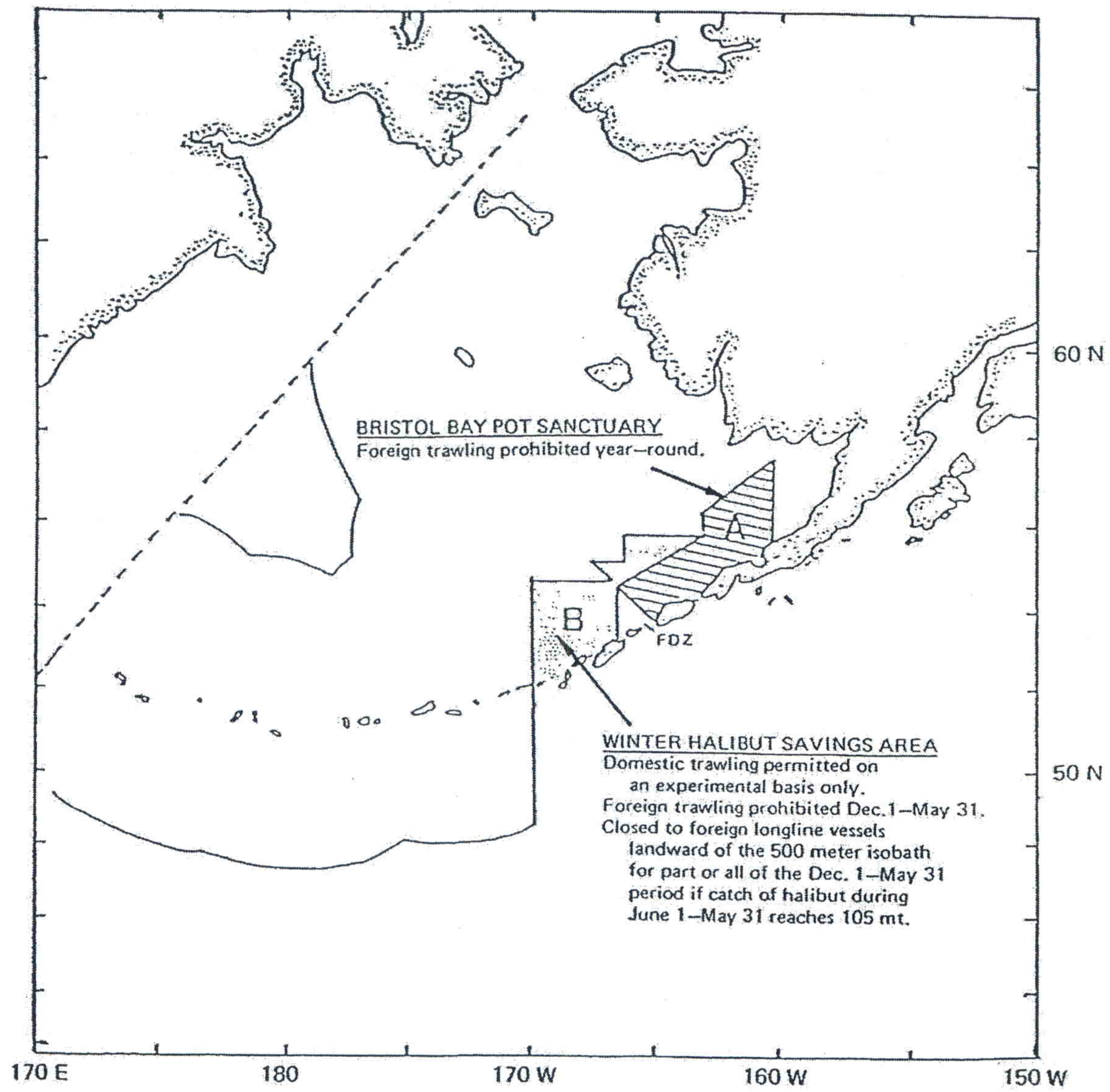


Figure 2-2. Restrictions on domestic and foreign fishing for groundfish in two areas in the eastern Bering Sea. Source: Fredin 1987.

2.2 1979–1982 Fishery Management Plans

The North Pacific Fishery Management Council (NPFMC) first convened in October 1976. One of its major tasks was to develop FMPs for the groundfish fisheries to replace the FMPs which applied only to foreign fisheries. The first FMP developed was for the GOA, implemented in January 1979; the BSAI FMP was implemented in 1982. Both plans carried forward most of the FMP management measures. Optimum yields were set for each of the main species, and species complexes and fisheries were closed when the OY was reached. The concept of a set-aside, or reserve was introduced to provide allocations to individual fisheries in season. The reserve in the GOA was 20 percent of each species. In the BSAI, the greater of 5 percent or 500 mt of each species was set aside. The OYs were distributed by management areas in both FMPs. The BSAI FMP had a specific objective to rebuild depleted groundfish stocks.

The first FMPs placed an emphasis on protecting prohibited species and the associated domestic fisheries. For example, each plan had an objective to protect halibut. The ban on retention of halibut in trawls was carried forward and some time-area closures were expanded (Figure 2-2). Bottom trawl restrictions were applied to the foreign fisheries, and depth restrictions were set on foreign longline fishing for Pacific cod in the Winter Halibut Savings Area in the eastern Bering Sea. For the first time in the GOA, domestic trawlers had a halibut prohibited species catch (PSC) cap, which, when reached, prohibited fishing with other than off-bottom trawls. No restrictions were placed on domestic fishermen in the Bering Sea other than non-retention of PSC species.

In summary, the first FMPs for groundfish were developed mainly to control the predominantly foreign fisheries, but they established the fundamental management tools that would later be used to control domestic fishing. FMP restrictions on foreign fisheries were carried over into the FMPs expanded in many cases to further two policy objectives: 1) protecting target groundfish species, and 2) protecting bycatch species and the associated domestic fisheries. A PSC limit for halibut for domestic trawlers was implemented for the first time off Alaska in the initial GOA FMP.

2.3 1982–1985 Groundfish Management

By the end of 1985, only minor foreign fisheries, harvesting pollock and Pacific cod, were being allowed in the GOA; foreign harvesting continued in the Bering Sea, but even there, foreign trawling had ended within 20 nm of the Aleutian Islands, and foreign longlining for cod was restricted to north of 55°N and west of 170°W, depending on ice conditions. Foreign harvests dropped to less than 1 million mt in 1985. In contrast, U.S.-foreign joint ventures grew rapidly through the early 1980s. They harvested about 880,000 mt in 1985, using over 100 U.S. trawlers working within some 28 different company arrangements with such countries as Japan, South Korea, Poland, the Soviet Union, Portugal, and Iceland. Completely domestic annual processing reached 105,000 mt in 1985, mostly by trawler catcher processors, also called factory trawlers. Pollock stocks in the GOA-Shelikof Straits were beginning to decline rapidly.

Target Species

The most significant change in management of target species was made in the BSAI groundfish FMP with the setting of an OY range from 1.4 to 2.0 million mt of groundfish, then using the specifications process to set TAC for each species, which, when combined, could not exceed the upper end of the OY range. A resource assessment document for the BSAI contained a full description of each stock and its current condition. Developed in 1984, it established in one document all the information needed to set the harvest levels for each groundfish species and species complex. A similar document would later be developed for the GOA groundfish fisheries (as would an OY range and TAC-setting process), which would later set the standard for the development of stock assessment and fishery evaluation documents required of all regional fishery management councils in the U.S.

Bycatch Control

The other main policy emphasis during the 1982–1985 period was on control of bycatch. By 1985, the remaining foreign fisheries were required to use off-bottom trawls year-round in the GOA, and much of the Pacific cod TALFF had been allocated to foreign longliners to reduce the bycatch that otherwise would have been incurred by trawlers. To protect halibut, southeast Alaska, east of 140°W, was closed to all foreign fishing in 1982. In the Bering Sea, a major bycatch reduction plan was established for foreign fisheries (Amendment 3) to decrease the bycatch of halibut, chinook salmon, bairdi Tanner crab, and red king crab over a five-year period.

Additional restrictions were placed on foreign fisheries, but with their directed harvest declining rapidly, management attention began to focus more on the rapidly developing joint venture fisheries and the completely domestic groundfish fisheries. Domestic groundfish fishermen could not retain PSC species, and only the PSC limit for halibut in the GOA could close on-bottom trawling. The PSC limit applied only to the western and central GOA Districts, but in 1984 it was applied to the entire GOA in response to the rapidly developing domestic trawl fisheries. Pelagic trawlers and longliners were exempted from PSC-related closures. In addition, biodegradable panels were required on all sablefish pots. Bering Sea domestic groundfish fishermen had no PSC limits, but when it passed Amendment 3, NPFMC made a major policy statement on the need for U.S. fishermen in the Bering Sea to monitor and control their bycatch. A major PSC framework for specifying PSC and allocating it to various sectors and seasons was established for the GOA and later applied to the BSAI. Observers were required on all joint venture processor vessels, and continued catch reporting on target and bycatch harvest as the foreign fisheries wound down.

Social and Economic Benefits

The priorities in the MSA require that fish be allocated first to totally domestic operations, then to joint ventures, and last to foreign directed fisheries. Therefore, when a sector of the U.S. industry established that it could harvest a certain amount, that amount had to be set aside for it; thereby creating economic benefits for domestic fishermen and communities. Two other measures that directly benefitted domestic fishermen were 1) a ban on the use of trawls and pots in the southeast Alaska sablefish fishery, leaving it for longliners, and 2) expansion of the Kodiak Island Gear Areas into one large area, bounded by the "Lechner Line," and its closure to all foreign trawling to protect the red king crab grounds.

Environmental Benefits

The NPFMC voted to prohibit the discard of nets and debris, which often caused entanglement and thus mortalities among marine mammals and other sea life.

Summary

By the end of 1985, both groundfish plans had been on-line for at least four years, and attention was increasingly focused on the rapidly growing domestic fleet, particularly trawlers working in foreign joint ventures. Conservative management of target fisheries was still the norm for both foreign and domestic fisheries, but the main policy emphasis, in terms of time and effort spent on the development of management measures, was on bycatch control.

2.4 1986–1991 Groundfish Management

During the five years between 1986 and 1991, the groundfish fisheries became totally domestic. The last years of foreign directed fishing in the BSAI and GOA were 1987 and 1986, respectively. Foreign joint ventures peaked in 1987, and their last years of operation in the Bering Sea and the GOA were 1991 and 1988, respectively. Americanization of the fishery happened more quickly than anyone had anticipated, and much of the management effort turned to determining how to restrict the impacts of the burgeoning domestic groundfish fleet on traditional fisheries for crab, halibut, salmon, and herring. Whereas the cumulative impacts of the bilaterals, the FMPs, and first FMPs in controlling bycatch had been aimed directly at the foreign fleet, managers now had to rapidly address bycatch problems caused by the domestic fleet, protect target species, and still allow for continued development of domestic fisheries.

Target Species

The basic management measures were already in place for the domestic fleet. Conservative harvest quotas (e.g., quotas set low due to uncertainty in state statutes) that had been applied to the foreign fleet were now applied to the domestic fleet. The GOA FMP was revised to incorporate an OY range and individual TACs within that range, mirroring the BSAI FMP. Overfishing definitions were also added to the BSAI FMP. The pollock stock in the western and central GOA declined significantly in 1986–1990, and NPFMC set lower harvest levels every year in response to scientific advice. The NPFMC also rebuffed several efforts to raise the OY limit in the BSAI to prolong the foreign joint venture operations. The NPFMC chose not to revise the OY limits because of concerns about the amount of groundfish taken outside the EEZ, the uncertainties in the amount of pollock and other groundfish species to support Steller sea lions, other marine mammals and seabirds, and the reliability of methodology used to determine acceptable biological catches (ABCs), among others.

The demise of the foreign directed fisheries and joint ventures left a large gap in at-sea data collection. Observers had been required on all foreign fishing and processing vessels, to cover activities and provide verification of catches. There was no observer coverage on the growing domestic fleet, despite some provisions which called for domestic vessels to take observers in certain areas when requested by National Marine Fisheries Service (NMFS or National Oceanic and Atmospheric Administration [NOAA] Fisheries). In the late 1980s, a small pilot observer program, funded partially by industry and partially by government, provided observers for a half-dozen volunteer trawlers in the BSAI and GOA. Frustrated by the lack of observer coverage and the lack of federal funding available, NPFMC voted to impose an industry-paid, comprehensive Observer Program on the domestic fleet beginning in 1990. It required 100 percent observer coverage on all vessels over 124 feet (ft) and 30 percent coverage on those between 60 ft and 124 ft. This program provided comprehensive catch verification and bycatch monitoring. It has endured over the past 10 years and is a critical component of North Pacific stock management. It provides the basis for control of target species harvest, and bycatch monitoring and interactions with marine mammals. Without the Observer Program, monitoring of deployment of the complex innovative bycatch management regimes now used in the domestic fisheries would have been difficult, if not impossible.

Bycatch Control

As noted, bycatch control in the domestic fisheries was a major policy emphasis in 1986–1990. Extensive closures were imposed on domestic trawlers around Kodiak Island and in the eastern Bering Sea to protect red king crab (Figures 2-3 and 2-4). Some closures were complete and year round; others were for parts of the year and applied just to bottom trawling. Bycatch limits were set for halibut, red king crab, and bairdi Tanner crab. At first, these limits were applied only to the joint venture flatfish fisheries, but by 1990 they were widely applied to the entire domestic fleet through a complex allocation of PSC by area, season, gear, and fishery sector, including both trawl and fixed gear. These PSCs closed down the fisheries for varying lengths of time. In 1990, a PSC limit was placed on herring for the trawl fleet. Also during 1986–1990, NPFMC and NOAA Fisheries developed the directed fishing standards that limit the amounts of a groundfish species that could be retained after the directed fishery for that species had closed. These measures allowed directed fisheries to be protected by bycatch-related closures in other directed fisheries. For example, the relatively high-bycatch fisheries for rock sole and yellowfin sole, when closed, would not impact continuation of the low-bycatch pollock fisheries. In summary, the complex program for controlling bycatch in domestic fisheries was established in 1986–1990, although it would be fine-tuned in years to come.

Social and Economic Benefits

The MSA's allocation priorities to domestic fishermen continued the favorable conditions for growth of the U.S. fishing industry off Alaska, and commensurate benefits to the communities and individuals that depended on it. Bycatch controls and time area closures to minimize grounds preemption and gear conflicts with traditional fisheries for halibut and crab also conferred economic benefits to domestic fisheries.

Environmental Benefits

Closures of groundfish fishing to protect walrus were implemented around Round Island, the Twins, and Cape Peirce from 3 to 12 miles from April 1 through September 30, beginning in 1990. That same year, NOAA Fisheries listed Steller sea lions as threatened under the ESA and implemented several measures to reduce direct impacts on them. These measures included a ban on shooting at sea lions, reductions in incidental kill quotas, and 3-mile buffer zones around principle rookeries. During those five years, NPFMC voted against raising the BSAI 2-million-mt groundfish cap, which reduced the probability of adverse impact of fishing harvests on food abundance for marine mammals and seabirds. Additionally, NOAA Fisheries began monitoring fishery interactions with seabirds and marine mammals, helped significantly by the comprehensive Observer Program.

NOAA Fisheries's policy on habitat was added to both the BSAI and GOA groundfish plans in 1986. In 1988, NPFMC approved its own habitat policy and established a habitat committee to review permit requests for significant developments that might impact fish habitat. The extensive trawl closures enacted in the BSAI and in the GOA also conferred protection on habitat.

Summary

The major new policy initiatives during 1986–1990 were control of bycatch, protection for marine mammals, and protection of habitat. Conservative management and control of target groundfish species harvests continued. The strong foundation for protecting target species had been established in the earlier period for

foreign fisheries and those measures, reinforced by the industry-paid comprehensive Observer Program beginning in 1990, were continued in the domestic fleet as it expanded.

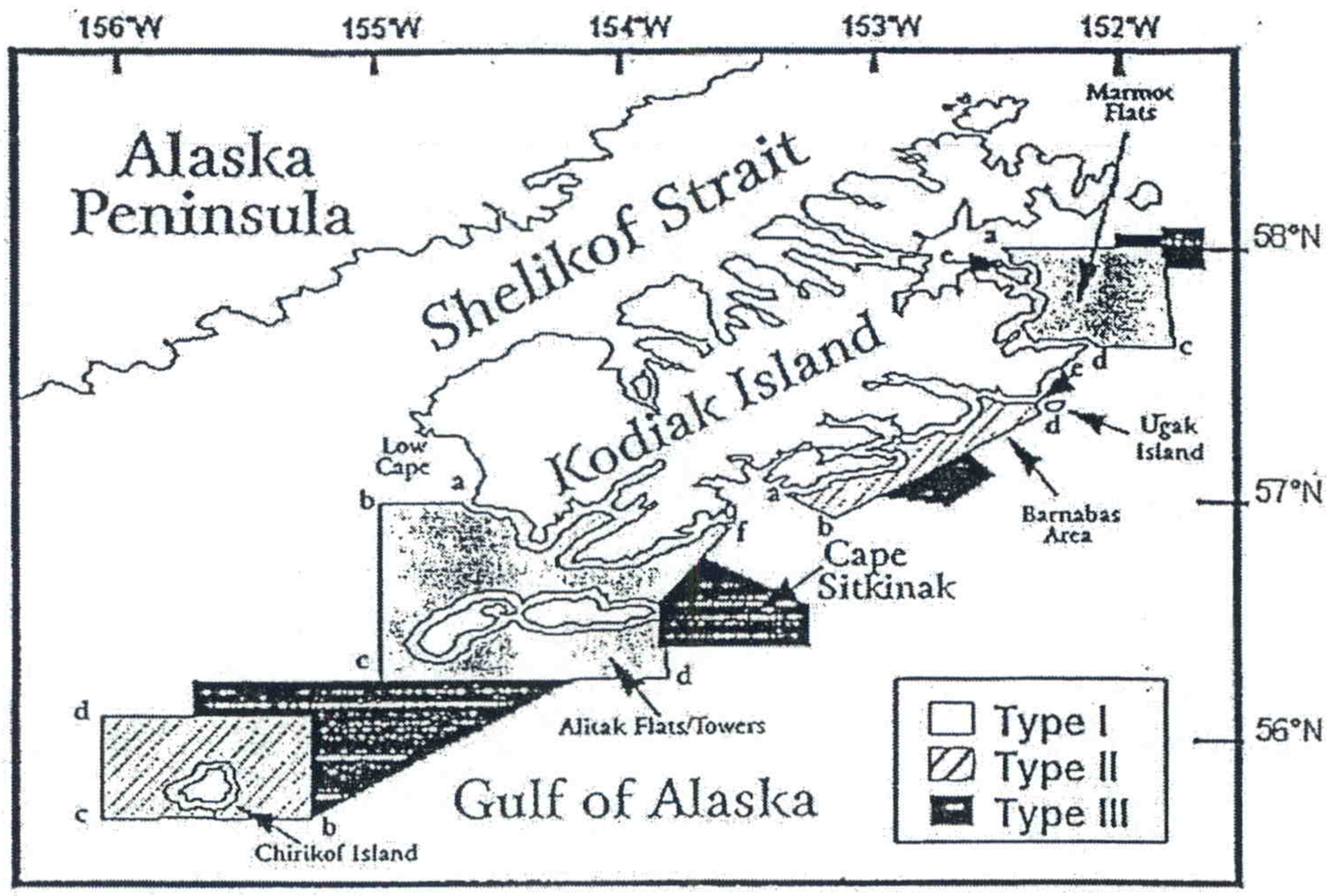


Figure 2-3. Kodiak Island non-pelagic trawl gear closures. Source: NPFMC.

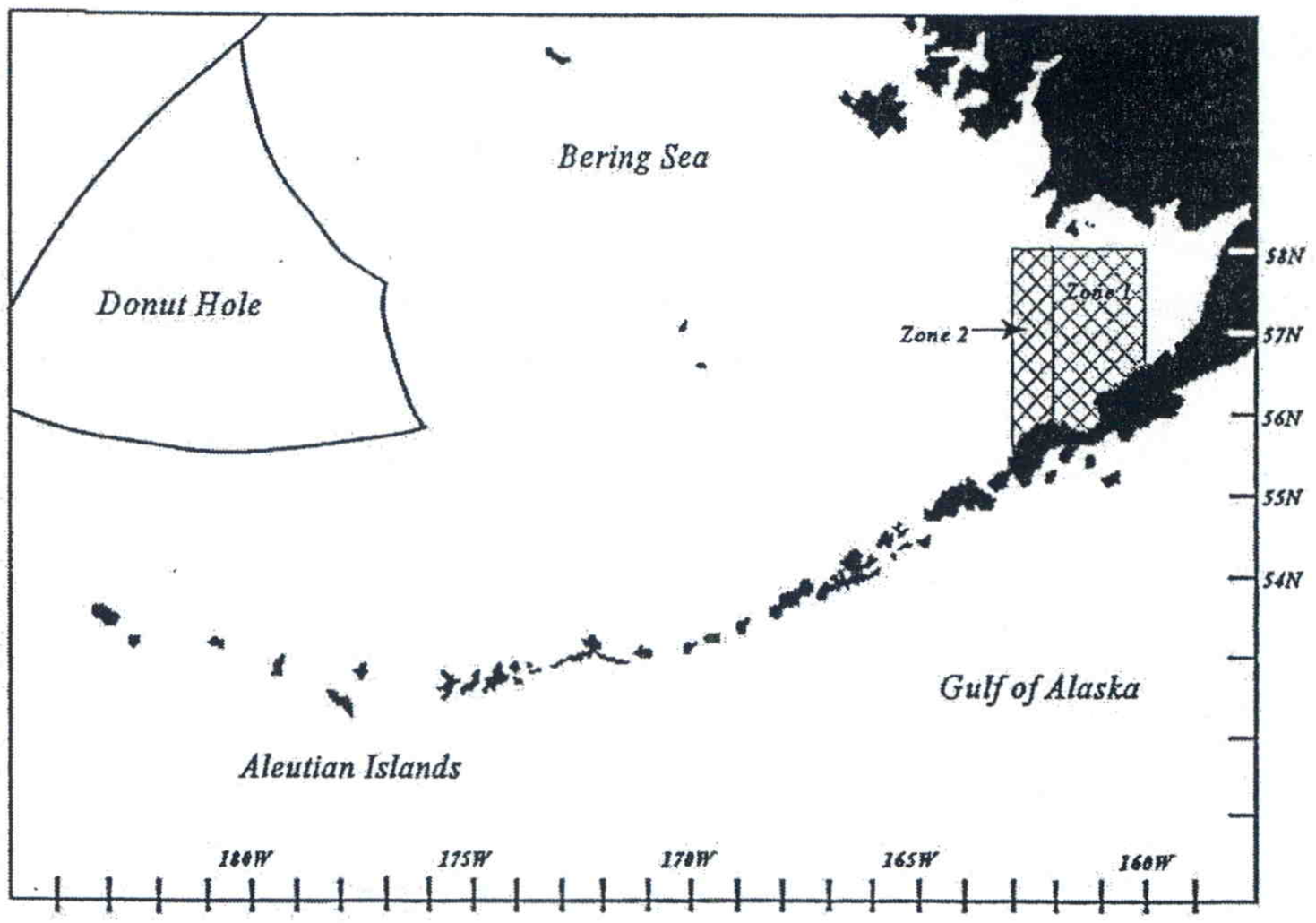


Figure 2-4. Crab and halibut protection zones. Source: NPFMC.

2.5 1991–1995 Groundfish Management

Beginning in 1991, the groundfish fisheries were fully domestic and they grew rapidly. By 1995, the groundfish fleet contained 1,545 vessels, including 1,159 vessels fishing with hook-and-line gear, 263 with pots, and 264 with trawls. Some of these vessels using more than one gear type; about 120 were catcher processors. The groundfish fleet vessels came mainly from communities in Alaska, Washington, and Oregon. Their total groundfish harvest in 1995 was approximately 2.1 million mt, with 90 percent coming from the BSAI management area. The overall catch was 65 percent pollock, 15 percent Pacific cod, 12 percent flatfish, 4 percent Atka mackerel, 2 percent rockfish, 1 percent sablefish, and lesser amounts of other species. Intense allocation disputes arose over pollock and Pacific cod. For the BSAI, actions were taken to allocate pollock and Pacific cod between the inshore and offshore processing sectors and between gear-type groups. The problem of excess fishing capacity in most sectors of the groundfish fleet began to be addressed during this period as well.

Target Species

New overfishing definitions were incorporated in the FMPs, a ban on pollock roe stripping was implemented, and the Bogoslof District in the Bering Sea was established as a separate management area for pollock. This latter measure was intended to isolate and control harvests of the component of the pollock stock that was associated with the Aleutian Basin pollock stock, which at the time was being heavily fished in central Bering Sea international waters by foreign fleets displaced from the U.S. EEZ. Additionally, the Aleutian Islands management area was partitioned into three separate areas to manage Atka mackerel and later, pollock. In the GOA, a rebuilding plan was implemented for Pacific ocean perch stocks, which had been decimated by Soviet fisheries in the 1960s and have still not recovered. These new measures were overlain on the existing conservative harvest management system.

Bycatch Control

Various restrictions were placed on the construction of groundfish gear to minimize bycatch not only of PSC species, but also of juvenile components of the groundfish stocks that had no market value, and, therefore, were discarded. For example, biodegradable panels and halibut excluder devices were required on all groundfish pots. Other restrictions included minimum mesh size in trawls, careful release mechanisms for the longline fishery, and refined definitions of pelagic trawls. Seines and gillnets were prohibited in the groundfish fisheries because of their indiscriminate bycatch. The Vessel Incentive Program was applied to the fisheries, establishing bycatch rate standards for PSC species. Hotspot authority was granted to allow NOAA Fisheries to close areas of high bycatch. A herring PSC limit was applied to the trawl fishery in the BSAI, and halibut PSC monitoring changed to a mortality basis. PSC limits were established for chum salmon in the Bering Sea and more Bering Sea areas were closed to protect red king crab. The chinook salmon bycatch donation program to food banks was approved, and a large area around the Pribilof Islands was closed to trawling for halibut and crab protection as well as other purposes.

Social and Economic Benefits

Measures enacted during this period addressed the intense competition for groundfish resources. Pollock and Pacific cod were allocated between the offshore and inshore sectors, and the Community Development Quota (CDQ) Program was established in the BSAI. Capacity problems in the groundfish and crab fisheries were addressed with a moratorium on further entry, beginning in 1995, and an Individual Fishing Quota (IFQ)

Program was implemented in 1995 for the fixed-gear sablefish and halibut fisheries. The Pribilof Islands trawling closure, described above, conferred benefits on local residents.

Environmental Benefits

The Pribilof Islands closure also provided protection for marine mammals and seabirds. The 1991–1995 period also saw broad implementation of closures to further protect the Steller sea lion. For example, NOAA Fisheries closed areas year-round to trawling within 10 miles of 37 Steller sea lion rookeries, and within 20 miles during the pollock A season (January 20–April 15) around five rookeries in the BSAI. There were comparable closures in the GOA.

To reduce competition for prey and avoid localized depletion, the pollock TAC was spread over three areas, and the amount of excess pollock that could be taken in a quarter was limited. In 1993, NPFMC reduced the GOA pollock limit significantly below the biologically safe harvest level in order to provide food for sea lions and for ecosystems needs. The pollock ABC for 1993 was 160,000 mt, but the harvest level was set at only 111,000 mt. In March 1993, NOAA Fisheries published a sea lion recovery plan and in August designated Steller sea lion critical habitat. The measures taken to protect sea lions at this time were the first pervasive restrictions on fishing fleet operations. Regarding seabirds, there were no restrictions on fisheries except for the Pribilof Island closure, but observers on crab vessels did receive training in seabird recognition.

New measures to protect habitat during this period include the aforementioned Pribilof Islands closure, and new bottom trawling closures.

Summary

During the five years from 1991 to 1995, conservative harvest strategies for groundfish species continued and the Pacific ocean perch rebuilding plan for the GOA was implemented. Allocation and fishing capacity issues were in the forefront during this period, although refinements were made to bycatch controls and PSC limits. Major new policy initiatives were implemented to protect the Steller sea lion as it became more evident that competition for prey may be significant in the long-term recovery of western Alaska sea lion populations.

2.6 1996–2000 Groundfish Management

Groundfish harvests during the second half of the 1990s were around 1.9 million mt per year. Their value surpassed all other fisheries off Alaska. In 1998, for example, groundfish harvests were valued at the ex-vessel level of $385 million, compared to shellfish, $219 million; salmon, $243 million; halibut, $94 million; and herring, $11 million. The total number of vessels active in the groundfish fishery declined from 1,545 in 1995 to 1,376 in 2001, the latest year for which such data are available. Against a backdrop of conservative harvest strategies, managers implemented additional restrictions on several groundfish gears and sectors to reduce their impacts on each other and on marine mammals, seabirds, and habitat. Spurred by the Sustainable Fisheries Act of 1996 (SFA), additional measures were implemented to reduce bycatch and waste. New PSC limits were introduced and discard of some species was banned. The 1998, American Fisheries Act (AFA) also changed the way pollock fisheries were conducted and allowed for the formation of fishing cooperatives.

Target Species

Conservative harvest strategies were continued to protect target species in the groundfish complex off Alaska. Overfishing definitions were revised in response to new SFA-mandated guidelines. The GOA rebuilding plan for Pacific ocean perch was revised, and a major new program called Improved Retention and Improved Utilization (IRIU) was approved for pollock and Pacific cod in the BSAI and the GOA. IRIU requires fishermen to land all pollock and cod harvested, including juveniles. Because there is little value in these small fish, it is hoped that fishermen will avoid areas with large juvenile catch concentrations, thus avoiding the economic costs of landing an unmarketable part of the resource. The overall intent of the program is to reduce bycatch and discard of juveniles, and thus help the stocks remain robust. Beginning in 2003, IRIU will be applied to Bering Sea yellowfin sole and rock sole and to GOA shallow water flatfish species.

Bycatch Controls

More areas in Bristol Bay were closed to trawling to protect red king crab and the red king crab PSC was revised (Figure 2-5). PSC limits were established for opilio Tanner crab and chinook salmon (Figure 2-6). The bairdi Tanner crab PSC was revised based on abundance. The pollock fisheries were restricted using off-bottom trawls, and IRIU was implemented to reduce bycatch and discards in the pollock and cod fisheries, and for several flatfish species beginning in 2003. A ban on directed fisheries for forage fish was implemented in 1998. A ban on the discard of demersal shelf rockfish in fixed-gear fisheries off southeast Alaska has been approved.

Social and Economic Benefits

Measures directly affecting the social and economic benefits in the fisheries included an extension of inshore-offshore processing allocations of cod and pollock, extension and expansion of the CDQ Program in the BSAI, a small jig gear allocation of Atka mackerel in the Aleutian Islands, and Pacific cod allocations among various gear sectors in the Bering Sea. The moratorium on new entrants into the groundfish and crab fisheries was superceded by the License Limitation Program (LLP) in 2000, and the sablefish and halibut fixed-gear fisheries continued under the 1995 IFQ program. The AFA led to a reduction in fishing capacity for pollock, and a structural change in the fishery through the introduction of cooperatives for the inshore,

mothership, and offshore fleet. These changes are still playing out in the fisheries, and cooperatives may be applied to species other than pollock.

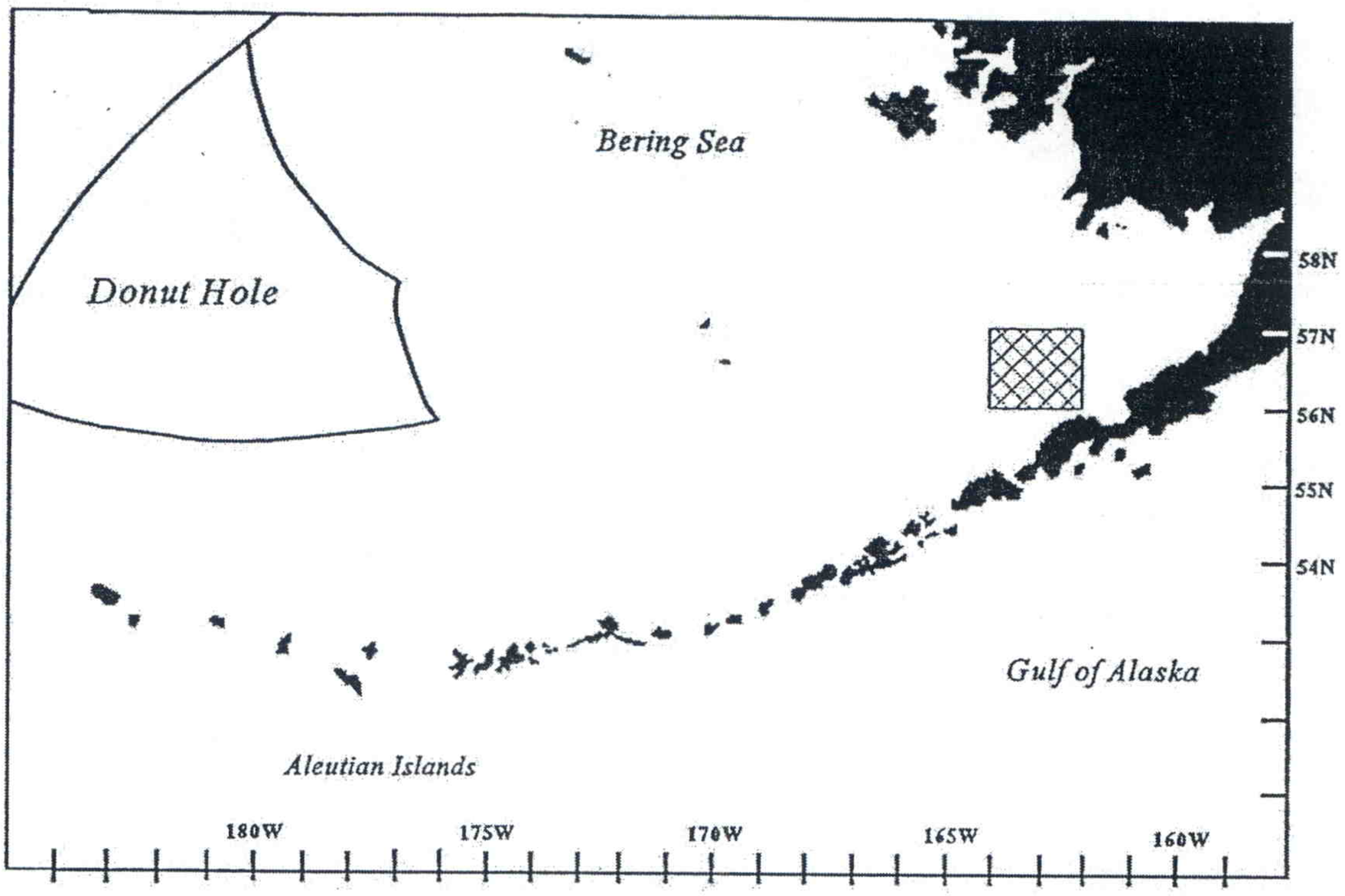


Figure 2-5. Bristol Bay red king crab savings area. Source: NPFMC.

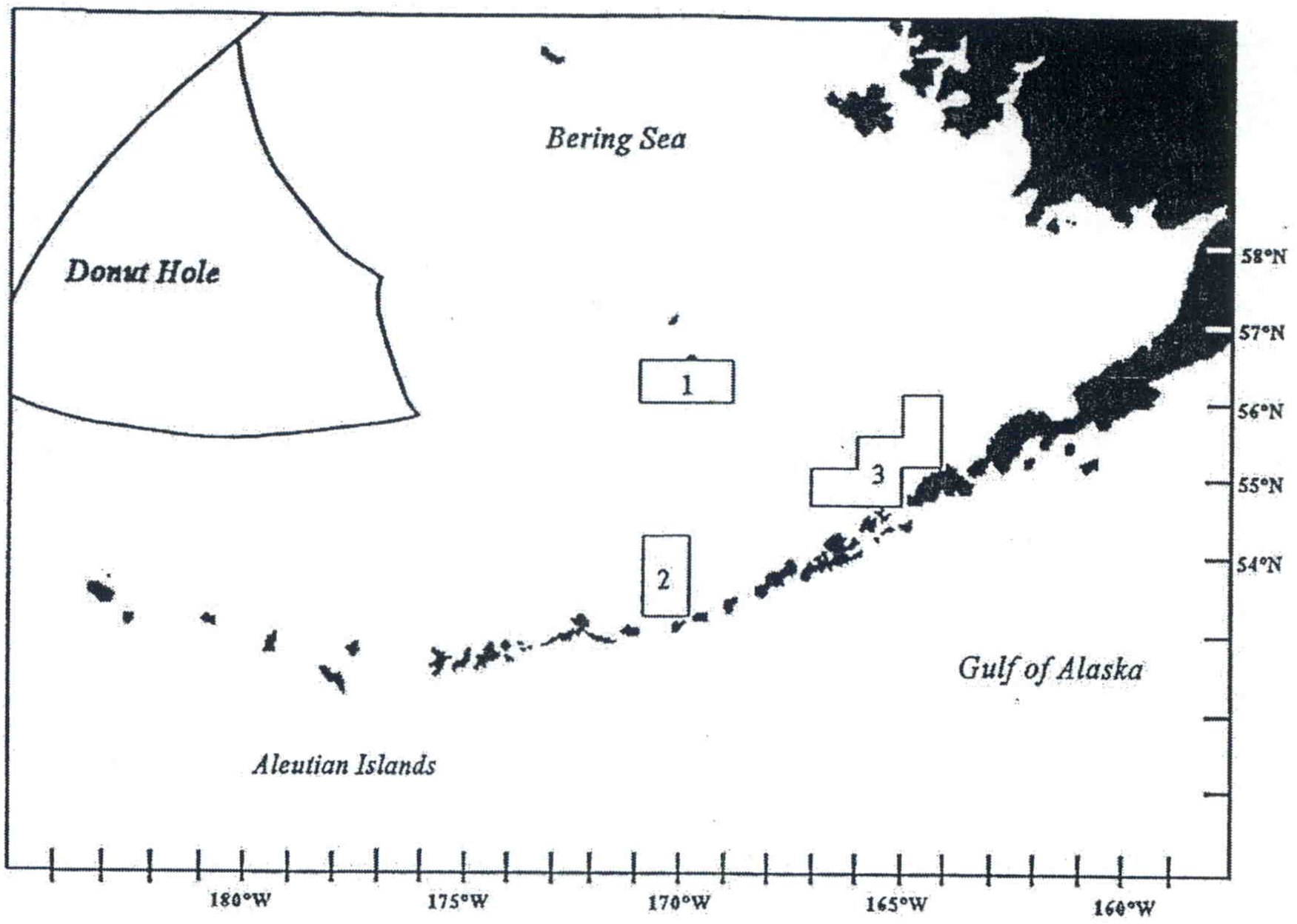


Figure 2-6. Chinook salmon savings area. Source: NPFMC.

Environmental Benefit

In May 1997, NOAA Fisheries reclassified the Steller sea lion into two distinct populations separated at 144°W. The eastern population remained listed as threatened under the ESA, but the western population was listed as endangered. This resulted in implementation of an extensive new array of fisheries restrictions, particularly on the pollock and Atka mackerel fleets. These measures were designed to spread the harvests out over time and space, to avoid localized depletion of prey for sea lions, and to greatly reduce the amount of harvest from areas designated as critical habitat for Steller sea lions. Additional rookeries and haulout areas were closed to fishing, and the entire Bogoslof and Aleutian Islands management areas were closed to pollock fishing. Further, a closure of directed fishing for forage fish was enacted to allow more prey items to be available for sea lions.

In 1997, the U.S. Fish and Wildlife Service (USFWS) concluded that the groundfish fisheries were having an effect on short-tailed albatross and established an incidental take of up to four birds during 1997 and 1998 in the longline groundfish fisheries. As a result, seabird avoidance measures were implemented in the longline fishery for groundfish and halibut: baited hooks must sink immediately, offal must be discharged aft of the hauling station, and streamer lines and avoidance gear must be used. These measures were expanded in 1999. In 2000, NOAA Fisheries issued changes to observer data collection and vessel logbook information to collect data on types of seabird avoidance measures used on each haul and their effectiveness.

Further protection was given to habitat with additional closures to bottom trawling, and the addition of identification and description of essential fish habitat to both groundfish management plans, as required by the SFA. For instance, Sitka Pinnacles Marine Reserve, an area totaling 2.5 square nm in the GOA off Cape Edgecumbe, is closed to groundfish fishing or anchoring by vessels holding a federal fisheries permit. Additionally, certain species of coral and sponges associated with habitat areas of particular concern were protected from commercial fisheries, and a stakeholder process has been initiated to further identify and protect essential fish habitat and areas of particular concern.

Summary

The major policy emphases from 1996 to 2000 have been control and reduction of the impacts of very robust groundfish fisheries on other fisheries, on marine mammals and seabirds, on habitat, and on the ecosystem as a whole. The most innovative new measure in this period was the complete ban on discards of pollock and cod, regardless of the groundfish fishery in which they were caught. Many of the new measures implemented in this period directly result from requirements of the SFA. Additionally, the AFA conferred many social and economic benefits on the pollock fisheries.

Economic and social benefits have been conferred on the industry also by the allocations of Pacific cod, continuation of the sablefish and halibut IFQ Program, continuation and expansion of the CDQ Program, and implementation of the LLP in 2000.

2.7 Current Federal Statues and Mandates

The legal basis for the federal government to conserve and manage marine fisheries in the U.S. EEZ is founded on the principle of western society known as the public trust doctrine. Because the public trust principles apply to the fisheries in the federal EEZ waters, the federal government has the responsibility to conserve those fishery resources for the overall benefit of the people of the U.S. Conservation of any biological resource, such as a fishery resource, implies imposing constraints on the use of the resource to prevent its destruction and provide for its sustained availability to current and future fisheries. Benefit implies an economic or socioeconomic objective which may not be consistent with conservation objectives. Hence, the federal public trust responsibility often is carried out by implementing management policies that reflect a fine balance between conflicting interests. Rarely does a fishery management policy maximize one particular objective–whether related to biological conservation or generation of economic wealth–over all others, except when the risk of severe depletion of a resource is at stake.

The formulation and implementation of all federal fishery management policies are guided by, and must comply with, the limitations and procedures stipulated in the body of federal statutes and executive orders (EOs) described in this section. Currently, these include 11 statutes and 6 EOs. Some of these mandates speak directly to the conservation or management of fishery resources, but most are directed at ensuring the fairness and equity of fishery management measures and that potential environmental, economic, and social effects of these mandates are considered before they are adopted. The executive branch's responsibility for compliance with these mandates resides primarily with the Secretary of Commerce and has been delegated largely to the NOAA Fisheries, one of the five agencies of the NOAA in the Department of Commerce.

2.7.1 Magnuson-Stevens Fishery Conservation and Management Act

The MSA is the principal federal statute that provides for the management of U.S. marine fisheries. Originally enacted as the Fishery Conservation and Management Act in 1976 (Public Law 94-265), this law is arguably the most significant fisheries legislation in U.S. history. It has been amended periodically since 1976; most recently in 1996, by the SFA (Public Law 104-297). The basic concepts of the MSA have not changed. They include:

- The biological conservation of a fishery resource has priority over its use;
- Conservation and management decision-making must be based on the best available scientific information, which should include social, economic, and ecological factors along with biological factors; and
- The needs of fishery resource users vary across the nation, and public participation in the policy making process should be maximized.

The MSA established ten National Standards that serve as the overarching objectives for fishery conservation and management (16 United States Code [U.S.C]. 1851, Sec. 301[a].):

"(a) IN GENERAL–Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the following national standards for fishery conservation and management:

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

(2) Conservation and management measures shall be based upon the best scientific information available.

(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.

(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 United States fishermen, such allocation shall be (a) fair and equitable to all such fishermen; (b) reasonably calculated to promote conservation; and ©) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

(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.

(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

(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.

(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.

(10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea."

The MSA also mandates the Secretary of Commerce to develop advisory guidelines to assist in FMP development. These guidelines serve primarily to interpret and aid compliance with the national standards (codified at 50 CFR Part 600, and most recently revised on May 1, 1998 [63 FR 24212]).

The following websites can be accessed for detailed information on the MSA:

- The Magnuson-Stevens Fishery Conservation and Management Act as amended through October 11, 1996 can be found on the NOAA Fisheries, National Marine Fisheries Service website in its entirety at http://www.nmfs.noaa.gov/sfa/magact/index.html.

- The Sustainable Fisheries Act can be found on NOAA Fisheries, National Marine Fisheries Service website in its entirety at http://www.nmfs.noaa.gov/sfa/sustainable_fishereries_act.pdf.

- 50 CFR Part 600, as revised on May 1, 1998, is available on the National Archives and Records Administration Code of Federal Regulation (CFR) website http://www.access.gpo.gov/nara/cfr/cfr-table- search.html and in its entirety at http://frwebgate1.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=42125310782+3+0+0&WAISaction=retrieve.

- 63 FR 24212 is available on the National Archives and Records Administration CFR website http://www.access.gpo/su-docs/aces/aces140.html.

2.7.2 American Fisheries Act

Next to the MSA, the AFA is the only other fisheries-specific legislation affecting how groundfish fisheries in the BSAI and, to a lesser extent, GOA are managed. The AFA, enacted in October 1998, represents the culmination of a decade-long struggle over the allocation of Alaska's most abundant fishery resource, walleye pollock in the BSAI. The AFA institutionalized a resource allocation scheme among competing onshore and offshore components of the fish processing industry.

Provisions mandated by the AFA to be in effect in 1999, were implemented through the TAC specification process and emergency interim rule-making (final specifications notice, 64 FR 12103, March 11, 1999; extended emergency interim rules, 64 FR 34743, June 29, 1999; and 64 FR 33425, June 6, 1999). Permanent federal regulations to implement provisions of the AFA required that NPFMC amend FMPs. Hence, final AFA implementing rules likely will not be in effect until 2001. For the 2000 fishing year, AFA provisions were implemented by emergency interim rules published January 5, 2000 (65 FR 380) and January 28, 2000 (65 FR 4520), and extended on June 23, 2000 (65 FR 39107) through December 24, 2000, and January 16, 2001, respectively.

Major provisions of the AFA include the following:

- Requirement of a minimum of 75 percent U.S. ownership of fishing vessels (up from majority ownership) and maximum size and horsepower limits for replacement vessels.

- Specific allocation of the BSAI directed pollock fishery TAC among the inshore component (50 percent), catcher processor vessels in the offshore component (40 percent), and motherships in the offshore component (10 percent) after first deducting 10 percent of the total TAC for the CDQ Program and an incidental catch allowance.

- Buyout of nine catcher processor vessels' future fishing privileges, financed through a combination of a grant and direct loan obligations, to be paid back by a tax of $0.006 per pound of pollock harvested by the inshore sector.

- Specific naming of 20 catcher processor vessels that may participate in the (offshore) pollock fishery, 7 catcher vessels that may deliver pollock to those catcher processors, and 19 catcher vessels that may deliver pollock to motherships.

- Criteria for catcher vessels to participate in harvesting BSAI pollock in the inshore sector, and criteria for limiting the participation of onshore processing plants in the BSAI pollock fishery.

- Fishery cooperatives with limitations on the structure and participation among cooperatives involving catcher vessels and the inshore sector processing plants.

- Directions for NPFMC to develop or improve on limitations (sideboards) on the activities of AFA vessels and processors in non-pollock fisheries to prevent negative spillover effects of fishery cooperatives.

The following websites can be accessed for detailed information on the AFA:

- The American Fisheries Act can be found on the NOAA Fisheries, National Marine Fisheries Service, Alaska Region website in its entirety at http://www.fakr.noaa.gov/sustainablefisheries/afa/afa.pdf.

- 64 FR 12103, 64 FR 34743, 64 FR 33425, 65 FR 380, 65 FR 4520, and 65 FR 39107 are available on the National Archives and Records Administration CFR website http://www.access.gpo/su-docs/aces/aces140.html.

- The December 17, 2001 proposed Amendment 61 to the AFA in the FR (66 FR 65028) can be found on NOAA Fisheries, National Marine Fisheries Service, Alaska Region website at http://www.fakr.noaa.gov/prules/amd6161pr.pdf.

2.7.3 National Environmental Policy Act

The National Environmental Policy Act (NEPA) is a cornerstone environmental mandate that declares a national policy to encourage productive and enjoyable harmony between man and the environment, and to promote efforts to better understand and prevent damage to ecological systems and natural resources important to the nation.

NEPA, signed into law in 1970 (42 U.S.C. 4321 *et seq.*), has two principal purposes:

1. Require federal agencies to evaluate the potential environmental effects of any major planned federal action is to ensure that public officials make well-informed decisions about the potential impacts.

2. Promote public awareness of potential impacts at the earliest planning stages of major federal actions. The Act requires federal agencies to prepare a detailed environmental evaluation for any major federal action significantly affecting the quality of the human environment.

As with the MSA, NEPA requires an assessment of both the biological and social/economic consequences of fisheries management alternatives in order to provide the public an opportunity to be involved and influence decision-making on federal actions. In short, NEPA ensures that environmental information is available to government officials and the public before decisions are made and actions are taken.

NEPA established NPFMC on Environmental Quality (CEQ) to review government policies and programs for conformity with the law. One of the CEQ's responsibilities is to advise and assist the President in preparing an annual environmental quality report, which is submitted to Congress. The CEQ is also responsible for oversight of regulations and procedures implementing NEPA, and has prepared guidance for federal agencies regarding NEPA regulations (40 CFR Part 1500). Identified processes for issue scoping, consideration of alternatives, evaluation procedures, public involvement and review, and coordination between agencies are applicable to NPFMC development of the groundfish FMPs.

The U.S. Department of Commerce, NOAA, has also prepared environmental review procedures for implementing NEPA (NOAA Administrative Order 216-6). This Order describes NOAA's policies, requirements, and procedures for complying with NEPA and the implementing regulations issued by the CEQ. The 1999 revision and update to the Administrative Order includes specific guidance regarding categorical exclusions, especially as they relate to endangered species, marine mammals, fisheries, and habitat restoration. The Order also expands on guidance for consideration of cumulative impacts and "tiering" in the environmental review of NOAA actions. This administrative order provides comprehensive and specific procedural guidance to NOAA Fisheries and NPFMC for preparing and adopting groundfish FMPs.

Federal fishery management actions subject to NEPA requirements include the approval of FMPs, FMP Amendments, and FMP implementing regulations. Such approval requires preparation of either 1) an environmental impact statement (EIS) or supplemental (S)EIS for major fishery management actions that significantly affect the quality of the human environment and documents the finding for public consideration and comment before a decision is made, or 2) an environmental assessment (EA) for fishery management actions that will not significantly affect the human environment. If an EA does not result in a finding of no significant impact, then an EIS or SEIS must be prepared. In addition to NEPA implementing regulations (40 CFR 1500-1508), NEPA compliance by fisheries management actions is guided by NOAA Administrative Order 216-6.

NEPA and the MSA requirements for schedule, format, and public participation are compatible and allow one process to fulfill both obligations. If an EIS or SEIS is prepared, however, the notice of availability of a final EIS (or SEIS) must be published at least 30 days before the Secretary of Commerce approves, disapproves, or partially approves an FMP or FMP Amendment.

The following websites can be accessed for detailed information on the NEPA:

- The National Environmental Policy Act can be found on NPFMC on Environmental Quality, NEPA website in its entirety at http://ceq.eh.doe.gov/nepa/regs/nepa/nepaeqia.htm.

- 40 CFR 1500-1508 can be found on NPFMC on Environmental Quality - Regulations for Implementing NEPA website at http://ceq.eh.doe.gov/nepa/regs/ceq/toc_ceq.htm.

- The NOAA Administrative Order 216-6 can be found on the NOAA website at http://www.rdc.noaa.gov/~nao/216-6.html.

2.7.4 Endangered Species Act

The ESA (16 U.S.C. 1531 *et seq.*), passed in 1973 and reauthorized in 1988, provides broad protection for fish and wildlife species that are listed as threatened or endangered. Provisions are made for the formal listing of species, development of recovery plans, and designation of critical habitats. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize species. Responsibilities for implementing the ESA are shared by the USFWS [freshwater fish, birds, terrestrial mammals, and plants] and NOAA Fisheries (anadromous and marine fish, marine mammals, and sea grasses). NOAA Fisheries is therefore tasked with both managing the groundfish harvest through FMPs, and ensuring that identified threatened and endangered species (e.g., the Steller sea lion) receive appropriate consideration and protection during the planning and implementation of groundfish harvests. It should be noted that compliance with ESA provisions is not subject to modification based on economic hardship. Recovery plans required under the ESA give priority to those listed species that may be affected by different economic activities.

Section 7(a)(1) of the ESA requires federal agencies to conserve endangered and threatened species; however, conservation is broadly defined. Section 7(a)(2) of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize or result in the destruction or adverse modification of the critical habitat of endangered or threatened species.

Under an FMP, all fishing activities must be considered; not just the specific management measures under consideration. NOAA Fisheries must conduct a formal Section 7 consultation that results in a biological opinion (BiOp) if a proposed action "may affect" or "is likely to adversely affect" endangered or threatened species or their critical habitat. If the BiOp concludes that the proposed action "is likely to jeopardize the continued existence of" threatened or endangered species, then reasonable and prudent measures are developed to minimize or mitigate the effect of the action. Once determined, the fishery management regulations must be revised to implement the reasonable and prudent measures.

The following website can be accessed for detailed information on the ESA:

- The Endangered Species Act can be found on the Legal Information Institute's United States Code Collection website in its entirety at http://www4.law.cornell.edu/uscode/16/ch35.html.

2.7.5 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 (16 U.S.C. 1361 *et seq.*), as amended through 1996, establishes a federal responsibility to conserve marine mammals; management responsibility for cetaceans (whales) and pinnipeds (seals) other than walrus is vested with NOAA Fisheries. The USFWS is responsible for all other marine mammals in Alaska including sea otter, walrus, and polar bear. Congress found that certain species and population stocks of marine mammals are or may be in danger of extinction or depletion due to human activities. Congress also declared that marine mammals are resources of great international significance, and they should be protected and encouraged to develop to the greatest extent feasible commensurate with sound resource management policies.

The MMPA's primary management objective is to maintain the health and stability of the marine ecosystem, with a goal of obtaining an optimum sustainable population of marine mammals within the carrying capacity of the habitat. The MMPA is intended to work in concert with the provisions of the ESA. The Secretary of Commerce is required to give full consideration to all factors regarding regulations applicable to the "take" of marine mammals, including the conservation, development, and utilization of fishery resources, and the economic and technological feasibility of implementing the regulations. If a fishery affects a marine mammal population, then the potential impacts of the fishery must be analyzed in the appropriate EA or EIS, and NPFMC or NOAA Fisheries may be requested to consider regulations to mitigate adverse impacts.

The following website can be accessed for detailed information on the MMPA:

- The Marine Mammal Protection Act can be found on the Legal Information Institute's United States Code Collection Website in its entirety at http://www4.law.cornell.edu/uscode/16/ch31.html.

2.7.6 The Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*) authorizes collection of fisheries data and coordination with other agencies for environmental decisions affecting living marine resources. Both formal and informal consultations, cooperative research, and data-gathering programs are routinely pursued.

The following website can be accessed for detailed information:

- The Fish and Wildlife Coordination Act can be found on the Legal Information Institute's United States Code Collection website in its entirety at http://www4.law.cornell.edu/uscode/16/h5AschI.html.

2.7.7 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) (16 U.S.C. 1451 *et seq.*) was designed to encourage and assist states in developing coastal management programs, to coordinate state activities, and to safeguard regional and national interests in the coastal zone. Section 307©) of the CZMA requires that any federal activity affecting the land or water uses or natural resources of a state's coastal zone be consistent with the state's approved coastal management program, to the maximum extent practicable.

A proposed fishery management action that requires an FMP Amendment or implementing regulations must be assessed to determine whether it directly affects the coastal zone of a state with an approved coastal zone management program. If so, NOAA Fisheries must provide the state agency having coastal zone management responsibility with a consistency determination for review at least 90 days before final NOAA Fisheries action.

The following website can be accessed for detailed information:

- The Coastal Management Act can be found on the Legal Information Institute's United States Code Collection website in its entirety at http://www4.law.cornell.edu/uscode/16/ch33.html.

2.7.8 Administrative Procedure Act

The Administrative Procedure Act (APA) (5 U.S.C. 553) requires federal agencies to give the public prior notice of rule-making and an opportunity to comment on proposed rules. General notice of proposed rule-making must be published in the FR, unless persons subject to the rule have actual notice of the rule. Proposed rules published in the FR must include reference to the legal authority under which the rule is proposed and explain the nature of the proposal including the action proposed and its intended effect, and any relevant regulatory history that provides a well-informed basis for understanding and commenting. The APA does not specify how much time the public must be given for prior notice and opportunity to comment; however, NOAA subscribes to a 30-day public comment period on proposed fishery management regulations. Exceptions to 30-day prior notice protocol include 1) proposed rules that would implement FMP Amendments, in which case the MSA indicates a 45-day period, and 2) emergency regulations, which often require immediate implementation.

Some regulations (e.g., emergency or interim) may be implemented immediately under the APA if the agency finds that prior notice and opportunity for public comment are impractical, unnecessary, or contrary to the public interest. The "good cause" reason for waiving normal public procedure must be fully explained in the FR notice. The MSA (at Section 305[c]) places further conditions and restrictions on the use of emergency or interim fishery regulations. For example, an emergency or interim fishery management measure may remain in effect for not more than 180 days and may be extended for an additional period, by notice in the FR, only once.

On August 21, 1997 (62 FR 44421), NOAA published further policy guidelines in the form of criteria and justification standards for using emergency rule authority to address marine fishery management issues. These criteria define the phrase in Section 305©) of the MSA, "an emergency exists involving any fishery," as a situation that:

1. results from recent, unforeseen events or recently discovered circumstances.

2. presents serious conservation or management problems in the fishery.

3. can be addressed through emergency regulations for which the immediate benefits outweigh the value of advanced notice, public comment, and deliberative consideration of the impacts on participants to the same extent as would be expected under normal rule-making process (62 FR 44422).

The emergency rule guidelines also state that the normal public rule-making process may be waived in an emergency if the emergency action might be justified under one or more of the following situations:

1. Ecological – (a) to prevent overfishing as defined in an FMP, or as defined by the Secretary in the absence of an FMP, or (b) to prevent other serious damage to the fishery resource or habitat.

2. Economic–to prevent significant direct economic loss or to preserve a significant economic opportunity that otherwise might be forgone.

3. Social–to prevent significant community impacts or conflict between user groups.

4. Public health–to prevent significant adverse effects to health of participants in a fishery or to the consumers of seafood products (62 FR 44422).

Except for the emergency or interim rule provisions, a proposed rule is designed to give interested or affected persons opportunity to submit written data, views, or arguments for or against the proposed action. After the end of a 30- or 45-day comment period, the APA requires comments received to be summarized and responded to in the final rule notice. Further, the APA requires the effective date of a final rule to be no less than 30 days after publication of the final notice in the FR. This delayed effectiveness or "cooling off" period is intended to allow the affected public to become aware of and prepared to comply with the requirements of the rule. The 30-day delayed effectiveness period can be waived for a final rule only if it relieves a restriction, merely interprets an existing rule, or provides a statement of policy, or it must be made effective earlier than 30 days after publication for good cause. For fishery management regulations, the primary effect of the APA is to provide for public participation which, in combination with the MSA, NEPA, and other statutes, limits the speed with which NOAA Fisheries can implement non-emergency fishery regulations.

The following websites can be accessed for detailed information:

- The Administrative Procedure Act can be found on the Legal Information Institute's United States Code Collection website in its entirety at http://www4.law.cornell.edu/uscode/5/553.html.

- 62 FR 44421 and 62 FR 44422 are available on the National Archives and Records Administration CFRs website http://www.access.gpo/su-docs/aces/aces140.html.

2.7.9 Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) (5 U.S.C. 601 *et seq.*) requires federal agencies to assess the impacts of their proposed regulations on small entities and to seek ways to minimize economic effects on small entities that would be disproportionately or unnecessarily adverse. The most recent amendments to the RFA were enacted on March 29, 1996, with the Contract with America Advancement Act of 1996 (Public Law 104-121). Title II of that law, the Small Business Regulatory Enforcement Fairness Act, amended the RFA to require federal agencies to determine whether a proposed regulatory action would have a significant economic impact on a substantial number of small entities. For a federal agency, the most significant effect of this Act is that it made compliance with the RFA judicially reviewable.

The assessment requirement of the RFA is satisfied by a regulatory flexibility analysis, which applies only to regulatory actions for which prior notice and comment is required under the APA. Hence, emergency or interim rules that waive notice and comment are not required to have regulatory flexibility analyses. Further, regulatory flexibility analyses are required only when an agency cannot certify that an action will not have a "significant economic impact" on a "substantial number of small entities."

For purposes of these analyses, small entities include: 1) small businesses which, for commercial fishing or fish processing, are firms with receipts of up to $3 million annually or up to 500 employees, respectively, 2) small non-profit organizations, and 3) small governmental jurisdictions with a population of up to 50,000 persons. For Alaska fisheries, these criteria include most fishing firms except for the large catcher processor vessels and most coastal communities except for Anchorage. NOAA Fisheries has published guidelines for RFA analysis; they include criteria for determining if the action would have a significant impact on a substantial number of small entities.

An initial regulatory flexibility analysis (IRFA) is prepared for any proposed regulatory action that meets the above criteria for having an anticipated "significant economic impact" on a "substantial number of small entities." Due to the difficulty of certifying that an action will not have significant economic impact, an IRFA is prepared routinely for most proposed fishery management measures. The IRFA usually is combined with the EA or (S)EIS document required by NEPA. However, if an action is determined to not have a "significant economic impact on a substantial number of small entities," then a statement to this effect including a factual basis for the statement, must be published in the FR and sent to the Small Business Administration.

If, following public comments on the proposed rule, the action is still considered to meet the criteria for requiring RFA analysis, then a final regulatory flexibility analysis (FRFA) must be prepared. The FRFA contains most of the same information presented in the IRFA, but must also include: 1) a summary of significant issues raised in public comment on the IRFA and the agency's response to those comments, and 2) a description of the steps the agency has taken to minimize the significant economic impacts on small entities, including a statement of factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why all other alternatives considered were rejected. Finally, the FRFA or a summary of it must be published in the FR with the final rule.

In addition, the Small Business Regulatory Enforcement Fairness Act established two new requirements on agencies that publish rules. First, for each rule or group of related rules for which an agency is required to publish an FRFA, the agency is required to publish one or more guides to assist small entities in complying with the rule. These guides, called "small entity compliance guides," must explain what a small entity is required to do to comply with the rule(s). The second new requirement directs each agency regulating the activities of small entities to establish a program for responding to inquiries from small entities concerning information on, advice about, and compliance with statutes and regulations, as well as interpreting and applying law to specific sets of facts supplied by small entities. Guidance given by an agency applying law to facts provided by a small entity may be considered as evidence of the reasonableness of any proposed fines, penalties, or damages sought against the small entity in any civil or administrative action.

The following websites can be accessed for detailed information:

- The Regulatory Flexibility Act can be found on the Legal Information Institute's United States Code Collection website in its entirety at http://www4.law.cornell.edu/uscode/5/pIch6.html.

- Public Law 104-121 (America Advancement Act of 1996) can be found on the U.S. Environmental Protection Agency (USEPA) website in its entirety at http://www.epa.gov/sbrefa/statute/publ104121.pdf.

2.7.10 Paperwork Reduction Act of 1995

Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501 *et seq.*, and 50 CFR Part 1320) is designed "to minimize the paperwork burden for individuals, small businesses, educational and non-profit institutions, federal contractors, state, local and tribal governments, and other persons resulting from the collection of information by or for the Federal Government." In brief, this law is intended to ensure that the government is not overly burdening the public with requests for information. This is accomplished through an information collection budget (ICB). This budget for each agency is in terms of the total estimated time burden of responding to official inquiries. The President's Office of Management and Budget (OMB) oversees each agency's ICB. Agencies must annually identify and obtain clearance from OMB for new or significant revisions to reporting and recordkeeping requirements.

Procedurally, the PRA requirements constrain what, how, and how frequently information will be collected from the public affected by a rule that requires reporting (e.g., harvested fish). New collections of information must be submitted to OMB for clearance before a final rule may take effect. For each rule that requires an information collection, the agency must describe in detail what data will be collected, how it will be collected and how often, from whom it will be collected, how much time will be spent by each affected person in complying with the information requirements, why the information is necessary, and how it will be used. OMB can take 60 days to review and clear a proposed information collection; hence, to avoid delay of a rule, NOAA Fisheries tries to start the PRA review and clearance process at least 30 days before submission of a proposed rule. Information collections approved by OMB have a maximum effectiveness of three years. An extension beyond that time requires another submission for OMB clearance. Required collections of information from the public can not be enforced without being included in an approved information collection budget.

The following website can be accessed for detailed information:

- The Paperwork Reduction Act of 1995 can be found on the Legal Information Institute's United States Code Collection in its entirety at http://www4.law.cornell.edu/uscode/44/ch35.html.

2.7.11 Executive Order 12114: Environmental Effects Abroad

This EO, issued in 1979, directs agencies to consider the effects of major federal actions upon the environment of foreign nations of the "global commons." These actions include those major federal actions that result in significant environmental effects that extend outside of the geographic borders of the U.S. In some cases, an EIS may be required. The EO encourages international agreements and an exchange of information between the affected nations and the U.S.

The following website can be accessed for detailed information:

- EO 12114: Environmental Effects Abroad, can be found on NPFMC on Environmental Quality website in its entirety at http://ceq.eh.doe.gov/nepa/regs/eos/eo12114.pdf.

2.7.12 Executive Order 12630: Takings

This EO on government actions and interference with constitutionally protected property rights came into effect on March 18, 1988. This EO requires that each federal agency prepare a "takings implications assessment" for any of its administrative, regulatory, and legislative policies and actions that affect, or may affect, the use of any real or personal property. Fishery management measures, for example, that limit fishing seasons, areas, catch quotas, the size of harvested fish, and bag limits do not appear to have any takings implications, and thus, no takings implications assessment is required. However, a takings implication assessment may need to be prepared if a fishing gear type is prohibited, for example, in such a way that a fisherman leaving the fishery would be unable to sell his investment in the gear, or if a fisherman is prohibited by federal action from exercising property rights granted by a state.

Takings issues are raised frequently in the context of limited access systems, which confer a harvesting privilege on a fisherman in the form of a permit to catch a specific amount of fish or a license to enter and participate in a fishery. Although such permits and licenses may be transferrable, and therefore increase (or decrease) in market value, they do not convey any property rights in the fishery resource (i.e., the fish). If, for conservation purposes, the federal government were to drastically reduce the amount of fish that may be harvested from a fishery for which a fisherman had a limited license or permit, thereby reducing the transfer value of that license or permit, a question is raised whether such action would have "takings implications."

The following website can be accessed for detailed information:

- EO 12630: Takings can be found on U.S. Environmental Protection Agency's website in its entirety at http://www.epa.gov/owow/wetlands/regs/eo12630.html.

2.7.13 Executive Order 12866: Regulatory Planning and Review

EO 12866, signed on September 30, 1993, and published October 4, 1993 (58 FR 51735), replaced EO 12291 and EO 12498. Its purpose, among other things, is to enhance planning and coordination with respect to new and existing regulations, and to make the regulatory process more accessible and open to the public. In addition, EO 12866 requires agencies to take a deliberative, analytical approach to rule-making, including assessment of costs and benefits of the intended regulations. For fisheries management purposes, it requires NOAA Fisheries 1) to prepare a regulatory impact review (RIR) for all regulatory actions, 2) to prepare a unified regulatory agenda twice a year to inform the public of the agency's expected regulatory actions, and 3) to conduct a periodic review of existing regulations.

The purpose of an RIR is to assess the potential economic impacts of a proposed regulatory action. As such, it can be used to satisfy NEPA requirements and as a basis for determining whether a proposed rule will have a significant impact on a substantial number of small entities which would trigger the completion of an IRFA under the RFA. For this reason, the RIR is frequently combined with an EA and an IRFA in a single EA/RIR/IRFA document that satisfies the analytical requirements of NEPA, RFA, and EO 12866 for any proposed rule. Criteria for determining "significance" for EO 12866 purposes, however, are different than

those for determining significance for RFA purposes. A significant rule under EO 12866 is one that is likely to:

- Have an annual effect on the economy (of the nation) of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities.

- Create 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.

- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in EO 12866.

Fisheries management actions rarely have an annual effect on the national economy; however, OMB makes the ultimate determination of significance under this EO based in large measure on the analysis in the RIR. A recent example of a fishery management action determined to be "significant" under this EO is the regulatory action to implement provisions of the AFA in part because, at least initially, the AFA rule-making raises novel legal or policy issues arising out of legal mandates. An action determined to be significant is subject to OMB review and clearance before its publication and implementation.

An initial determination of significance, frequently without benefit of an RIR, is made for each proposed regulatory action by NOAA Fisheries through a "listing document." The listing document is a brief description of a proposed regulatory action, including a regulatory identifier number, and the expected schedule for rule-making. Listing documents are prepared by NOAA Fisheries and submitted through NOAA General Counsel and Department of Commerce Office of General Counsel to OMB. If OMB concurs in a determination of "not significant" under EO 12866, then OMB will not need to review the rule. In practice, NOAA Fisheries attempts to submit a listing document at least three months before submission of the proposed rule.

The regulatory planning function of EO 12866 is served by the unified regulatory agenda, which is prepared twice a year to inform the public of the agency's expected regulatory actions and to provide brief descriptions and timelines. In addition, a regulatory plan is prepared annually to report on the most significant regulatory actions that the agency reasonably expects to issue in proposed or final form in that fiscal year or later.

The following website can be accessed for detailed information:

- EO 12866: Regulatory Planning and Review can be found on the U.S. Environmental Protection Agency's website in its entirety at http://www.epa.gov/fedrgstr/eo/eo12866.htm.

2.7.14 Executive Order 12898: Environmental Justice

EO 12898, issued in 1994, requires that federal agencies make achieving "environmental justice" part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low income populations in the U.S.

The following website can be accessed for detailed information:

- EO 12898: Environmental Justice can be found on the U.S. Environmental Protection Agency's website in its entirety at http://www.epa.gov/civilrights/eo12898.htm.

2.7.15 Executive Order 13084: Consultation and Coordination with Indian Tribal Governments

This EO was signed May 14, 1998, and published May 19, 1998 (63 FR 27655). Its purpose is to establish regular and meaningful consultation and collaboration with Indian tribal governments in the development of federal regulatory practices that significantly or uniquely affect their communities; to reduce the imposition on unfunded mandates on Indian tribal governments; and to streamline the application process for and increase the availability of waivers to Indian tribal governments. This EO requires federal agencies to have an effective process to involve and consult with representatives of Indian tribal governments in developing regulatory policies, and it prohibits regulations that impose substantial direct compliance costs on Indian tribal communities.

The following website can be accessed for detailed information:

- EO 13084: Consultation and Coordination with Indian Tribal Governments can be found on the U.S. Environmental Protection Agency's website in its entirety at: http://www.epa.gov/fedrgstr/eo/eo13084.htm.

2.7.16 Executive Order 13132: Federalism

The Federalism EO was signed August 4, 1999, and published August 10, 1999 (64 FR 43255). This EO supercedes previous federalism EOs (12612 and 13083), but supplements EOs 12372, 12866, and 12988. This EO is intended to guide federal agencies in the formulation and implementation of "policies that have federalism implications," such as regulations, legislative comments or proposed legislation, and other policy statements or actions that have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.

The EO establishes fundamental federalism principles based on the U.S. Constitution, specifies federalism policymaking criteria, and special requirements for preemption of state law. For example, a federal action that limits the policymaking discretion of a state is to be taken only where there is constitutional and statutory authority for the action and it is appropriate in light of the presence of a problem of national significance. Also, where a federal statute does not have expressed provisions for preemption of state law, such a preemption by federal rule-making may be done only when the exercise of state authority directly conflicts with the exercise of federal authority. Conflict between state and federal law is possible on fishery management issues; however, the MSA (Section 306) explicitly establishes conditions for federal preemption

of state regulations (and extension of state fishery management authority into the EEZ). This EO also requires consultation between federal and state officials and requires a federalism impact statement for rules that have federalism implications. Federalism impact statements are rarely needed for federal Alaska groundfish regulations because of close state-federal consultation provided by NPFMC process.

The following website can be accessed for detailed information:

- EO 13132: Federalism can be found the U.S. Environmental Protection Agency's website in its entirety at http://www.epa.gov/fedrgstr/eo/eo13132.htm.

2.7.17 Executive Order 13158: Marine Protected Areas

This EO, signed May 26, 2000, and published May 31, 2000 (65 FR 34909), directs the Departments of Commerce and the Interior to jointly develop a national system of marine protected areas (MPAs). The purpose of the system is to strengthen the management, protection, and conservation of existing protected areas and establish new or expanded MPAs. The MPA system is to be scientifically based, representing diverse U.S. marine ecosystems and the nation's natural and cultural resources. Establishing such a system is intended to reduce the likelihood that MPAs are harmed by federally approved or funded activities.

The following website can be accessed for detailed information:

- EO 13158: Marine Protected Areas can be found on NPFMC on Environmental Quality website in its entirety at http://ceq.eh.doe.gov/nepa/regs/eos/eo13158.html.

2.7.18 Executive Order 13186: Protection of Migratory Birds

This EO was signed January 10, 2001 and published January 17, 2001. Its purpose is to reinforce the Migratory Bid Treaty Act (16 U.S.C. 703 *et seq.*) which focuses on the conservation of migratory birds and their habitat. This EO calls for a Memorandum of Understanding on any federal action taken that may have a measurably negative effect on migratory bird populations. This Memorandum is to support the conservation intent of migratory bird by integrating bird conservation principles, measures, and practices into activities and by avoiding adverse impacts on migratory bird resources. The Secretary of the Interior is to be the overseer of this EO.

The following websites can be accessed for detailed information:

- EO 13186: Protection of Migratory Birds can be found NPFMC on Environmental Quality website in its entirety at http://ceq.eh.doe.gov/nepa/regs/eos/eo13186.html.

- The Migratory Bird Treaty Act can be found on the Legal Information Institute's United States Code Collection in its entirety at http://www4.law.cornell.edu/uscode/16/ch7schII.html.

Section 3 The Decision-Making Process

3.1 The Federal Fishery Management Process

Conservation and management policies that govern marine fisheries outside of state jurisdiction are given effect through federal regulations. These regulations are published in the FR and codified in the CFR at Title 50. General regulations governing U.S. fisheries appear at 50 CFR part 600, and regulations specifically governing the groundfish fisheries in the EEZ off Alaska appear at 50 CFR 679. Current regulations codified at these parts prescribe the existing regulatory regime for the federally managed groundfish fisheries off Alaska.

This section reviews the procedures used to develop and change the fishery conservation and management policies implemented by these federal regulations and the statutory authority and limitations that dictate these procedures. In addition, it describes five basic types of fisheries regulations and provides examples of each.

The following websites can be accessed for detailed information:

- 50 CFR Part 600, as revised on May 1, 1998, is available on the National Archives and Records Administration CFR website http://www.access.gpo.gov/nara/cfr/cfr-table-search.html.

- 50 CFR 679 is available on the National Archives and Records Administration CFR website http://www.access.gpo/gov/nara/cfr/cfr-table-search-html.

3.1.1 Federal Policymaking Under the Magnuson-Stevens Fishery Conservation & Management Act

Federal fishery management policymaking for the groundfish fisheries off Alaska begins with NPFMC. Unlike management of the nation's timber, mineral, grazing, and water resource, for which policy is dictated by the responsible agency, the U.S. Congress instituted a regional council system for marine fisheries resources. These regional councils use a formal public process that strives toward consensus-building in shaping policy, balancing competing interests, and addressing resource conservation issues. The NPFMC is one of eight regional fishery management councils (regional councils) established by Section 302(a) of the MSA. The regional councils respond to the basic concept of the MSA that the needs of fishery users vary across the nation and should be addressed at a regional level. This section describes the process by which NPFMC develops fishery management policy and proposes it for federal implementation. The other seven regional councils may use slightly different procedures to arrive at the same end. The procedures described here have evolved since NPFMC's first meeting in October 1976, and reflect its partnership with the NOAA Fisheries and the Alaska Department of Fish & Game (ADF&G) in crafting fishery management policy. In addition, these procedures reflect the Operational Guidelines published by NOAA Fisheries to assist regional councils in developing fishery management policy consistent with the MSA and other applicable laws.

FMPs provide the basis for federal regulations used to manage fisheries under regional council jurisdiction. The MSA lists the first function of the councils as follows:

> *"(1) for each fishery under its authority that requires conservation and management, [to] prepare and submit to the Secretary (A) a fishery management plan, and (B) amendments to each such plan that are necessary from time to time (and promptly, whenever changes in conservation and management measures in another fishery substantially affect the fishery for which such plan was developed) (Section 302[h])."*

Each FMP provides a policy statement and describes goals and objectives for managing the fisheries. FMPs and FMP Amendments are developed by the regional councils, submitted to the Secretary of Commerce for review, and, if approved or partially approved, implemented by federal regulations. Once approved, the regulations are put into effect and NOAA Fisheries has responsibility of executing the day-to-day fisheries management. Enforcement of the regulations is carried out jointly by NOAA Fisheries and the U.S. Coast Guard. Disapproved and partially approved FMPs and FMP Amendments are returned by NOAA Fisheries with an explanation of the reasons for disapproval to the regional council. The regional council may then decide whether or not to revise and resubmit the FMP or FMP Amendment. Secretarial authority to approve, disapprove, or partially approve is set out in Section 304(a)(3) of the MSA. This authority has been delegated through the Under Secretary of Commerce and Administrator for Oceans and Atmosphere of the NOAA to the Assistant Administrator for Fisheries to the NOAA Fisheries Regional Administrators. This delegation may be rescinded, however, for any particular approval/disapproval decision.

An FMP or FMP Amendment may not always be implemented by federal regulations. For example, overfishing definitions may exist only in an FMP–not in regulations–as a policy guide for prompting a regional council to develop a stock rebuilding plan. Likewise, not all fishery management policy changes require an FMP or FMP Amendment. Some changes may be accomplished by a regulatory amendment that serves to reinterpret an existing FMP provision without changing it. Regulatory amendments may be developed by NPFMC or by NOAA Fisheries in consultation with NPFMC. In either case, a regulatory amendment also must be submitted for Secretarial review for consistency with the MSA and other applicable laws before it can be implemented as a final rule. For simplicity and, unless otherwise stated, the remainder of this discussion will use the term *FMP Amendment* to mean FMP, FMP Amendment, or regulatory amendment.

A regional council is not required to prepare an FMP for every fishery. FMP preparation is only required for each fishery under a regional council's authority that requires conservation and management (MSA Section 302(h)(1)). A fishery to which an FMP applies is identified as a fishery management unit, as required by National Standard 3 (MSA 301(a)(3)). The National Standards Guidelines at 50 CFR 600.320 provide guidance in specifying the fishery management unit for an FMP. In addition to specifying a fishery management unit, the MSA (Section 303(a)) requires the contents of an FMP to include 14 provisions. An additional 12 provisions are discretionary to the regional council preparing the FMP.

Proposed Action

FMP Amendments may be inspired by a variety of events, including new or triggered statutory requirements, operational need, or public recommendation. Examples of statutory requirements causing NPFMC to initiate FMP Amendments include: 1) passage of the SFA in 1996, which amended the MSA by, among other things, changing and including several new required provisions for FMPs (Section 303(a)), and 2) passage of the AFA in 1998, which fundamentally changed the management of the BSAI pollock fishery and required NPFMC to amend the BSAI Groundfish FMP. An example of an operational need causing an FMP Amendment is the need to reform the TAC-setting process to better accommodate public comment on

proposed TACs. Most FMP Amendments, however, are generated by public recommendation through an open process established by NPFMC.

The NPFMC annually solicits FMP Amendment proposals from the public (Figure 3-1). These proposals are reviewed and qualitatively ranked in terms of analytical difficulty by NPFMC's Plan Development Team. All of the amendment proposals are reviewed by NPFMC's Advisory Panel, which makes recommendations on which proposals should be considered. After hearing the recommendations and public comment on them, NPFMC selects the amendment proposals it will consider during the coming year. Typically, about 30 proposals are submitted annually; however, the number of proposals that merit serious policy consideration exceed the number of policy analyses that reasonably can be accomplished by NPFMC, NOAA Fisheries, or ADF&G staff in any one year. Hence, only the most critical proposals can be addressed.

Policy Analysis

The NPFMC's FMP Amendment cycle continues during the winter as various alternatives to the proposed fishery management action are analyzed. These analyses: 1) fulfill requirements under certain statutes and EOs; 2) provide opportunity for the public to bring information regarding the proposed and alternative actions to NPFMC's attention; and 3) help NPFMC examine the potential effects of alternative actions to their stated policy goals and objectives and make a well-reasoned decision on what amendment proposal to recommend to the Secretary of Commerce.

The principal analytical requirements are established in the NEPA and the NEPA implementing regulations. This law requires either an EIS for major federal actions or an EA for those actions that will not significantly affect the human environment. The human environment is defined by NEPA implementing regulations (40 CFR 1508.14) as including the natural and physical environment and the relationship of people with that environment. With regard to natural populations of fish, this definition recognizes that a policy change has its primary effect on the behavior of people, and through a change in human behavior, a secondary effect on the natural or physical environment of the fish. For example, a basic premise in fishery management is that humans control the growth rate and abundance of a fish stock through the regulation of fishing mortality. Allowing increased harvests of the fish stock or decreasing harvests through restrictions on catches produces socioeconomic benefits or costs, respectively, in the short-term. Because a fishery management policy change normally has interrelated economic, social, and physical environmental effects, NEPA analysis must include socioeconomic as well as biological considerations of the fishery being managed and its habitat.

Socioeconomic considerations are explicitly addressed, by EO 12866, which requires preparation of a regulatory impact review, and the Regulatory Flexibility Act which requires an analysis of the potential effects of a proposed action on "small entities." The economic questions posed by these requirements are different: the former is more concerned with broad national effects or effects on sectors of the national economy, and the latter with the potential effects on small businesses, non-profit organizations, and small governmental units. In addition, the MSA (Section 303(a)(9)) requires FMPs/amendments to include a fishery impact assessment, which assesses, specifies, and describes the likely effects of any conservation and management measures on affected fisheries participants and fishing communities, and participants in adjacent fisheries. When proposed actions primarily concern the allocation of fishing privileges or opportunities, the public's focus, and therefore the focus of the analysis, usually centers on what groups of persons would benefit or suffer as a result of implementing the amendment proposal.

A central theme of the analytical requirements of NEPA, EO 12866, and the Regulatory Flexibility Act is to require NPFMC and NOAA Fisheries to examine the potential direct and indirect effects of the proposed action and reasonable alternatives to the proposed action (including the no action alternative). The NPFMC, in choosing to recommend an amendment proposal, must explain why the chosen alternative is superior to all others and how it will likely result in net benefits to society. These analyses usually are combined in a single analytical document (referred to frequently as an EA/RIR/IRFA analysis), with separate sections dealing with biological and socioeconomic details. The combined analysis, however, is not necessarily limited to satisfying only the requirements of NEPA, EO 12866, and the Regulatory Flexibility Act. Other analyses or assessments may be combined with or prepared separately from the EA/RIR/IRFA, including a biological assessment of potential effects on endangered or threatened species, assessment of the potential effects of an action on marine mammals, a state's coastal zone management program, estimation of the paperwork burden that the amendment proposal would impose on affected individuals and businesses, essential fish habitat and fishery impact statements, and possibly a federalism impact statement. For simplicity, these analyses and assessments collectively are referred to here as the "analysis" of an FMP Amendment.

No specific time limit is imposed by law for completing of the draft analysis. Generally, NPFMC staff attempts to complete its analysis before the April meeting following the year in which NPFMC decided to address the proposal. This is not always possible, however. Especially controversial proposals, or those that have a large number of alternatives and options for analysis, may require more time than the four months typically allocated for the analytical task. A proposal that, if implemented, could have a significant impact on the human environment is required by NEPA to have an EIS or SEIS instead of an EA. In this event, "scoping" is required. Under NEPA, scoping is "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). Formal scoping officially begins with publication in the FR of a notice of intent to prepare an EIS or SEIS. Depending on the nature of the proposed action, it may be a lengthy period involving numerous public hearings, or it may be fairly brief and involve no hearings and only a brief public comment period. At a minimum, however, the public comment period on the scope of issues to be addressed in the analysis should be 30 days. This additional public process, which occurs at the beginning of the analysis period, plus the greater depth of analysis in a draft EIS or SEIS, adds substantially to the overall time to plan and draft the analysis.

Amendment analyses are usually drafted by NPFMC staff biologists and economists. Some of the analyses, however, require collaboration with NOAA Fisheries and ADF&G scientists and managers, or private analysts contracted by NPFMC to prepare all or part of an analysis. Proposals made by NOAA Fisheries or ADF&G to improve the implementation of existing management policies frequently are analyzed by staff of the proposing agency.

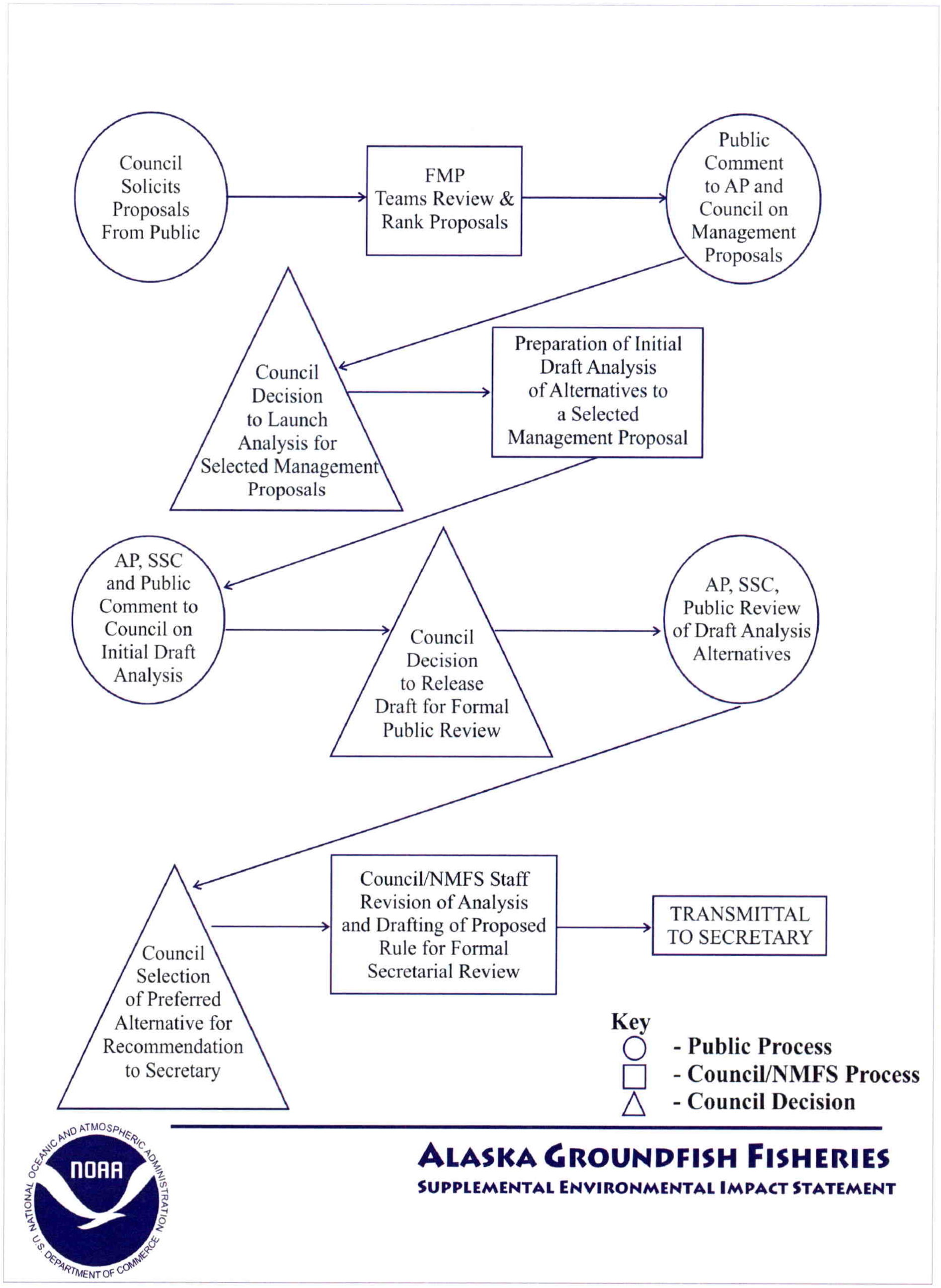


Figure 3-1. NPFMC process for developing Fishery Management Plan and regulatory amendments.

NPFMC Action

The NPFMC's first action in the policymaking process, as indicated above, is to decide which (if any) of the amendment proposals should be developed, with reasonable alternatives for analysis. To make this decision, NPFMC frequently looks at what conservation or management problem would be resolved by the proposal and how important that particular problem is compared to other problems identified in other proposals. Amendments that are needed to address critical issues, such as overfishing, take precedence. In fact, the MSA (Section 304(e)(3)) requires NPFMC to prepare, within one year of being informed by NOAA Fisheries of overfishing or an overfished stock under its jurisdiction, an FMP Amendment that would end overfishing and rebuild the overfished stock. Other statutory requirements also may cause NPFMC to launch a policy change as a priority FMP Amendment. For example, a "jeopardy" determination under Endangered Species Act would require NPFMC to respond with reasonable and prudent revisions to its management regime that eliminates the jeopardy finding. Passage of the SFA in 1996, and the AFA in 1998, also prompted NPFMC to initiate FMP Amendments.

Responding to such statutory requirements for priority attention in initiating policy or management actions may severely limit the amount of staff time NPFMC allocates to analyze the amendment proposals brought by its constituency. The staff's analytical time and resources, even when augmented by NOAA Fisheries and ADF&G staff and contract analysts, is finite while the potential number and depth of amendment analyses requested far exceeds this limit. This has resulted in robust competition for NPFMC attention among various constituency groups and their amendment proposals.

After NPFMC decides to prepare an analysis of a proposed management action, its next step is to review an initial draft of the analysis to determine whether it should be released for public review and comment. In making this decision, NPFMC relies heavily on the advice it receives from its Advisory Panel and Scientific and Statistical Committee. The NPFMC also receives public testimony before making this decision, which indicates that the public has access to the initial draft analysis before the formal public comment period begins. This "public release" decision also considers whether the analysis adequately addresses a reasonable range of alternatives and options, and adequately responds to the requirements of the MSA and other applicable laws. The NPFMC may decide at this point to release the initial draft analysis for formal public review, instruct staff to make certain minor revisions before release, request major revisions and another NPFMC review before release, or suspend further action on the analysis, which would, at least temporarily, stop further development of the proposal.

If NPFMC decides to release the initial draft analysis for public review, the comment period normally is scheduled to begin at least four weeks before NPFMC's next action. The NPFMC's next action on a management proposal is to decide on its preferred alternative. The NPFMC's preferred alternative may be entirely different from the preference of the person or constituency group that originally proposed the action, or NPFMC may decide to abandon the proposal. Choosing the no action alternative, for example, would end further progress of the amendment proposal. Normally, however, NPFMC selects a preferred alternative from those in the analysis or one that is reasonably within the range of alternatives analyzed. The NPFMC takes this action after hearing again from its Advisory Panel, Scientific and Statistical Committee, and the public. If NPFMC chooses a policy alternative that is not explicitly assessed in the analysis as its preferred alternative, the analysis is revised to include the preferred alternative before it is formally submitted for review by the Secretary of Commerce.

This NPFMC process, from soliciting of amendment proposals to submitting a management recommendation for Secretarial review, is illustrated in Figure 3-1. In summary, the annual NPFMC action cycle on policy proposals is as follows:

1. During summer months proposals are solicited.

2. The NPFMC reviews and selects policy proposals at its October meeting.

3. NPFMC staff prepares the required analyses during fall/winter months.

4. Analyses undergo initial review at the April NPFMC meeting.

5. Draft analyses undergo public review in May.

6. The NPFMC adopts a preferred alternative at its June meeting.

7. The analysis is revised and rules are prepared, published, reviewed, etc., during fall months.

8. Approved FMP Amendments for succeeding fishing year are implemented.

The NPFMC deviates from this seasonal cycle of amendment proposals, analysis, and public review to respond to statutory requirements and emergency issues.

3.1.2 Federal Action on Proposed Amendments

Final Action of NPFMC and Document Preparation

The NPFMC's choice of a preferred alternative (other than the no action alternative) frequently is referred to as the "final action of NPFMC to adopt an FMP Amendment for recommendation to the Secretary of Commerce," or simply NPFMC's "final action." Although the analysis frequently needs to be revised to specify the preferred alternative and rule-making documents need to be drafted, NPFMC (i.e., the 11 voting members) rarely reviews the decision-making documents and analyses following a final vote. Instead, NPFMC relies on the work of its staff, the NOAA Fisheries staff in the Alaska Regional Office, and NOAA General Counsel, Alaska Region, to prepare the necessary documents in final form for official submission to NOAA Fisheries for Secretarial review.

The MSA (Section 304(a) and (b)) refers to the submission of a proposed FMP Amendment as a transmittal. This term is important in the regulatory process because the MSA is specific about the time allowed for Secretarial review of an FMP Amendment. Statutory deadlines for providing the public notice of an FMP Amendment proposal and for making an approval/disapproval decision are measured from the transmittal date. Hence, the sequence and timing of federal actions on proposed amendments is delineated by the MSA and other statutes. By contrast, however, the sequence and timing of NPFMC actions on proposed actions is governed primarily by its standard operating procedures. Therefore, NPFMC staff work closely with NOAA Fisheries/NOAA General Counsel staffs to make the transmitted FMP Amendment documents as structurally complete as possible, without prejudice to the particular NPFMC policy change being proposed, so that document revision and clarification after transmittal is minimized and the statutory deadlines can be adhered to as closely as possible.

The principal documents that are submitted or transmitted for Secretarial review include 1) the proposed FMP text, or text changes in the case of an FMP Amendment; 2) the draft analysis of potential environmental and socioeconomic impacts of the preferred alternative and other alternatives considered by NPFMC (the EA/RIR/IRFA and other assessments required by statutes and EOs discussed above); and 3) proposed regulations that would implement the proposed action, if it is approved. In addition to the FMP Amendment text, regional NPFMCs are required by the MSA (Section 303(c))) to simultaneously submit proposed regulations for implementing the FMP Amendment.

The proposed implementing regulations document is a draft FR notice of proposed rule-making. As such, it must conform to the form and style guidance of the Office of the FR. In addition to the actual proposed regulatory text that would amend existing CFR language, the draft proposed rule notice must include a narrative preamble that explains what action is being proposed, why it is necessary, and its legal basis. Proposed rules actions that would affect management and enforcement programs administered by NOAA Fisheries also must be carefully coordinated with those offices to ensure that the proposed requirements could be administered efficiently. For example, a new licensing or permit requirement would have to be carefully crafted so that NPFMC's proposed action, if approved, could be effectively carried out and subsequently enforced. For these reasons, NOAA Fisheries regulatory specialists in the Alaska Regional Office draft the proposed rule document in close consultation with NOAA General Counsel and NPFMC staff.

The proposed FMP text and the draft analysis also may be revised by NOAA Fisheries Alaska Region staff in consultation with NPFMC staff. Again, the purpose of such revisions is to ensure compliance with the MSA and other applicable laws and to ensure that the proposed amendment, if approved, is administratively practicable. If NOAA Fisheries finds a substantive problem in achieving NPFMC's policy goals, however, Alaska Region staff may bring this to NPFMC's attention and recommend a resolution. Also, these documents are carefully reviewed to ensure consistency among the proposed amendment text, the draft proposed rule, and the preferred alternative. NOAA Fisheries Alaska Region staff do the work of coordinating among NPFMC staff, program implementing staff, NOAA Fisheries scientists, and NOAA General Counsel to be certain that all the pertinent documents are as clear and consistent as possible before the proposed amendment is transmitted or formally submitted. At that point, the draft proposed rule and other documents are returned to NPFMC staff for final review and formal submission for Secretarial review.

Cooperation among the professional staffs of NPFMC, NOAA Fisheries Alaska Region, and NOAA General Counsel is critical to avoid rejection, for technical or procedural reasons, of an amendment proposal after official submission. Although NPFMC rarely reconsiders its final action on a policy proposal in light of the revised analysis or draft proposed implementing rules, for highly complex proposals (e.g., limited access programs) NOAA Fisheries staff may review the key elements of the draft proposed rule with NPFMC to be certain that it accurately reflects NPFMC's policy intent. Clarifications are requested when the record of NPFMC's final action is vague. Ultimately, final review by NPFMC staff affords NPFMC with a last opportunity to correct any mistakes in the three principal documents that are submitted for formal Secretarial review before the transmittal date.

Secretarial Review

A schematic representation of the procedural steps involved from NPFMC transmittal to an approval/disapproval decision is presented in Figure 3-2. Official Secretarial review of a proposed FMP Amendment is triggered by the transmittal of the FMP Amendment, analysis, and proposed rule documents.

Section 304(a)(1) of the MSA requires the Secretary of Commerce, "upon transmittal by NPFMC to the Secretary of a fishery management plan or plan amendment," to "immediately commence a review" of the FMP Amendment and to "immediately publish" a notice of availability (NOA) in the FR soliciting public comment on the proposed plan/amendment for a 60-day period beginning on the date of publication.

After receipt of the official FMP Amendment review package, and before publication of the NOA, the Secretary is first required to "immediately review" the proposed FMP Amendment to determine whether it is consistent with the MSA, including the National Standards, and other applicable law. This is essentially a cursory review to see if the policy proposal is structurally complete. If the associated analysis is missing an obvious section required by the RFA or NEPA, for example, or some other critical flaw is apparent, then NOAA Fisheries may return the FMP Amendment package to the Regional NPFMC for additional work. Rejection of an FMP Amendment submitted by NPFMC at this stage rarely occurs primarily because of the collaborative work by the Alaska Region, NOAA General Counsel, and NPFMC staffs.

The draft proposed rules, as previously mentioned, must be submitted by NPFMC at the same time the FMP Amendment is submitted for official Secretarial review. If NPFMC were proposing a regulatory amendment with no change to a FMP, only the draft proposed rule and supporting analysis would be submitted without FMP Amendment language or an NOA. The public comment period for a proposed regulation is specified in the MSA (Section 304(b)) as 15 to 60 days. As a matter of policy, NOAA Fisheries requires proposed rules that would implement FMP Amendments to be available for public comment for 45 days, and proposed rules not associated with FMP Amendments to be available for public comment for 30 days, although shorter and longer comment periods are possible.

The Secretarial decision to approve or disapprove a proposed change also is prescribed by the MSA (Section 304(a) and (b)). For an FMP Amendment, the Secretary must approve, disapprove, or partially approve the FMP Amendment within 30 days of the end of the comment period published in the NOA. If Secretarial action is not taken within this 30-day period, the FMP Amendment takes effect as if it were fully approved. This law limits the Secretary only to approve, disapprove, or partially approve a NPFMC-recommended FMP Amendment and does not allow NOAA Fisheries to substitute its judgment for that of NPFMC's or attach conditions for approval. Section 304(a)(3) states that if an FMP Amendment is disapproved or partially approved, the written notice to NPFMC must specify the applicable law with which the FMP Amendment is inconsistent, the nature of the inconsistency, and recommendations on how NPFMC could correct the inconsistency. Secretarial action on a proposed rule is similarly prescribed. For a proposed regulatory amendment, however, NOAA Fisheries is directed to make the determination of consistency with the FMP/ amendment, the MSA, and other applicable law within 15 days of "immediately" initiating an evaluation of the proposal (i.e., within 20 days of the transmittal date of NPFMC's proposed action).

If NOAA Fisheries determines that the proposed regulatory amendment is consistent, then it is published in the FR, but if the determination is negative, NOAA Fisheries must notify NPFMC in writing, specifying inconsistencies and providing revision recommendations that would make the proposed regulation consistent. An approved FMP Amendment is implemented by publication of the final rule in the FR. The preamble to a final rule must summarize and respond to comments received on the proposed FMP Amendment or proposed rule. For regulations implementing FMPs developed by NPFMC, this final rule FR notice is drafted by NOAA Fisheries Alaska Region staff. The MSA, Section 304(b)(3), requires that a final rule be published within 30 days of the end of the comment period on the proposed rule. The rule normally is not effective for an additional 30 days after it is published as required under the Administrative Procedure. This 30-day delayed effectiveness period can be waived for a final rule only if it relieves a restriction, merely interprets an existing rule, or provides a statement of policy, or it must be made effective earlier than 30 days after publication for good cause.

3.1.3 Fishery Management Regulations

Generally, fisheries management regulations govern the conduct of the fishery; for example, by limiting fishing to a certain area or to a certain time period. Fishery regulations also require reporting and recordkeeping of certain data to provide data to fishery biologists charged with developing conservative harvesting strategies, monitoring the biological and economic health of the fishery, and enforcing regulations. In addition, measures that ensure fairness for all participants in a fishery are sometimes defined in regulations; for example, requiring a fisherman to apply for a license, file a particular report, or pay certain fees. Such fairness rules also may apply to the fishery agency; for example, by requiring it to issue certain reports, specify catch limits, or make certain determinations by a certain date. Fairness rules and reporting and recordkeeping rules may be combined under an administrative category of regulations, which are essential for management operations, but are not necessarily designed to govern the potential harvesting power of individuals. Regulations designed to govern potential harvesting power include five types of restrictions that can be categorized in very general terms as "who," "what," "when," "where," and "how." A regulatory regime for any particular fishery can be comprehensively described in terms of these five basic types of restrictions.

Who Can Participate

Until the MSA was implemented in 1977, the only restrictions on who could participate in fisheries in the EEZ were imposed by bilateral or multilateral agreements. Fishery resources beyond the territorial sea jurisdiction of any nation were considered common property and open to fishermen from all nations. Freedom of fishing on the high seas was considered a basic principle of international law of the sea. The MSA established, for the first time at the national level, a fishery resource access priority for U.S. domestic fishermen over fishermen from other countries. Section 201(d) of the MSA defined the Total Allowable Level of Foreign Fishing as that portion of the optimum yield of a fishery in the EEZ that will not be harvested by vessels of the U.S.

In the 1950s, an economic connection was made between the amount of fishing effort or capital invested in a commercial fishery and the overall cost of fishing as a result of fishery resources being considered common property (Gordon 1954). In 1978, the open access fishery problem was summarized as follows,

If there is no control over access in fisheries and if demand for a stock (or stocks) of fish is increasing, then:

- Overcapitalization is inevitable and will become worse as prices for the product increase.
- Measures to prevent depletion will either impose or lead to increased costs of fishing to the fishermen, and these costs will become greater as prices for the product increase.
- The costs of management, research, and enforcement will be borne entirely by the taxpayer (Christy 1978).

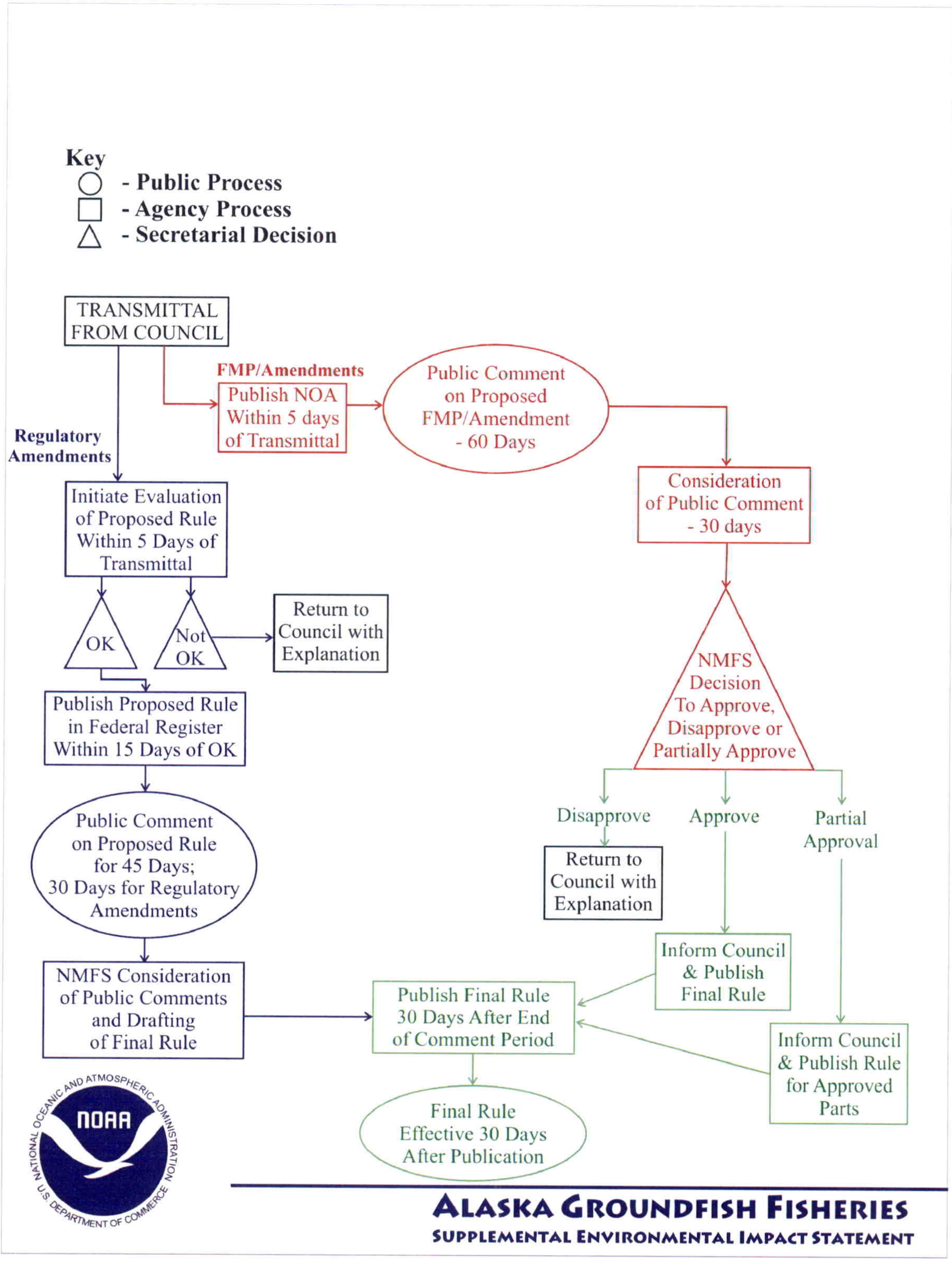


Figure 3-2. Secretarial process for review of North Pacific Fishery Management Council-proposed Fishery Management Plan and regulatory amendments.

Theoretically, the open access problem faced by managers of common property resources may be easily fixed by limiting access or, unlike most fisheries, establishing a system of property rights in the resource. Once a policy decision is made to use a limited access tool in a fishery management regime, the question quickly becomes, to whom should exclusive harvesting privileges be granted? Typically, fishermen who have traditionally and regularly participated in a fishery in the past (i.e., licensed or permitted) are included in a limited access fishery, and those who have never participated or have had insignificant involvement are not included. Early limited access programs had problems in defining these categories of participants (Ginter and Rettig 1978). Fair and defensible implementation of a limited access system requires precise and politically acceptable definitions of traditional, regular, and insignificant participation. Not surprisingly, most of the political controversy surrounding and legal contests to limited access have focused on the questions, "Who is in?" "Who is out?" and "Why?".

Under the MSA, limited access systems are discretionary, but the law provides some guidance and standards in their development. National Standard 4 (Section 301(a)(4)) states:

> *"If it becomes necessary to allocate or assign fishing privileges among various United States 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."*

Although National Standard 5 (Section 301(a)(5)) appears to foster the development of limited access systems by requiring fishery policymakers to "consider efficiency in the utilization of fishery resources," it quickly tempers that direction by requiring that conservation and management measures not have economic allocation as their sole purpose. Instead, the MSA ties a limited access to optimum yield (50 CFR 600.330). At Section 303(b)(6), the Act provides for the establishment of

> *"...a limited access system in order to achieve optimum yield if, in developing such a system, NPFMC and the Secretary take into account:*
> *(A) present participation in the fishery,*
> *(B) historical fishing practices in, and dependence on, the fishery,*
> *(C) the economics of the fishery,*
> *(D) the capability of fishing vessels used in the fishery to engage in other fisheries,*
> *(E) the cultural and social framework relevant to the fishery and any affected fishing communities, and*
> *(F) any other relevant considerations.*

The NPFMC has exercised this discretionary limited access authority on several occasions. In 1985, a removal of a Japanese sablefish fishery from the EEZ caused a price increase for sablefish stimulating overcapacity conditions. This prompted NPFMC to attempt a limited access policy. In December 1991, NPFMC adopted an IFQ Program for the halibut and sablefish fixed-gear fishery. An IFQ is a limited access system that involves a federal permit to harvest a specified quantity of fish derived from units representing a percentage of the TAC of a fishery. A person holding an IFQ has an exclusive harvesting privilege to catch a specified amount of fish. The IFQ Program developed by NPFMC provided for certain limited transfer of IFQ underlying units. The NPFMC's attempt at proposing a limited access policy was successful. The NPFMC submitted this policy proposal as a combined regulatory amendment with regard to halibut and an

FMP Amendment with regard to sablefish. The policy was fully approved by NOAA Fisheries on January 29, 1993, and final implementing rules were published on November 9, 1993 (58 FR 59375). A new feature of the IFQ Program is that it included a separate allocation of halibut and sablefish for a CDQ Program. By definition in the MSA (Section 3(21)), a CDQ does not include an IFQ.

Although limiting the number of vessels that can fish a given area is a powerful tool for protecting limited stocks, modern fishing technologies (i.e., computerized fish detectors and global positioning systems as well as gear improvements) often allow fishermen to harvest a large amount of fish in a short period of time. If the TAC for a given area can be caught in a matter of days, fishermen wishing to participate in that particular fishery are forced into a "race-for-fish". This is one indication that, even with limited entry, a given fishery may have an over-harvesting capacity. While the race-for-fish system is "fair" in the sense that everyone has the same opportunity to step into the race, there are significant concerns that this practice compels fishermen to work with very little sleep, heedless of weather or sea conditions, and thus leads to needlessly dangerous fishing conditions. Another argument against the race-for-fish is that it tends to swamp the capacity of fish processors when all the fish come in at the same time and leads to wasteful and inefficient use of the resource.

One way that fishery managers have responded to this situation is by developing so-called "rationalized" or "rights-based" fisheries. These controversial programs give specific individuals or communities the right to harvest a given percentage of the catch. These programs can be designed to allow individuals to catch their quota of fish over a relatively long time period. The intent is that quota holders would fish when it is safe or convenient to do so, given all other fishing restrictions. If designed properly, this individual flexibility could reduce the race-for-fish, increase the temporal and spatial distribution of fishing effort, and even out the demands on the processing/marketing sectors of the industry. The controversy arises over the contention that these programs grant private access to public resources, with all the economic benefits that accrue, to the exclusion of other citizens. Some people feel that rationalization plans have less to do with conservation or safety concerns and are really designed to preserve profitability for the select few who receive fishing rights.

Under the MSA, limited access systems are discretionary, but the law provides some guidance and standards in developing them. The NPFMC has exercised this discretionary limited access authority on several occasions.

In late 2000, Congress and the President of the United States approved the "Fishing Capacity Reduction Program for Bering Sea and Aleutian Islands Crab" (Crab Capacity Reduction Program, Public Law 106-554). The goal of this law is to reduce fishing capacity in the BSAI crab fisheries by creating a license and vessel buyback program. Congress amended this law by Public Law 107-20 and 107-177. The buyback program regulations remain under development. (See NOAA website at http://www.fakr.noaa.gov/ram/crab.htm)

Although Pacific halibut is not a groundfish governed under the MSA, under the Northern Pacific Halibut Act of 1982, NPFMC is authorized to recommend allocation measures for the halibut fishery to the Secretary of Commerce. In December 1991, NPFMC adopted an IFQ Program for the halibut and sablefish fixed-gear fishery in response to overcapacity conditions. An IFQ is a limited access system that involves a federal permit to harvest a specified percentage of the TAC of a fishery. A person holding an IFQ has an exclusive harvesting privilege to catch a specified amount of fish. A novel feature of the IFQ Program is that it included

a separate allocation of halibut and sablefish for a CDQ Program. A CDQ is an allocation of a specific amount of fish that may be harvested by a particular type of coastal community or group of communities.

In the early 1990s, NPFMC also became increasingly aware of excess harvesting capacity in the groundfish and crab fisheries under its jurisdiction. In June 1992, NPFMC again exercised its discretion to recommend a limited access policy by adopting another moratorium on the entry of new vessels into the groundfish and Bering Sea crab fisheries. The Vessel Monitoring Program (VMP) was designed to be an interim measure until a comprehensive rationalization plan could be developed and implemented. The VMP proposal was approved by NOAA Fisheries on June 29, 1995, and implemented by final rule on January 1, 1996 (final rule published August 10, 1995, 60 FR 40763, correction published September 12, 1995, 60 FR 47312). The VMP limited the ability of new participants to enter these fisheries until it was replaced by the LLP in January 2000. The LLP was adopted by NPFMC in June 1995, together with a multi-species CDQ program that included all other groundfish and crab species for which there were no CDQ allocations at that time (in addition to halibut and sablefish, NPFMC created a CDQ allocation of pollock in conjunction with its inshore-offshore allocation in 1992). The NPFMC's LLP, including the multi-species CDQ program, was approved by NOAA Fisheries on September 12, 1997, and implementing rules for the LLP were published October 1, 1998 (63 FR 52642; amended on August 6, 1999 (64 FR 42826), May 12, 2000 (65 FR 30549), and May 16, 2000 (65 FR 31103)).

Currently, participation in all fisheries for which NPFMC has an FMP is managed under limited access system. The federal regulations that implement such systems for the IFQ, CDQ, LLP, and AFA programs for the groundfish fisheries are published primarily at 50 CFR 679.4, 679.30–32, 679.40–45, and 679.60–64, which lists the qualification criteria for receiving and transferring harvesting privileges (permits or licenses) under these limited access systems and other management consideration. NOAA Fisheries Alaska Region's Restricted Access Management office administers these systems.

The following websites can be accessed for detailed information on FR documents:

- 60 FR 40763 can be found on the USEPA website in its entirety at http://www.epa.gov/fedrgstr/EPA-SPECIES/1998/November/Day-13/e30435.htm.

- 63 FR 52642 can be found on the NOAA website in its entirety at http://www.fakr.noaa.gov/frules/39-41-5LLP.pdf.

- 64 FR 42826 can be found on the NOAA website in its entirety at http://www.fakr.noaa.gov/frules/llpappl.PDF.

- 65 FR 30549 can be found on the NOAA website in its entirety at http://www.fakr.noaa.gov/frules/llpcorrection.pdf.

- 65 FR 31103 can be found on the NOAA website in its entirety at http://www.fakr.noaa.gov/frules/llpendorsement.pdf.

- 50 CFR 679 is available on the National Archives and Records Administration CFR website http://www.access.gpo/gov/nara/cfr/cfr-table-search-html.

What May Be Harvested

Regulations on what species of fish and how much of a particular species of fish may be harvested represent the most basic form of fisheries management. Such regulations focus on amounts of a regulated species and are commonly referred to as *quotas*, *catch limits*, or *bag limits*. The basic conservation premise for regulating what or how much is harvested is that fish stock abundance is inversely related to fishing mortality. That is, lower fish mortality due to fishing will produce greater abundance of the stock. A catch limit is designed to balance the harvest of the stock with the natural growth of the stock, minus the growth needed for the stock to reproduce itself. Theoretically, at the "right" catch limit, the harvest is sustainable over time. A size limit is frequently integrated in a catch limit rule. Minimum size limits are designed to allow fish to grow to sexual maturity and spawn at least once before becoming vulnerable to fishing gear. Maximum size limits may also be used to protect the largest animals because, in some species, they are the most productive.

Another harvest is that of regulation of incidentally caught species. Incidental catch, also called bycatch, is virtually inevitable in any fishery except those highly selective, low-volume fisheries such as dive fisheries for sponges, sea urchins and ornamental fish, or clam digging, in which the fisherman visually selects and captures the animal he is fishing. Other fisheries that use nets, hook gear, or traps of any kind are likely to capture or kill species other than the species being targeted.

Bycatch may not always be a species other than that being targeted. For example, there may be a market for a particular species and thus a fisherman targets that species with his fishing gear: individual fish of the species that are too small, too large, or of the wrong gender may be worthless at market. Hence, fish–regardless of whether they are the species targeted–that have little or no value to the fisherman may be considered bycatch. This bycatch is often referred to as economic bycatch. Regulatory bycatch occurs when fishermen are required to discard fish that would violate size, sex, season, area, gear, and others regulations.

Because bycatch is not likely to be zero, regulatory incentives can be provided to minimize it. For example, a bycatch limit may be imposed that, when reached, causes closure of the targeted fishery or causes closure of certain high bycatch areas. Alternatively, bycatch may be required to be retained, which imposes an economic cost on fishermen in terms of the time taken to handle the bycatch, and hold space on the fishing vessel that is used to store the bycatch. Retained bycatch, however, is an oxymoron under the MSA which defines bycatch only in terms of discarded fish, i.e., ". . . fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards" (Section 3(2)).

For the groundfish fisheries in the EEZ off Alaska, the two groundfish FMPs specify what species constitute groundfish, fishing for which is governed under the FMPs (BSAI, Section 3.1 and 13.2; GOA, Section 3.1). Prohibited species are also identified in the FMPs (BSAI, Section 13.2; GOA, Section 4.2.3) and their implementing regulations at 50 CFR 679.21(b). These species are prohibited in the groundfish fisheries because other fisheries depend on them. The prohibited species are the only non-groundfish species required (with certain exceptions) to be discarded if caught while fishing for groundfish and, therefore, are considered regulatory discards or bycatch under the MSA. The amount of groundfish that may be harvested annually is referred to in the FMPs and FMP implementing regulations as TAC. A TAC is specified for each groundfish species, and the sum of all groundfish species is restricted to a TAC range. A catch limit specified for certain prohibited species is the PSC limit. The FMP implementing regulations require NOAA Fisheries, in consultation with NPFMC, to annually establish TACs for each groundfish species based on biological condition of the stocks as well as socioeconomic considerations (50 CFR 679.20(a)). These amounts, and

some PSC limits, also are apportioned and allocated among various fishing industry components during the annual TAC-setting process as specified in the FMP implementing regulations (50 CFR 679.20–21).

The annual TAC-setting process is similar to the rule-making process for FMP Amendments in that proposed TACs for the upcoming year are published in the FR for public comment before publication of final TACs. The analytical basis for NPFMC's TAC recommendations are Stock Assessment and Fishery Evaluation (SAFE) reports, produced annually by NOAA Fisheries fishery biologists and economists and reviewed by NPFMC's FMP Teams, Science and Statistical Committee, and Advisory Panel before adoption by NPFMC. The TAC-setting process begins in September with the Plan Teams' review of preliminary stock assessment data. For public comment purposes, NPFMC recommends proposed TACs for the following fishing year at its October meeting and finalizes TACs at its December meeting. Once approved by NOAA Fisheries, the TAC amounts and their apportionments and allocations among areas, gear types, or sectors are published in the FR. Fishery closures are made by NOAA Fisheries during that fishing year to avoid exceeding the TACs.

The groundfish fishing year in both the BSAI and the GOA begins January 1. Publication of final TAC specification over one month after that date causes a logistical problem for authorizing management actions (such as closures when various seasonal or sector apportionments of a TAC are reached) before the final TACs are effective. The initial remedy for this problem was to publish interim TACs, which would be effective from January 1 until publication of the final TACs. The interim TACs are prescribed as 25 percent of the proposed TACs. This approach has been unsatisfactory in recent years, however, because the proposed TACs do not represent the best available scientific information. This information typically does not become available until November, after the stock assessment biologists have an opportunity to integrate the previous summer's biological survey data in their population dynamics models. The NPFMC recommended a revision of the TAC-setting process in 1996 (BSAI/GOA FMP Amendments 48/48), but technical difficulties pertaining to the timing and completion of analyses required by NEPA, RFA, and other statutes (Section 2.3.2 and Section 2.3.3) have delayed a regulatory amendment that would implement a revised TAC-setting process. A new draft analysis to revise the process was presented to NPFMC in June 2000 (Draft EA/RIR/IRFA For Amending the Process by Which Total Allowable Catch Specifications Are Established For Alaska Groundfish Fisheries, NOAA Fisheries, May 25, 2000).

In December 2001, an EA for the TAC Specifications for the year 2002 was issued by NOAA Fisheries. (http://www.fakr.noaa.gov/npfmc/safes/2001/2002EA.pdf). On December 20, 2001, the U.S. Department of Commerce issued a finding of no significant impact (FONSI) for the 2002 TAC Specifications EA. The TAC specifications were established "by emergency interim rule in order to manage and conserve the groundfish fisheries in the exclusive economic zone off Alaska" (U.S. Dept. of Commerce Memo, December 20, 2001). See http://www.fakr.noaa.gov/sustainablefisheries/ea/fonsi2001tac.pdf.

When and Where Harvesting May Occur

Fishing is allowed unless regulations specifically close or limit the harvesting of fish. Limitations are specified in terms of the area and time period during which they apply and regulations governing when and where fish may be harvested are nearly always linked. For example, a rule usually specifies an area in which certain restrictions apply for a specified time period or season in which certain fishing may or may not occur. An area may be closed all the time, for only certain time periods, or for only certain fishing-gear types. Alternatively, an area may be open at the beginning of a fishing year and remain open unless certain criteria are triggered during the year that cause it to close. The reasons for restricting fishing in a certain area are as varied as the types of restrictions that apply. An area may be closed to fishing for conservation reasons; for

example, protecting spawning stock of the target species or controlling the bycatch of a different species, or preventing competition between the fishery and marine mammals protected under the ESA. Fishing in certain areas also may be restricted for allocation purposes or to ensure an orderly fishery; for example, conflicts between different gear types may require prohibiting one gear type in an area for a particular period of time or fishing effort may be spread over a larger area by selectively closing smaller areas.

For the groundfish fisheries in the EEZ off Alaska, rules stipulating where and when fishing is restricted generally appear at 50 CFR 679.22–23. Regulations at 50 CFR 679.20–21, however, also provide for certain area closures when specified TAC and PSC limits are reached.

How Harvesting May Occur

Another basic fishing restriction is regulations prescribing what types of fishing gear may or may not be used to harvest certain species. Fishing gear regulations also may be specific to certain areas or seasons and often are linked with restrictions on when and where harvesting may occur. The purpose of gear restrictions may be biological conservation, socioeconomic management, or both. Some types of fishing gear are more selective than others for the species targeted. Regulations may minimize the impact of fishing gear on non-targeted species, fish habitat, and the sea bottom. Also, gear restrictions may be necessary to resolve gear conflicts or to protect the interests of fishermen who have traditionally used a particular gear type. For example, GOA FMP Amendment 14, adopted in 1985, prohibited the use of pot gear in the eastern GOA in the sablefish fishery because pots conflicted with the retrieval of hook-and-line gear, which was traditionally used in that fishery. In addition, gear restrictions are commonly used in an open access fishery to impose constraints on the harvesting efficiency of the fleet. Efficiency restrictions effectively allow for more participation in the fishery rather than less, which may be desirable to slow the pace of harvesting or to distribute the social and economic benefits of the harvest among more participants, as, for example, in a recreational fishery.

Until recently, any fishing gear could be used to harvest fish in the EEZ unless it was specifically prohibited or regulated. The 1996 amendments to the MSA (Section 305(a)) changed this approach by requiring the Secretary of Commerce to publish a list of authorized fisheries and fishing gear. Under this change, a fish, regardless of whether it was targeted for capture, may be retained only if it is taken within a listed fishery, is taken with gear authorized for that fishery, and is taken in conformance with all other applicable regulations. A final rule that lists authorized fisheries and gear types was published December 2, 1999 (64 FR 67511). Authorized gear types for the BSAI and GOA groundfish fisheries are listed in part VII of the table in 50 CFR 600.725(v). Management measures controlling the use of fishing gear for groundfish also set out in the BSAI FMP at Section 13.4.4 and in the GOA FMP at Section 4.3.1.2.3. These groundfish gear limitations are implemented by regulations at 50 CFR 679.24.

The following website can be accessed for more information:

- 64 FR 67511 can be found on the NOAA website in its entirety at http://www.nmfs.noaa.gov/sfa/022498f.pdf.

3.1.4 Groundfish Catch Monitoring and In-season Fishery Management

Groundfish fisheries in U.S. EEZ waters of the North Pacific Ocean are managed under several different programs, including the CDQ Program, the sablefish IFQ Program, the AFA pollock fishery, and the fishery that is open to all permitted vessels that have licenses under the LLP, which will be referred to as the general groundfish fishery. Catch information data used to manage these fisheries is collected from vessels and processors and from fishery observers trained by NOAA Fisheries. This section discusses permitting, recordkeeping, and reporting requirements; data used for catch estimation; and the in-season fishery management programs.

Permitting Requirements

NOAA Fisheries manages the groundfish fisheries of the BSAI and GOA in part through federal fisheries permits and federal processor permits, which are issued upon request (50 CFR 679.4). These permits authorize participants to harvest, receive, or process groundfish from the BSAI and GOA. A federal fisheries permit may be issued to a vessel that functions as a catcher vessel (greater than 60 ft length over-all [LOA]), catcher processor, mothership, tender vessel, or any combination of the four categories. Or, a vessel may be permitted as a support vessel. No vessel may fish for groundfish or receive groundfish harvested in the BSAI or GOA without a federal fisheries permit. A federal processor permit may be issued to a shoreside processor or a stationary floating processor that receives or processes groundfish. No shoreside processor or stationary floating processor may receive or process groundfish harvested in the BSAI or GOA without a federal processor permit. In 1999, moratorium permits (50 CFR 679.4(c)) were required for vessels fishing for groundfish and crab, with the objective of limiting fishing effort in BSAI and GOA fisheries. In 2000, the LLP (50 CFR 679.4(k)) replaced the vessel moratorium requirements and vessels are now required to obtain groundfish LLP licenses and crab LLP licenses. No vessel may fish in the BSAI or GOA without an LLP license. As of 2002, the requirements include:

- Catcher vessels: federal fisheries permit, LLP Permit, High Seas Fishing Compliance Act permit (for vessels fishing outside the U.S. EEZ).
- Catcher processors and motherships: federal fisheries permit, federal processor permit, LLP Permit.
- Shoreside processors: federal processor permit.
- IFQ vessels: IFQ Permit, IFQ Card.
- IFQ buyers and processors: registered buyer permit.
- Vessels and processors authorized under the AFA to harvest or process Bering Sea pollock: AFA permits.

In 2000, the LLP replaced the vessel moratorium program and qualifying vessels were issued LLP permits. LLP permits are based on the vessel catch history during the LLP qualifying period (the general qualification period was January 1, 1988 to June 27, 1992). Under the LLP, the number of vessels allowed to fish for groundfish in federal waters is limited, although the number of LLP permits still exceeds the number of vessels historically fishing in any one year. The LLP permits for groundfish include area endorsements. See

License Limitation Program Groundfish Licenses (NOAA Fisheries-RAM) for a list of License Holders as of July 11, 2002 http://www.fakr.noaa.gov/ram/daily/llp_gf.pdf.

In addition, the AFA authorized the issuance of AFA permits in the year 2000 to those catcher vessels, motherships, catcher processors, shoreside processors, and stationary floating processors qualified to harvest or process pollock in the BSAI. Inshore cooperative fishing permits also are required. The number and type of AFA permits issued are discussed under Bering Sea pollock.

All permits are issued without charge, except for the High Seas Fishing Compliance Act Permit (50 CFR 300.13), which is issued by NOAA Fisheries for fishermen fishing outside of the U.S. EEZ and requires a $50 fee. The fisheries participant must apply to NOAA Fisheries for permits, renew existing permits within appropriate time limits, and maintain the supporting documents required to demonstrate that he or she meets permit or license criteria. Appeal programs are available for applicants who believe they were falsely denied an AFA permit, IFQ permit or card, CDQ permit or card. (See Groundfish Federal Fisheries Permit or Federal Processor Permit Application and Instructions http://www.fakr.noaa.gov/ram/ffp_fpp_app_inst.pdf High Seas Fishing Compliance Permit Application http://www.fakr.noaa.gov/ram/hsfca_apn.pdf).

Source: Experimental fisheries permits (50 CFR 679.6) are issued to qualified applicants to authorize fishing for groundfish in a manner that would otherwise be prohibited and that otherwise may not be available through research or commercial fishing operations. Scientific research permits (50 CFR 600.745) are issued to qualified research agencies (generally NOAA Fisheries) under specific conditions for either fishery research vessels or fishing vessels chartered by NOAA Fisheries to fish groundfish outside the established TAC quotas. In addition, NOAA Fisheries issues permits to fishermen for high seas salmon fishing, a fishery that ADF&G monitors and manages.

Recordkeeping and Reporting Requirements

Participants issued federal fisheries permits, federal processor permits, groundfish LLP permits, and AFA permits are required to comply with recordkeeping and reporting requirements to report groundfish harvest, discard, receipt, and production (50 CFR 679.5). This enables NOAA Fisheries to collect data necessary to manage groundfish and prohibited species quotas. Reporting requirements include logbooks maintained at both the shoreside processing plant and onboard the processor vessel, as well as forms that are submitted to NOAA Fisheries.

Catcher vessels and buying stations (tender vessels and land-based buying stations) are required to record daily fishery information in logbooks. Processors (motherships, catcher processors, shoreside processors, and stationary floating processors) are required to record daily fishery information in logbooks, summarize the information on weekly production reports (WPR), and submit them to NOAA Fisheries via fax or an approved electronic reporting system. To assist NOAA Fisheries in determining fishing effort by species, processors also report the start and end of their participation in fishing operations (called check-in/check-out reports). To assist NOAA Fisheries in developing a catch history for catcher vessels delivering to motherships, each mothership must issue ADF&G fish tickets for each groundfish delivery. (See 2002 Check-in/Check-out Report for Mothership or Catcher Processor http://www.fakr.noaa.gov/rr/forms/chckmcp.pdf; 2002 Check-in/Check-out Reports for Shoreside Processor http://www.fakr.noaa.gov/rr/forms/chckss.pdf; 2002 Weekly Production Report for Mothership or Catcher Processor http://www.fakr.noaa.gov/rr/forms/wprmcp.pdf; 2002 Weekly Production Report for Shoreside Processor http://www.fakr.noaa.gov/rr/forms/wprss.pdf; 2002 Alaska Groundfish Processor Daily Report

http://www.fakr.noaa.gov/rr/forms/dpr.pdf; Alaska Department of Fish & Game Groundfish Ticket http://www.fakr.noaa.gov/rr/forms/dpr.pdf; 2002 U.S. Vessel Activity Report http://www.fakr.noaa.gov/rr/forms/var.pdf; and go to http://www.fakr.noaa.gov/rr/log.htm to see the Daily Production Logbooks for Catcher Vessel Trawl, Longline and Pot Gear, Catcher Processor Trawl, Longline and Pot Gear, Mothership, and Shoreside Processor.)

As of September 2001, groundfish motherships and catcher processors are also required to submit a Commercial Operator's Annual Report (COAR) annually to ADF&G (66 FR 43524 and 66 FR 55123). The objectives are to gather information on exvessel and first wholesale values for state-wide finfish and shellfish products from catcher processors and motherships at sea. These data will provide means to compare value information (in dollars) of different types of species and products from all processors of fish harvested from Alaska State and Federal waters within a year and comparisons of several years through consistent yearly collection of information http://www.fakr.noaa.gov/frules/rrrcoarfr.pdf. NOTE: 66 FR 43524 and 66 FR 55123 can be found on the NOAA website in its entirety at http://www.fakr.noaa.gov/frules/rrrcoarfr.pdf and http://www.fakr.noaa.gov/frules/coarcorrection.pdf.

NOAA Fisheries administers and permits several programs in the EEZ off Alaska in addition to open-access groundfish, and for these programs, requires additional permits. Permit types, dates of creation, and initiating documentation are presented in Table 3-1. The IFQ Program (50 CFR 679.4(d)) allocates annual total catch limits for the IFQ Pacific halibut (halibut) and sablefish fisheries among individual fishermen and issues IFQ permits, IFQ cards, and IFQ registered buyer permits. The CDQ program (50 CFR 679.32(f)) is allocated a percentage of all BSAI quotas for groundfish, prohibited species, halibut, and crab. Eligible communities in western Alaska are issued halibut CDQ permits and cards. NOAA Fisheries issues AFA permits (50 CFR 679.4(l)) to qualified vessels, processors, and cooperatives for the harvest and processing of BSAI non-CDQ pollock. The Prohibited Species Donation program (50 CFR 679.26) issues salmon permits and halibut permits to tax-exempt organizations, which may then receive the PSC of salmon and halibut from vessels using trawl gear. The organizations participating in the Prohibited Species Donation program package and distribute the product to hunger relief agencies, food bank networks, or food bank distributors.

Seven types of logbooks, with instruction manuals, are provided by NOAA Fisheries to participants of the groundfish fisheries free-of-charge: catcher vessel groundfish/IFQ daily fishing logbook, catcher vessel groundfish daily fishing logbook, catcher processor groundfish/IFQ daily cumulative production logbook, catcher processor groundfish daily cumulative production logbook, mothership daily cumulative production logbook, shoreside processor daily cumulative production logbook, and buying station daily cumulative logbook. The shoreside processor daily cumulative production logbook is also available as a shoreside processor electronic logbook with daily automated data submittal to NOAA Fisheries. If using the shoreside processor electronic logbook, the processor is not required to submit WPR or quarterly logsheets to NOAA Fisheries. Shoreside processors and stationary floating processors that receive deliveries of AFA non-CDQ pollock from catcher vessels must use the shoreside processor electronic logbook. Information common to all the logbooks includes: participant identification; amount and species of harvest, discard, and product; gear type used for harvest; area of harvest; and observer information. For most logbooks and forms, the area reported is the NOAA Fisheries reporting area. For the shoreside processor electronic logbook, the area reported is the ADF&G statistical area, which is more precise than the NOAA Fisheries reporting area. NOAA Fisheries can determine the reporting area from the ADF&G statistical area. Catcher vessels and catcher processors with an IFQ permit and IFQ card for Pacific halibut or sablefish must notify NOAA Fisheries by telephone before an IFQ landing to arrange for enforcement presence. A participant with an IFQ registered buyer permit must submit an electronic landing report through a transaction terminal after an IFQ

landing and must submit a shipment report for each transfer of IFQ fish. Other reports are required if the IFQ fish leave the EEZ off Alaska or leave Alaska State waters. For new regulations see

- 2002 IFQ/CDQ Manual Landing Report http://www.fakr.noaa.gov/rr/forms/ifqlandrpt.pdf.
- 2002 IFQ/CDQ Shipment Report http://www.fakr.noaa.gov/rr/forms/ifqshiprpt.pdf.
- CDQ Catch Report and Instructions http://www.fakr.noaa.gov/cdq/02cdqcr.pdf.
- CDQ Delivery Report and Instructions http://www.fakr.noaa.gov/cdq/02cdqdr.pdf.
- 2002 Buying Station Report http://www.fakr.noaa.gov/rr/forms/bsr.pdf.
- 2002 Groundfish Product Transfer Report http://www.fakr.noaa.gov/rr/forms/ptr.pdf.

Table 3-1. Permits and programs.

Program	FMP Reference	Date
Groundfish		
Bering Sea and Aleutian Islands (BSAI)	BSAI Amendment 1	1983
Gulf of Alaska (GOA)	GOA Amendment 1	1978
High seas salmon		1978
Individual fishing quota (IFQ)		
Halibut	50 CFR 300	
Sablefish	BSAI Amendment 15 GOA Amendment 20	1993 1994
Community development quota (CDQ)		
Sablefish	BSAI Amendment 30 GOA Amendment 34	1997 1994
Groundfish and crab	BSAI Amendment 39 GOA Amendment 41	1996 1996
Groundfish Observer Program	GOA Amendment 18	1994
Moratorium		
Groundfish and crab	BSAI Amendment 23 GOA Amendment 28	1996 1995
License Limitation Program (LLP)		
Groundfish and crab	BSAI Amendment 39 GOA Amendment 41	1996 1997
King and tanner crab	BSAI Amendment 1	1989
Donated prohibited species	BSAI Amendment 50 GOA Amendment 50	1995 1996
Experimental fishing permit	GOA Amendment 22	1992

Shoreside processors and stationary floating processors that receive deliveries of groundfish or prohibited species under the CDQ program must submit a CDQ delivery report to NOAA Fisheries for each delivery. If using the shoreside processor electronic logbook, the processor is not required to submit separate CDQ delivery reports. CDQ groups must submit CDQ catch reports to NOAA Fisheries detailing the groundfish and prohibited species catch by vessels fishing for the CDQ group.

Catch Monitoring by Groundfish Observers

Regulations at 59 CFR 679.50 require groundfish observers aboard vessels equal to or greater than 60 ft LOA and at shoreside processors that process more than 500 mt of groundfish in a single monthly period. Two levels of observer coverage are established:

1. Vessels in the 60- to 124-ft LOA range and all vessels equal to or larger than 60 ft LOA using pot gear are required to carry groundfish observers during 30 percent of their fishing days. Vessels not using pot gear and that are greater than 124 ft LOA, require 100 percent observer coverage.

2. Shoreside processors that process 500–1,000 mt of groundfish in a monthly period require 30 percent observer coverage; those that process more than 1,000 mt require 100 percent coverage.

Under the new observer program, approximately of 5 percent of the Kodiak set gillnet fishery will be observed during the 2002 and 2003 salmon seasons. The objectives are to:

1. Obtain reliable estimates of incidental serious injury and mortality of marine mammals and seabirds.

2. Identify fishing methods or technology that may increase or decrease incidental serious injury or mortality.

3. Collect biological samples to support and promote scientific studies.

4. Record data on bycatch and discard levels of all species for scientific purposes.

From a letter to Kodiak setnetter permit holders, http://www.fakr.noaa.gov/protectedresources/observers/kodiaksetnetltr.pdf (this expands the observer program to small boats).

Additional observer coverage requirements are established for vessels and processors participating in management programs involving vessel-specific fishery quotas, such as the Western Alaska CDQ program or the AFA pollock fisheries.

Observers provide estimates of total catch and species composition, and species-specific biological data used in stock assessments. Observers have multiple duties, but the remainder of this section focuses on only the highest priority duties of catch weight estimation, species composition estimation, and timely inseason reporting of these data.

Observer Methods of Estimating Catch Weight

Haul-specific total catch weights are estimated by observers using one of three methods: 1) volumetric, 2) direct weight, or 3) tally. Volumetric and direct weight methods are applied primarily in trawl fisheries, while tally methods are used in hook-and-line and pot fisheries. Observers are instructed to make independent estimates of catch weight for as many hauls and sets as possible. Unverified vessel estimates of catch weight are reported by observers as official total catch (OTC) for hauls and sets where observers are unable to make an independent estimate. In 1997, observers independently estimated 72 percent of hauls and sets aboard observed vessels, accounting for 68 percent of the total reported observed OTC of 1.5 million mt. Vessel estimates were used for 7 percent of hauls and sets (10 percent of OTC by weight), and a different estimate

(proportioned delivery weight, expansion from sampled to unsampled hook-and-line sets, etc.) was used for the remaining 20 percent of hauls and sets (22 percent of OTC by weight).

Volumetric catch weight estimates have two components: 1) the measured volume of the catch and 2) the estimated density of the catch used to convert catch volume to catch weight. Observers either measure the volume of full codends before the catch is emptied, or in holding bins after it is emptied:

- In *codend volume estimation*, the observer estimates the approximate geometric shape (cylinder, elliptical solid, rectangular solid, or more complex shape) of the codend. The observer measures the total length of the codend and calculates the average height and width of the codend by measuring in several places along its length. These measurements are inserted into the appropriate geometric formula to calculate codend volume, and that volume is converted to weight using a density factor.

- In *bin volume estimation*, the observer measures the floor area of each empty holding bin on the vessel and marks height increments on the bin walls or verifies any preexisting increments. When the bins are filled, the observer measures the height of fish in the bin at four or more points and calculates average height. The known floor area of the bin is multiplied by average height of fish in the bin to calculate bin volume, and that volume is converted to weight using a density factor.

- The *density factor*, measured in weight per unit volume, is used to convert estimates of catch volume to catch weight. In pollock fisheries, the density factor prescribed by NOAA Fisheries is 0.98 metric tons per cubic meter (mt/m^3) for bin volumes and 1.02 mt/m^3 for codend volumes. Density is estimated for all other fisheries using the basket method, in which four observer baskets are filled with unsorted catch to a consistent level and weighed. The sum of the weight in the baskets divided by the sum of the known basket volumes is used as the density factor. When possible, observers are encouraged to use larger known volume containers to estimate density, but most must use baskets.

- In *direct weighing*, catch weight (excluding discards) is measured directly for catcher vessels delivering to shoreside processors, and on a subset of catcher processors equipped with in-line, motion-compensated flow scales.

The catch estimation methods used by observers vary among the vessel types, due to differences in available equipment and in fishery operations. Observers aboard catcher vessels make volumetric (usually codend) estimates of catch weight for individual hauls at sea. In some cases, this is not possible due to large codend sizes. Discard information is also collected. When the vessel delivers to a shoreside processor, the catch is weighed on scales. The observer then uses the at-sea volumetric estimates and any discard information to proportion the delivery weight back to individual haul weights. If an observer is unable to make volumetric estimates at sea, vessel estimates of individual haul weights may be used to proportion the delivery weight. In-line flow scales are installed aboard many catcher processors and can provide very accurate individual haul weights. The trawl catcher processors that fish under the AFA or the CDQ regulations are required to weigh their catches using NOAA Fisheries-inspected, in-line motion-compensated scale systems. All fish coming aboard these vessels are weighed, and these weights are reported to NOAA Fisheries. The observer also has a role in monitoring the daily testing of the scale to ensure accuracy.

Catch weight is estimated by tally methods aboard hook-and-line and pot vessels. Aboard hook-and-line vessels, observers count or estimate the total number of hooks in each set, tally the number and species caught in sampled sections of the set, estimate the average weight of individuals of each species sampled, and multiply these average species weights and numbers by the number of hooks in the entire set. Observers are instructed not to use vessel estimates of total catch aboard hook-and-line vessels because they usually do not include bycatch and dropoffs. Consequently, observer catch estimates for unsampled sets are extrapolated from similar sampled sets. Observers aboard boats fishing pots count and weigh the catch in sampled pots and estimate the total catch in a set by multiplying the sampled species numbers and average weights by the number of pots in the set. When observers do not make an independent estimate of total catch or obtain a weighed catch from a flow scale, a vessel estimate of total catch is used as OTC. Variable methods are applied on different vessels for obtaining vessel estimates of catch weight. The accuracy or precision of vessel estimates, or the effect of their incorporation into observer reported OTC, is unknown.

Observer Methods of Estimating Species Composition

Aboard all vessel types, hauls to be sampled for species composition are selected at random using the Observer Program random sampling table. One random sampling table is used for catcher vessels and one random sampling table is used for catcher processors, with a break table for catcher processors.

Observer Program guidelines on sampling selected catches for species composition require that observers collect samples from different parts of the haul and that the sample weights meet or exceed 300 kg. Observers are trained in simple random sampling techniques for haul sampling. However, there are many obstacles to executing random sampling aboard commercial fishing vessels and many observers must resort to haphazard and potentially biased sample selection methods.

Three basic approaches to collecting a species composition sample on a trawl vessel are: 1) basket sampling, 2) partial haul sampling, and 3) whole haul census. The basket sample is usually a small (minimum 300 kilograms [kg]) portion of the haul. Some form of basket sampling is incorporated in all trawler sample methods. A partial haul sample is a relatively large portion of the entire haul. A whole haul is a census of the entire haul. The sampling methods observers choose depend on the diversity and size of the catch, the shipboard setup, and their time and energy. Observers use a combination of these methods, as appropriate, to obtain the best data aboard trawlers. Aboard hook-and-line and pot vessels, observers use tally methods to sample for species composition.

The basket sample method is used to estimate species composition in a haul by weighing all target and bycatch fish. Observer baskets may or may not be used to collect the sample. For example, many basket samples on catcher vessels are obtained using a method in which the sample is collected by raising a checker bin board on deck and allowing a portion of the catch to flow in from the trawl alley, where the codend is being dumped. Other collection methods may include removing all catch from a section of a conveyor belt or an area of the deck, diverting flow from a conveyor belt, or using brailers. The basket is intended to be the object in which the sample is weighed, but, occasionally, it must be used as a selection device. Basket sampling is recommended when the catch is diverse, no species have been sorted out previous to sampling, and time or vessel cooperation does not permit a quality whole-haul or partial-haul sample.

Observers have the option to increase sample size to a partial or whole haul for individual prohibited species when target and other bycatch species are collected using a basket sample. Observers are instructed not to whole-haul sample for prohibited species at the expense of the overall species composition subsampling.

The partial-haul sampling method is used to determine species composition in a haul by counting and weighing all bycatch from a measured portion of the haul. The weight of the predominant species is determined by subtracting the total bycatch weight from the estimated partial-haul sample weight. The partial-haul sample weight is usually determined by differences in bin volume multiplied by a density factor. A subsample is used to determine predominant species average weight for extrapolation to total number. The average weight subsample is required to be a minimum of two baskets of small target species, or 50 individuals of large target species.

The main criteria for using partial-haul sampling are that the observer must be able to obtain an accurate partial-haul sample weight, and that the portion of haul sampled has less than 400 kg of bycatch that must be counted and weighed. In addition, the observer must be confident that sorting of bycatch species from the sample is thorough, that all bycatch passes the sampling point, and that sorting the partial haul does not take excessive time or affect higher priority duties.

The whole-haul census method is used to estimate species composition in a haul by counting and weighing all bycatch from the haul. The weight of the predominant species is determined by subtracting the total bycatch weight from the estimated whole-haul weight. As in partial-haul sampling, the catch is subsampled to determine the average weight of the predominant species to estimate their number. Because it is very time consuming and may interfere with higher priority observer duties, whole-haul census is typically applied only to prohibited species or other species that only rarely occur in the catch.

For observers to census a haul, there should be less than 400 kg of bycatch in the entire haul. The observer must be confident that sorting of bycatch species from the haul is thorough, that all bycatch is accessible during sorting, and that sorting does not take excessive time or affect higher priority duties.

The tally method is used to estimate species composition aboard hook-and-line and pot vessels. Sections of sets or groups of pots are selected for sampling. Aboard hook-and-line vessels, observers tally the number and species caught, released, or dropped off in sampled sections of the set and estimate the average weight of individuals of each species tallied. Similarly, observers aboard pot boats count and weigh the catch in sampled pots and estimate average weights for sampled species.

Observer Methods of Estimating Discards

Observers do not have elaborate methods for estimating discard by species. In most cases, at-sea discard information is based on the observer's best guess of percentage of each species retained. This guesstimate may be more standardized among observers on catcher vessels from which portions of hauls are discarded or all discards occur within the observer's view at one location on deck. In some rare cases, the discarded catch is retained by the vessel long enough for the observer to make a volumetric estimate of weight, or to weigh each species. The guesstimate of at-sea discard aboard catcher processors may be less standardized between observers, because discards occur simultaneously at multiple points from the deck and throughout the factory, often after the observer has taken the samples.

Observer Data Reporting Methods

Observers record catch weight and effort information from vessel logbooks and their own estimates on either Form 2US for trawlers, or Form 1US for hook-and-line vessels and pot vessels.

Observers send data to the Observer Program by various methods, depending on the level of technology available to them onboard the vessel. The Observer Program has implemented a comprehensive electronic reporting system on processing vessels and shoreside processors. This program allows the observer to send raw data which is automatically error checked and incorporated into NOAA Fisheries databases. It also allows daily communication between field observers and Observer Program staff. Currently, the program is installed on most catcher processors and shoreside processors and is working very well. Expansion of the system to catcher vessels that deliver to shoreside processors is planned.

Weekly summary reports of observer data are sent to the NOAA Fisheries Alaska Region for use in groundfish and prohibited species accounting. Daily reports are sent as needed to monitor specific fisheries.

Observer Monitoring of Processors

All processors that receive groundfish from any vessel holding a federal fisheries permit are subject to federal reporting requirements and must report all groundfish and prohibited species from all vessels and areas.

All processors subject to federal reporting requirements must maintain a daily cumulative production logbook. NOAA Fisheries issues logbooks tailored to the specific requirements of the processing mode to shoreside processors, mothership processors, and catcher processors. Daily production amounts by species and product type, and discard reports are recorded in mothership and catcher processor logbooks. Daily landing weights of fish by species, as well as daily products derived from those landings, are recorded in shoreside processors logbooks. Each day of a weekly reporting period, the daily production is recorded and added to the cumulative total for the week. At the end of the weekly reporting period, the totals are reported to NOAA Fisheries on a weekly production report and the weekly cumulative totals are reset to zero. Completed logbooks are forwarded to NOAA Fisheries Enforcement, which maintains the hard copy.

The WPR is a form on which data is recorded in a daily cumulative production logbook and transmitted to NOAA Fisheries for use in quota monitoring and statistical reporting. WPRs must be received by NOAA Fisheries no later than noon the Tuesday following the end of a weekly reporting period. The WPR contains weekly amounts of each species and product type, including discards, aggregates by federal reporting area, gear types, and whether the catch accrues to the CDQ fishery or a standard groundfish quota. Data submitted on the WPR are the only data collected on the daily cumulative production logbook that are made available in a computerized database.

Processors that receive groundfish harvested by AFA catcher vessels are required to use a NOAA Fisheries-approved electronic reporting system. Shoreside processors may choose to use a NOAA Fisheries-approved electronic logbook report to replace the daily cumulative production logbook and the paper copy of the WPR. The electronic reporting system provides information, to the species level, on each delivery of fish. It provides all the information collected by the daily cumulative production logbook and WPR, but provides more detail on catch by vessel and harvest location. These data are submitted to NOAA Fisheries daily rather than weekly.

Catch Monitoring through Vessel Monitoring System Data

A vessel monitoring system (VMS) consists of a global positioning system unit and satellite communication device configured as a tamper proof system. The VMS determines vessel location in latitude and longitude at the resolution available from the global positioning system and transmits the vessel identifier, position, and time of transmission to NOAA Fisheries. VMS data are used to monitor compliance with closed areas and to verify the location of catch when separate quotas are established inside small or irregularly shaped areas that do not correspond with the standard reporting or statistical areas.

Effective June 10, 2002, vessels authorized to participate in the directed fisheries for Pacific cod, pollock and Atka mackerel in the GOA and BSAI must have on board, and use, a VMS, while conducting directed fishing for groundfish or Pacific Halibut IFQ, regardless of where the vessel is operating as part of 2002 Steller sea lion protection measures. (See NOAA info bulletin, http://www.fakr.noaa.gov/infobulletins/permit.html.)

Groundfish Catch Estimation

Groundfish catch is estimated using information from WPRs and observer reports. These data are used differently depending on the industry component. For shoreside processors, landed weights from WPRs are used to account for the landed component of catch, and these weights are used in conjunction with observer data from catcher vessels which deliver to shoreside processors to estimate at-sea discards of groundfish. For observed catcher processors and motherships, the blend process is used. For unobserved processor vessels, the WPR provides the only source of data on groundfish catch by species. Observer data from observed vessels are used to estimate prohibited species catch for the unobserved vessels.

The accounting for catch is done for each processor, and the results summed by species, gear, and area across all processors to obtain the total catch for the fishery. Total groundfish catch from the groundfish catch accounting system is also used as the basis for computing estimates of prohibited species catch. Groundfish catch data are published in numerous regional and national reports and fishery stock assessments.

The different reports and quota monitoring processes for groundfish catch accounting vary by processing sector. The particulars of each are discussed in more detail in the following sections.

Catcher Processor and Mothership Vessels

The catcher processor and mothership fleet have a high level of observer coverage. Observers on processor vessels estimate total catch weight and collect species composition samples for a high percentage of hauls or sets. In addition to observer data, each processor submits also WPRs. Product weights are converted to equivalent round weights using product recovery rates, which are published in federal regulations. The blend process is used to select which report (observer or WPR) will be taken as the official catch estimate for the processor for a particular week.

Vessels with certified scales and two observers.

Processor vessels fishing in the AFA pollock fishery are required a) to have certified scales to weigh total catch and b) to have two NOAA Fisheries-certified observers to monitor catch at all times. The scale weight is used as the observer's official catch estimate. Because of the confidence NOAA Fisheries has in certified scale weights, data obtained from vessels equipped with scales are excluded from the blend process. NOAA Fisheries uses the observer reports of catch as the official catch estimate. Certified scales are also required on many vessels in the CDQ fishery.

Vessels without certified scales and two observers.

Estimating the catch by processor vessels without scales is done using a process commonly called the *blend process*. Total groundfish catch for all species combined is computed weekly from the WPR and from the observer report. If either report is missing, the report present is selected as the source of data for that processor during that week. If both reports are present, the blend compares the two total catch weights as follows:

- If the WPR and OTC weights are within 5 percent, the WPR is selected as the source.
- If the WPR is more than 30 percent higher than the observer total catch (for pollock fishery target) or more than 20 percent higher (all other targets), the WPR is selected as the source.
- In all other cases, the observer report is selected as the source.

The blend program then returns to the source data (observer or WPR) and copies the detailed records, showing gear type, area, and species, to the catch accounting database. Records from the WPR are identified in the blend by a source field value of W; observer records are identified by a source field value of zero.

Catcher Vessels Delivering to Shoreside Processors

Groundfish catch accounting for catcher vessels delivering to shoreside processors uses WPRs for accounting of landed catch, and uses catcher vessel observer data combined with landed catch amounts to estimate at-sea groundfish discards by catcher vessels prior to landing.

Landed catch quantity and composition.

WPRs for shoreside processors contain landed weight of catch. These data are used to estimate for the retained portion of the groundfish catch. Landings on a WPR are reported separately for each week, reporting area, and gear type. Catches under a CDQ program or research fishery are also separately identified. Landings are typically in round weight, or in a form, such as "bled only," or "headed and gutted," with a high product recovery rate. For fish landed in forms other than round, landed weights are converted to round weight using product recovery rates.

Some shoreside processors use a NOAA Fisheries-approved electronic logbook system. Electronic logbook reports contain detailed information on each landing of fish, identify the vessel making the landing, and report catch locations at the level of the Alaska groundfish statistical area.

Alaska state law requires all fish purchased to be weighed on a state-certified scale. Some fish landed, but not purchased, may not be required to be weighed on a state-certified scale, but the processors must still log and report these fish in the federal reporting system. No information is available about the accuracy of weights from state-certified scales under operational conditions. Observers at shoreside plants collect biological samples, but do not verify the accuracy or completeness of landed weights.

At-sea discards by catcher vessels delivering to shoreside processors.

Recordkeeping and reporting regulations require catcher vessel operators to report at-sea discards to the shoreside processor for inclusion on the shoreside processor WPR. NOAA Fisheries estimates at-sea discards by using observed discard rates from catcher vessels delivering to shoreside processors and extrapolating them to the total catch.

Observers on catcher vessels delivering to shoreside processors collect data on at-sea discards of groundfish. All observer data for a month, gear, and target fishery are used to calculate discard rates for each groundfish species. These discard rates are expressed as a ratio of the weight of the discarded species to the total retained groundfish weight. These discard rates are multiplied by the retained landings rates for each shoreside processor to make an estimate of total at-sea discards of groundfish.

Groundfish Total Allowable Catch Monitoring

The annual TAC for each species of groundfish may be allocated to industry components based on gear type, vessel size category, processing sector, or quota recipient class such as CDQ group or AFA Cooperative. These allocations result in a set of quotas that NOAA Fisheries must monitor. The monitoring and management programs differ depending on the regulatory program establishing the quota.

Community Development Quota Program Fishery

The CDQ program receives a percentage of each groundfish species or species group managed under the BSAI FMP and with an annual TAC. CDQ groups also receive allocations of prohibited species catch, which is called prohibited species quota (PSQ). Monitoring and management of PSQ is discussed below.

When a vessel is fishing for a particular CDQ group, the catch of groundfish is subtracted from that group's CDQ allocations. NOAA Fisheries requires the group to submit a CDQ Catch Report documenting the catch of all CDQ by all vessels fishing for it. The group is required to use one of the following sources for the catch data submitted on the CDQ Catch Report:

- Catch estimates extrapolated from observer data.
- CDQ delivery reports submitted by a shoreside processor for groundfish CDQ and PSQ delivered to the shoreside processor by a catcher vessel.
- IFQ landings report submitted by the registered buyer (either shoreside processor or custom processor) to NOAA Fisheries Enforcement for halibut CDQ only.

The use of these three different data sources is summarized in Table 3-2.

Observer data are used to monitor groundfish CDQ harvests by all catcher processors and motherships taking deliveries of unsorted codends from trawl catcher vessels. Observer data are also used to monitor harvest by catcher vessels, depending on gear type and method selected by the CDQ group for catch accounting.

For catcher processors and trawl catcher vessels delivering unsorted codends to motherships, observer data are sent by observers to the NOAA Fisheries Observer Program Office in Seattle. CDQ groups, NOAA Fisheries' Alaska Region (CDQ Program) management staff, and vessel operators obtain catch estimates based on observer data from the Observer Program Office. The CDQ groups use the estimates of total catch based on observer data to prepare a CDQ catch report for each CDQ haul or set by a catcher processor or mothership. The CDQ Program management staff subtract the catch reported from the group's CDQ allocation and use the observer data to verify the accuracy of the CDQ Catch Reports.

CDQ catch accounting for catcher vessels is more complicated than for catcher processors and motherships for a number of reasons. It is more difficult to collect species composition samples on most catcher vessels than on catcher processors. NOAA Fisheries does not require more accurate catch accounting (scales) to weigh total catch, or observer sampling stations for catcher vessels. The catch accounting requirements for catcher vessels are based on a combination of retention requirements, accounting at the shoreside processor, and the choice to use observer data for some catcher vessels.

Trawl catcher vessels are required to retain and deliver groundfish CDQ harvest to a shoreside processor, where they must be sorted by species, weighed or counted, and reported by the processor on a CDQ delivery report. Although observer data are not used to directly estimate the catch of groundfish CDQ, they are used to verify the species reported on the CDQ delivery report and to check the species weights.

For hook-and-line vessels and pot catcher vessels (non-trawl gear) 60 ft or more LOA, the CDQ group and vessel operator have two choices regarding the source for CDQ catch accounting:

- **Option 1** – They may retain all groundfish CDQ species and use the CDQ delivery report. Observer data must be used for halibut PSQ from hook-and-line vessels required to discard halibut at sea.

- **Option 2** – They may discard some groundfish CDQ species at sea, but then use observer data as source for all CDQ and PSQ. This option requires an observer sampling station with the same specifications as required for a hook-and-line catcher processor.

Option 1 is the same as required for trawl catcher vessels and Option 2 is the same as required for all catcher processors and motherships. Trawl catcher vessels were not given a choice on CDQ catch accounting methods because Option 2 would have required the use of a scale.

Sablefish Individual Fishing Quota Fishery

The sablefish TAC, after subtraction of the CDQ reserve, is allocated to trawl gear and fixed gear. The trawl gear allocation is managed under the general groundfish fishery. The fixed gear allocation is managed under an IFQ program. Permits are issued to qualified IFQ fishermen, allocating them a specific amount of sablefish quota by area and vessel size category. Individual accounts are established for each permit in the NOAA Fisheries database. Fishermen must report landed weights of sablefish using a real-time transaction processing system. The computer system converts the landed weight to round weight using standard product recovery rates, subtracts the round weight amount from the IFQ account, and prints a receipt showing the

transaction amount and remaining account balance. The computer system sums landing transactions. Account overages are electronically referred to the NOAA Fisheries Office of Law Enforcement.

Table 3-2. Source of data for Community Development Quota catch accounting by quota category, gear type, and vessel category.

Gear type/vessel category	Community development quota (CDQ) groundfish	Halibut prohibited species catch (PSC)	Crab PSC	Salmon PSC
Trawl				
Catcher processor	Obs.	Obs.	Obs.	Obs.
Mothership	Obs.	Obs.	Obs.	Obs.
Catcher vessel ≥60 feet (ft)	Del.	Obs.	Obs.	Obs.
Catcher vessel ≤60 ft	Del.	Del.	Del.	Del.
Hook-and-line				
Catcher processor	Obs.	Obs.	na	na
Catcher vessel				
≥60 ft, option 1	Del.	Obs.	na	na
≥60 ft, option 2	Obs.	Obs.	na	na
<60 ft, groundfish	Del.	Del.	na	na
<60 ft, halibut	na	na	na	na
Pot				
Catcher processor	Obs.	Obs.	na	na
Catcher vessel				
≥60 ft, option 1	Del.	na	na	na
≥60 ft, option 2	Obs.	na	na	na
<60 ft, groundfish	Del.	na	na	na

Notes: Del. – Data from the CDQ delivery report submitted by the shoreside processor reporting the weight of each species from the delivery for groundfish CDQ. The CDQ delivery report also provides the vessel operator's report of prohibited species discarded at sea from unobserved catcher vessels (<60 ft).
na – not applicable
Obs. – Estimates of total catch determined by extrapolating observer species composition data to the official total catch for each haul or set.

AFA Pollock Fishery

The pollock fishery in the BSAI is managed under regulations that implement the AFA, in addition to the MSA. The annual pollock TAC, after subtracting the CDQ reserve, and an incidental catch allowance, is allocated to three sectors– catcher processor, mothership, and inshore–that have formed cooperatives. There is one catcher processor cooperative and one Mothership cooperative. Eight inshore cooperatives have formed, each of which receives an allocation of pollock based on the historic harvest percentages of each catcher vessel in the cooperative. The history of catcher vessels not in cooperatives forms the basis of an open access quota available to vessels not in cooperatives.

Pollock caught in the directed pollock fishery count against the cooperative allocations. NOAA Fisheries considers all pollock caught by vessels using pelagic trawl gear to be directed fishing. Because regulations (50 CFR 679.24(b)(4)) prohibit directed pollock fishing with non-pelagic trawl gear, this catch is counted against the incidental catch allowance.

The pollock cooperatives actively monitor pollock harvest and cease fishing activity when their catch equals their allocation. NOAA Fisheries also monitors the pollock harvest and can close a cooperative fishery, if needed.

Separate pollock quotas have been established for the Steller Sea Lion Conservation Area (SCA) in the Bering Sea. NOAA Fisheries monitors pollock catch to ensure the pollock quota inside the SCA is not exceeded. For observed catcher vessels, the haul retrieval location is recorded by the observer to establish the catch location. Vessels with observers can fish both inside and outside the SCA during a single trip; the observer reports provide information on the amount caught inside the SCA. Vessels without observers may carry a VMS unit that provides detailed information on vessel location and speed. These vessels may fish either inside or outside the SCA during a single trip, and the VMS data are used to verify the reported fishing location. If they fish both inside and outside the SCA during a single trip, the pollock catch for the entire trip is counted against the SCA pollock quota. Catches from unobserved vessels that do not provide VMS data are counted against the SCA pollock quota as NOAA Fisheries has no way to verify the catch location. If the SCA is closed because the pollock quota is reached, the requirements to provide VMS data and to have unobserved pollock catch counted outside the SCA is removed.

Effective June 10, 2002, vessels authorized to participate in the directed fisheries for Pacific cod, pollock and Atka mackerel in the GOA and BSAI must have on board, and use, a VMS, while conducting directed fishing for groundfish or Pacific Halibut IFQ, regardless of where the vessel is operating as part of 2002 Steller sea lion protection measures(See NOAA info bulletin, http://www.fakr.noaa.gov/infobulletins/permit.html).

General Groundfish Fishery

For all groundfish fishing not under the CDQ, IFQ, and AFA Cooperative Programs, NOAA Fisheries monitors catch and issues regulatory notices to open and close specific fisheries. In some cases, catch is monitored from daily or weekly reports and the closure date is projected by extrapolating catch rates. If fishing effort is high relative to the available quota, NOAA Fisheries will estimate the length of the fishery using historic effort and catch rates, and open the fishery for a specific length of time, ranging from as little as six hours to several days.

If NOAA Fisheries determines that a groundfish allocation will be reached, a directed fishing allowance is established under regulations at 50 CFR 679.20(d)(1)(I). The directed fishing allowance is an amount less than the quota, leaving a portion to support incidental catch needs of the species in other fisheries. When the directed fishing allowance is reached, NOAA Fisheries prohibits directed fishing (50 CFR 679(d)(1)(iii)). When directed fishing is closed, fishermen may retain incidental catch of the species up to specified percentage limits (50 CFR 679.20(e)), allowing limited retention of the species but greatly reducing the catch rate.

When a quota is reached, NOAA Fisheries prohibits further retention of the species (50 CFR 679.20(d)(2)). If catch amounts reach the level defined as overfishing, NOAA Fisheries can take actions to restrict other fisheries (50 CFR 679.20(d)(3)).

Most groundfish quotas are for areas that correspond with NOAA Fisheries statistical areas or FMP areas. For these quotas, the location of catch is determined by the reported catch location or the observed haul location. When catch quotas are established for small areas, for example, the Atka mackerel quotas in the Aleutian Island Steller sea lion critical habitat, NOAA Fisheries cannot monitor the quotas based on the reporting areas or observer data. In small areas, vessels can set and retrieve gear outside the area, but fish inside the area. NOAA Fisheries has adopted two strategies to monitor quotas for these small areas.

One strategy is to treat the critical habitat quota as a limit within the overall area quota. NOAA Fisheries monitors the overall area catch, and when the critical habitat quota is reached, NOAA Fisheries closes critical habitat. This method is very effective in controlling the catch inside critical habitat. Because all catch from the larger area is initially counted against the critical habitat quota, it tends to result in vessels fishing inside critical habitat first, which may cause concerns about temporal concentration of the catch in critical habitat, even though the catch amount is well-controlled.

Another strategy is to utilize VMS data in conjunction with observer data to monitor the vessel location during the time between gear set and retrieval. This method allows assignment of catch from a specific haul or set as inside or outside critical habitat. If any portion of the haul or set occurs inside critical habitat, the catch is counted as coming from inside critical habitat.

Prohibited Species Catch Estimation

Several fish and shellfish species are prohibited in North Pacific groundfish fisheries. These include all species of salmon, steelhead, Pacific halibut, Pacific herring, and crabs. Prohibited species must be returned to the sea as soon as possible after they are caught. One exception is the Prohibited Species Donation Program, a program to retain and donate salmon to food banks. Unlike halibut and crab, salmon caught with trawl gear suffer nearly 100 percent mortality. Regulations implementing this program are separate from a regulation that requires all salmon be retained until counted by an observer.

Observers were first deployed in the domestic groundfish fishery in 1990 to collect information on groundfish catch, PSC, and other biological data. Observer coverage is based on vessel length; vessels 125 ft LOA or longer carry an observer 100 percent of the time and vessels from 60–124 ft LOA carry an observer 30 percent of the time. Vessels smaller than 60 ft do not carry observers. The salmon set gillnets of Kodiak will be carrying observers in the summer of 2002 and 2003. Actual observer coverage varies widely by fishery; the pollock fishery, conducted by large vessels, has very high coverage while the hook-and-line fishery for demersal shelf rockfish, which involves small vessels, has little or no observer coverage.

The NOAA Fisheries Observer Program sends PSC data weekly to the Sustainable Fisheries Division of NOAA Fisheries Alaska Region. These data contain the official total catch, weight of sampled hauls, and numbers and weights for each prohibited species, aggregated by unique combinations of vessel, week, reporting area, and gear. NOAA Fisheries Alaska Region assigns a target fishery to the record based on the groundfish catch composition. For catcher vessel observer reports, both the vessel and the processor are identified.

Prohibited Species Catch Rates

Prohibited species catch rates are calculated by dividing the sum of the weights or counts of PSC in a set of observer data by the sum of the weight of groundfish in the dataset. For rates from observed vessels that will be applied to unobserved vessels, a minimum of three different weekly observer reports is required before an average rate is used. For some rates, this threshold is set at a higher number.

PSC rates for observed catcher processor and mothership vessels.

Prohibited species catch rates for a catcher processor or mothership that carries an observer during a weekly reporting period are computed using data reported by that observer. A catch rate, for each prohibited species is computed from observer sampling data as a ratio of weight (halibut and herring) or numbers (crab and salmon) per metric ton of groundfish.

PSC rates for catcher vessels delivering to shoreside processors.

All observer data for a target fishery, gear type, and reporting area from a three-week period of observed catcher vessels that deliver to shoreside processors are combined to generate an average rate, which is applied to groundfish catch from shoreside processors. In order to prevent application of a small number of observer reports to a large amount of groundfish harvest, these three-week average rates are used only if there are at least ten applicable observer reports. If the shoreside-specific rate is not available, this combined average rate is used. If current year observer reports are not available, a rate is used based on prior year observer data. Finally, if no current or prior year data exist for the particular reporting area, a rate based on the average of current year data for the same management area, gear, and target fishery is applied.

PSC rates for unobserved processor vessels.

PSC estimation procedures for unobserved processor vessels are identical to those used for shoreside processors, except that the first rate applied is based on an average of observer reports from the same processing mode. If at least ten observer reports are available over a three-week period, the rate used for an unobserved catcher processor will be calculated from data collected by observers on catcher processors. Likewise, the rate used for an unobserved mothership will be calculated from data collected by mothership observers.

Computation of Prohibited Species Catch

Once the PSC has been estimated, the PSC rate estimates are calculated by multiplying each prohibited species rate times the total groundfish weight for the processor from the groundfish catch accounting system. For PSC limits, which are expressed in terms of mortality, the PSC amount is multiplied by the mortality rate to obtain an estimate of mortality. The following factors used to estimate PSC rates are provided to identify how the catch rates are applied to groundfish catch from the groundfish catch accounting system.

- For the "processor-specific" rate, the factors used are week, permit number, reporting area, and gear.

- For the three-week average rates, the factors are week, reporting area, gear, and target. Four different types of three-week average rates are: 1) average of all observer data for a particular factor, 2) average of shore-delivering catcher vessel data, 3) average of mothership-delivering catcher vessel data, and 4) average of catcher processor data.

- For rates based on data from prior years, the factors used are reporting area, gear, and target.

- For BSAI and GOA annual average rates, the factors used are gear and target.

Observer coverage levels are higher in the BSAI than in the GOA because coverage is based on vessel size. The BSAI has a higher proportion of large vessels; as a consequence, more processor-specific rates are used in the BSAI, and more average rates are used in the GOA.

Prohibited Species Catch Limit Monitoring

Annual PSC limits for some species are specified under 50 CFR 679.21, or through the annual specification process. To create PSC quotas, PSC limits may be further allocated to fishery categories, gear groups, or seasons.

General Groundfish Fishery

NOAA Fisheries monitors PSC quotas for the general groundfish fishery using the PSC estimates described above. When NOAA Fisheries determines that a PSC quota will be reached, a notice closing the fishery is published in the FR. Authority for PSC closures is under 50 CFR 679.21. Reaching a PSC quota can result in closure of an area or a season, even if groundfish quotas remain unharvested.

Community Development Quota Program Fishery

The CDQ Program receives an allocated 7.5 percent of the PSC limits for halibut, red king crab, bairdi Tanner crab, opilio Tanner crab (snow crab), chinook salmon, and non-chinook salmon (all other salmon species) in the BSAI. These allocations are called PSQs.

Whether the catch of a prohibited species accrues against the CDQ group's PSQ allocations depends on the gear used to catch the prohibited species and, in some cases, on the date or area of the bycatch. Table 3-3 summarizes the regulations for accrual of prohibited species bycatch against PSQs for CDQ fisheries. Halibut accrues against the PSQ when caught with trawl or hook-and-line gear anywhere in the BSAI at any time of the year. Based on NPFMC recommendation, pot and jig gear are annually exempt from the BSAI halibut PSC limit. The justification for this exemption is that only small amounts of halibut are caught by these gear types. This exemption is not a permanent regulation, but is published in the FR each year with the groundfish TAC amounts.

Although crab and salmon are always prohibited species in any groundfish fishery, they accrue against the PSQ only when caught with trawl gear. In addition, crab and non-chinook salmon count against the PSQ only when caught in certain areas and, in the case of salmon, only when caught during certain times of the year.

The same data sources discussed above and summarized in Table 3-3 for use in monitoring CDQ groundfish catch are used for monitoring PSQ. For trawl catcher vessels, salmon PSQ must be retained and delivered to a shoreside processor, where they must be sorted by species, weighed or counted, and reported to NOAA Fisheries by the shoreside processor on a CDQ delivery report. Although observer data are not used directly to estimate salmon PSQ, they are used to verify the species reported on the CDQ delivery report and to check the species weights. Because halibut and crab are required to be discarded at sea, observer estimates of halibut PSQ and crab PSQ are used as the basis for subtracting bycatch amounts from the CDQ group's PSQ allocations.

Halibut discarded by vessels using pot or jig gear does not count against the BSAI halibut PSC limit, and also does not count against a CDQ group's halibut PSQ. Because vessels less than 60 ft LOA are unobserved, NOAA Fisheries requires the vessel operator to report discards on the CDQ Delivery Report. It is impossible to verify the accuracy of these reports.

Table 3-3. Regulations regarding accrual of prohibited species bycatch against prohibited species quotas in the Community Development Quota fisheries, by species, gear, area, season, and target fishery.

	Halibut	Red king crab	Bairdi Tanner crab	Opilio Tanner crab	Chinook salmon	Non-chinook salmon
Gear	Trawl or hook-and-line only (not pot or jig).	Trawl.	Trawl.	Trawl.	Trawl.	Trawl.
Area	All Bering Sea and Aleutian Islands (BSAI).	Zone 1 only.	Separate prohibited species catch (PSC) for Zone 1 and Zone 2.	Opilio Tanner crab bycatch limitation zone (COBLZ).	All BSAI.	Catcher vessel operational area (CVOA).
Time/Season	All year.	All year.	All year.	All year.	Jan. 15 - Apr. 15.	Aug. 15 - Oct. 14.
Target fisheries	All.	All trawl.	All trawl.	All trawl.	All trawl.	All trawl.

Section 4 Fishery Management Tools

4.1 Stock Assessments for Alaska Groundfish Stocks

The Alaska Fisheries Science Center (AFSC) is responsible for BSAI and GOA groundfish assessments. Early assessments were in response to a perceived need of U.S. fishery scientists to gain management control and influence over expanding foreign fisheries on Alaska's groundfish. Initial efforts were directed at monitoring the foreign catch levels through bilateral agreements for the exchange of catch statistics and international cooperative program to conduct independent fishery resource surveys. The MSA gave the NOAA Fisheries authority to regulate foreign and domestic fisheries within the U.S. EEZ. The MSA marks the beginning of NOAA Fisheries' data collection of fisheries information to generate stock assessments of major groundfish resources. Stock assessments are updated annually. Reports are prepared and reviewed by AFSC scientists, the ADF&G, and the University of Alaska Fairbanks, with support of NPFMC BSAI and GOA groundfish plan teams.

Stock assessment analysis is a way to estimate how many fish are in a specific geographic ocean area or fishing ground and to predict how these fish populations will respond to harvesting. Scientists use resource survey and fishery information in mathematical calculations to estimate how many fish are in a specific management area. Life history information is used to estimate how many fish can be caught in a fishing season without impacting future stocks and while accounting for natural mortality (*M*), including removals by predators. Fishery managers use the biomass and fishing rate information to determine the allowable amount of fish that can be caught during an upcoming fishing season. (These limits will be discussed further in section A.4.2.) Managers weigh economic and social considerations, with biological and ecological concerns. But, scientists are primarily concerned with biological limits and stock production variability. The assessments are reviewed by NPFMC's groundfish plan teams, composed of biologists, economists, and mathematicians from government agencies and academia. The plan teams compile the individual species assessments into an annual SAFE document, which contains information on historical catch trends, biomass estimates, preliminary ABC estimates, harvest impact assessments, and alternative harvesting strategies. The plan teams' recommendations are passed on to NPFMC and its advisory committees.

4.1.1 Stock Assessment Modeling

Three analytical assessment methods are typically used for Alaska groundfish: 1) index methods, 2) stock synthesis, and 3) Automatic Differentiation (AD) model builder. The simplest assessment is an index of population size or biomass based primarily on resource surveys. A number of survey methods have been developed to estimate abundance or biomass of a fish stock. The survey method selected is usually designed to target one or more stocks in a specific area. The exact survey method may differ among fishing grounds and target stocks. However, scientists are careful to maintain standard sampling methods to ensure consistency and comparability of data over time by following consistent protocols and deploying standardized sampling gear. Fish abundance or biomass estimates are derived by multiplying the average catch rate by the size of the survey area. The results can be either expressed as an index of abundance or estimate of stock biomass in metric tons. Stock assessments may be based on the most recent survey or on an average of survey estimates over time. The latter approach is somewhat limited because it does not typically precisely forecast trends in abundance, particularly when surveys occur infrequently. Furthermore, survey biomass estimates can be biased or inaccurate if the sampling gear is not efficient in capturing all the fish at sampling stations, if fish for some reason avoid a particular habitat being sampled or if a significant

portion of the stock is outside the survey area. Thus in many cases, a survey biomass estimate may be a conservative estimate. The more frequent the surveys, the longer the time series of index of abundance or biomass, and the better scientists are at judging a survey's ability to track true trends in stock magnitude.

Assessment methods can be greatly improved if annual catch data and age composition from fisheries and resource surveys are available. For the Alaska groundfish fisheries, catch quantities are monitored by a program that includes at-sea observers and sampling for shoreside landings. Roughly 30,000 observer days (equivalent to 114 full-time employees) are expended annually to collect catch data from the Alaska groundfish fisheries. All vessels capable of hosting an observer may be required to do so at the vessel's expense. The recreational harvest of groundfish in Alaskan waters is a minor component of the total catch.

Observers collect biological data, such as otoliths (ear bones, which grow in layers like tree rings), length frequencies, stomach samples, and maturity stage for a variety of species. Age composition estimates come from otolith samples collected during resource surveys. The age data are combined with the (typically) large sample of fish lengths measured from fleet catches and resource surveys. The appearance of small, younger fish provide data to forecast the strength of incoming year (all fishes born in a particular year). The survival and growth of the eggs, larvae, and juvenile fish are highly variable, due to natural conditions and the variability of the marine environment. Recruitment is the principal component of the variability of a fish stock's annual production. As a result, interannual variability in recruitment is a major source of uncertainty in projecting stock trends. Therefore, the ability to determine the age-structure of a fish population for the time series of the fishery is critical in accurate assessment of a stock, particularly if it has undergone major swings in abundance.

With a time series of age composition data, scientists can employ complex population models, such as Stock Synthesis and AD model builder software, to apply biological characteristics and the dynamics of fish populations to estimate population trends over time, sustainable harvest rates, and biomass levels. For most Alaska groundfish, spawning is seasonal, so that all fish in a particular year-class will have been born within a month or two of each other. Stock Synthesis and AD model builder are age-structured models, meaning that they keep track of each year-class as it ages, enters the fishery, and eventually dies out. Recruitment begins when a year-class is captured by fishing gear. For example, the relatively strong 1994 year-class of pollock in the GOA "recruited" to the fishery in 1996 at age two; in 1999, at age five, it was 36 percent of the total pollock catch. Being able to keep track of year-classes improves abundance estimates and allows scientists to better predict short-term trends.

The Stock Synthesis computer model is used for many Alaska groundfish assessments. This program was developed as a tool for incorporating complex fishery and survey data in a single framework (Methot 1990). Stock synthesis requires fewer assumptions about data than earlier age-structured methods. Quantities in the model that are uncertain are estimated using appropriate statistical methods. The key philosophy is to treat observations as random quantities about some true underlying values.

One way to think about how the program is designed is to imagine trying to say something about a stock of fish before looking at any data. Given that the species of fish is known, along with some general biological characteristics, it is possible to synthesize the abundance of that stock given some crude approximations. The essence of the initial dataless or synthesized population model can be illustrated in the following example.

First, assume that the fishery had average catches of about 500 mt for the past 10 years, then assume that, in year 10, the harvest represented about 10 percent of the total stock. Given some assumptions about the natural mortality rate and the average weight at age, the abundance trend can be sketched. The calculation used to construct population numbers is complete, but observed catch and survey data and values for various biological parameters must be incorporated to add realism to this synthesized stock. First, biological guesses such as average weights at age are replaced with estimates based on real data. Similarly, information on longevity and reproductive output of the species is incorporated to estimate the natural mortality rate. Information about gear type and surveys provide background on the selectivity patterns to be expected. Running the model, at this point, improves the realism and scales the population values in general terms. Further refinements occur as age or size composition data are added, which provide critical information on the variability of year-class strengths and historical pattern of age structure of the population. The computer model can then be tuned–optimization–by adjusting the several hundred parameter values using a maximizing algorithm until the simulation results become most consistent with the observations.

AD model builder is a new modeling environment for developing and fitting complex statistical models (Fournier 1998). It is more flexible than Stock Synthesis because almost any kind of population model can be written in computer code and fit using available data. Most applications of AD model builder to Alaska groundfish are age-structured models, which are similar to but have advantages over Stock Synthesis. First, the optimization routine in AD model builder takes advantage of recent methodological advances in computer science. AD model builder also provides a suite of statistical tools for evaluating uncertainty.

Finally, because the modeling environment is open-ended, the analyst can tailor the assessment model to the unique characteristics of the stock and the available information. It is anticipated that more age-structured assessments will use AD model builder to assess future Alaska groundfish stocks.

One of NOAA Fisheries' primary long-term objectives is to reduce uncertainty in stock assessments. Moving from an assessment based on a biomass index, or an aggregate biomass model, to an age-structured assessment is a positive step towards achieving this objective. In 1990, four Alaska groundfish assessments were based on age-structured models. In 1999, 18 assessments were based on age-structured models, and 19 were based on survey index (Table 4-1). Further refinements may further reduce uncertainty, but only moderate gains can be expected. The real strength of these modern assessment methods lies in their ability to realistically model the uncertainty inherent in the assessment processes. Ironically, this may make uncertainty appear to increase. For example, earlier assessment typically provided only a point estimate of current stock size.

Using AD model builder, it is possible to obtain confidence limits for current stock size that reflect the uncertainty in the input parameters and how well the model fits the data. These confidence limits may be rather large for many groundfish stocks.

For the BSAI, scientists contribute to annual groundfish assessment reports for 16 stocks and 6 multi-species groups, including walleye pollock (3 areas), Pacific cod, Atka mackerel, yellowfin sole, Greenland turbot, arrowtooth flounder, rock sole, flathead sole, Alaska plaice, other flatfish, Pacific ocean perch (2 areas), sharpchin/northern rockfish, shortraker/rougheye rockfish, other red rockfish, other rockfish (2 areas), sablefish, squid, and other species. For the GOA, 15 assessments are updated annually, including walleye pollock (2 areas), Pacific cod, thornyhead rockfish, Pacific ocean perch, shortraker/rougheye rockfish, northern rockfish, demersal shelf rockfish, pelagic shelf rockfish, other rockfish, arrowtooth flounder, rex sole, shallowwater flatfish, sablefish, and other species. The stocks or stock complexes assessed for each plan

are the most valuable species, accounting for a high percentage of catch. Periodically, new species or species groups are added to the list. Often, models are modified substantially to accommodate new information and modeling improvements. The addition of another year of data also improves certainty of the model estimates of stock abundance and recruitment for prior years.

Table 4-1. Methods used to update annual stock assessments for Alaska groundfish, 1999.

Species	Area	Assessment method
Walleye pollock	Bering Sea and Aleutian Islands (BSAI)	AD Model Builder
	Aleutian Islands	Survey Index
	Bogoslof	Survey Index
	Gulf of Alaska (GOA)	AD Model Builder
	Southeast	Survey Index
Pacific cod	BSAI	Stock Synthesis
	GOA	Stock Synthesis
Sablefish	BSAI and GOA	AD Model Builder
Atka mackerel	Aleutian Islands	Stock Synthesis
Yellowfin sole	BSAI	AD Model Builder
Rock sole	BSAI	AD Model Builder
Greenland turbot	BSAI	Stock Synthesis
Arrowtooth flounder	BSAI	Stock Synthesis
	GOA	AD Model Builder
Flathead sole	BSAI	Stock Synthesis
	GOA	AD Model Builder
Alaska plaice	BSAI	AD Model Builders
Other flatfish	BSAI	Stock Index
Pacific Ocean perch	BSAI	Stock Synthesis
	Aleutian Islands	Stock Synthesis
	GOA	Stock Synthesis
Other red rockfish	BSAI	Survey Index
Sharpchin/northern	Aleutian Islands	Survey Index
Northern rockfish	GOA	Survey Index
Shortraker/rougheye	Aleutian Islands	Survey Index
	GOA	Survey Index
Other rockfish	BSAI	Survey Index
	Aleutian Islands	Survey Index
	GOA	Survey Index
Squid	BSAI	Survey Index
Other species	BSAI	Survey Index
Deepwater flatfish	GOA	Survey Index
Rex sole	GOA	Survey Index
Shallow water flatfish	GOA	Survey Index
Pelagic shelf rockfish	GOA	Survey Index
Thornyhead rockfish	GOA	AD Model Builder
Demersal shelf rockfish	GOA	Survey Index
Total by assessment method		
Stock synthesis	9	
Ad model builder	9	
Survey index	19	

4.1.2 Independent Resource Surveys

Measuring fish stock abundance or biomass in the ocean is not easy. Unlike trees, fish cannot simply be counted because they are out of sight, below the water surface. Counting is further complicated because fish move around and may migrate extensively over relatively short time periods. For oceanic fish stocks, the survey sampling method is the only feasible option for estimating fish abundance independent of the fishery.

The AFSC has several different surveying methods for the BSAI and GOA areas, including area-swept bottom trawl surveys for shellfish and bottomfish stocks, acoustic echo-integration/trawl surveys for the dominant semipelagic stocks such as pollock, and longline surveys for measuring relative abundance of valuable bottom species than inhabit the deeper waters of the upper portion of the continental slope. Each survey has unique strengths and weaknesses for estimating abundance depending on the fish's social behavior, preferred habitat, location in the water column or proximity to the sea floor, swimming ability, attraction to bait, and other such variables. For example, the bottom trawl survey can do a good job of estimating rock sole biomass, but will do a poorer job with midwater or pelagic species such as herring and squid. Fish without air bladders or fish that live on the sea floor, are very difficult to detect by acoustic survey systems.

The NOAA Fisheries survey strategy for Alaska groundfish resources was formulated in the mid-1970s but not fully implemented until 1984. The comprehensive survey strategy consists of a suite of annual and triennial bottom trawl and acoustic surveys alternating among the eastern Bering Sea, Aleutian Islands, GOA, and the West Coast regions. Annual surveys have been conducted for the crab and groundfish stocks in the Bering Sea, spawning pollock in Shelikof Strait of the GOA and Bogoslof Island area of the Bering Sea, and sablefish in the GOA. In recent years, an area of approximately 600,000 square kilometer (km) has been sampled annually with as many as 1,400 stations on the NOAA Fisheries bottom trawl surveys. The winter and summer acoustic surveys cover about 15,000 km of tracklines annually. The annual Alaska sablefish longline survey covers about 95,000 square km and fishes 16 km of longline per station over a depth range of about 660 to 3,960 ft at about 90 stations.

The history of NOAA Fisheries groundfish research off Alaska began with the Bureau of Commercial Fisheries exploratory fishing research groups in the late 1950s. They are accredited with the development of the area-swept method for estimating bottomfish abundance in the northeast Pacific Ocean. Most of the AFSC's standardization for trawl designs, gear deployment, on-deck catch sampling procedures, and data analysis were initiated by this group. The trawl survey of the eastern Bering Sea shelf area for estimating the abundance of red king crab was started in the late 1960s by NOAA Fisheries scientists from the Auke Bay Laboratory; it was not until 1975 that the current standard grid survey was implemented to measure the abundance of crab and groundfish. The survey has been conducted annually since 1979.

The original survey gear was a 400 Eastern otter trawl, a two-seam trawl designed to catch flatfish. This trawl is made with 4- and 3.5-inch nylon webbing. This net was enlarged in the early 1980s to more closely match the horsepower of survey vessels. Both trawls were fished with a footrope made of a single steel cable wrapped with rope and rubber hose and attached to chain tied to the front edge of the bottom of the net. This footrope design was chosen because it effectively fishes the organisms living on the seafloor, particularly on the relatively smooth bottom of the eastern Bering Sea. The trawl net was spread with standard (9 ft by 6 ft) V doors. The modified net has a 103.6 ft long footrope and fishes with an opening about 56 ft wide and 8 ft high.

The time series for the triennial bottom trawl surveys over the continental shelf began in 1977 for the West Coast off Washington, Oregon, and California; 1980 for the Aleutian Islands; and 1984 for the GOA. The standard trawl for these surveys was initially a four-seam, high-rise net made with 5-in nylon webbing and was referred to as the *nylon Nor'eastern trawl*. An upgraded net included replacing the nylon webbing with 5-in polyethylene webbing and replacing the net wings with a cut away wing design. This modification is referred to as the *poly Nor'eastern trawl*. Following a rigorous experimental design, the two nets were compared over 1986 and 1987 and no significant differences were found. The *poly Nor'eastern trawl* fishes with an average width opening of 52.8 ft and a height of 24.75 ft. The footrope design of both nets is roller gear design made with 14-in bobbins. Each net is spread by standard V doors. The codends of all the NOAA Fisheries survey trawls are fitted with a 1.25-in mesh liner to retain small or juvenile fish. All survey nets are built and refurbished to strict standards by a team of AFSC's gear specialists. Also, for a particular survey, identical fishing gear is used at each station each year. Survey gear is generally designed to catch a wide range of fish sizes so surveys provide a consistent sample of fish and provide information on prerecruit-sized fish that would otherwise not be available for stock assessment. Survey stations are either laid out in a systematic pattern over the fishing grounds or in a stratified random pattern. The area-swept estimate of biomass is derived from the average of the catch rates for all survey stations, multiplied by the geographic area of the survey. The catch rate for a station is the ratio of catch for a species, divided by the area fished. The area fished is determined by the width of the net spread multiplied by length of the tow when the net is in contact with the seafloor.

The Bering Sea bottom trawl survey is conducted annually starting as early as late May and continuing to August. The survey is based on a grid of fixed, equally spaced, survey stations that allow for sampling across all habitat types. Each station is located approximately 20 nm apart, giving a sampling intensity of one station for every 383 square nm (Figure 4-1). Since 1993, the same two commercial fishing trawlers, identical sister ships, have been chartered to carry out the 65-day survey. The survey samples approximately 400 trawl stations over 460,000 square km inside the 660-ft depth contour. The catch from each tow is sorted by species, then weighed and counted for total values. Each species component is sampled for sex composition, individual lengths and weights, and, as needed, biological samples such as Greenland turbot, arrowtooth flounder, Kamchatka flounder, and Pacific halibut.

The bottom trawl survey along the Aleutian Islands from 165°W to 170°30'E has been conducted triennially from June to early August from 1980 to 1986 and from 1991 to present time by two fishing vessels. On the first three surveys, the Japanese fisheries agency provided one vessel and the other was either a NOAA ship or fishing vessel chartered by NOAA Fisheries. The U.S. vessels used the standard *Nor'eastern* survey trawl; the Japanese vessel supplied its own trawl gear. The survey followed a stratified, random station pattern, with just under 500 stations, covering the continental shelf and slope from 16 meter (m) inshore depth out to a depth of 1,650 m for a total area of 66,900 square km (Figure 4-2). Since 1991, the survey has been conducted by two chartered U.S. fishing vessels for about 120 to 130 days. Starting with the 1997 survey, the standard 30-minute tow was reduced to 15 minutes to increase the number of possible stations and reduce the quantity of fish caught per tow closer to 1 mt on average. Over 100 species of fish and vertebrates were identified in the survey catch.

The area for the GOA triennial survey is just under 320,000 square km, including the upper slope. The offshore extent of the survey has varied by survey year, depending on survey objectives and fishing depth limits of the chartered vessels (Figure 4-3). Starting with the 1996 survey, the standard trawl tow was reduced from 30 minutes to 15 minutes. About 140 species of fish and 200 species of invertebrates were identified in the survey catches. Survey results are summarized for 30 fish species, including arrowtooth flounder,

Pacific ocean perch, walleye pollock, Pacific cod, Pacific halibut, flathead sole, southern rock sole, northern rock sole, rex sole, Dover sole, yellowfin sole, Alaska plaice, starry flounder, English sole, butter sole, Atka mackerel, sablefish, northern rockfish, rougheye rockfish, light dusky rockfish, dark dusky rockfish, sharpchin rockfish, shortraker rockfish, shortspine thornyhead, redstripe rockfish, silvergray rockfish, harlequin rockfish, redbanded rockfish, yellowmouth rockfish, and rosethorn rockfish.

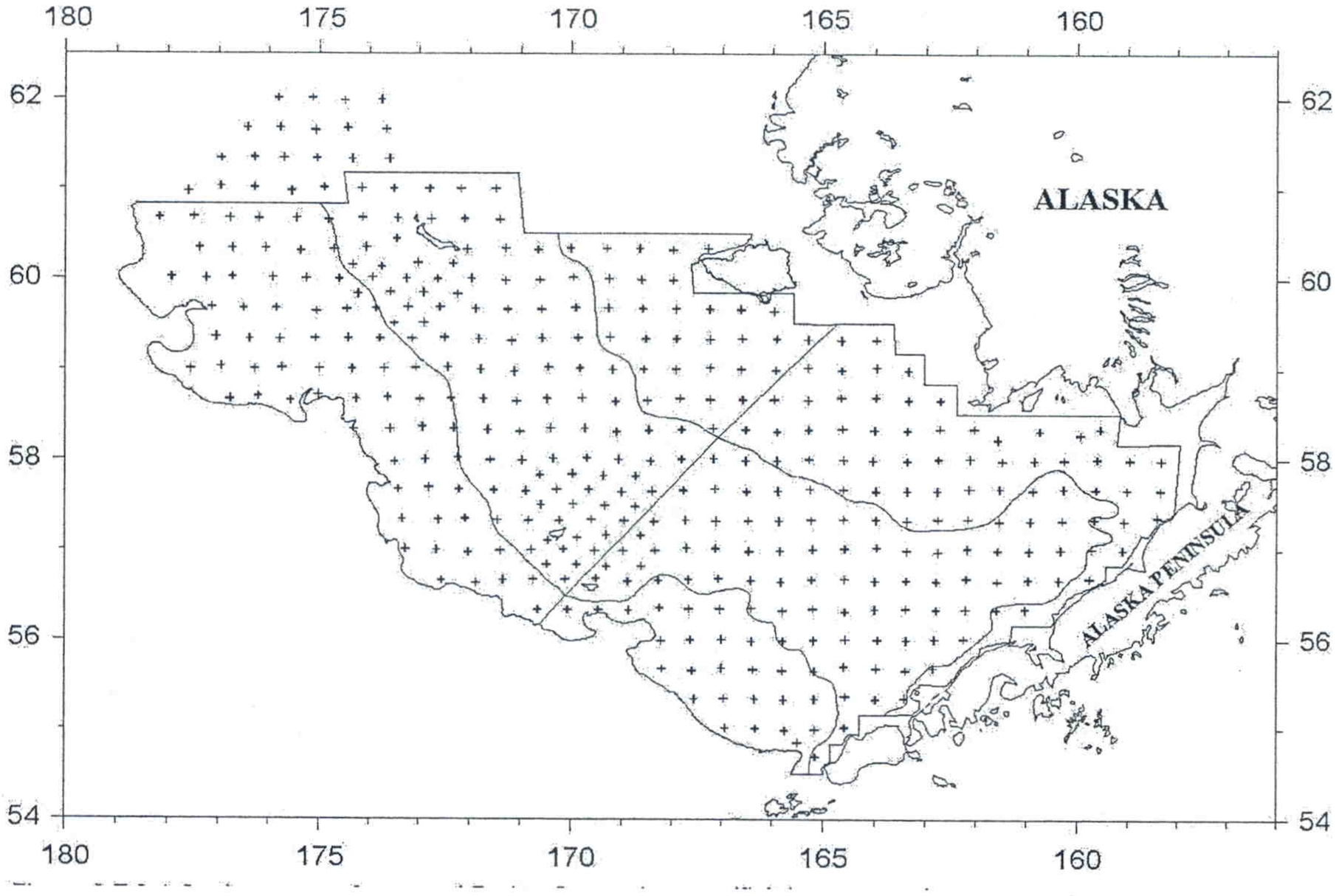


Figure 4-1. Station pattern for annual Bering Sea crab–groundfish bottom trawl survey. Source: NOAA Fisheries.

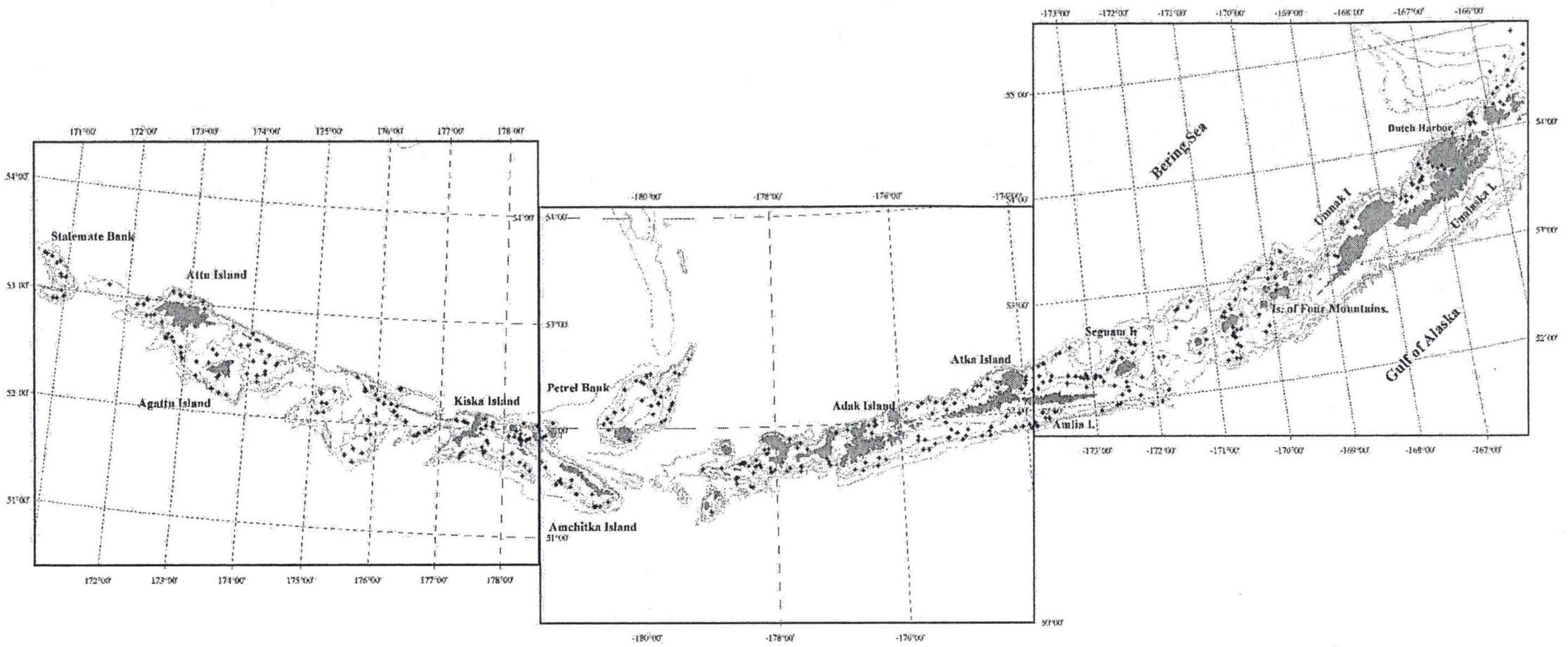


Figure 4-2. Aleutian Islands bottom trawl survey station locations. Source: NOAA Fisheries.

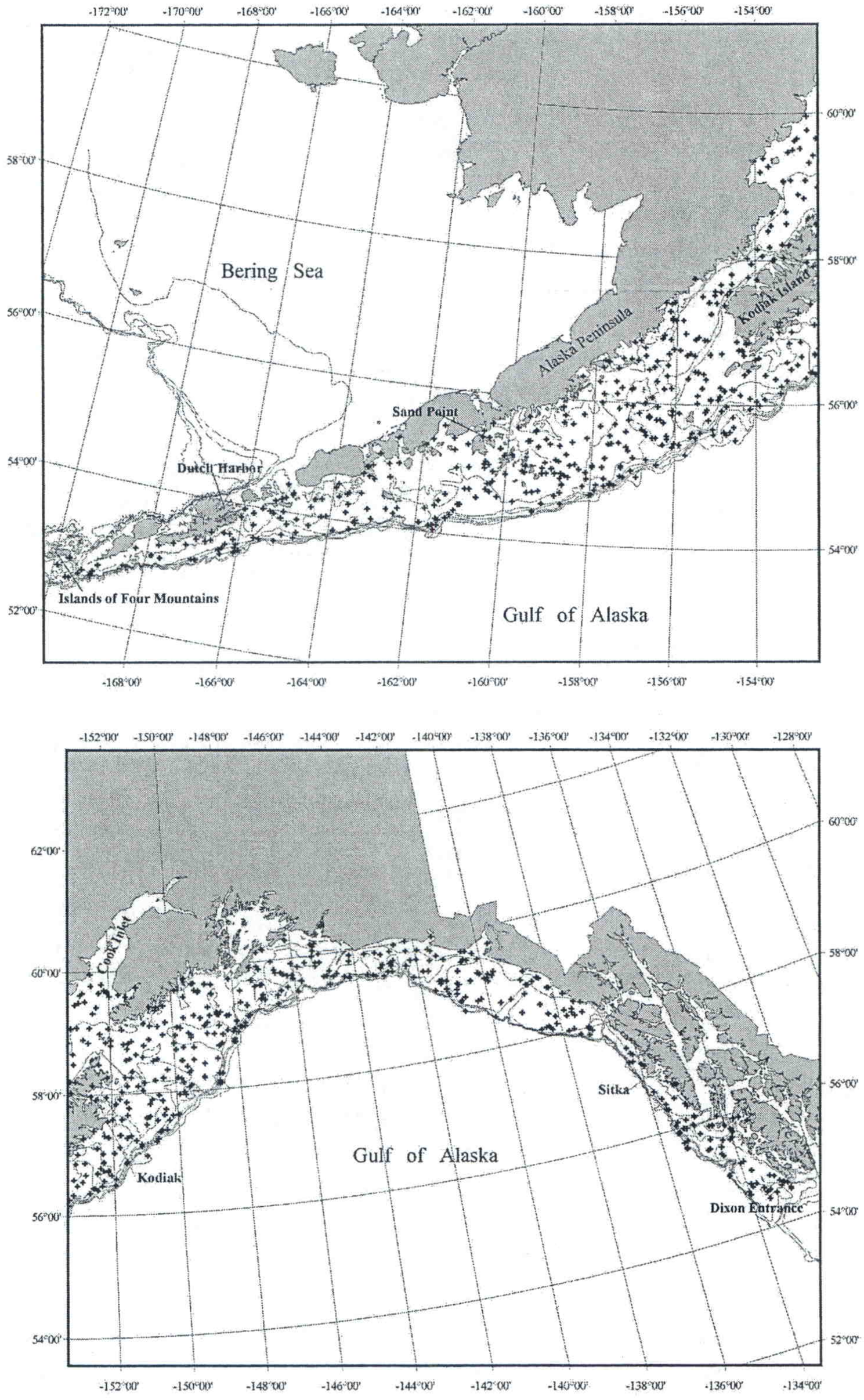


Figure 4-3. Gulf of Alaska bottom trawl survey station locations. Source: NOAA Fisheries.

Beginning with the 1999 GOA survey, AFSC initiated a new survey strategy to increase the frequency of the survey schedule from triennial to biennial (Table 4-2). This new schedule continues the annual eastern Bering Sea bottom trawl survey for crab and groundfish. The summer bottom trawl survey is expanded to include a biennial shelf survey alternating between the GOA and the Aleutian Islands, a biennial slope survey alternating between the GOA and the eastern Bering Sea, and a biennial acoustic summer survey targeting on walleye pollock alternating between the eastern Bering Sea and the GOA. Full implementation of this new schedule depends in part on transferring AFSC survey responsibility for the west coast groundfish resources to the Northwest Fisheries Science Center. Currently, the centers are preparing for the transition of responsibilities to be completed by the end of the 2001 triennial cycle. Additional research is under way to further quantify the various sources of bias in the standard bottom trawl tows resulting from fish being herded by the trawl doors into the path of the capture net, the avoidance of fish to escape capture in front of the oncoming trawl, or the escape of fish through the trawl meshes. Although this is a new line of research, considerable progress is being made each year.

In the mid-1960s, a program was initiated at the University of Washington with the support of Washington Sea Grant to develop acoustic technology and survey methods to measure fish abundance. A prototype echo-sounder and echo-integration system was first used by NOAA Fisheries in the mid-1970s to measure the off-bottom (pelagic) component of the west coast Pacific whiting population. Based on the success of this research, standard surveys were designed to assess whiting in 1977 and Bering Sea pollock in 1979 as part of the summer triennial survey (see Figure 4-4 for a survey pattern example). In 1981, a winter acoustic survey was initiated to measure the spawning pollock abundance aggregated in Shelikof Strait. The winter survey was expanded in 1988 to assess spawning pollock concentrated in the Bogoslof Island area. Both surveys have been continued on an annual schedule. In the late 1980s, AFSC invested in second-generation echo-sounder and echo-integration technology. This new system was installed on the NOAA ship *Miller Freeman,* which has served as the principal vessel for AFSC acoustic surveys since then. This new equipment greatly improved the quality and accuracy of acoustic survey data and the capability to calibrate the system and to measure target strength (the acoustic reflectivity of an individual fish used to convert the magnitude of the acoustic echos from fish in the water column to fish density). The quality of the acoustic data was further enhanced by mounting the transducer on the *Miller Freeman*'s centerboard. This amidship location is forward of the noise field generated by propeller cavitation and away from any disturbances created by the air bubbles in the water flow over the ship's hull. This new system greatly enhanced the acoustic data and the capability of an acoustic survey to detect deeper and lower densities of fish. Although the *Miller Freeman* is the primary vessel used by the AFSC acoustic surveys, U.S. scientists frequently conduct surveys in cooperation with research vessels from foreign fisheries agencies. The current AFSC policy when undertaking cooperative acoustic surveys is to conduct a one- to three-day side-by-side survey to estimate intership calibration factors to provide a way to combine results from both vessels into one biomass estimate.

The successful application of acoustic survey technology to assess abundance of midwater, semipelagic marine fish resources requires that target species be the dominant species in the water column. This requirement reduces the problem of signal contamination from other species. In addition, the acoustic system must be routinely calibrated during the course of the survey and in situ target strength measurements must be collected from single individual fish targets of known species, size, and depth. Current acoustic systems cannot determine fish species or fish size, consequently a major component of an acoustic survey is sampling targets with bottom or midwater trawls. The trawl catches are critical for identifying species and collecting biological data (e.g., size, sex, age, maturity, and food habits).

Additional research efforts are needed to collect target strength data for all target species and to understand the effect of vessel and gear noise on the behavior of pollock sampled during acoustic surveys and bottomfishes from area-swept bottom trawl surveys. Statistical research continues to improve survey design so that the survey variance is minimized, considering fish schooling patterns, transect spacing, and continuous collection of acoustic data along the transects. Researchers are assessing the impact of vessel and gear noise on the AFSC acoustic survey for pollock using the *Miller Freeman*. Fish aggregations have been observed to change location and density as a vessel passes or a trawl net approaches. Fish avoidance could create a considerable bias in acoustic estimates of stock biomass, the composition of midwater trawl catches, and even in the catch rates from bottom trawl surveys. The biggest gains in the AFSC acoustic survey strategy will come from increasing the frequency of surveys in the eastern Bering Sea from triennial to biennial, alternating between the Bering Sea and the GOA. The new biennial schedule includes a new summer pollock survey to be conducted synoptically with the new biennial bottom trawl survey (Table 4-3). Currently, there is no summer acoustic survey in the GOA. The implementation of this summer survey in the GOA is hampered by the responsibility of the AFSC to also conduct acoustic surveys for Pacific whiting off the west coast.

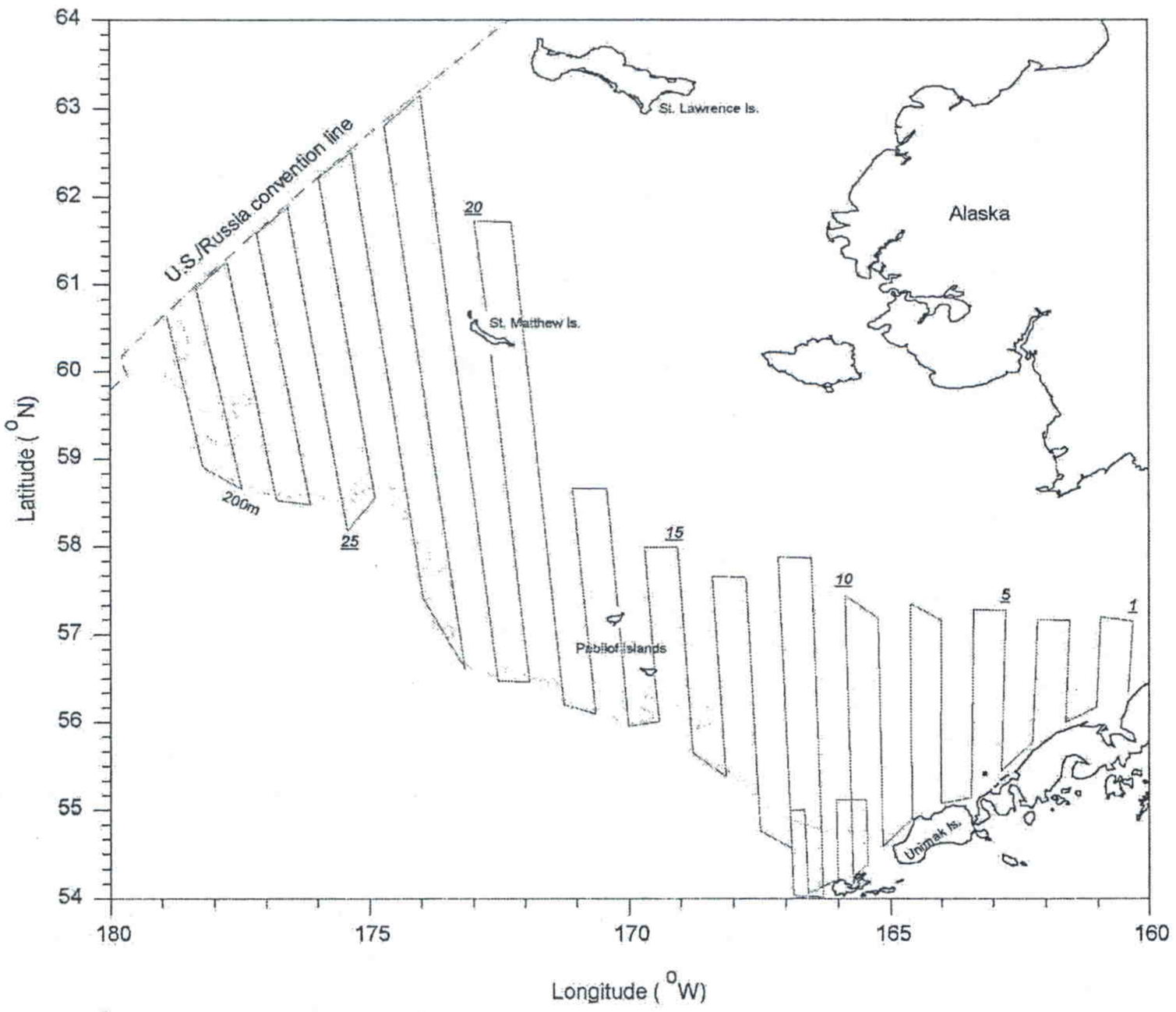


Figure 4-4. Example of a summer acoustic-midwater trawl survey pattern for pollock, eastern Bering Sea. Source NOAA Fisheries.

A preliminary survey effort is needed to determine the feasibility of using acoustic surveys in the GOA during the summer because of the potentially high diversity of other fish and invertebrate species, which could contaminate pollock echos. The Bering Sea survey should be expanded into Russian waters because the Russian fishery has increased in the area immediately to the west of the U.S. EEZ. This survey expansion into Russian waters is critical because pollock stocks are transboundary. Efforts in recent years to expand the survey have failed because the Russian government has refused to grant the *Miller Freeman* permission to enter its waters.

In 1979, Japanese scientists from the National Research Institute of Far Seas Fisheries and AFSC scientists initiated a cooperative longline survey of the groundfish resources of the GOA upper continental slope. Sablefish inhabit the upper slope over a broad depth range extending out beyond 1,000 m. This survey developed into the principal method for measuring sablefish abundance in Alaska. After Japanese scientists withdrew from the cooperative survey, the AFSC initiated a second longline survey using U.S. fishing vessels and gear and a nearly identical survey design (Figure 4-5). A private Japanese fishing company agreed to continue the survey to ensure calibration so the times series for the two surveys could be linked. The two surveys were conducted together, with two vessels surveying the same stations just a few days apart. Design specifications were identical for the two surveys, including skate length, number of hooks per skate, distance between hooks, total number of skates fished per station, and type of bait. The primary difference was the style of hooks. Both surveys were conducted for seven years, 1988–1994, to establish comparative data sets. Subsequent analysis of the paired, observed catch rates showed a nearly identical relationship for the last five years. This consistency in catch rates provided the basis for adjusting the catch rates from the original survey to be comparable to the new U.S. survey, thereby forming one time series of abundance index of 21 years long. This survey is the primary data source for tracking trends in sablefish abundance, and it is used to allocate harvest quotas among fishery management areas. The early U.S. longline survey was restricted to the GOA management areas. In recent years, the survey was lengthened to include the Aleutian Islands area, and in alternate years, the eastern Bering Sea slope region.

Alaska groundfish stock assessment analyses have been ongoing for about 25 years. Increasingly more sophisticated over time, a number of these assessments are now based on complex age-structured models supported by high-speed desktop computers. These models depend on data collected by NOAA Fisheries North Pacific Groundfish Observer Program and groundfish resource assessment surveys. The groundfish surveys conducted off Alaska are probably the most extensive survey effort implemented by a single government agency anywhere in the world. The survey strategy is currently being expanded to an annual/biennial cycle, which will greatly increase the pollock stock monitoring in the eastern Bering Sea, GOA, and Aleutian Islands groundfish stocks. The increased age composition data from expanded surveys will also improve stock assessments and forecasts, particularly for the younger incoming year-classes. Data collection management and observer and resource survey data has been enhanced by modern computer technology, which has expedited the availability of fishery catch data to allow in-season management of harvest quotas and of survey results to within 1 to 3 months. Both survey and catch data now become available in time to incorporate into annual stock assessment updates used to set ABCs for the upcoming fishing season. Furthermore, survey sample sizes are sufficient to provide coefficients of variation for the abundant stocks, which range from about 8 to 12 percent for many flatfish stocks and 20 to 40 percent for most rockfish species. The biennial survey cycle will further increase the overall precision in biomass time series by 20 to 30 percent (Table 4-2). These surveys also provide the best database for identifying essential fish habitat, interspecific interactions, and biodiversity of marine ecosystems.

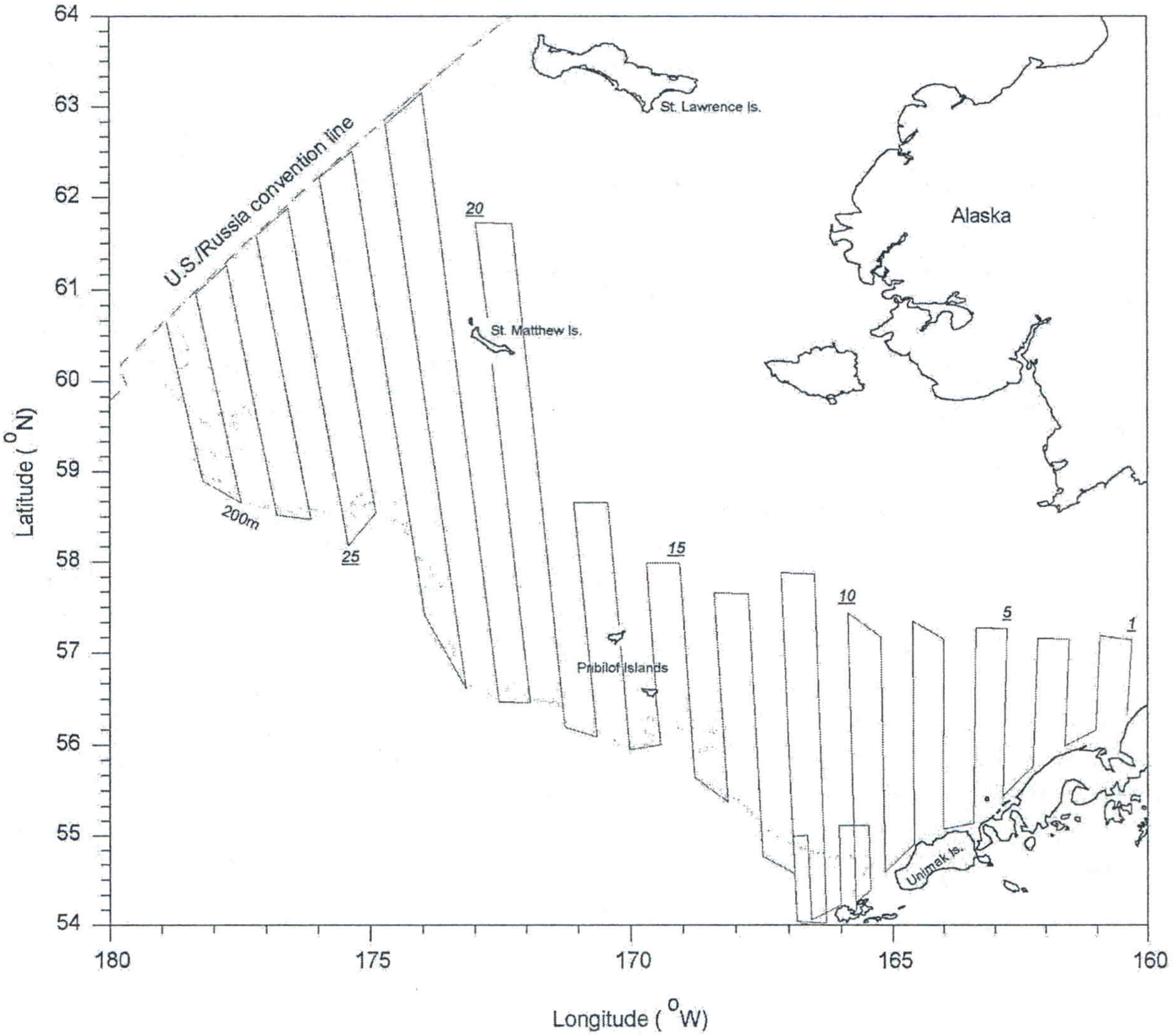


Figure 4-5. Sablefish longline survey station locations for eastern Bering Sea, Aleutian Islands (eastern half), and Gulf of Alaska management areas. Source: NOAA Fisheries.

Table 4-2. Stock assessment survey strategy for the Gulf of Alaska and Bering Sea and Aleutian Islands groundfish resources based on the 1999–2000 biennial cycle.

Survey	Season	Frequency	Number of vessels	Area (square kilometers)	Number of stations or trackline (kilometers)	Days at sea
Bottom trawl surveys						
Bering Sea shelf	Summer	Annual	2	463,000	400	135
Bering Sea slope	Summer	Biennial	1	25,000	100	35
Aleutian Islands shelf	Summer	Biennial	2	66,900	476	140
Gulf of Alaska shelf and slope	Summer	Biennial	3	320,000	870	220
Longline surveys						
Gulf of Alaska slope	Summer	Annual	1	55,500	74	83
Bering Sea slope	Summer	Biennial	1	17,400	16	18
Aleutian Islands slope	Summer	Biennial	1	24,600	14	18
Acoustic surveys						
Bering Sea pollock	Summer	Annual	1	340,000	10,200	60
Bogoslof pollock	Winter	Annual	1	31,000	2,300	11
Shelikof pollock	Winter	Annual	1	38,000	1,700	15

Non-Target Species Surveys and Data Collection Programs

There is no way to assess whether there have been trends in catch per unit effort for individual non-target species over the course of the fisheries or whether there have bene trends in the size or age composition of a particular non-target species caught by fisheries, each of which could be important indicators of population status. Nevertheless, the information on non-target species catch quantity and location collected by observers is integral to all of the following analyses.

4.2 Derivation of Overfishing Level and Acceptable Biological Catch

The overfishing level (OFL) for a stock is the fishing mortality rate that reduces the level of spawning biomass per recruit to some percentage of the original, pristine level. In contrast, ABC is the calculated level of the sustainable harvest of a stock. Values for the OFL and ABC are developed according to definitions prescribed by Amendments 56/56 to the BSAI and GOA Groundfish FMPs (see Appendices C and D). These definitions are governed by the MSA and the National Standard Guidelines. The most recent revision of the National Standard Guidelines was published May 1, 1998, reflecting changes resulting from passage of the SFA on October 11, 1996. Two pieces of relevant statutory language are:

- Section 3(29) of the MSA defines overfishing as "a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the MSY (i.e., the largest average catch or yield that can continuously be taken under existing environmental conditions) on a continuing basis."

- Section 303(1)(10) of the MSA mandates that all FMPs "specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which NPFMC or the Secretary has determined is approaching an overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery."

The National Standard Guidelines interpret the above mandate as requiring that each FMP specify, to the maximum extent possible, a pair of objective and measurable "status determination criteria" for each stock or stock complex covered by that FMP. One of these criteria is the maximum fishing mortality threshold (MFMT), equivalent to OFL in the BSAI and GOA Groundfish FMPs. Exceeding the MFMT for a period of one year or more constitutes overfishing. The other status determination criterion is the minimum stock size threshold (MSST), which is covered in Section 4.4.

The National Standard Guidelines also draw a distinction between limit reference points, such as OFL which management seeks to *avoid*, and target reference points, such as OY, which management seeks to *achieve* (ABC is another example of a target reference point). OY is the amount of fish that will 1) provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities, 2) is prescribed as such on the basis of MSY from the fishery, and 3) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY. The National Standard Guidelines endorse a precautionary approach to setting target reference points, an approach characterized by three features:

1. Target reference points, such as OY, should be set safely below limit reference points, such as the fishing mortality rate (F) or level defined by the status determination criteria.

2. A stock that is below its MSY level should be harvested at a lower rate than if the stock were above its MSY level.

3. Criteria used to set target catch levels should be explicitly risk-averse, so that greater uncertainty regarding the status or productive capacity of a stock corresponds to greater caution in setting target catch levels.

The National Standard Guidelines' characterization of a precautionary approach was modeled upon the definitions of OFL and ABC found in the then-current BSAI and GOA Groundfish FMPs. The NPFMC approved modifications to these definitions in June 1998 for the purpose of bringing them into compliance with changes mandated by passage of the SFA.

4.2.1 Acceptable Biological Catch

Acceptable biological catch is a preliminary description of the acceptable harvest (or range of harvests) for a given stock complex. Its derivation focuses on the status and dynamics of the stock, environmental conditions, other ecological factors, and prevailing technological characteristics of the fishery. The fishing mortality rate used to calculate ABC is capped as described under Section 4.2.2.

4.2.2 Overfishing

Overfishing is defined as any amount of fishing in excess of a prescribed maximum allowable rate (e.g., OFL or MFMT). The OFL and ABC are calculated through a set of six tiers. These tiers organize each stock according to data availability and are arranged in descending order, the first tier being the most data-rich.

The data-rich category (Tier 1) usually include reliable estimates of MSY-related quantities, current stock size, the constant fishing mortality rate which results in the MSY (F_{MSY}) and the corresponding average spawning biomass (B_{MSY}). The stock assessments may be advanced and take uncertainty into account. The NPFMC's Science and Statistical Committee (SSC) will have final authority for determining whether a given item of information is "reliable" for the purpose of this definition, and may use either objective or subjective criteria for such determinations.

In cases where stock data are unavailable or inaccurate, MSY control rules may be used. These rules give management some flexibility and control when reliable fishing mortality rates and/or average spawning biomass information is unavailable. MSY control rules are used to set the criteria for determining whether a stock is being overfished or the stock is in a overfished condition, and enable the use of proxies. Proxies are established according to the National Standard Guidelines and the NOAA technical guidance report (Restrepo *et al.* 1998).

Tier 1 ABC and OFL values are calculated according the mean of the probability density function (pdf) (the statistical distribution of F_{MSY}). For Tiers 1-3, the coefficient *a* is set at a default value of 0.05, with the understanding that the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information.

Data-moderate cases may include unreliable or limited MSY-related quantities, incomplete life history, and inconsistent data or recruitment, but reliable estimates of current stock size (B) and all necessary life history and fishery parameters. For Tiers 2- 4, a designation of the form "$F_{X\%}$" ($F_{\%SPR}$) refers to the fishing mortality rate (F) associated with a stable level of spawning per recruit which is equal to a percentage of the level of spawning per recruit at equilibrium when no fishing has taken place. By way of the MSY control rule, these fishing mortality rates act as proxies to the Tier 1 definitions (mean of pdf), and have been developed to achieve approximately the same results. The fishing mortality rates differ among tiers (2-4), and are chosen based on the information available. $F_{20\%}$ has been used to calculate thresholds for well-known stocks with high resilience and $F_{30\%}$ for less well-known stocks with relatively high resilience. $F_{35\%}$ has been advocated

for stocks with average resilience and $F_{50\%}$ to $F_{60\%}$ may serve as proxies for stocks with very low productivity. However, much of the work on $F_{\%SPR}$ may not be a viable assumption for long-lived species and those with low reproductive output. The OFL definitions for Tiers 1-3 are equivalent to MSY control rules based on constant fishing mortality when stocks are above reference levels, but are substantially more conservative than an MSY control rule based on constant fishing mortality when stocks are below reference levels. Tier 4 OFL definition is equivalent to MSY control rule based on constant fishing mortality.

Data-poor cases lack much of the essential information including current stock size, fishing mortality rates, and life history information. Stock assessment data is incomplete, and measurements of uncertainty may be qualitative rather than quantitative. For Tiers 5 and 6, ABC and OFL are calculated according to *M* and reliable historical catch data. The OFL definitions in Tier 5 are equivalent to MSY control rule based on constant fishing mortality, while Tier 6 OFL definitions are equivalent to MSY control rule based on constant catch.

Equations Used to Derive OFL and ABC in the Respective Tiers

1. *Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.*

   1a. *Stock status:* $B/B_{MSY} > 1$

   $F_{OFL} = m_A$, the arithmetic mean of the pdf

   $F_{ABC} \le m_H$, the harmonic mean of the pdf

   1b. *Stock status:* $a < B/B_{MSY} \le 1$

   $F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$

   $F_{ABC} \le m_H \times (B/B_{MSY} - a)/(1 - a)$

   1c. *Stock status:* $B/B_{MSY} \le a$

   $F_{OFL} = 0$

   $F_{ABC} = 0$

2. *Information available: Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{35\%}$, and $F_{40\%}$.*

   2a. *Stock status:* $B/B_{MSY} > 1$

   $F_{OFL} = F_{MSY}$

   $F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%})$

   2b. *Stock status:* $a < B/B_{MSY} \le 1$

   $F_{OFL} = F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$

   $F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - a)/(1 - a)$

   2c. *Stock status:* $B/B_{MSY} \le a$

   $F_{OFL} = 0$

   $F_{ABC} = 0$

3. *Information available: Reliable point estimates of B, $_{40\%}$, $F_{35\%}$, and $F_{40\%}$.*

   3a. *Stock status:* $B/_{40\%} > 1$

   $F_{OFL} = F_{35\%}$

   $F_{ABC} \le F_{40\%}$

   3b. *Stock status:* $a < B/_{40\%} \le 1$

   $F_{OFL} = F_{35\%} \times (B/_{40\%} - a)/(1 - a)$

   $F_{ABC} \le F_{40\%} \times (B/_{40\%} - a)/(1 - a)$

   3c. *Stock status:* $B/_{40\%} \le a$

   $F_{OFL} = 0$

   $F_{ABC} = 0$

4. *Information available: Reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.*

   $F_{OFL} = F_{35\%}$

   $F_{ABC} \leq F_{40\%}$

5. *Information available: Reliable point estimates of B and natural mortality rate M.*

   $F_{OFL} = M$

   $F_{ABC} \leq 0.75 \times M$

6. *Information available: Reliable catch history from 1978 through 1995.*

   OFL = the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information

   $ABC \leq 0.75 \times OFL$

4.3 Specification of Total Allowable Catch

The FMPs divide the fish species likely to be taken in the groundfish fishery into four categories. The OY is applied to all categories except the "prohibited species" category. OY is the amount of fish that will 1) provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities, 2) is prescribed as such on the basis of MSY from the fishery, and 3) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY.

- **Target Species**. Those species that are commercially important and for which a sufficient database exists that allows each to be managed on its own biological merits. Accordingly, a specific TAC is established annually for each target species. Catch of each species must be recorded and reported. This category includes pollock, Pacific cod, yellowfin sole, Greenland turbot, arrowtooth flounder, rock sole, other flatfish, sablefish, Pacific ocean perch, other rockfish, Atka mackerel, and squid.

- **Other Species**. Species groups that are currently of little economic value and not generally targeted. This category contains species with economic potential or which are important ecosystem components, but sufficient data are lacking to manage each separately. Accordingly, a single TAC applies to this category as a whole. Catch of this category as a whole must be recorded and reported.

- **Non-specified Species**. Those species and species groups of no current economic value taken by the groundfish fishery only as incidental catch. Virtually no data exist that would allow population assessments. No record of catch is necessary. The TAC for this category is the amount that is taken incidentally while fishing for target and other species, whether retained or discarded.

- **Prohibited Species**. Those species and species groups whose catch must be returned to the sea with minimum injury, except when their retention is authorized by other applicable law. Groundfish species and species groups for which the quotas have been achieved are treated in the same manner as prohibited species.

The NPFMC may set a maximum catch quota, the TAC, for target and other species, either by individual species or groups of species. The groupings are based on commercial importance of a species or species group and whether sufficient biological information is available to manage a species or species group on its own biological merits. Catch specifications are made for each managed species or species group, and in some cases, by species and subarea. Because both BSAI and GOA FMPs have OY ranges for the aggregate groundfish target species, any of the target species assemblages can be assembled/disassembled during the annual TAC-setting process. Over the years, NPFMC has done such disassembling several times. For example, in the BSAI, arrowtooth flounder were combined with Greenland turbot, but broken out separately in 1986. Rock sole were combined with "other flatfish" but broken out separately in 1989. Red rockfish were combined with "rockfish" but broken out separately in 1991, and further broken out into sharpchin/northern and shortraker/rougheye rockfish in a subsequent year. Such disassembling can only occur with the target species category. The "other species" category requires an FMP Amendment to break out a species and make it a target species category, as does the non-specified species category. An FMP Amendment would be required to make a non-specified species a target species.

For example, in 1999, FMP Amendments 63/63 were initiated to remove the shark and skate species groups from other species in both the BSAI and GOA to better protect these vulnerable, long-lived species (NPFMC 1999). Based on the 1999 stock assessments for other species, the Plan Teams recommended that all other species be considered in an expanded FMP Amendment to establish TACs at the species group level. While this amendment was being revised, NPFMC recommended to NOAA Fisheries that other species be placed on bycatch only status to prevent a directed fishery from developing in the interim. NOAA Fisheries determined that it did not have regulatory authority for such an action; therefore, aggregate other species TACs remain in place in the BSAI and the GOA despite efforts to limit directed fisheries and develop more protective management within this category. Final action on the revised plan amendments to set other species as bycatch only and to re-define the GOA TAC setting process will be scheduled in 2001.

The TAC specifications define upper harvest limits, or fishery removals, for the next fishing year. The sum of the TAC specifications is important because the FMPs specify the upper and lower ceilings for total TAC in each management area. In the BSAI, the lower limit is 1.4 million mt and the upper limit is 2 million mt (50 CFR 679.20(a)(1)(I)). In the GOA, the lower limit is 116,000 mt and the upper limit is 800,000 mt (50 CFR 679.20(a)(1)(ii)).

Suballocations of TAC are made for biological and socioeconomic reasons according to percentage formulas established through FMP Amendments. For particular target fisheries, TAC specifications are further allocated within management areas (eastern, central, and western Aleutian Islands; Bering Sea; western, central, and eastern GOA) among management programs (open access or CDQ Program), processing components (inshore or offshore), specific gear types (trawl, non-trawl, hook-and-line, pot, jig), and seasons according to regulations 50 CFR 679.20, 50 CFR 679.23, and 50 CFR 679.31.

Suballocations of TAC to the various gear groups, management areas, and seasons are made according to regulation driven formulas or, for discretionary allocations, according to Secretary of Commerce-approved specifications. NOAA Fisheries uses in-season management authority to open and close the fisheries (50 CFR 679.25). The entire TAC amount is available to the domestic fishery (50 CFR 679.20). The gear authorized in the federally managed groundfish fisheries off Alaska includes trawl gear, fixed-gear, longline gear, pot gear, and non-trawl gear (50 CFR 679.2).

Fishing areas correspond to the defined regulatory areas within the fishery management units. The BSAI is divided into 16 reporting areas (Figure 4-6), some of which are combined for TAC specification purposes. The Aleutian Islands group comprises regulatory Areas 541, 542, and 543. Referred to individually, 541 represents the eastern Aleutian Islands, 542 the central Aleutian Islands, and 543 the western Aleutian Islands. The GOA is divided into seven reporting areas (Figure 4-7): the western Gulf is Area 610, the central Gulf includes Areas 620 and 630, and the eastern Gulf includes Areas 640 and 650. Area 649 is state waters in Prince William Sound: Area 659 is state waters in southeast Alaska.

Fisheries are opened and closed by regulatory announcement. Closures are made when in-season information indicates the apportioned TAC or available PSC has been or will soon be reached, or at the end of the specified season if the particular TAC has not been taken (50 CFR 679.25).

4.3.1 Annual Promulgation of TAC

Establishing harvest specification rules is required for federal groundfish fisheries to run from one fishing year to the next. Specifying TAC and PSC limits follows the fishery regulation rule-making process. To conform with rule-making requirements, particularly those originating from the Administrative Procedures Act concerning standards for prior public review and input, three separate rules are published per management area, per year. The publications are first, proposed specifications, then interim specifications, and finally, final specifications. This three-part process has been in place, with various refinements, since implementation of the FMPs. The process is summarized in Table 4-3.

Proposed Specifications

Proposed ABC, TAC, and PSC[1] specifications are recommended by NPFMC at its October meeting and published in the FR for public review and comment. The recommendations are based on the preliminary Stock Assessment and Fishery Evaluation reports prepared by NPFMC's BSAI and GOA Plan Teams during and subsequent to their September meetings. Any new data on stock levels obtained from the previous summer's surveys are generally not yet in a useable form; therefore, the proposed specifications are based on previous year's data. Preliminary Stock Assessment and Fishery Evaluation reports are incorporated into the environmental analysis accompanying the proposed specifications rule. The Plan Teams' meetings and NPFMC meeting are open public meetings. The NPFMC also solicits public comment on the proposed TAC specifications during its October meeting.

Drafting, review, clearance, and FR publication of proposed ABCs, TACs, and PSC limits takes approximately two months. In 1999, for example, NPFMC met and recommended proposed year 2000 specifications on October 17, 1999, and the proposed specifications were published December 13, 1999. December 13, 1999 was the first day of the 30-day public comment period required under Administrative Procedures Act.

[1]BSAI crab and herring and GOA halibut only; BSAI PSC limits for halibut and salmon are established in regulations (50 CFR 679.21.)

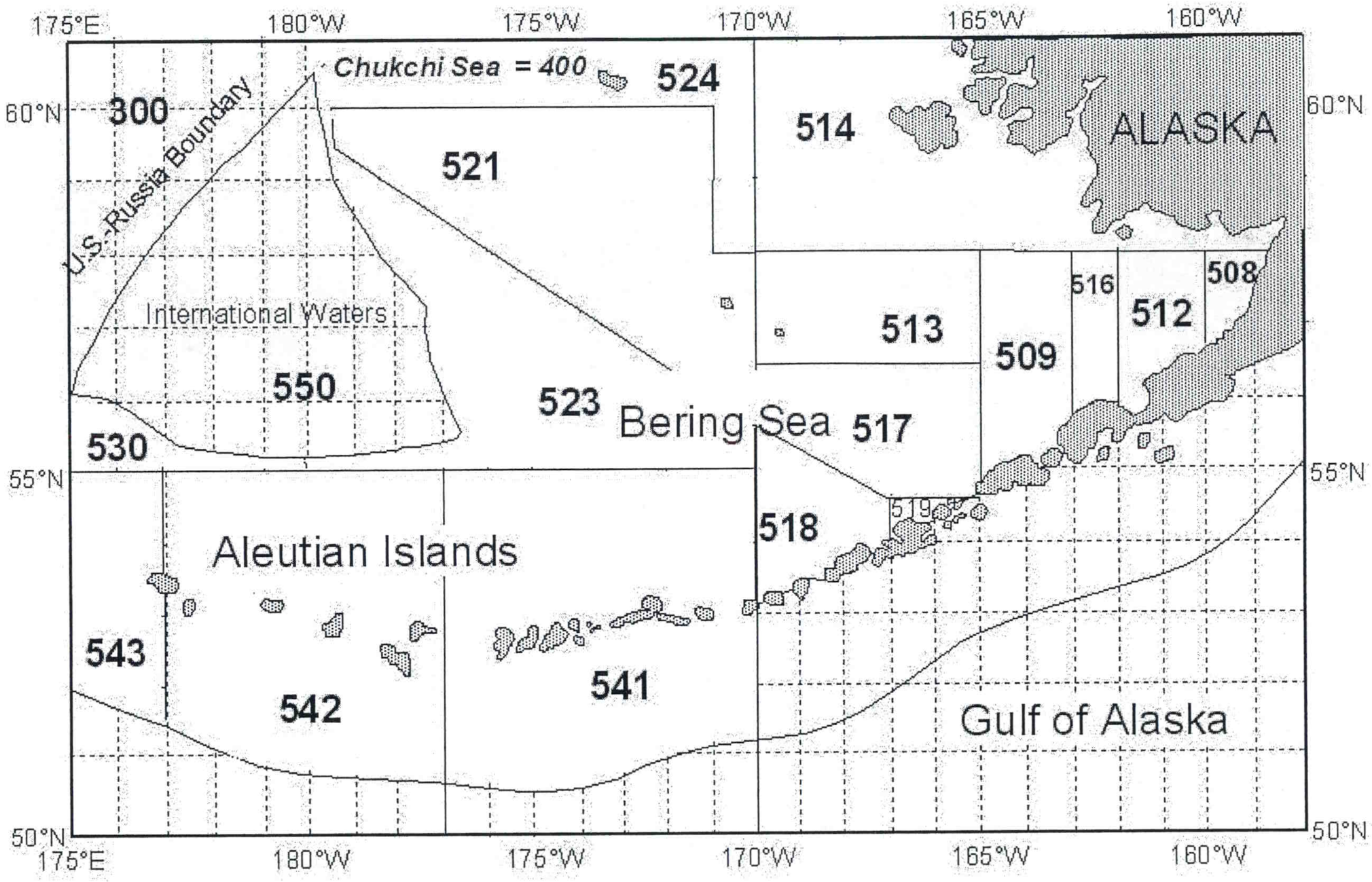


Figure 4-6. Bering Sea and Aleutian Islands statistical and reporting areas. Source: NOAA Fisheries.

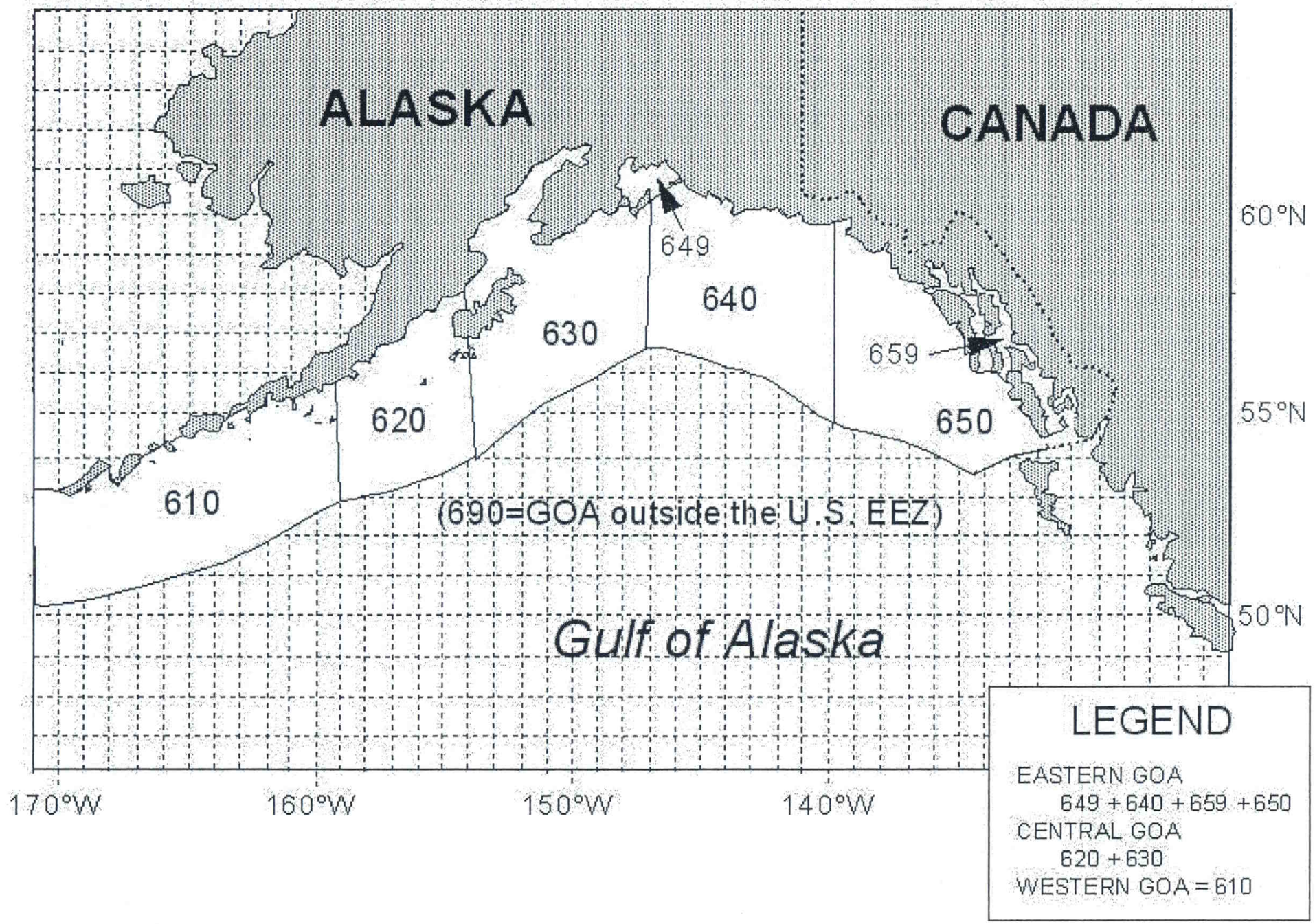


Figure 4-7. Gulf of Alaska statistical and reporting areas. Source: NOAA Fisheries.

Table 4-3. Steps and time line for annual total allowable catch specifications and prohibited species catch limit rules.

Month	Step in the process
September	Stock assessment authors provide Groundfish Plan Teams with proposed acceptable biological catch (ABC) recommendations. Groundfish Plan Teams provide scientific and statistical committee (SSC), advisory panel (AP), and North Pacific Fishery Management Council (NPFMC) proposed ABC recommendations.
October	NPFMC recommends proposed ABC, total allowable catch (TAC) specifications, and prohibited species catch (PSC) limits.
November	Specifications are published as proposed rule.
December	Interim specifications are published as a final rule. Groundfish Plan Teams provide final ABC recommendations. NPFMC recommends final ABC, TAC specifications, and PSC limits.
January	Non-trawl groundfish fisheries open January 1, and trawl fisheries open January 20 under interim specifications.
February-March	Final specification are published as final rule and replace interim specifications.

Interim Specifications

Interim TAC specifications are mathematical determinations authorizing one-fourth of each proposed interim TAC and apportionment thereof, one-fourth of each PSC allowance and the first seasonal allowance of BSAI and GOA pollock and BSAI Atka mackerel to be in effect on January 1 on an interim basis and to remain in effect until superceded by final specifications. NOAA Fisheries publishes the interim specifications in the FR as soon as practicable after the October NPFMC meeting. In 1999, for example, the year 2000 interim TAC specifications were published January 3, 2000. Retention of sablefish with fixed gear is not currently authorized under interim specifications. Further, existing regulations do not provide for an interim specification for the CDQ non-trawl sablefish reserve or for an interim specification for sablefish managed under the IFQ program.

Final Specifications

Final TAC and PSC specifications are recommended by NPFMC at its December meeting. The recommendations are based on Stock Assessment Fishery Evaluation reports prepared by NPFMC's BSAI and GOA Groundfish Plan Teams during and subsequent to their November meetings. Final Stock Assessment Fishery Evaluation reports are incorporated into the environmental analysis accompanying the final rule (NMFS 1999). The Groundfish Plan Team meetings and NPFMC meetings are open public meetings. The NPFMC solicits public comment on the proposed TAC specifications during its December meeting. Finalizing specifications takes approximately two months. For example for year 2000 final specifications, NPFMC met December 7 through 12, 1999, and recommended final TAC specifications and PSC limits that were published in the FR February 18, 2000.

While the above is an accurate description of the TAC-setting process to date, it is known to have flaws. The proposed specifications are outdated by the time they are published and the public has a formal opportunity to comment on them.

The NPFMC recommended a revision of the TAC-setting process in 1996 (BSAI/GOA FMP Amendments 48/48), but technical difficulties pertaining to the timing and completion of analyses required by NEPA, RFA, and other statutes have delayed a regulatory amendment that would implement a revised TAC-setting process. A new draft analysis to revise the process was presented to NPFMC in June 2000 (Draft EA/RIR/IRFA For Amending the Process by Which TAC Specifications Are Established For Alaska Groundfish Fisheries, NOAA Fisheries, May 25, 2000). If approved, a revised TAC-setting process for the 2002 fishing year would likely not be in effect until 2001.

4.3.2 Stock Assessment Information

The flow of new target species stock assessment information through the process starts when the AFSC stock assessment authors make ABC and OFL recommendations. For most species and species groups, the timing of new survey information that would lead to new calculations of ABC and OFL is after deadlines for the preliminary Stock Assessment Fishery Evaluation. The information is first available to the Plan Teams at their November meetings and, therefore included in the final Stock Assessment Fishery Evaluation. For species and species groups not receiving new stock survey information, the prior year's ABC and OFL recommendations are documented in the preliminary and final Stock Assessment Fishery Evaluation reports.

4.3.3 Role of Plan Teams, Scientific and Statistical Committee, Advisory Panel, and North Pacific Fishery Management Council, and the Secretary of Commerce in Total Allowable Catch Specifications

The role of NPFMC-appointed Groundfish Plan Teams is to make ABC and OFL recommendations, which may be different from that of the stock assessment author. These recommendations are also documented in the Stock Assessment Fishery Evaluation reports.

The role of NPFMC's Scientific and Statistical Committee is to make proposed ABC and OFL recommendations at the October NPFMC meeting and final recommendations at the December NPFMC meeting. These recommendations are documented in NPFMC meeting minutes.

The role of NPFMC's Advisory Panel is to recommend TAC specifications and PSC limits to NPFMC. The Advisory Panel's TAC recommendations must acknowledge the Plan Teams' and Science and Statistical Committee's ABC recommendations to ensure their recommended TAC is not higher than an ABC recommendation.

The NPFMC makes the last run at determining ABC and recommending proposed and final TAC specifications and PSC limits. The proposed specifications are made at the October meeting and the final specifications at the December meeting. NPFMC action taken during public meetings, is informed through the Stock Assessment Fishery Evaluation reports, which are part of an environmental analysis prepared according to National Environmental Policy Act regulations.

Since 1991, an environmental assessment has been prepared each year on TAC specifications. The environmental assessment is used in the decision-making process and accompanies the specification rules through regulatory review and filing with the Office of the FR.

NOAA Fisheries packages NPFMC recommendations into proposed or final rule specification documents and forwards them to the Secretary of Commerce for approval. Secretarial approval of final specifications usually occurs by March.

Because some fisheries would be under way before the final specifications approval, an interim specifications rule is published on or before January 1 by the Secretary of Commerce. The interim specifications implement one-fourth of the proposed TAC specifications and apportionments thereof toward fisheries occurring in the first quarter of the calendar year (50 CFR 679.20(c)(2)). Upon approval, the new TAC specifications replace the preliminary TAC specifications (50 CFR 679.20(c)(3)).

4.4 Derivation of Minimum Stock Size Threshold

The National Standards Guidelines require that each FMP specify, to the maximum extent possible, objective and measurable status determination criteria for each stock or stock complex covered by the FMP, provide an analysis of how the status determination criteria were chosen, and describe how they relate to reproductive potential. One such criterion is the MFMT, equivalent to OFL in the BSAI and GOA Groundfish FMPs. Exceeding the MFMT for a period of one year or more constitutes *overfishing*. The second status determination criterion is the MSST, which has no equivalent in the BSAI and GOA Groundfish FMPs. If a stock falls below its MSST, it is considered *overfished*.

Although MSSTs are not specified by the BSAI and GOA Groundfish FMPs, the fact that their use is required by the National Standard Guidelines resulted in their becoming a standard component of the Stock Assessment Fishery Evaluation reports prepared in 1999 for the 2000 fishery[2]. To evaluate stocks with respect to their minimum stock size thresholds, the 1999 SAFE Reports contained two sets of projections for each stock managed under Tiers 1, 2, or 3 of Amendments 56/56. The two sets of projections were distinguished by the harvest scenario assumed (see the following). For each harvest scenario, the projections began with the vector of 1999 numbers at age estimated in the respective assessment. This vector was then projected forward to the beginning of 2000 using the schedules of natural mortality and selectivity described in the assessment and the best available estimate of total catch for 1999. In each subsequent year, the projected fishing mortality rate was prescribed on the basis of the spawning biomass in that year and the respective harvest scenario. In each year, projected recruitment was drawn from a distribution whose parameters consisted of maximum likelihood estimates determined from the time series of recruitments estimated in the assessment. Because an environmental regime shift appears to have occurred around 1977 (see Section 3 for more information), only year-classes spawned after 1976 were included in this time series. Projected spawning biomass was computed in each year based on the time of peak spawning and the maturity and weight schedules described in the assessment. Total catch was assumed to equal the catch associated with the respective harvest scenario in all years. This projection scheme was run 1,000 times to obtain distributions of possible future stock sizes, fishing mortality rates, and catches.

The harvest scenarios used in the two sets of projections were as follows (maximum F_{ABC} refers to the maximum permissible value of F_{ABC} under Amendment 56): (For information regarding the derivation of OFL and ABC, see Section 4.2)

- *Scenario 1*: In all future years, F is set equal to F_{OFL}.
- *Scenario 2*: In 2000 and 2001, F is set equal to $max\ F_{ABC}$, and in all subsequent years, F is set equal to F_{OFL}.

[2]The proxy for MSSTs as described in the FR notice announcing the approval of Amendments 56/56 proved unworkable and NOAA Fisheries relied on the procedure described in this section for specifying MSSTs for the 2000 fishing year.

Harvest scenarios 1 and 2 were used to determine the status of each stock with respect to its MSST as follows (for Tier 3 stocks, the MSY level is defined as $_{35\%}$):

- Is the stock overfished? This depends on the stock's estimated spawning biomass in 2000:
  - If spawning biomass for 2000 is estimated to be below ½ B_{MSY}, the stock is below its MSST
  - If spawning biomass for 2000 is estimated to be above B_{MSY}, the stock is above its MSST
  - If spawning biomass for 2000 is estimated to be above ½ B_{MSY} but below B_{MSY}, the stock's status relative to MSST is determined by referring to harvest scenario #1. If the mean spawning biomass for 2010 is below B_{MSY}, the stock is below its MSST. Otherwise, the stock is above its MSST

- Is the stock approaching an overfished condition?

  This is determined by referring to harvest scenario #2:
  - If the mean spawning biomass for 2002 is below ½ B_{MSY}, the stock is approaching an overfished condition
  - If the mean spawning biomass for 2002 is above B_{MSY}, the stock is not approaching an overfished condition
  - If the mean spawning biomass for 2002 is above ½ B_{MSY} but below B_{MSY}, the determination depends on the mean spawning biomass for 2012. If the mean spawning biomass for 2012 is below B_{MSY}, the stock is approaching an overfished condition. Otherwise, the stock is not approaching an overfished condition

It is currently considered impossible to evaluate the status of stocks in Tiers 4 through 6 with respect to their MSSTs because stocks qualify for management under these tiers only if reference stock levels (such as MSST) cannot be reliably estimated.

Section 5 Groundfish Fishery Descriptions

5.1 Pollock

The pollock fishery is a single species target fishery. Directed fishing for pollock is conducted entirely with trawl gear. Most of the pollock is harvested by vessels using pelagic (or midwater) trawl gear, a much smaller amount is harvested by vessels using by bottom (non-pelagic) trawl gear. Other gear types incidentally take pollock in other fisheries in relatively small amounts.

BSAI

In 2002, almost 1,500,000 mt of pollock were harvested in the eastern Bering Sea (assuming that the full TAC was taken) and about 1,000 mt (as of Oct 19, 2002) in the Aleutian Islands (NPFMC 2002a). In 2001, about 1,390,000 mt were harvested in the BSAI by 104 catcher vessels and 16 catcher processors. (Hiatt *et al.* 2002, Economic Status of the Groundfish Fisheries off Alaska 2001, Appendix D of NPFMC 2002a). Of this catch, over 1,330,000 mt of pollock were taken by pelagic trawls in the directed fishery with about 16,000 mt taken by bottom trawls in the BSAI (Hiatt *et al.* 2002). In that same period, an additional 138,000 mt of pollock was taken as incidental catch in other directed groundfish fisheries, mostly by vessels using trawl gear targeting yellowfin sole (16,000 mt).

Bycatch of non-targeted species in the directed pollock fishery using pelagic trawl gear is comparatively low by weight of the targeted pollock. Prohibited species may not be retained, unless they are donated to charitable food banks (50 CFR 679.26). The incidental catch of other groundfish species and prohibited species catch by vessels using pelagic and bottom trawl targeting pollock in 2001 is presented in the Hiatt *et al.*(2002). Incidental catch of salmon is highest in the pollock fishery with about 85,000 salmon (about 31,000 of which are chinook) taken . Bycatch of other prohibited species such as halibut (51 mt in the bottom trawl pollock fisheries and 164 mt in the pelagic fisheries), herring (2 mt in the bottom trawl and 224 mt in pelagic) and crab (king, bairdi, and tanner; about 50,000 ind. total), has been documented for 2001.

The pattern of the modern pollock fishery in the BSAI is to focus on a winter, spawning-aggregation fishery. This is termed the "A" fishery with an opening on January 20th. This season lasts about 4-6 weeks depending on the catch rates. Since 1992, the "B" season (typically September-October) fishery has been conducted to a greater extent west of 170°W longitude than previously (Ianelli *et al.* 1998). Fishing is closed for pollock in all areas from November 1 to January 20. Fishing is also closed around designated rookeries and haulouts out to 20 nm in the Bering Sea. The Bering Sea pollock TAC is allocated 40 percent to the combined A/B seasons and 60 percent to the combined C/D seasons. Half of the 40 percent allocation to the A/B season (i.e., 20 percent) can be taken inside the SCA during the combined A and B seasons, with 15 percent allocated to the A and 5 percent to the B. The 60 percent TAC allocation to the C/D season is similarly apportioned by area inside and outside the SCA, except that a maximum of 4.5 percent.

In addition to these allocations, under the AFA, 10 percent of the Bering Sea annual pollock TAC is allocated to the CDQ sector, 5 percent of the remainder is removed for bycatch allowance in other fisheries, and the remainder is subdivided among catcher processors (40 percent), motherships (10 percent), and the inshore sector (50 percent). To prevent competition among sectors, the allocation of pollock TAC to each sector is managed by season and area.

Disentangling the specific changes in the temporal and spatial dispersion of the eastern Bering Sea pollock fishery resulting from Steller Sea Lion Protection Measures and from implementation of the AFA is difficult. An example of the allocation of Bering Sea pollock under the AFA is shown in Table 5-1 using a hypothetical allocation of a 1 million mt pollock TAC for the Bering Sea subarea and the percentage formulas contained in the AFA. Within the sectors, the catcher processors and inshore and offshore catcher vessels have formed pollock fishery cooperatives that contribute to rationalizing the fishery by reducing the pace of harvest, increasing the fishing seasons, and facilitating overall management of the fishery.

GOA

The fishery for pollock in the GOA is entirely shore-based with about 90 percent of the catch taken using pelagic trawls. During winter, fishing effort usually targets pre-spawning aggregations in Shelikof Strait and near the Shumagin Islands . Fishing areas in summer are less predictable, but fishing typically occurs on the east side of Kodiak Island and in nearshore waters along the Alaska Peninsula.

In 2002, over 53,000 mt of pollock were harvested in the GOA (assuming that the full TAC was taken) (NPFMC 2002a). In 2001, the most recent year for which vessel data is available, about 70,000 mt of pollock were taken by 83 catcher vessels and no catcher processors in the GOA (Hiatt *et al.* 2002). Of this catch, about 42,000 mt of pollock were taken by pelagic trawls in the directed fishery with about 27,000 mt taken by bottom trawls in the BSAI (Hiatt *et al.* 2002). In that same period, an additional 2,400 mt of pollock was taken as incidental catch in other directed trawl groundfish fisheries.

Since 1992, the GOA pollock TAC has been apportioned spatially and temporally to reduce impacts on Steller sea lions. The Steller Sea Lion Protection Measures implemented in 2001 establish four seasons in the Central and Western GOA beginning January 20, March 10, August 25, and October 1, with 25 percent of the total TAC allocated to each season. In addition, a new harvest control rule was implemented that requires a cession of fishing when spawning biomass declines below 20 percent of unfished stock biomass.

Bycatch of non-targeted species in the directed pollock fishery using pelagic trawl gear is comparatively low by weight of the targeted pollock. Prohibited species may not be retained, unless they are donated to charitable food banks (50 CFR 679.26). The incidental catch of other groundfish species and prohibited species catch by vessels using pelagic and bottom trawl targeting pollock in 2001 is presented in the Hiatt *et al.*(2002). Bycatch of salmon is highest in the pollock fishery with about 12,000 salmon (about 10,000 of which are chinook) taken . Bycatch of other prohibited species such as halibut (72 mt in the bottom trawl pollock fisheries and 16 mt in the pelagic fisheries), herring (4 mt in the bottom trawl and 3 mt in pelagic) and bairdi crab (about 9,000 ind. and 6,000 ind. in the bottom and pelagic trawl fisheries respectively), has been documented for 2001.

Table 5-1. Sector-specific Bering Sea subarea pollock total allowable catch allocation procedures using a hypothetical Bering Sea subarea pollock total allowable catch of 1 million metric tons.

Allocation of Bering Sea subarea pollock total allowable catches (TACs) under Alternative 2	Hypothetical allocations (metric tons)	% of Bering Sea and Aleutian Islands (BSAI)
Step 1: Establish TAC for the Bering Sea Subarea. Separate TACs are established for the Bering Sea Subarea and Aleutian Islands Subarea. In this hypothetical example, the Bering Sea Subarea pollock TAC is set at 1 million mt.	1,000,000	100
Step 2: Allocate 10 Percent of TAC to community development quota (CDQ). Under the AFA, 10 percent of the Bering Sea and Aleutian Islands Subarea TACs are allocated to the Western Alaska CDQ program.	100,000	10
Step 3: Establish incidental catch allowance (ICA). Establish an ICA to account for incidental catch of pollock in other groundfish fisheries. Approximately 5 percent in recent years.	50,000	5
Step 4: Establish directed fishing allowance (DFA). Establish the DFA for the pollock target fisheries. The DFA is the TAC minus the CDQ and ICA amounts.	850,000	85
Step 5: Allocate 40 Percent of DFA to catcher processor sector. Under the AFA, the catcher processor sector is allocated 40 percent of the DFA. In addition, not less than 8.5 percent of the catcher processor sector DFA is allocated to catcher vessels delivering to catcher processors, and the unlisted AFA catcher processors are limited in the aggregate to 0.5 percent of the catcher processor sector DFA.		
Catcher processor sector DFA (40 percent)	340,000	34
Catcher processor sector catcher vessel set-aside (8.5 percent)	28,900	2.89
Unlisted AFA catcher processors (0.5 percent)	1,700	0.17
Step 6: Allocate 10 Percent of DFA to mothership sector. Under the American Fisheries Act (AFA), the mothership sector is allocated 10 percent of the DFA.	85,000	8.5
Step 7: Allocate 50 Percent of DFA to inshore sector. Under the AFA, the inshore sector is allocated 50 percent of the DFA. The inshore sector allocation is further divided into allocations to individual inshore catcher vessel cooperatives and to the open access inshore sector, which is composed of AFA inshore catcher vessels not in cooperatives.	425,000	42.5
Step 8: Allocate to inshore cooperatives. Under the AFA, any inshore catcher vessel cooperative that is composed of at least 80 percent of the vessels that delivered the majority of their pollock to a particular inshore processor and that has agreed to deliver at least 90 percent of its pollock to that same inshore processor is eligible for a suballocation of the inshore sector DFA. The cooperative's allocation is a percentage of the inshore sector DFA that is equal to the aggregate catch histories of the member vessels from 1995 to 1997, relative to total inshore landings during that same period. Up to eight inshore catcher vessel cooperatives may form under the AFA to match the eight AFA inshore processors. In this example, it is assumed that vessels representing 95 percent of the 1995–1997 inshore catch history have joined cooperatives.	398,884	39.9
Step 9: Allocate to inshore open access fishery. Under the AFA, vessels that do not join inshore catcher vessel cooperatives are eligible to fish in the open access sector of the inshore pollock fishery. The open access sector allocation is equal to the inshore DFA minus the aggregate allocation of pollock to cooperatives.	26,116	2.6

5.2 Pacific Cod

BSAI - Trawl

In the BSAI, the Pacific cod fishery attracts a broad group of participants. Small catcher vessels and large catcher processors target Pacific cod with a variety of different gear types. While most of the Pacific cod harvest is conducted by vessels using fixed-gear comprised of hook and longlines, pots, and jig gear, in 2001, the most recent year for which data is available, 21 trawl catcher processors and 66 trawl catcher vessels harvested Pacific cod in the BSAI (Hiatt *et al.* 2002). In 2001, these vessels harvested about 35,000 mt. Through August 2002, about 46,000 mt had been harvested by trawl gear in the directed fishery (NPFMC 2002a). In 2001, about 19,000 mt of Pacific cod were taken incidentally in the other groundfish trawl fisheries. The majority of Pacific cod harvested by trawl gear is taken in shallow waters on the eastern Bering Sea shelf.

Under regulations at 50 CFR 679.20(b)(1)(iii), 7.5 percent of the annual Pacific cod TAC is allocated to the CDQ fishery. The non-CDQ Pacific cod TAC is split into three gear allocations; trawl, fixed gear (hook-and-line and pots), and jig. Regulations at 50 CFR 679.20 (a)(7)(I) allocate 47 percent to trawl gear (split 50:50 between catcher vessels and catcher processors), 51 percent to fixed gear, and 2 percent to jig gear.

The bycatch of other groundfish species and prohibited species catch by vessels using trawl gear targeting Pacific cod in 2001 in the BSAI is presented in Hiatt *et al.*(2002). Bycatch of halibut was about 590 mt in 2001. Bycatch of other prohibited species such as herring (5 mt), king crab (about 2,000 ind) and salmon (about 5,000 ind. chinook and other combined) is quite low in the Pacific cod trawl fishery. Incidental catch of bairdi and other tanner crabs of about 66,000 and 30,000 individuals, respectively, has been documented for 2001.

The most common Pacific cod products for at-sea processors are headed and gutted fish and fillets. The most common products for shoreside processors are salted cod, fillets, and fish meal. The trawl fishery for Pacific cod opens by regulation on January 20 (50 CFR 679.23(c)) and closes when either the Pacific cod TAC or the halibut mortality bycatch allowance for the trawl fishery is reached.

BSAI - Fixed Gear

In 2001, 72 catcher vessels and 42 catcher processors targeted Pacific cod with hook-and-line gear. In addition, 70 catcher vessels and 6 catcher processors used pot gear to target Pacific cod. In that year hook and line vessel harvested about 100,000 mt of Pacific cod while pot fisherman took about 16,000 mt. In 2002, TACs were set at about 62,000 mt for hook and line and about 11,000 mt for pot gear. In 2001, about 19,000 mt of Pacific cod were taken incidentally in the other groundfish trawl fisheries.

Under regulations at 50 CFR 679.20(b)(1)(iii), 7.5 percent of the annual Pacific cod TAC is allocated to the CDQ fishery. In 2000, NOAA Fisheries approved Amendment 64 to the BSAI groundfish fishery, which authorizes a further apportionment of the 51 percent fixed-gear allocation among vessels using hook-and-line or pot gear. Amendment 64 establishes the following apportionment of the fixed-gear allocation after deducting incidental catch of Pacific cod in other groundfish fixed-gear fisheries:

- 80 percent to hook-and-line catcher processors.
- 0.3 percent to hook-and-line catcher vessels.
- 18.3 percent to pot vessels.
- 1.4 percent to hook-and-line or pot vessels less than 60 ft.

Regulations at 50 CFR 679.20 (a)(7)(iv) split the fixed gear cod TAC into three seasonal allocations: January 1, May 1, and September 1.

The incidental catch of other groundfish species and prohibited species catch by vessels using hook and line gear targeting Pacific cod in 2001 is presented in Hiatt *et al.*(2002). Bycatch of halibut was about 776 mt in 2001. Incidental catch of other prohibited species included king crab (about 26,000 individuals) and bairdi and other tanner crabs (about 103,000 individuals). The Pacific cod pot fisheries in 2001 took about 2 mt of halibut, about 12,000 king crabs, and about 192,000 bairdi and other tanner crabs. As expected, there were no incidental catches of herring or salmon by the hook-and-line or pot fisheries for Pacific cod.

Hook-and-line harvested cod are mostly taken along the slope of the continental shelf break and along the Aleutian Islands. Pacific cod harvested by pot gear is taken along the slope as well as north and west of Unimak Island and adjacent to the Aleutian Islands. The most common Pacific cod products for at-sea processors are headed and gutted fish and fillets. The most common products for shoreside processors are salted cod, fillets, and fish meal.

GOA - Trawl

After pollock, Pacific cod is the largest volume fishery in the GOA. In 2001, 95 catcher vessels and 6 catcher processors harvested about 20,000 mt in the directed fishery. Also during that year, about 5,000 mt were taken as incidental catch in other directed groundfish trawl fisheries. As of August 2002, 18,500 mt had been taken by trawl. The percentage of the total TACs for Pacific cod harvested by trawl gear in the GOA has declined in recent years as additional vessels using fixed gear have entered the fishery. The federal Pacific cod TACs are not allocated by gear type in the GOA harvests, by all gear types are deducted from a shared TAC established for each management area.

The federal Pacific cod TACs in the GOA are affected by a developing Pacific cod fishery in state waters. Since the beginning of a separately managed Pacific cod fishery by the State of Alaska in 1998, the federally managed TACs have been adjusted downward from ABC levels by the amount of guideline harvest levels (GHLs) established by the state. Trawl vessels of all sizes target Pacific cod, and the fishery attracts the greatest number of trawl vessels participating in the groundfish fisheries (Hiatt *et al.* 2002). In recent years, 20 percent of the annual TACs were held in reserve until after the principal directed fisheries closed as a management buffer to prevent exceeding the annual TACs and to provide greater assurance that incidental catch of Pacific cod may be retained throughout the fishing year. In the GOA, the Pacific cod TACs are allocated 90 percent to vessels targeting Pacific cod for processing by the inshore component and 10 percent to vessels targeting Pacific cod for processing by the offshore component.

Pacific cod is also included in the improved retention and utilization regulations at 50 CFR 679.27. The most common primary products are skinless, boneless fillets. Processors who have no filleting machinery process headed and gutted fish. A wide variety of ancillary products may also be produced, including roe, milt, trimmings that can be processed into surimi, collars, stomachs, heads, fish meal, and oil.

The Pacific cod trawl fishery has the highest prohibited species catch of halibut and bairdi Tanner crab of all GOA trawl fisheries (Hiatt *et al.* 2002). In 2001, this amounted to 746 mt of halibut and about 47,000 individual bairdi crabs.

GOA - Hook and Line Gear

The Pacific cod hook-and-line fishery in the GOA is second to sablefish in both volume and value. In 2001, the hook-and-line gear harvest was about 10,000 mt taken by 427 catcher vessels and 13 catcher processors. About 200 mt of Pacific cod were taken as incidental catch in Sablefish hook and line fishery. The catch of prohibited species in the Pacific cod hook-and-line fishery is extremely minimal, with only about other tanner crabs taken in 2001. In 2002, about 12,000 mt had been harvested as of August. The Pacific cod TACs are not allocated by gear type in the GOA; harvests by all gear types are deducted from a shared TAC established for each management area. The Pacific cod TACs in the GOA are affected by a developing Pacific cod fishery in state waters.

In recent years, 20 percent of the annual TACs have been held in reserve until after the principal directed fisheries close as a management buffer to prevent exceeding the annual TACs and to provide greater assurance that incidental catch of Pacific cod may be retained throughout the fishing year. Pacific cod is also included in the IRIU Program regulations (50 CFR 679.27). The most common primary products are skinless, boneless fillets and, for processors without fillet machinery, headed and gutted fish. A wide variety of ancillary products may also be produced, including roe, milt, trimmings processed into surimi, collars, stomachs, heads, fish meal, and oil.

GOA - Pot Gear

Only single buoyed pots may be fished in the GOA. Fishing for groundfish using pot gear is almost entirely limited to targeting Pacific cod in the GOA. Following the implementation of the moratorium program in 1995, the establishment of a state waters Pacific cod fishery in 1998, and the LLP in 2000, most new entrants are limited to fishing within state waters during both the federal and subsequent state water openings. In 2001, the pot gear harvest of Pacific cod in the federal fisheries was about 7,000 mt taken by 150 catcher vessels and 4 catcher processors. As of August 2002, almost 15,000 mt of Pacific cod had been harvested by pot gear in the GOA.

The federal Pacific cod TACs in the GOA are affected by a developing Pacific cod fishery in state waters. Since the beginning of a separately managed Pacific cod fishery by the State of Alaska in 1998, the federally managed TACs have been adjusted downward from ABC levels by the amount of GHLs established by the state. In 2001 and 2002, TAC was set at 23 percent below ABC to accommodate the state hook-and-line fishery. In the state waters fisheries in the GOA, the Pacific cod GHLs are allocated by gear type (between pot and jig) and vessel size (5 AAC 28.276, .367, .467, .537, and .577).

The net effect is that the amount of Pacific cod harvested by vessels using pot gear has increased in recent years. Pot gear vessels of all sizes target Pacific cod. The most common primary products are skinless, boneless fillets, and for processors without fillet machinery, headed and gutted fish. A wide variety of ancillary products may also be produced, including roe, milt, trimmings processed into surimi, collars, stomachs, heads, fish meal, and oil. Bycatch of other groundfish species and prohibited species catch by vessels using pot gear targeting Pacific cod is presented in Hiatt *et al.* (2002). Bycatch of other groundfish species is very low for pot gear targeting Pacific cod with only abut 200 mt of octopus from the other species assemblage taken in 2001. However, pot gear has the highest bycatch of crab in the GOA. In 2001, pot gear incidental catch of bairdi Tanner crab in the GOA Pacific cod fishery was almost 70,000 individuals. By regulation (50 CFR 679.2) the circumference of the tunnel entrance is limited to 36 in. and a biodegradable panel must be installed to reduce bycatch. In recent years bycatch of halibut has been low (5 mt in 2001) and pot gear has been exempted in the GOA from halibut prohibited species catch limitations.

Jig Gear

Jig gear is used to target primarily Pacific cod and rockfish in the GOA. Catches of Pacific cod by vessels using jig gear in the federally managed fishery was about 150 mt in 2001. Vessels using jigging gear are more active in the state-managed Pacific cod and black rockfish fisheries than in the federally managed fisheries. In state waters, Pacific cod fisheries GHL allocations have been made to vessels using jig gear; however, these allocations have not yet been fully utilized. The use of jig gear is especially attractive to owners of small-sized vessels. The gear is relatively inexpensive and can fished from small vessels with minimum crew. Primary and ancillary products from jig-caught Pacific cod are the same as from catches by other gear types. The vast majority of vessels using jig gear are under 60 ft LOA and are exempt from federal observer, recordkeeping, and reporting requirements. In recent years, jig gear, and pot gear, in the GOA have been exempted from halibut prohibited species catch limitations. While the amount of incidental catch of halibut by vessels using jig gear is unknown, it is assumed to be low. Bycatch rates and attendant mortality rates are also relatively low.

5.3 Atka Mackerel

The directed Atka mackerel fishery is a bottom trawl fishery that occurs off the continental shelf in the EBS and in the passes between the islands of the central and western Aleutians. As of October 12, 2002, about 42,000 mt of Atka mackerel had been harvested (TAC set a 49,000 mt). The most common Atka mackerel products are headed and gutted (eastern cut) and whole frozen fish (destined for processing).

In 2001, 12 trawl catcher processors and no catcher vessels harvested Atka mackerel in the BSAI (Hiatt *et al.* 2001). These vessels harvested approximately 60,000 mt of Atka mackerel in the directed fishery. An additional 1,500 mt of Atka mackerel was incidentally caught in the other groundfish trawl fisheries. Also in 2001, the directed Atka mackerel fishery incidentally caught about 11,000 mt of other groundfish species, the majority of which consisted of rockfish and Pacific cod (about 8,000 mt and 2,000 mt, respectively). Bycatch of prohibited species in the BSAI trawl Atka mackerel fishery in 2001 consisted mostly of halibut (61 mt), and a small amount of bairdi crabs (2,000 individuals).

In 1998, 1 percent of the BSAI Atka mackerel TAC was allocated to vessels using jig gear. Beginning in 1999, the non-jig portion of the Atka mackerel annual TAC is divided equally into two seasons, with 50 percent of the TAC available in the A season and 50 percent in the B season. Under regulations at 50 CFR 679.20 (a)(8)(ii)(A), the A season begins on January 20 and remains open until the seasonal allocation is harvested or until April 15, when it closes. The B season opens September 1 and remains open until the seasonal allocation is harvested or until November 1, when it closes.

Since 1994, the Atka mackerel quota has been split in the annual final specifications into three separate area allocations based on the most recent biomass estimates. The three areas are the Bering Sea/eastern Aleutian Islands (Bering Sea and Area 541), the central Aleutian Islands (Area 542), and the western Aleutian Islands (Area 543). In 1999, Area 542 and Area 543 were further split into critical habitat and non-critical habitat areas due to Steller sea lion concerns (CFR 679.22(a)(8)(iii), Tables 1 and 2, and Figure 4 of 50 CFR 226). In Area 542 of the central Aleutian Islands 80 percent of the Atka mackerel seasonal TAC was allowed to be harvested within the critical habitat area. In the western Aleutian Islands (Area 543), the critical habitat allocation was 65 percent of the seasonal TAC.

Once the critical habitat percentage of Atka mackerel is harvested, all trawl fisheries are prohibited inside critical habitat until the remaining seasonal allocation is harvested outside the critical habitat area. At that point, the Atka mackerel fishery closes and other trawl fisheries can take place inside the critical habitat area.

5.4 Rock Sole, Flathead Sole, Deepwater Flatfish, Shallow Water Flatfish, Rex Sole, and Other Flatfish

BSAI

In the BSAI, the rock sole, flathead sole, and other flatfish fisheries are almost exclusively prosecuted by catcher processors using bottom trawl gear. Although the fisheries are open to other vessel categories and gear types, very few rock sole, flathead sole, other flatfish are harvested by other types of vessels. In 2001, 26 trawl catcher processors targeted rock sole, flathead sole, and other flatfish in the BSAI. In 2001, the directed fishery for flathead sole harvested about 10,000 mt with an additional 7,500 mt of these fish harvested incidentally in the other BSAI groundfish trawl fisheries. The directed fishery for rock sole harvested about 15,000 mt in 2001, with an additional 13,000 mt harvested incidentally. In 2002, the catch of rock sole in the BSAI was about 40,000 mt and the catch of flathead sole was about 15,000 mt (both current through November 12, 2002).

Flathead sole fisheries also incidentally catch pollock (about 4,500 mt in 2001), Pacific cod (2,800 mt in 2001), rock sole (1,900 mt in 2001), and yellowfin sole (2,900 mt in 2001). Bycatch of bairdi and other tanner crabs is relatively high in the flathead sole fishery (almost 300,000 bairdi crabs, over 475,000 other tanner crabs in 2001). Other prohibited species bycaught in the 2001 flathead sole BSAI trawl fishery included about 360 mt of halibut, about 10 mt of herring, about 1,200 king crab individuals, and a small amount of salmon (fewer than 1,500 individuals, chinook and other salmon combined).

The rock sole fisheries in 2001 also caught several species of groundfish incidentally: pollock and yellowfin about 5,000 mt each, pacific cod about 4,000 mt, and flathead sole about 1,000 mt. The rock sole fishery also has a fairly high bycatch rate for bairdi and other tanner crabs (almost 270,000 individuals of each category in 2001). Almost 820 mt of halibut were caught in the rock sole fishery along with about 13 mt of herring and nearly 30,000 red king crab and other king crab combined. As expected, very few salmon (less than 3,000 chinook and other salmon combined) were caught by rock sole directed fisheries in 2001.

Outside of the high-value rock sole roe fishery in the spring, the rock sole, flathead sole, and other flatfish category is used as a fill-in when more valuable target species are not available. The most common rock sole and flathead sole products are headed and gutted fish (with and without roe) and fish meal. The most common products for other flatfish are whole frozen fish and fish meal.

Vessels participating in these fisheries generally fish for rock sole during the roe season until the first seasonal halibut bycatch cap is reached. Generally, after the rock sole roe fishery closes, these vessels shifted to several different targets; notably Atka mackerel, yellowfin sole, and Pacific cod. Vessels also can go into the GOA to fish for rex sole.

In the BSAI, most of the rock sole, flathead sole, and other flatfish fisheries occur on the continental shelf in the eastern Bering Sea in water shallower than 200 m. Some effort follows the contour of the shelf to the northwest and extends as far north as Zhemchug Canyon. Very few rock sole, flathead sole, and other flatfish are taken in the Aleutian Islands due to the limited shallow water areas present.

GOA

Deepwater flatfish, rex sole, and flathead sole are targeted exclusively with bottom trawl gear in the GOA. Most shorebased catcher vessels targeting these species are homeported in, and deliver to, processing plants in Kodiak. Small sized (less than 125 ft length overall [LOA]) trawler catcher processors also target these species. These species are particularly attractive to smaller sized catcher processors because the low average daily catch amounts of high-value targets, such as rex sole, are well-suited to low-volume processing capacity. These targets are made additionally attractive by the larger amounts of highly valuable species closed to directed fishing that may be retained as bycatch. In 2001, 41 catcher vessels and 11 catcher processors targeted flatfish in the GOA. These vessels caught a total of 3,400 mt of flathead sole, rex sole, and deepwater flatfish, combined, with an additional 1,500 mt caught by other groundfish fisheries such as the pollock and Pacific cod trawl fisheries. In 2002, the combined catch was about 5,500 mt.

The rex sole fisheries catch a fairly large amount of halibut as bycatch (252 mt in 2001) with the flathead sole and deepwater flatfish fisheries also catching halibut at the rate of 70 and 44 mt, respectively. For example, in 2002 the deepwater flatfish and rex sole fisheries were closed in each quarter on May 24, August trawling for flatfish on October 13 due to reaching the halibut bycatch limit. The only other substantial bycatch is that of bairdi crab in the flathead sole fishery (about 42,00 individuals in 2001).

Target fishery is defined by the dominant species, that is, when deepwater flatfish, rex sole or flathead sole comprise the largest portion of an observed haul's catch. Deepwater flatfish, rex sole, and flathead sole are most often fished at depths greater than 80 fathoms, where valuable species on bycatch status, such as sablefish, thornyhead, shortraker, and rougheye rockfish, may be incidentally taken. For many vessels, the value of groundfish species retained as bycatch exceeds the value of targeted species retained. The most common primary products are skinless, boneless fillets; headed and gutted fish; and whole fish. The most common ancillary products are roe, fish meal, and oil.

Shallow water flatfish, as a target, includes all other species of flatfish for which a separate TAC is not established. These species are targeted exclusively with bottom trawl gear. This target fishery is defined by the dominant species; that is, when shallow water flatfish comprise the largest portion of an observed haul's catch. In 2001, directed fisheries for shallow water flats harvested about 3,400 mt of this species, with an additional 3,000 mt taken in the other flatfish and groundfish fisheries. Bycatch of halibut is high in the shallow water flatfish fishery with almost 490 mt taken in 2001. The 2002 shallow water flatfish fishery was closed on May 15, August 5, and October 13 due to attainment of the halibut bycatch limit.

Shallow water flatfish are targeted mostly by medium-sized shorebased catcher vessels homeported in and delivering to Kodiak. Rock sole and butter sole comprise the majority of the catch in this target fishery. The most valuable species is rock sole bearing roe. The most common primary and ancillary products are similar to the deeper water flatfish fisheries described previously.

5.5 Yellowfin Sole

The yellowfin sole fishery takes place in the relatively shallow waters of the eastern Bering Sea shelf. And is primarily caught by catcher processors using bottom trawl gear. Vessels begin to target yellowfin sole after the rock sole roe fishery closes in the early spring. In recent years, yellowfin sole seasons have been longer than any other major groundfish fishery in the BSAI; in some years, the fishery never officially closes. This is due to large annual TACs and a relatively low value for yellowfin sole products. In 2001, 54,000 mt of yellowfin were taken in the directed fishery, with an additional 10,000 mt taken incidentally in the other groundfish fisheries.

Bycatch of halibut and tanner crabs is high in the yellowfin fishery and often constrains the fishery. In 2001 over 1,000 mt of halibut, 32,000 red king crabs, 324,000 bairdi crabs and 1,000,000 other tanner crabs were taken. And in 2002, the yellowfin sole harvest was constrained by two seasonal closures due to the attainment of halibut PSC limits: from May 11-May 21 and from June 15-June 30. In addition zone 1 was closed on May 21 for the remainder of 2002 to prevent exceeding the 2002 bycatch allowance of red king crab specified for the yellowfin sole target fishery.

The most common yellowfin sole products for catcher processors were headed and gutted (eastern cut) fish and whole frozen fish. Shoreside processors made a small amount of surimi in 1999.

5.6 Greenland Turbot

Greenland turbot are harvested by hook-and-line gear in the Bering Sea from Unimak Island along the continental shelf break to above Zhemchug Canyon. They are large flatfish harvested in relatively deepwater (beyond 200 m) off the BSAI continental slope, and also along the Aleutian Islands chain. The major portion of the harvest is taken by hook-and-line catcher processors although a small amount is taken by bottom trawl. In 2001, hook and line vessels harvested about 3,000 mt of Greenland turbot, while trawl vessels took only about 400 mt. Greenland turbot are also taken as incidental bycatch in trawl fisheries, most notably those targeting flatfish and rockfish species in the Bering Sea (about 1,500 mt in 2001).

Separate TACs for Greenland turbot are specified for the Bering Sea Subarea and the Aleutian Islands Subarea. In recent years, vessels using hook-and-line gear to target Greenland turbot (as well as sablefish) have experienced a problem with killer whales, which strip the fish off the hooks as the gear is retrieved. In some areas and years, the killer whale problem has been severe enough that vessels stopped fishing and left the grounds. Although pot gear may alleviate predation by killer whales, longline pot gear is not authorized for the Bering Sea fishery and single pot gear is not deemed economically viable. Anecdotal information from vessel operators indicated that the killer whale problem, as well as poor flesh quality, made fishing for Greenland turbot unprofitable. The most common Greenland turbot product was headed and gutted, with the tail removed.

The opening date of the Greenland turbot fishery is May 1 (50 CFR 679.23(e)(1)). This opening date was implemented to reduce halibut bycatch rates in late winter and early spring months. In 2001, turbot fisheries took about 16 mt of halibut, 8,000 other tanner crabs, and about 2,000 bairdi crabs.

5.7 Arrowtooth Flounder

Arrowtooth flounder is harvested exclusively with bottom trawl gear in the BSAI and GOA. The flesh rapidly loses it texture due to enzyme activity. For this reason, when retained by catcher processors, it is immediately processed or, when targeted by shorebased catcher vessels, delivered to the processing plant within 24 hours. When retained, the most common products are surimi, fillets, whole fish, and meal. The most common ancillary products are fish meal and oil.

In 2001 in the BSAI, 14,000 mt of arrowtooth flounder were taken by groundfish trawl and fixed gear fisheries. In the GOA in 2001, almost 20,000 mt were taken. The GOA catch through October 5, 2002 was 19,000 mt. Under current fishing practices, arrowtooth flounder are mostly discarded when caught, although the percent retained has increased from below 10 percent in the early 1990s to 49 percent in 2002 (NPFMC 2002a and 2002b).

5.8 Rockfish

BSAI

Thirty five species of rockfish (genus *Sebastes* and *Sebatolobus*) occur in the BSAI of which eight are commercially important. In recent years, the only BSAI rockfish species open for directed fisheries has been the Pacific ocean perch complex which includes Pacific ocean perch, sharpchin, northern, shortraker, and rougheye rockfish. In 2001, Pacific ocean perch in the eastern Bering Sea/Aleutian Islands was assessed and managed as a single stock. Standardizing and partitioning total groundfish effort into effort directed solely toward Pacific ocean perch is extremely difficult. However, the November 2002 SAFE Report reports that in 2001, nearly 9,000 mt of Pacific ocean perch were removed from the BSAI. Through September 7, 2002, Pacific ocean perch removals totaled over 9,700 mt. The most common rockfish products are headed and gutted (eastern cut) and whole frozen fish.

Prior to 2001, harvests of sharpchin, northern, shortraker, and rougheye rockfish were managed in the eastern Bering Sea as the other red rockfish (ORR) complex, while in the Aleutian Islands, they were split into the sharpchin/norther (SCNO) and shortraker/rougheye (SRRE) complexes. In 2001, over 6,000 mt of rockfish in the SCNO complex were harvested in the eastern Bering Sea and Aleutian Islands, with nearly 98 percent caught in the Aleutians. That same year, only about 750 mt of the SRRE complex was taken in the BSAI, with almost 95 percent of the total taken in the Aleutian islands. Beginning in 2002, the sharpchin rockfish were removed from the SCNO, leaving northern rock fish to be managed with single-species catch levels. Estimated removals through September 7, 2002 for northern rockfish were almost 2,100 mt with 95 percent taken in the Aleutian Islands. For the SRRE complex over the dame time period, removals were about 550 mt, with 83 percent taken in the Aleutian Islands.

The Other Rockfish complex includes the 29 species of *Sebastes* and *Sebastolobus* not managed in the groups described above. These species have been observed at least once in the BSAI surveys and/or have occurred in at least 1 percent of the hauls where species from the ORR have been caught. The tow most abundant species in this complex are light dusky rockfish and shortspine thornyheads. In 2001, nearly 900 mt of other rockfish were harvested in the BSAI with about 67 percent taken in the Aleutian Islands. Through September 21, 2002, catch of other rockfish totaled about 850 mt with about 57 percent of the catch occurring in the Aleutian Islands.

In the BSAI, directed fisheries for these are mostly conducted by catcher processors using bottom trawl gear and hook and line catcher vessels. For example, in 2001, 8 trawl catcher processors and only one catcher vessel using bottom trawl gear harvested rockfish, while and 15 hook and line catcher vessels and only two fixed gear catcher processors conducted the fishery in the BSAI. Prohibited species caught as bycatch in the rockfish trawl fisheries include halibut (55 mt in 2001), and other king crab (4,700 individuals in 2001).

GOA

GOA rockfish include all species of the genera *Sebastes* and *Sebastalobus*. Since 1988, the NPFMC has divided these species into three management groups: demersal shelf rockfish, pelagic shelf rockfish, and slope rockfish. The slope rockfish group is dominated by one species Pacific ocean perch which historically has provided most of the past commercial catch. Separate TACs are established for Pacific ocean perch,

northern rockfish, pelagic shelf rockfish, other slope rockfish, shortraker and rougheye rockfish, thornyheads, and demersal shelf rockfish in the southeast Outside District.

Bottom trawl gear is mostly used to target the most abundant species: Pacific ocean perch, northern, and pelagic shelf rockfish. Pelagic trawl gear has also been successfully used to target Pacific ocean perch. In recent years, the number of participants has increased to include medium-sized shorebased trawlers as well as medium- to large-sized catcher processors. In 2001, 33 catcher vessels and 12 catcher processors targeted rockfish using trawl gear in the GOA. Also in 2001, 418 hook and line catcher vessels and 3 catcher processors prosecuted the fishery. Through October 5, 2002, harvests in the GOA rockfish fisheries amounted to just over 3,000 mt of northern rockfish, 3,300 mt of pelagic shelf rockfish, nearly 12,000 mt of Pacific ocean perch, and 700 mt of other slope rockfish. Additionally, 70 mt of demersal shelf rockfish, 1,200 mt of SRRE rockfish, and 1,500 mt of thornyhead rockfish were taken through October 5, 2002. The most common primary products are skinless, boneless fillets; headed and gutted fish; and whole fish. The most common ancillary products are fish meal and oil.

Most of the rockfish harvested by hook-and-line gear in the GOA is taken as incidental catch in the directed sablefish fishery. In 2001, more fish were taken as bycatch in the hook-and-line sable fish fishery (1,400 mt) as compared to the directed rockfish hook and line fisheries (1,000 mt). Thornyhead, shortraker, and rougheye rockfish (e.g., deepwater rockfish) are commonly found along the continental slope at depths where sablefish are frequently harvested. Prohibited species caught as bycatch in the 2001 rockfish fisheries included: halibut (390 mt), and bairdi crab (nearly 3,000 individuals).

5.9 Sablefish

Sablefish are harvested in relatively deepwater along the continental slope (100–1,000 m) and along the Aleutian Islands. Since 1996 directed fisheries for sablefish have only been open to vessels using hook-and-line and pot gear in the BSAI. Only hook-and-line gear and jig gear are permitted to target sablefish under the IFQ management program in the GOA (50 CFR 679.42(b)(1)). The use of pot gear to target sablefish is prohibited in the GOA (50 CFR 679.24(c)(2)(B) and (3)).

In 1995, sablefish (as well as Pacific halibut) became a closed fishery based on historical participation. An IFQ program was implemented which assigns quota shares on an annual basis to authorized fishermen (50 CFR 679(d)). The directed sablefish fishery is open only to IFQ shareholders who use fixed gear (hook-and-line or pot gear).

Five state fisheries also land sablefish outside of the IFQ program and are . For federal and state fisheries combined, the total number of longline vessel targeting sablefish in 2001 was 438 (NPFMC 2002a). In 2001 these vessels harvested about 12,000 mt of sablefish, 92 percent of which was taken in the GOA. Small amounts of sable fish are taken incidentally in the other groundfish fisheries, totally about 2,000 mt in the BSAI and GOA combined in 2001. A small amount of prohibited species have been historically taken as bycatch in the sablefish fisheries. For example, the hook-and-line fishery only took less than 100 tanner crabs as bycatch in 2001, and the 2001 pot fishery for sablefish took about 4 mt of halibut, less than 1,000 king crab, and about 300 other tanner crabs (Hiatt *et al.*2002).

Under the IFQ Program, individual fishermen have a known amount of sablefish that they are allowed to harvest within a specified area and year. As a consequence, sablefish operations are slightly more structured than open access fisheries, and individuals are more able to plan their sablefish harvest to maximize logistical and financial returns. IFQ sablefish can be targeted in a directed fishery, or they can be harvested in conjunction with other fisheries in a "mixed" fishery. One common BSAI mixed fishery is Greenland turbot and sablefish. The vessel will target Greenland turbot and take whatever sablefish are harvested along with the turbot. It should be noted that gear types other than hook-and-line are allowed to retain sablefish as long as the amount does not exceed the legal maximum retainable bycatch limit. Hook-and-line vessels without IFQ are required to discard any sablefish harvested.

Sablefish are similar to Greenland turbot in that killer whales will congregate and strip sablefish from longline gear as it is being retrieved. The most common sablefish product is headed and gutted (eastern cut). The IFQ sablefish fishery opens concurrent with the IFQ Pacific halibut fishery. The season dates are specified annually and typically open on March 15 and close on November 15 (50 CFR 679.23(g)(1)).

5.10 Other Species Fisheries

The other species category in includes squid, sculpin, skate, shark, and octopus. With the exception of octopus, there are no directed commercial fisheries for these species, but they are taken as incidental bycatch in the trawl and hook-and-line fisheries.

Since 1993, four vessels have registered with the ADF&G to fish octopus with pot gear in the Bering Sea. To date, the fishery has not generated enough money to make it attractive. An unknown number of octopus are also taken by pot vessels during crab fisheries and used as bait.

Skate, sculpin, and shark are commonly taken in GOA bottom trawl fisheries. Almost all other species incidental catch is discarded or used to make fish meal and oil. Each year, about 2,000 mt of skate is retained from the bottom trawl and hook-and-line fisheries combined. The primary products are skate wings and whole skates, fish meal, and oil.

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APPENDIX C

Bering Sea and Aleutian Islands Fisheries Management Plan Amendment Summaries

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Amendments to the Fishery Management Plan for Groundfish in the Bering Sea / Aleutian Island Area

Prepared by the staff of the
North Pacific Fishery Management Council

Amendments to the Fishery Management Plan for Groundfish in the Bering Sea / Aleutian Island Area

This document contains 1-page descriptions of the amendments to the Fishery Management Plan for Groundfish in the Bering Sea / Aleutian Island Area (BSAI FMP), through 2003. The BSAI FMP was implemented effective 1981. The Final EIS and RIR were published in August 1981.

Amendment Number	Amendment Title	Date of Final Rule	Supporting Analysis
1	Optimum Yield and TAC Framework, Modify Domestic Area Restrictions	1984	FMP EIS, RIR, FRFA
1a	Foreign Fleet Prohibited Species Catch Limits for Chinook Salmon	1982	FMP EIS
2	Increase Allocation to Domestic Fleet	1982	FMP EIS, EA
3	Specification of Halibut, Crab, and Salmon Prohibited Species Catch Limits for Foreign Fleet	1983	FMP EIS, RIR, IRFA
4	Increase Domestic Allocation II, Increase Pacific Cod Acceptable Biological Catch and Optimum Yield, Relax Foreign Area Restrictions in the Aleutian Islands	1983	EA, FRFA
5	Reduce Chinook Salmon Prohibited Species Catch Limit (withdrawn)	–	–
6	Domestic Fishery Development Zone (disapproved)	–	–
7	Relax Foreign Longline Restrictions in Winter Halibut Savings Area	1983	EA, RIR
8	1984 and 1985 Salmon Prohibited Species Catch Limits for Foreign Trawl	1983	–
9	Reporting Requirements, Habitat Protection Policy	1985	EA, RIR, IRFA
10	Bristol Bay Trawl Closure, Crab and Halibut Prohibited Species Catch Limits, Catcher/Processor Reporting Requirements, Domestic Observer Requirements	1987	EA, RIR, IRFA
11	Apportionment of Pollock for Joint Venture Vessels	1987	EA, RIR, IRFA, supplement
11a	Catcher Processor Reporting Requirements	1988	EA, RIR, FRFA
12	Permit Requirements, Prohibited Species Catch Limit Framework, Establish Rock Sole as Separate Target Species	1989	EA, RIR, FRFA
12a	Revise Crab and Halibut Prohibited Species Catch Limits, Modify Bristol Bay Crab and Halibut Protection Zone	1989	EA, RIR, FRFA
13	Observer Program, Sablefish Gear Allocations, Walrus Island Closure, Reporting Requirements	1989, 1990	EA, RIR, FRFA, addendum
14	Regulate Pollock Roe Stripping, Seasonal Allowance Schedule for Pollock	1991	EA, RIR, FRFA
15	Establish Sablefish Individual Fishing Quotas, Establish Western Alaska Community Development Quota Program	1993	EIS, SEIS (incl RIR & FRFA)
16	Interim Harvest Levels, Revise Prohibited Species Catch Limits for Crab and Halibut and Apportion by Fishery and Season, Fishing Gear Restrictions, Define Overfishing, Implement Vessel Incentive Program	1991	EA, RIR, IRFA

Amendment Number	Amendment Title	Date of Final Rule	Supporting Analysis
16a	Establish Herring Prohibited Species Catch Limits and Herring Savings Areas, Specify Allocation of Pollock Total Allowable Catch to Bottom Trawl	1991	EA, RIR FRFA
17	Renew Walrus Islands Closures, Experimental Permits, Establish Bogoslof District	1992	EA, RIR, IRFA
18	Inshore/Offshore Allocations for Pollock, Establish Catcher Vessel Operational Area, Designate Western Alaska Community Development Quota for Pollock	1992	SEIS, RIR, FRFA, supplement
19	Establish Prohibited Species Catch Limits for Non-trawl Fisheries, Revise Trawl Fishery Categories for Prohibited Species Catch Accounting, Delay Fisheries Start Date, Expand Vessel Incentive Program	1992	EA, RIR, FRFA
20	Steller Sea Lion Buffer Zones	1992	EA, RIR, FRFA
21	Framework Halibut Prohibited Species Catch Limits Including Authority to Specify by Fishery Category or Season	1993	EA, RIR, FRFA
21a	Pribilof Islands Habitat Conservation Area	1995	EA, RIR
21b	Chinook Salmon Savings Area	1995	EA, RIR, FRFA
22	Establish Trawl Gear Test Zones	1993	EA, RIR, IRFA
23	Moratorium	1995	EA, RIR, FRFA, supplement
24	Pacific Cod Allocation by Gear Type and Season	1994	EA, RIR, FRFA
25	Adjust Trawl Prohibited Species Catch Limits for Halibut	1994	EA, RIR
26	Salmon Retention for Food Banks	1996	EA, RIR
27	Research Plan/Observer Program (not implemented)	1994	EA, RIR
28	Divide Aleutian Islands into Regulatory Areas	1993	EA, RIR
29	Salmon Bycatch Accounting (withdrawn)	–	–
30	Increase Community Development Quota Allocation for Sablefish	1994	RIR
31	Sablefish Individual Fishing Quota Share Blocks	1994	EA, RIR, FRFA
32	Transfer of Sablefish Community Development Quota Compensation Quota Shares	1996	RIR
33	Limited Processing of Non-Individual Fishing Quota species	1996	EA, RIR
34	Atka Mackerel Jig Allocation	1997	EA, RIR, FRFA
35	Chum Salmon Savings Area	1995	EA, RIR, FRFA
36	Establish Forage Fish Category	1998	EA, RIR
37	Modify Red King Crab Prohibited Species Catch Limits, Establish Bristol Bay Red King Crab Savings Area and Nearshore Bristol Bay Trawl Closure Area, Increase Observer Coverage	1996	EA, RIR, FRFA

Amendment Number	Amendment Title	Date of Final Rule	Supporting Analysis
38	Extend Inshore/Offshore Pollock Allocations, Reauthorize Pollock Community Development Quota Program, Modify the Catcher Vessel Operational Area	1995	EA, RIR, IRFA
39	Establish a License Limitation Program, Multi-species Community Development Quota Program	1998	EA, supplement
40	Establish Opilio Prohibited Species Catch Limits and Bycatch Limitation Zones	1997	EA, RIR, FRFA
41	Reduce Bairdi Prohibited Species Catch Limits	1997	EA, RIR, FRFA
42	Individual Fishing Quota Vessel Buy Down	1996	EA, RIR, FRFA
43	Increase Individual Fishing Quota Sweep Up Levels	1996	EA, RIR
44	Overfishing Definitions	1997	EA
45	Permanently Extend Community Development Quota Allocation	1999	EA, RIR, FRFA
46	Pacific Cod Allocation ll	1996	EA, RIR
47	Third Party Observer Program (withdrawn)	–	–
48	Total Allowable Catch Streamlining (proposed, approved by Council October 2003)	–	EA, RIR, IRFA
49	Improved Retention / Improved Utilization Program	1997	EA, RIR, FRFA
50	Halibut Donation Program	1998	EA, RIR
51	Extend the Catcher Vessel Operational Area	1999	EA, RIR, IRFA
52	Vessel Registration Program (tabled)	–	–
53	Shortraker/Rougheye Rockfish Allocation in Aleutian Islands by Gear	1998	EA, RIR
54	Individual Fishing Quota Indirect Ownership and Use Caps	2002	RIR, IRFA, FRFA
55	Define Essential Fish Habitat	1999	EA
56	Revised Overfishing Definitions	1999	EA
57	Pollock Bottom Trawl Gear Prohibition, Reduce Crab and Halibut Prohibited Species Catch Limits	1999	EA, RIR, FRFA
58	Reduce Chinook Salmon Prohibited Species Catch Limits, Modify Chinook Salmon Savings Area	2000	EA, RIR, FRFA
59	Moratorium Extensions	1999	RIR
60	Adjustments to License Limitation Program	2001	EA, RIR, IRFA, FRFA
61	American Fisheries Act Implementation	2002	EIS, incl RIR & FRFA
62	Single Geographic Location and Inshore/Offshore Language Changes (proposed, approved by Council October 2002)	–	–
63	Sharks/Skates (proposed)	–	–
64	Pacific Cod Fixed Gear Allocations	2000	EA, RIR, IRFA, FRFA

Amendment Number	Amendment Title	Date of Final Rule	Supporting Analysis
65	Habitat Areas of Particular Concern: Harvest Control Measures (postponed)	–	–
66	Remove Squid from Community Development Quota Program, Define Directed Fishing for Pollock	2001	EAs, RIRs, IRFAs, FRFA
67	Pacific Cod Species and Gear Endorsements to License Limitation Program License	2002	EA, RIR, IRFA, FRFA
68	Pacific Cod Pot Gear Allocation (withdrawn)	–	–
69	American Fisheries Act Inshore Co-operative Contracts with Catcher Vessels Outside Co-operative	2003	RIR, FRFA
70	Steller Sea Lion Protection Measures (withdrawn)	–	–
71	Community Development Quota Policy and Administrative Changes (proposed, approved by Council June 2002)	–	RIR, IRFA
72	Individual Fishing Quota Vessel Clearance and Recordkeeping and Reporting Changes	2003	RIR, IRFA
73	Sideboard Measures for Winter Pacific Cod (postponed indefinitely)	–	–
74	(unassigned)	–	–
75	Repeal of Increased Retention / Increased Utilization Program Flatfish Requirement	2003	EA, RIR, IRFA
76	Increased Retention / Increased Utilization Flatfish Exemptions (withdrawn)	–	–
77	Pacific Cod Fixed Gear Allocations	2003	EA, RIR, IRFA
78	Revisions to Essential Fish Habitat (proposed)	–	EIS, RIR, IRFA
79	Increased Retention / Increased Utilization Groundfish Retention Standards (proposed, approved by Council June 2003)	–	EA, RIR, IRFA
80	Increased Retention / Increased Utilization Sector Allocations and Head & Gut Cooperative (proposed)	–	EA, RIR, IRFA
81	Revised Management Policy (proposed, approved by Council April 2004)	–	PSEIS
82	Allocation of the Aleutian Islands Pollock Total Allowable Catch to the Aleut Corporation (proposed)	–	EA, RIR
83	Housekeeping updates to the FMP	–	–

BSAI Amendment 1 Optimum Yield and TAC Framework, Modify Domestic Area Restrictions

Dates:. BSAI Amendment 1 was adopted by the Council in May 1982. NMFS published final rule on January 4, 1984 (49 FR 397). Effective date of implementation was January 1, 1984.

Purpose and Need: The single species OY levels that were established in the original FMP draft did not provide the flexibility needed to respond to biological changes and the rapidly developing domestic fishery. Plan amendments were required for each adjustment to the OY and the amount allocated to domestic and foreign fisheries. This was a very cumbersome, costly, and slow process that impeded the development of a domestic fishery. Additionally, trawl and longline closure areas implemented with the original FMP inhibited the developing domestic fisheries, so some of these restrictions were removed.

Regulation Summary: The amendment included the following measures:

1. Established a multi-year, multi-species optimum yield for BSAI groundfish complex (1.4 million to 2.0 million mt);
2. Established a framework procedure for the determination and apportionment of amounts of groundfish specified for total allowable catch (TAC), domestic annual harvest (DAH), reserves, and total allowable level of foreign fishing (TALFF);
3. Allowed year-round domestic trawling and longlining in the Winter Halibut Savings Area and Bristol Bay Pot Sanctuary;
4. Modified seasonal foreign trawl restrictions in the Petrel Bank area to be based on crab opening dates;
5. Updated appendices and annexes to the FMP; added Annex I (description of SAFE document); and
6. Eliminated "Misty Moon" grounds south of the Pribilofs from the winter halibut savings area.

Analysis: A 32-page RIR/IRFA (final draft dated August, 1982) was prepared for this amendment. Three primary alternatives including the status quo were considered. The other alternative that was not chosen would have adopted a multi-species OY of 1.6 million mt (which equaled 80% of the midpoint range of the MSY estimate). The alternative adopted for OY was conservative (set equal to 85% of the MSY range, estimated to be 1.7 to 2.4 million mt), and based on a range (1.4 to 2.0 million mt) to allow for flexibility with changes in the ecosystem. The original FMP OY specifications for individual groundfish species were replaced by the OY range for the complex, with total allowable catch (TAC) specified annually for each target species and for the "other species" category. Fifteen percent of each TAC for target and "other species" was set aside for reserves, which could be used for unexpected expansion of the domestic fleet or unexpected conditions of a stock during a fishing year, and for in-season allocations. The TAC could then be apportioned between the domestic annual harvest (DAH) and the total allowable level for foreign fisheries (TALFF).

Results: Since the 2 million mt OY cap was implemented in 1984, six proposals from fishing associations and foreign interests were submitted to increase the cap. The Council initiated formal analysis three times (1988, 89, and 90), but rejected any increase for the following reasons: its aim to eliminate foreign and joint venture fishing, concerns about the adequacy of biological information, economic, and ecological factors. In 1991, the U.S. General Accounting Office (GAO) investigated this rejection of an OY increase, and concluded that the Council's decision was appropriate (GAO/RCED-91-96). Total annual catch of groundfish has remained at or below 2 million mt. Recent catches have been 1.3 to 1.8 million mt.

BSAI Amendment 1a Foreign Fleet PSC Limits for Chinook Salmon

Dates: Amendment 1a was adopted by the Council in March, 1981. A proposed rule was published on October 29, 1981 (46 FR 53475) and a final rule published on January 12, 1982 (47 FR 1295). Effective date of implementation was January 12, 1982.

Purpose and Need: Western Alaska Native groups expressed concern over the apparent increase in the incidental catch of western Alaska chinook salmon in the foreign trawl fisheries. Western Alaska Native groups had negotiated with the Japanese trawling interests to limit the number of chinook salmon caught incidentally in foreign trawl operations to 55,250 in 1982. Amendment 1a made this agreement formal by establishing a prohibited species catch (PSC) limit of 55,250 fish in the eastern Bering Sea foreign trawl fishery. This amount was a 15 percent reduction from the 1981 chinook salmon PSC of 65,000 fish implemented under the preliminary management plan. Additionally, Amendment 1a established a formula used to distribute the salmon PSC so that if there were changes in TALFF during the year with releases of reserves, the salmon PSC for a country would be adjusted also.

Regulation Summary: Amendment 1a established foreign chinook salmon PSC limits as follows: During any fishing year, that portion of fishing Area 1 lying between 55° N and 57°N latitude and 165° W and 170° W longitude and all of fishing Area 2 may be closed for the remainder of the periods January 1 through March 31, and October 1 through December 31 to trawl vessels of any nation. This closure will occur when vessels of a nation have intercepted that nation's portion of the PSC of chinook salmon. A nation's initial portion of the chinook salmon PSC for a fishing year was determined by multiplying 55,250 (the total PSC for chinook salmon) by the ratio of that nation's initial groundfish allocation to the total initial TALFF plus reserves for groundfish.

Analysis: No formal analysis of this amendment was located in the files. Note that the final rule states "*The Administrator of NOAA has determined that this proposed rulemaking is not a 'major rule' requiring a regulatory impact analysis under Executive Order 1291, and that the sector of the U.S. fishing industry dealing in groundfish from the Bering sea and Aleutian Islands is too small for the proposed action to have a significant effect on the economy...The Administrator also certifies that approval and implementation of Amendments 1a and 2 will not have a significant economic impact on a substantial number of small entities, and thus do not require the preparation of a regulatory flexibility analysis.*"

Results: Bycatch of chinook salmon was greatly reduced in the early 1980's, from a high of about 115,000 fish in 1980 to only 10,000 fish by 1983. An estimated 15,644 chinook salmon were taken as bycatch in foreign trawl fisheries in 1982.

BSAI Amendment 2 Increase Allocation to Domestic Fleet

Dates: Amendment 2 was adopted by the Council in September, 1980. A proposed rule was published on October 29, 1981 (46 FR 53475) and a final rule published on January 12, 1982 (47 FR 1295). Effective date of implementation was January 12, 1982.

Purpose and Need: The domestic fleet was beginning to grow, and U.S fishermen, particularly those delivering fish to foreign vessels under joint venture arrangements, judged that they would be able to catch more flatfish than in the past. Additionally, NMFS resource assessment data indicated a short-term increase in Pacific cod due to a strong year class entering the fishery, along with a rapid expansion of the domestic fishery for this species.

The purpose of the amendment was to increase the domestic annual harvesting (DAH) amount and the joint venture processing (JVP) amount of yellowfin sole and other flatfish, and consequently decrease the amount available to foreign fishing (TALFF). The Pacific cod catch specifications were increased, particularly for domestic fisheries, to reflect best available scientific information.

Regulation Summary: The amendment changed the specifications for yellowfin sole, other flatfish, and Pacific cod as follows:

Yellowfin sole:	DAH increased from 2,050 mt to 26,200 mt. JVP increased from 850 mt to 25,000 mt. TALFF decreased by 24,150 mt.
Other flatfish:	DAH increased from 1,300 mt to 4,200 mt. JVP increased from 100 mt to 3,000 mt. TALFF decreased by 2,900 mt.
Pacific cod:	MSY decreased from 58,700 mt to 55,000 mt. EY increased from 58,700 to 160,000 mt. ABC increased from 58,700 mt to 160,000 mt. OY increased from 58,700 mt to 78,700 mt. Reserve increased from 2,935 mt to 3,935 mt. DAP increased from 7,000 mt to 26,000 mt. DAH increased from 24,265 mt to 43,265 mt.

Analysis: A 5-page EA analysis and a 4- page RIR analysis was prepared for this amendment. Only one alternative to the status quo was considered.

Results: The domestic and joint venture fisheries continued to grow. Additional increases in domestic allocations were made in 1983 under Amendment 4. Allocations of catch were frameworked under Amendment 1 in 1984.

BSAI Amendment 3 Specification of Halibut, Crab, and Salmon Prohibited Species Catch Limits for Foreign Fleet

Dates: Amendment 3 was adopted by the Council in September 1981. NMFS published a proposed rule on March 11, 1983 (48 FR 10383) and a final rule on July 2, 1983 (48 FR 24719). The effective date of implementation was July 4, 1983.

Purpose and Need: The purpose of this amendment was to reduce incidental bycatch of salmon, halibut, king and Tanner crab in the foreign trawl fisheries, and thereby reduce the economic costs to U.S. fishers that participate in these fisheries. The Council felt the existing requirement that these species be returned to the sea as soon as possible was not reducing the incidental bycatch and associated mortality of these species. The intent of this amendment was to set low allowable bycatch rates to reduce bycatch. By providing incentives (more groundfish TALFF allocation to that country), it was felt that foreign vessels could reduce their bycatch of prohibited species and still catch the groundfish TALFF.

Regulation Summary: Amendment 3 reduced bycatch of prohibited species in foreign groundfish fisheries. Essentially, total PSC allocations for foreign nations were based on bycatch rates multiplied by the nations TALFF allocation. Bycatch rate reductions to be met by 1986 from status quo base years (1977-80) were as follows: halibut, 50%; king and Tanner crab 25%; salmon 75%. The target level of salmon bycatch was 17,473 fish. If bycatch apportionments for any PSC species were met or exceeded, that nation's fleet was prohibited from fishing in the entire BSAI area, unless exempted by the NMFS Regional Director.

Analysis: A 39-page RIR/IRFA (final draft dated November, 1981) was prepared for this amendment. There were three alternatives, including the status quo that were considered. The other non-status quo alternatives not chosen would have closed INPFC Areas I and II during the period October 1 through March 31, when prohibited species were believed to be highly concentrated.

Results: The foreign fleet successfully reduced bycatch in their fisheries (of course, part of this reduction is attributable to reduced TALFF). However, bycatch savings were offset by the growing joint venture (JV) fisheries. The adjacent table illustrates these results.

Bycatch in foreign and JV groundfish fisheries in the BSAI 1983-1986.
Source: Guttormsen et al. 1990.

	Halibut (mt)		Salmon (#)		King crab (#)	
Year	Foreign	JV	Foreign	JV	Foreign	JV
1983	1,872	438	18,173	24,493	404,013	630,144
1984	2,128	617	16,516	67,622	292,223	398,865
1985	1,789	1,026	10,003	10,420	219,783	1,005290
1986	1,192	1,711	1,643	19,340	14,631	260,435

BSAI Amendment 4 — Increase Domestic Allocation II, Increase Pacific Cod Acceptable Biological Catch and Optimum Yield, Relax Foreign Area Restrictions in the Aleutian Islands

Dates: Amendment 4 was adopted by the Council in 1981. NMFS published a proposed rule/notice of partial approval on December 6, 1982 (47 FR 54841) and a final rule on May 12, 1983 (48 FR 21336). Effective date of implementation was May 9, 1983.

Purpose and Need: The primary purpose was to provide additional opportunities for growth in domestic fisheries. U.S. fishermen who delivered fish to foreign processing vessels indicated that the existing domestic annual harvests (DAHs) would not allow joint venture (JV, a component of DAH) operations to continue, because the amounts of certain species (pollock, yellowfin sole, other flatfish, Atka mackerel, and other species) allocated to DAH were insufficient. Additionally, the abundance of Pacific cod had increased due to a strong 1977 year-class entering the fishery, so Amendment 4 also increased the ABC and OY for Pacific cod. Amendment 4 was also implemented to allow foreign fishing between 3 to 12 miles in the Aleutian Islands, so that they could catch their groundfish allocations. Previously, foreign fisheries were only allowed to operate outside of 12 miles, but the continental shelf is very narrow in this area, making fishing impracticable and thus the catch could not be taken. In its original draft, Amendment 4 would have provided more flexibility and timeliness of conservation measures by giving the Secretary authority to issue field orders for adjusting time/area closures. This part was disapproved because "the amendment failed to specify adequately the procedures, limits, and types of responses that could be made in issuing such orders."

Regulation Summary: Amendment 4 allowed foreign trawling outside 3 miles north of the Aleutians between 170°30 W and 170°W and south of the Aleutians between 170°W and 172°W, and allowed foreign longlining outside 3 miles west of 170°W longitude. Amendment 4 also changed the specifications for yellowfin sole, other flatfish, and Pacific cod as follows:

Pollock:	DAH increased from 19,550 mt to 74,500 mt, JVP increased from 9,050 mt to 64,000 mt. TALFF decreased from 930,450 mt to 875,500 mt.
Yellowfin sole:	DAH increased from 26,200 mt to 31,200 mt, JVP increased from 25,000 mt to 30,000 mt. TALFF decreased from 84,950 mt to 79,950 mt.
Other flatfish:	DAH increased from 4,200 mt to 11,200 mt, JVP increased from 3,000 mt to 10,000 mt. TALFF decreased from 53,750 mt to 46,750 mt.
Atka mackerel:	DAH increased from 100 mt to 14,500 mt, JVP increased from 100 mt to 14,500 mt TALFF decreased from 23,460 mt to 9,060 mt.
Other species:	DAH increased from 2,000 mt to 7,800 mt, JVP increased from 200 mt to 6,000 mt. TALFF decreased from 68,537 mt to 65,648 mt. ABC corrected to be 79,714 mt, OY to 77,314 mt, and reserves to 3,566 mt.
Other rockfish:	DAP set at 1,100 mt for BSAI area combined.
POP:	DAP set at 550 mt for Bering Sea and 550 mt for Aleutians. JVP set at 830 mt for Bering Sea and 830 mt for Aleutians.
Sablefish:	JVP set at 200 mt for Bering Sea and 200 mt for Aleutians. MSY set at 11,600 mt for Bering Sea and 1,900 mt for Aleutians.
Pacific cod:	EY and ABC increased from 160,000 mt to 168,000 mt, OY increased from 78,700 mt to 120,000 mt. Reserve increased from 3,935 mt to 6,000 mt, TALFF increased from 31,500 mt to 70,735 mt.

Analysis: A 16 page Environmental Assessment was prepared for this amendment. Eight alternatives including the status quo were considered. Essentially, the alternatives considered were different combinations of the management actions contained in this amendment.

Results: Allocations of catch were frameworked under Amendment 1 in 1984.

BSAI Amendment 5 Reduce Chinook Salmon Prohibited Species Catch Limit (withdrawn)

Dates: Amendment 5 was adopted by the Council in September 1981 in conjunction with Amendment 3. A proposed rule was drafted but withdrawn because it was redundant to Amendment 3, which finally was implemented on July 2, 1983 (48 FR 24719) after a long delay.

Purpose and Need: The purpose of Amendment 5 was to limit the prohibited species catch (PSC) of chinook salmon in the eastern Bering Sea foreign trawl fisheries to 45,500 fish. This was the amount approved by the Council as part of Amendment 3, and was a reduction from the existing limit of 55,250 fish established by Amendment 1a. These values for the proposed chinook salmon PSC were based upon the Council approval of the PSC reduction schedule for salmon that was negotiated between principal domestic and foreign user groups (western Alaska residents and Japanese trawl industry representatives). Because there was a long implementation delay for Amendment 3, Amendment 5 was proposed to reduce the salmon PSC sooner.

Regulation Summary: The amendment was withdrawn when it was superceded by implementation of Amendment 3.

Analysis: There is no record of an analysis in the files.

Results: Salmon PSC limits for foreign trawl fisheries were reduced in accordance with Amendment 3.

BSAI Amendment 6 Domestic Fishery Development Zone (disapproved)

Dates: Amendment 6 was adopted by the Council in September, 1982. NMFS published a proposed rule on October 7, 1983, (48 FR 45806) and a notice of withdrawal on February 9, 1984 (49 FR 4956).

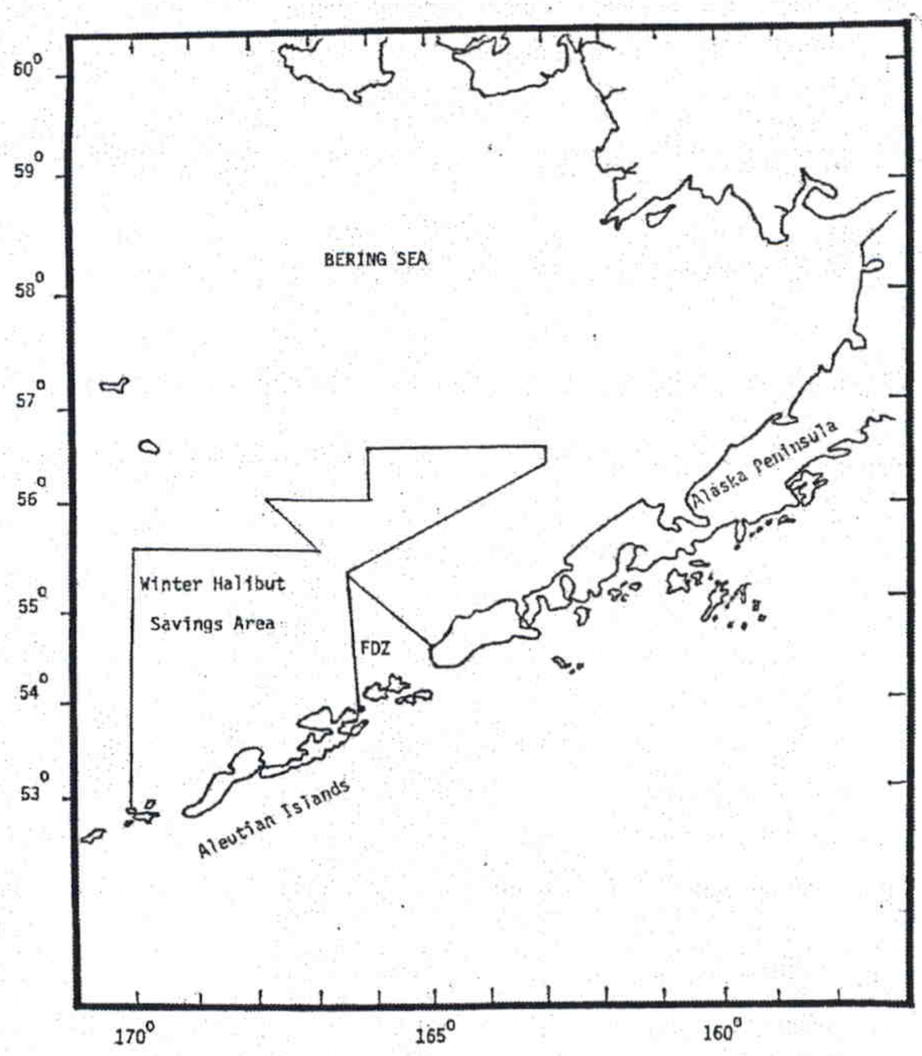
Purpose and Need: The purpose of the amendment was to provide a sanctuary for U.S. fishing vessels in a productive fishing area of the Bering Sea and to encourage the expansion of the U.S. groundfish fishery. It was felt that by setting aside a very productive area in relatively close proximity to the only three developed harbors in the Bering Sea (Unalaska, Akutan, and Sand Point), the domestic fisheries would gain a competitive advantage. Creation of the FDZ would have had the effect of eliminating a 6 month foreign fishery from areas near the three harbors, because the nearby Winter Halibut Savings Area is closed to foreign trawling from December 1 through May 31.

Regulation Summary: Amendment 6 would have established a fishery development zone (FDZ). The proposed FDZ was located north and west of Unimak Pass and was bounded by the following coordinates:

55°16' N Latitude, 166°10' W Longitude;
54°00' N Latitude, 166°10' W Longitude;
54°35' N Latitude, 164°55'42'' W Longitude;

The FDZ would have been reserved for use by domestic fishing vessels – including those delivering to shore-based processors, U.S. catcher/processors, and foreign processing vessels involved in U.S. joint venture operations. All foreign harvest operations would have been excluded year-round from the FDZ.

Analysis: A 79 page RIR/IRFA (final draft dated November 1983) was prepared for this amendment. Two alternatives to the status quo were examined. The other alternative would have defined a larger area as the FDZ.



Location of the Fishery Development Zone (FDZ), northeast of Unalaska.

Results: The amendment was disapproved by the Secretary of Commerce under Section 304(b)(2) of the Magnuson Fishery Conservation and Management Act on December 8, 1983. Instead of resubmitting the proposed amendment, the Council agreed to a voluntary foreign industry abstention from fishing in the local areas of importance to U.S. fishermen and processors.

BSAI Amendment 7 Relax Foreign Longline Restrictions in Winter Halibut Savings Area

Dates: Amendment 7 was adopted by the Council in September 1982. NMFS published the proposed rule on May 16, 1983 (48 FR 21978), and the final rule on August 2, 1983 (48 FR 34962). Effective date of implementation was August 31, 1983.

Purpose and Need: The purpose of the amendment was to modify the regulations designed to control halibut bycatch in the foreign longline fisheries. Under the original FMP, foreign longline vessels were prohibited from fishing landward of the 500 meter depth contour in the Winter Halibut Savings Area (WHSA) from December 1 through May 31. The provision was intended to protect juvenile Pacific halibut when they concentrate in the WHSA. An amendment was proposed by the Japanese longline industry to eliminate the 500 meter depth restriction, because they felt it would prevent the harvest of their Pacific cod allocations.

Regulation Summary: Amendment 7 allowed the foreign longline fleet to fish in the shallow waters of the WHSA so as to allow them to catch their allocation of Pacific cod. However, the depth restriction would be reimposed if the foreign longline fleet in the entire BSAI caught 105 metric tons of halibut as bycatch during the 12 month period of June 1 through May 31. Thus, if the incidental catch of Pacific halibut by foreign longline vessels in the BSAI reached 105 mt between June 1 and November 30, the WHSA would be closed to foreign longlining landward of the 500 meter depth contour for the 6-month period December 1 through May 31. If the incidental catch limit of 105 mt was reached from December 1 though May 31, the restriction would be reimposed for whatever remained of that 6-month period.

Analysis: An 18 page EA was prepared for this amendment. Three alternatives including the status quo were considered. The other alternative not chosen would have eliminated all area restrictions on foreign longliners and thus allowed them to fish year-round in the WHSA regardless of depth. Problems identified with this alternative included gear conflicts and an increase in bycatch of halibut.

The alternative chosen would allow foreign longline vessels to pursue Pacific cod in shallow waters, while at the same time provide incentives to reduce halibut bycatch. The 500 meter depth restriction was maintained because bycatch rates for halibut in the Pacific cod fishery are higher in shallower waters. The 105 mt bycatch limit was a 25 percent reduction from the average 1978-81 incidental take of halibut in the BSAI foreign longline fishery.

Results: Foreign longline vessels were able to catch their allocation of Pacific cod, until phased out by domestic fisheries. The adjacent table shows the catch of Pacific cod in foreign and domestic longline fisheries. No information could be found on the bycatch of halibut associated with this fishery.

Catch of BSAI Pacific cod in foreign longline fisheries and domestic longline fisheries, 1981-1992.

Year	Foreign	Domestic
1981	6,086	27
1982	3,618	5
1983	6,847	4
1984	27,446	8
1985	37,571	50
1986	26,563	49
1987	47,028	1,417
1988	0	2,611
1989	0	14,219
1990	0	47,716
1991	0	79,696
1992	0	101,249

BSAI Amendment 8 1984 and 1985 Salmon Prohibited Species Catch Limits for Foreign Trawl

Dates: Amendment 8 was adopted by the Council in March 1983. Effective date of implementation was July 4, 1983. No final rule is on file.

Purpose and Need: The purpose of Amendment 8 was to extend reductions of incidental bycatch of salmon in the foreign trawl fisheries implemented under Amendment 3. Its intent was to continue the Council's salmon bycatch reduction efforts begun under Amendment 3, which controlled salmon PSC through 1983 only.

Regulation Summary: Amendments 3 and 8 reduced bycatch of prohibited species in foreign groundfish fisheries. Amendment 3 set a goal of total salmon bycatch of 17,473 fish by 1986, which was a 75% reduction from the 1981 salmon PSC of 69,893 and a 78% reduction from the average salmon bycatch of 80,000 fish for the years 1977-80. Amendment 8 implemented a salmon PSC limit of 38,441 fish for 1984 and 27,957 fish for 1985. The 1986 limit remained at the 17,473 fish PSC envisioned in Amendment 3.

Target reduction schedule of salmon prohibited species catches based on the average 1977-80 foreign trawl salmon incidental catch.

Year	Chinook Salmon (#)	Total Salmon (#)
1981	65,000	69,893
1982	55,250	59,409
1983	45,500	48,925
1984	35,700	38,441
1985	26,000	27,957
1986	16,250	17,473
Average incidental catch 1977-80	74,400	80,000

Analysis: The Council reviewed the status of the salmon resource and the economic and technological reasonableness of further PSC reductions in context with the 75% reduction goal by 1986. The 1984-86 salmon PSC levels reflect limits negotiated between representatives for those Western Alaska residents who depend on the salmon resource and the Japanese trawl industry. A 39-page analysis of salmon, halibut, and crab bycatch reductions was prepared for Amendment 3 in 1981.

Results: The foreign fleet successfully reduced bycatch in their fisheries. However, bycatch savings were offset by the growing JV fisheries.

BSAI Amendment 9 Reporting Requirements, Habitat Protection Policy

Dates: Amendment 9 was adopted by the Council in May 1985. It was partially disapproved on October 17, 1985. The proposed rule (50 FR 33080) was published on August 16, 1985. The final rule (50 FR 46072) was published on November 6, 1985; a correction to the final rule (50 FR 48601) was published on November 26, 1985. Effective date of approved measures was January 1, 1986.

Purpose and Need: Rapid growth of the domestic groundfish fleet led to the development of reporting requirements of catch information by vessels that process their catch at sea. While fish tickets collected catch data from vessels landing at shore-based processing facilities, the action was aimed at collecting necessary and timely catch information from at-sea processors on extended trips.

While not required by law at the time, incorporation of habitat concerns into the FMP was approved in response to the NMFS Habitat Conservation Policy which advocated such consideration in development of FMPs and amendments. The policy further aimed to strengthen the federal/state partnership to act as stewards of marine habitat.

Regulation Summary: Three parts of Amendment 9 were approved:

1) incorporate catcher/processor and mothership vessel reporting requirements to provide NMFS with more timely catch information necessary for adequate in-season management (weekly processor report with check-in/check-out reporting). A reporting system for catch held aboard for 14 days or more by the expanding domestic fleet was established. Permit holders must identify vessels as: (a) harvesting/processing, (b) mothership processing; ©) harvesting only; or (d) support only.
2) incorporate the NMFS habitat protection policy into the FMP in response to NMFS' Habitat Conservation Policy which advocates consideration of habitat concerns in developing or amending FMPs; and
3) incorporate a definition of directed fishing.

One action associated with habitat consideration in the FMP, to prohibit the discard of fishing gear and marine debris, was reserved until the required analysis was prepared. A measure to reduce bycatch of fully utilized species by closing an area within 20 miles of the Aleutian Islands to foreign trawling was disapproved.

Analysis: A 40-page RIR/IRFA (dated May 28, 1985) reviewed two actions which arose from the Council's first call for proposals:

(1) Reporting requirements:
   (a) operators of catcher/processor and mothership vessels must indicate on federal fishing permits their capability and intent to preserve catch at sea;
   (b) same operators must check-in/out of a regulatory area;
   (c) same operators that retain fish at sea for 14 days or more to provide a weekly report of the amounts of groundfish caught or received by species by fishing area.

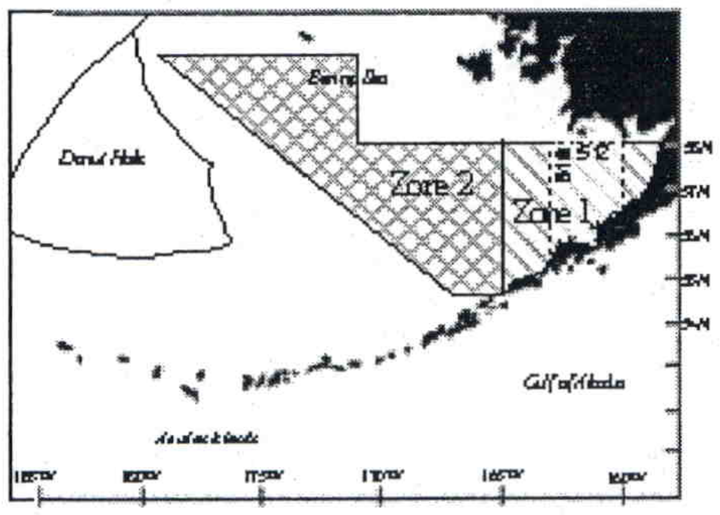
Four rejected alternatives included the status quo, weekly processor reports with no check-in/check-out reporting, placing observers aboard a portion of the catcher/processor and mothership fleet, and placing observers aboard the entire processing fleet. Approximately 25 vessels harvesting $114 million of groundfish were affected by the decision in 1985.

(2) Habitat. The Council identified habitat as the source of productivity of the groundfish resource. Two rejected alternatives included status quo and a general habitat conservation objective that would include habitat information in a separate, referenced document rather than in the FMP; .

Results: Under Amendment 9, NMFS implemented weekly processor reporting which has provided necessary data for inseason management and numerous subsequent groundfish analyses.

BSAI Amendment 10 Bristol Bay Trawl Closure, Crab and Halibut Prohibited Species Catch Limits, Catcher Processor Reporting Requirements, Domestic Observer Requirements

Dates: Amendment 10 was adopted by the Council in September 1986. The proposed rule for Amendment 10 was published on December 18, 1986 (51 FR 45349) and NMFS published a final rule on March 19, 1987 (52 FR 8592), with a corrected version published on April 22, 1987 (52 FR 13375). Effective date of implementation was March 9, 1987.



Purpose and Need: Amendment 10 was proposed primarily in response to concerns that commercial trawl fishing was contributing to the mortality of crabs through their incidental capture and mutilation from trawl gear. At its January 1986 meeting, the Council determined that stocks of Bering Sea Tanner and king crab were low in abundance, and that trawling for groundfish, especially yellowfin sole and other flounders, was threatening both the crab and halibut stocks. Although regulations governing foreign trawl fishing (Amendment 9 banned foreign trawling in the Aleutian Islands) provided certain closed areas and prohibited species catch (PSC) limits for Pacific halibut, Tanner crab, and king crab, domestic trawl fishing vessels and joint ventures (domestic catchers delivering to foreign catcher/processors) had not been similarly restricted.

In response, the Council approved an emergency rule to close an area north of the Alaska Peninsula to all trawling, with the exception of trawling for Pacific cod (with a PSC limit of 12,000 red king crab). The closed area was expected to protect about 70% of the mature female red king crab spawning stock. The emergency rule also established PSC limits for *C. bairdi*, red and blue king crab, and halibut that, when reached, would close a directed fishery. The rule also required that domestic vessels carry NMFS observers in certain areas and comply with a data gathering program. The Secretary implemented the emergency rule, with the deletion of blue king crab and halibut, on June 3, 1986, and it was extended until December 2, 1986.

Regulation Summary: The final regulations contained the following four parts:

1) Closed the area north of the Alaska Peninsula, south of 58° N. latitude, west of 160° W longitude, and east of 162° W longitude to all trawling year-round and established the following PSC limits and bycatch limitation zones:
   Applicable to all domestic vessels in directed fisheries for yellowfin sole and other flatfish in the specified zone:
   a) 80,000 C. bairdi in bycatch limitation Zone 1
   b) 135,000 red king crab in Zone 1
   c) 326,000 C. bairdi in Zone 2;
   Applicable to foreign directed fishing for yellowfin sole and other flatfish: 64,000 *C. bairdi* in Zones 1 and 2 combined;
   Applicable to domestic vessels in directed fisheries for yellowfin sole and other flatfish and delivering to foreign processing vessels (i.e. joint ventures): 828,000 halibut in the entire BSAI.
2) Required written weekly catch reports from all catcher/processors and motherships regardless of when the catch is landed (BSAI Amendment 9 implemented the same requirement for catcher/processors holding their catch for more than 2 weeks);
3) Provided authority to the Secretary to make inseason changes to gear regulations, season, and harvest quotas; and
4) Provided the Secretary with inseason authority to reapportion surplus groundfish within the domestic allowable harvest.

Analysis: A 79-page RIR/IRFA (final draft dated November 1986) was prepared for Amendment 10. Six alternatives were considered for the proposed area closing, including no action. The alternatives included variations on the closed area, PSC limits, and bycatch limitation zones. The other actions were evaluated on the basis of the preferred alternative and the no action alternative.

Results: This action caused a substantial change in the distribution of groundfish fishing effort, especially the joint venture yellowfin sole and other flatfish fisheries. The benefits, in the form of bycatch savings that occurred during the 1986 fishery under the emergency rule compared to the 1985 fishery, were significant. The bycatch rates for red king crab, *C. bairdi*, and halibut declined by 90%, 44%, and 17%, respectively. The *C. opilio* bycatch rate, however, increased by a factor of 10 when the fleet moved out of Zone 1. Imposition of the emergency rule saved an estimated 1,162,000 red king crab, 221,000 *C. bairdi*, and 64,000 halibut, and a loss of juvenile 4,492,000 *C. opilio*, providing an estimated net benefit of $6.7 - $14.6 million in ex-vessel revenue.

Since 1986, crab stocks have continued to fluctuate. For example, the opilio stock peaked in 1991 and again in 1998, then declined. A rebuilding plan is being developed for both the *C. opilio* and Tanner (*Bairdi*) crab stocks. The red king crab fishery was closed in 1994 and 1995, but has since provided a small fishery. Crab and halibut PSC limits were further revised under BSAI Amendments 12a, 16, 19, 21, 25, and 37.

BSAI Amendment 11 Apportionment of Pollock for Joint Venture Vessels

Dates: Amendment 11 was adopted by the Council in May 1987. The proposed rule for the Amendment was published on September 1, 1987 (52 FR 32942) and NMFS published a final rule on December 3, 1987 (52 FR 45966). Effective date was December 30, 1987.

Purpose and Need: Amendment 11 was proposed in response to concerns that the domestic annual harvest was being dominated by the joint venture processing fishery (domestic catcher vessels delivering to foreign processing vessels). Since 1977, the pollock fishery in the BSAI evolved from an entirely foreign-harvested fishery to a predominantly domestic-harvested fishery. Yet the volume of fish delivered to foreign processors continued to largely exceed the amount delivered to domestic shore-based processors. In 1986, nearly 95% of the total 886,000 mt domestic annual harvest was harvested in joint venture operations.

The transition to domestic-dominated fisheries was also accompanied by a trend toward harvesting more pollock early in the season, from January-April. Prior to 1980 and the advent of the joint venture fisheries, less than 25% of the pollock harvest was taken before April. By 1987, 73% of the pollock harvest had been harvested by May in the joint venture fisheries. There are two economic advantages to harvesting early in the year: 1) spawning pollock populations are highly aggregated, improving catch per unit effort, and 2) the open access nature of the fishery provides incentive to fish as soon as possible. Higher catch rates posed a significant biological risk; at times, catch rates were so high that it became economically feasible to retain only the valuable pollock roe and discard whole male and female carcasses (a practice called roe-stripping).

Instead of relegating joint venture operations to specific areas and prohibiting roe-stripping, the Council adopted a split-season proposal to reduce the amount of pollock harvested by the joint venture fisheries during the spawning season. This action would prevent development of an efficient fishery for the highly valued pollock roe, as well as allow for the expansion of the domestic processing fishery.

Regulation Summary: The regulations implemented the following three provisions:

1) Established an apportionment of the pollock TAC allocated to joint venture operations of 40% in the first season (January 1-April 15) and 60% in the second season (April 16-December 31). The measure was effective only in 1988 and 1989;
2) Revised the definition of acceptable biological catch (ABC) to conform with that used by the Pacific Council and includes definitions for "threshold" and "overfishing;"
3) Revised the definition of prohibited species to specifically name the species to be prohibited in the catches of foreign and domestic fishermen. Steelhead and Pacific salmon were added to the prohibited species list of halibut, herring, and king and Tanner crab for domestic and foreign fisheries; all salmonids are prohibited for foreign fishermen.

The final rule for Amendment 11 also clarified that the definition of directed fishing (20% or more of the harvest) applied to domestic fisheries as well as foreign fisheries. This was inadvertently omitted from the proposed and final rule for BSAI Amendment 10.

Analysis: An RIR/IRFA (final draft dated July 1987) and supplemental document was prepared for Amendment 11. A draft analysis dated April 1987 considered seasonal apportionments of 0/100% and 50/50% for the joint venture pollock fisheries. The Council's preferred alternative (40/60%) was bounded by the range considered, and therefore the available data and likely effects of the preferred action were sufficiently addressed in the draft analysis. The preferred 40/60% split was carried over in the final analysis as the preferred alternative, along with the no action alternative. Continuing to concentrate the pollock harvest in the beginning of the year (no action) was deemed unacceptable due to the possible risk to the reproductive potential of the pollock stocks. The alternatives for revising the definitions of prohibited species catch and ABC included the preferred alternative and no action.

Results: By 1991, foreign fishing had been phased out of the EEZ and the entire BSAI groundfish harvest (2,126,000 mt) was taken by 391 U.S. vessels. The Council has also since prohibited the practice of roe-stripping of pollock.

BSAI Amendment 11a Catcher Processor Reporting Requirements

Dates: The Council adopted BSAI Amendment 11a (GOA Amendment 16) in 1987. The proposed rule for Amendment 11a was published on December 21, 1987 (52 FR 48303)and NMFS published a final rule on March 10, 1988 (53 FR 7756). Effective date was April 7, 1988.

Purpose and Need: Amendment 11a was proposed in response to a need for better information from catcher/processors and mothership processor vessels in order to sufficiently address fishery management problems, enforce current regulations, and meet the conservation goals identified in the FMPs. The amendment intended to add to the currently required weekly catch reports by catcher/processors and motherships: information on the number of cartons and unit net weight of a carton of processed fish by species; a Product Transfer Report; and a Cargo Transfer/Offloading Log.

The purpose of the amendment also was to redefine the definition of prohibited species and respecify the other three species categories, and to institute some regulatory changes that would affect the public comment period. Several other minor regulatory changes were made specific only to the Gulf of Alaska FMP.

Regulation Summary: The regulations implemented the following provisions to the BSAI FMP:

1) Augmented the current catcher/processor and mothership reporting requirements with at-sea transfer information, specifically, a Cargo Transfer/Off-Loading Log and Product Transfer Report;

2) Revised the definition of prohibited species to include Pacific salmonids, Pacific herring, Pacific halibut, king crab, Tanner crab, and steelhead trout. Respecified the other three categories:
    a) Target species–pollock, Pacific cod, flounders, rockfish, and sablefish
    b) Other species–Atka mackerel, squid, sculpins, sharks, skates, eulachon, smelts, capelin, and octopus
    c) Non-specified species–those species taken incidentally in the groundfish fisheries but are not managed by the FMP. No catch records are required;

3) Required the public comment period for proposed annual specifications and prohibited species catch limits to be 30 days following the date of filing of the notice for public inspection with the Office of the Federal Register.

Analysis: An EA/RIR/IRFA was prepared for Amendment 11a, which determined that there was no significant environmental impact as a result of this action.

Results: Since the amendment was passed, the four species categories have remained intact, and the "optimum yield" concept is applied to all except the prohibited species category. The prohibited species group has maintained the definition listed in the amendment. A single total allowable catch still exists for the other species group which currently includes smelts, octopus, sharks, skates, and sculpins; squid and Atka mackerel were moved to the target species group in 1993. In 1998, a final rule on forage fishes was published which removed smelts from the other species category and placed them in a separate "Forage Fish" category beginning in 1999.

BSAI Amendment 12 Permit Requirements, Prohibited Species Catch Limit Framework, Establish Rock Sole as Separate Target Species

Dates: BSAI Amendment 12 (GOA Amendment 17) was adopted by the Council in June 1988. The proposed rule was published on September 6, 1988 (53 FR 34322) and the final rule was published on May 1, 1989 (54 FR 18519). Effective date of approved measures was May 26, 1989.

Purpose and Need: As part of its annual call for proposals, the Council initiated a plan amendment to address six proposals to amend the BSAI FMP. The Council identified the rationale for the preferred actions under the amendment:

(1) revise the federal permit requirements:
   (a) the single species rule (whereby the catch of a species approaches its TAC) placed no limit on the amount of a species discarded after its retention is prohibited because its TAC has been fully harvested. The amount of bycatch discard increased during the rapid increase in the domestic fleet; and
   (b) the single species rule did not apply to foreign fishing. Bycatch would be treated as PSC when a species reached its TAC. Therefore, a foreign fishery could not retain or discard bycatch without accounting for it against each species' allocation which were by then being fully harvested by the joint venture and domestic fisheries;
(2) an increased interest by the domestic fishery to target roe-bearing rock sole led to competition with the foreign fishery for the "other flatfish" TAC;
(3) mirror an administrative procedure in the GOA FMP whereby annual specifications of PSC limits in BSAI could be set for BSAI groundfish.

Regulation Summary: Amendment 12 required:

(1) All vessels receiving groundfish harvested in the EEZ to hold a federal permit and comply with federal reporting requirements;
(2) established PSC limit framework for groundfish species in the joint venture and foreign fisheries;
(3) established rock sole as a target species separate from the "other flatfish" category;
(4) removed the July 1 deadline for resource assessment document.

Analysis: A 133-page EA/RIR/IRFA (dated May 18, 1988) analyzed four amendment proposals for the BSAI FMP (the four listed above) and:

(5) remove the 2 million mt upper limit to the optimum yield range. The Council chose the status quo for this proposal, for which it produced a separate SEIS (53 FR 16319) (this was not adopted by the Council).

Results: The BSAI rock sole fishery has developed into a nearly 135,000 mt fishery as of 2000, comprising 25% of combined flatfish TACs.

BSAI Amendment 12a Revised Crab and Halibut Prohibited Species Catch Limits, Modify Bristol Bay Crab and Halibut Protection Zone

Dates: Amendment 12a was adopted by the Council in December 1988. The proposed rule (54 FR 19199) was published on May 4, 1989. The final rule was published on August 9, 1989 (54 FR 82642). Effective date of approved measures was September 3, 1989 through December 31, 1990.

Purpose and Need: The Council intended that Amendment 10 expire at the end of 1988 due to uncertainty about fluctuations in population levels of prohibited species and development of domestic groundfish fisheries. Concern about continued crab and halibut bycatch prompted the Council to develop more comprehensive controls to replace those that were set to expire. Amendment 12a, separated from Amendment 12, specified PSC limits on Tanner crab, red king crab, and Pacific halibut in the BSAI groundfish fisheries and apportioned these limits among four specified groundfish fisheries. These PSC limits were in effect during 1989 and 1990. The Council aimed to balance the avoidance of bycatch with providing reasonable opportunities for trawl fisheries to harvest their target species. Its bycatch policy was developed because discarding crab and halibut is wasteful, may adversely affect their use as a target species in other commercial fisheries, and potentially could result in their being overfished.

Regulation Summary: The PSC limits set in regulation under Amendment 12a are listed at right.

Crab and halibut PSC limits

Species and fishery	Zone 1	Zone 2	Zone 1& 2H (1°)	BSAI (2°)
red king crab (animals)				
domestic flatfish	50,579			
domestic other	20,879			
JV flatfish	111,858			
JV other	16,684			
	200,000			
Tanner crab (animals)				
domestic flatfish	68,790	260,910		
domestic other	609,519	1,828,558		
JV flatfish	93,359	280,077		
JV other	210,152	630,455		
	1,000,000	3,000,000		
Pacific halibut (mt)				
domestic flatfish			181	220
domestic other			3,408	4,131
JV flatfish			146	177
JV other			665	805
			4,400	5,333

Analysis: An 86-page EA/RIR/IRFA (dated March 29, 1989) analyzed the following management alternatives to address crab and halibut PSC limits:

(a) status quo;
(b) extending specific bycatch provisions in Amendment 10;
(c) establishing a framework for management procedure to control bycatch of Tanner crab, red king crab, and Pacific halibut;
(d) establishing fixed, but increasingly restrictive, numerical limits for particular zones; and
(e) establishing aggregate PSC limits, apportioned by "target fishery" and area (preferred).

Results: Since 1986, crab stocks have continued to fluctuate. For example, the opilio stock peaked in 1991 and again in 1998, then declined. A rebuilding plan is being developed for both the opilio and Tanner crab stocks. The red king crab fishery was closed in 1994 and 1995, but has since provided a small fishery.

This amendment was an extension of Amendment 10. Amendment 12a reexamined available data for crab and halibut bycatch and revised the PSC limits through 1990. Crab and halibut PSC limits were further revised under Amendments 16, 19, 21, 25, and 37.

BSAI Amendment 13 Observer Program, Sablefish Gear Allocations, Walrus Island Closure, Reporting Requirements

Dates: BSAI Amendment 13 (GOA Amendment 18) was adopted by the Council in June 1989, and approved by the Secretary on November 1, 1989. A proposed rule (54 FR 36333) was published on September 1, 1989 and corrected on September 22, 1989 (54 FR 39022). A final rule implementing actions in Amendments 13/18 (54 FR 50386), except for the Observer Program, was published on December 6, 1989 and effective January 1, 1990. A correction was filed on January 11, 1990 (55 FR 1036). A final rule implementing the Observer Program (55 FR 4839) was published on February 12, 1990 and effective on February 7, 1990.

Purpose and Need: Since foreign fishing had been curtailed, NMFS needed to augment the fisheries observer program to cover the domestic fishery. The purpose of a comprehensive data collection program for the domestic groundfish fishery is to provide adequate and reliable data on which to:

(1) base in-season and inter-season management decisions;
(2) efficiently carry out resource management; and
(3) measure fishery performance against existing and proposed management measures.

Additionally, the Council identified concerns regarding sablefish bycatch and a 50% decline in the number of walrus hauled out on Round Island.

Regulation Summary: Amendment 13 to the groundfish FMPs authorized a comprehensive domestic fishery observer program. The 1990 and 1991 Observer Plans required specific levels of observer coverage which varied with size of fishing vessel and quantity of fish processed.

The Observer Plans required that owners and operators of vessels and shoreside processing facilities participating in the groundfish fishery arrange for and pay for the cost of placing observers aboard their vessels and at their shoreside processing facilities beginning in January 1990. Each vessel or processor required to have observer coverage is responsible for the cost of obtaining the required observers from a certified contractor.

Amendment 13 also:

(1) allocated sablefish: 50/50 percent to fixed and trawl gear in the BS and 75/25 percent to fixed and trawl gear in the AI;
(2) closed waters seaward of 3 miles out to 12 miles surrounding the Walrus Islands (Round Island and the Twins) and Cape Peirce from April 1 through September 30 to groundfish fishing;
(3) deleted fishing season dates from the FMPs but retained them in regulation;
(4) clarified authority to recommend TACs for additional or fewer target species within the "target species" category.

Analysis: A 193-page EA/RIR/IRFA (final draft dated July 21, 1989) was prepared for this amendment. Alternatives examined included the preferred alternative and the status quo for four of the five actions affecting GOA groundfish management. In approving its action to allocate sablefish between fixed and trawl gear, the Council also considered an alternative to determine and allocate "true" bycatch needs, with any residual being made available to the directed fishery without regard to gear type.

Results: The domestic observer program provides information for stock assessment and in-season management, including the ability to accurately assess catch and bycatch in the fisheries. Three problems were later identified for observer coverage payment. It was not an equitable system in that some operations paid for 100% coverage and others did not pay anything, it limited the ability of NMFS to effectively manage the observer program, and it may result in a conflict of interest that could reduce the credibility of observer data. The research plan, under Amendment 30, was designed to address these three problems. Industry support for such a change is demonstrated by the willingness and ability of the industry to convince Congress and the President to amend the Act to allow the North Pacific Fisheries Research Plan to be established and paid for by a broad-based system of user fees. The proposed plan was to be applicable to the groundfish, halibut, and BSAI crab fisheries. Instead, implementation was delayed one year, then replaced with a modified pay-as-you-go system adopted under Amendments 47/47. Fees were collected by NMFS in the first year of implementation, which were later returned when the research plan was repealed.

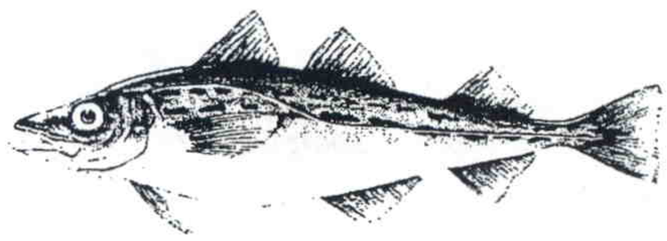
BSAI Amendment 14 Regulate Pollock Roe Stripping, Seasonal Allowance Schedule for Pollock

Dates: Amendment 14 (GOA Amendment 19) was approved by the Council in June 1990. NMFS published the final rule on January 7, 1991 (56 FR 492), effective January 1, 1991.

Purpose and Need: Growth of the domestic harvesting and processing capacity in the pollock fishery had created competition for the pollock TAC by 1990. Competition for pollock during the roe season is intensified due to the high value of the roe relative to other products. In addition, extraction of roe can be done faster than production of other pollock products. By roe stripping, fishermen can increase their share of the pollock TAC by quickly producing the most valuable product at the least cost. This amendment was intended to address the following problems:

(a) roe stripping is a wasteful use of the pollock resource;
(b) roe stripping causes unintended allocation of pollock TAC among seasons and industry sectors;
(c) roe stripping may adversely affect the ecosystem;
(d) roe stripping may adversely affect the future productivity of the stock; and
(e) roe stripping increases the difficulty of accurately monitoring the pollock TAC for inseason management.

Regulation Summary: The amendment implemented rules that regulated the practice of stripping roe (eggs) from female pollock and discarding female and male pollock carcasses without further processing, and seasonally allocated the TAC of pollock. Season opening dates were established as follows for the GOA: January 1, April, July, and October, and for the BSAI: January 1 and June 1. To get at the issue of roe stripping, product recovery rate standards were established, which if exceeded would constitute a violation. The recovery rate standard established was 10 percent of the total round-weight equivalent of pollock and other pollock products onboard a vessel at any time during a fishing trip. To extrapolate round weight equivalents, the rule established product recovery rates as follows: fillet (18%), surimi (15%), mince (17%), meal (17%), and head & gut (50%).



Analysis: A 138-page EA/RIR/IRFA (final draft dated July 20, 1990) was prepared for this amendment. Five primary alternatives including the status quo were considered. The other alternatives that were not chosen would have just prohibited pollock roe-stripping, required full utilization of all pollock in pollock fisheries, or implemented seasonal allowances for pollock to reduce the amount harvested in the winter-early spring. Options for these alternatives included applying the regulations only to certain areas, and restricting the GOA pollock fishery to midwater gear only. The alternative adopted combined the elements of roe-stripping and seasonal allowances for all areas.

Results: Since the amendment was approved, the practice of roe stripping has stopped. In 1993, regulations were further tightened to close loopholes that could have potentially undermined the intent of the roe stripping regulations (58 FR 57752). 'Fishing trip' and 'pollock roe' were better defined as were pollock products that could be used to calculate retainable amounts of pollock roe. Full retention and utilization of pollock were required under Amendment 49.

BSAI Amendment 15 Establish Sablefish Individual Fishing Quotas, Establish Western Alaska Community Development Quota Program

Dates: NMFS published the proposed rule for BSAI Amendment 15 and GOA Amendment 20 on December 3, 1992 (57 FR 57130) with a corrected version published December 29, 1992 (57 FR 61870). These amendments were adopted jointly by the Council in December 1991. The final rule was published November 9, 1993 (58 FR 59375), with the effective date of implementation December 9, 1993. Actual program implementation was March 15, 1995, following applications, appeals, and establishment of monitoring systems. Portions of the regulations were amended in subsequent final rules.

Purpose and Need: In 1987, the Council recognized a need to take management action with regard to the sablefish fishery because it was exhibiting significant problems created by a short-season, derby-style fishery. Over time, with the constant increase of new entrants in the fishery, the sablefish fixed gear fishing seasons had degenerated to several short seasons each year. Typical problems included allocation conflicts, gear conflict, deadloss from lost gear, increased bycatch and discard mortality, excess harvesting capacity, decrease in product wholesomeness, safety concerns, and economic instability in the fisheries and fishing communities. In December 1988, the Council decided that the status quo was unacceptable and expressed a desire to explore the limited access options of license limitation, Individual Fishing Quotas (IFQs), and annual fishing allotments in a draft EIS. In January 1990, the Council decided to focus on IFQ options as an alternative to the status quo. The IFQ approach was preferable in that it provided fishermen with the authority to decide how much and what type of investment they wished to make to harvest the resource (by guaranteeing a certain amount of catch at the beginning of the season and extending the season over a period of 8 months), while also addressing the problems created by a derby-style fishery. In addition, in early 1991, the Council found that the management problems in the fixed gear sablefish fishery also afflicted the halibut fishery, and therefore decided to consider a similar IFQ system for the halibut fishery. The intent was that a single IFQ program would apply to both fisheries.

The IFQ Program is a regulatory regime designed to promote the conservation and management of the halibut and sablefish fisheries, and to further the objectives of the Magnuson-Stevens Act and the Northern Pacific Halibut Act. The program essentially assigns the privilege of harvesting a percentage of the sablefish and halibut quota to specific individuals with a history of harvest in the fisheries. The rights given to each person are proportional to their fixed gear halibut and sablefish landings during the qualifying period determined by the Council and are represented as quota shares. Under this program, only persons holding quota shares are allowed to make fixed gear landings of halibut and sablefish in the regulatory areas identified.

Regulation Summary: The IFQ Program was approved for the Pacific halibut and sablefish fixed gear fisheries in the Federal waters of the BSAI and GOA, and these fisheries have been managed under the program since 1995. The regulations outline several key provisions of the program: initial allocation of quota shares; vessel categories; transfer provisions; use and ownership provisions; the annual process for allocating quota shares (QS); and the establishment of Community Development Quotas. The regulations state that legal landings of halibut or sablefish harvested with fixed gear had to occur at any time during 1988-1990 to qualify for an initial allocation of quota share. Generally, if a vessel owner or lessee is qualified, their initial quota share would be based on their highest total landing of halibut for any 5 years of the 7-year base period 1984-1990. For sablefish, the initial quota share would be based on the highest total landing of sablefish for any 5 years of the 6-year base period 1985-1990. Each person eligible to receive quota share would have it assigned to one of four vessel categories: "A"-freezer vessels of any length; "B"- catcher vessels greater than 60'; "C"- catcher vessels less than or equal to 60' for sablefish, or between 35'-60' for halibut; "D"- catcher vessels less than or equal to 35' for halibut. Initial quota share would be assigned to the vessel category that a person's most recent fixed gear landings of groundfish or halibut were caught by that vessel. Various restrictions on transfer and ownership are designed to maintain the owner/operator characteristics of the fleet, and to prevent consolidation of QS in the hands of a few participants.

Analysis: A Supplemental Environmental Impact Statement/Environmental Impact Statement (final draft dated September 1992) and several appendices containing background information and an evaluation of the New Zealand Individual Transferrable Quota program were prepared for the initial review of the IFQ management alternative. Two alternatives were considered: 1) the status quo open access system characterized by fixed quotas for each regulatory area, and 2) IFQs. In addition, the document recognized the Council's previous determination that open access or more traditional management measures are not acceptable for the sablefish

Continued

fishery. The Council rejected license limitation on the basis that it may not be possible to reduce the fleet size in an equitable manner, and because of the significant potential for the reduction in vessel number to be offset by an increase in fishing power per vessel. Annual fishing allotments that were also considered previously were deemed a more complicated management program that would not solve the race for fish. With the preferred IFQ alternative, the Council intended to acknowledge and reward long-term and consistent participation in the fisheries; those whose catch histories showed less dependence on and participation in the fisheries were supposed to receive relatively small amounts of quota share. However, the method by which initial quota shares were calculated also allowed for one to two years of poor performance in the fishery due to circumstances beyond a person's control.

Results: The fixed gear halibut and sablefish IFQ program continues to rationalize the fishery and is generally considered a successful market-based management system to address overcapitalization. Overall, for the combined sablefish and halibut fisheries, an estimated total of 5,875 vessel owners received initial quota shares, and as expected, the number of quota share holders has decreased over time. The total number of initial issuees (unique number of people) in the halibut fishery was 4,827, which was reduced to 3,795 by the end of 1998. The total number of issuees in the sablefish fishery was 1,048, reduced to 919 by the end of 1998. The fishing season was converted from several 24-hour period openers each year to an eight-month season from March 15 to November 15. Among some of the anticipated and realized benefits are bycatch reductions and safety improvements. Bycatch reduction was inherent in the program, due to the close interaction between sablefish and halibut fisheries. Much of the longline bycatch of halibut occurred in the sablefish fisheries, and many fishermen fish for both (and received IFQ for both). To the extent sablefish fishermen have halibut IFQ, this halibut is now retained and counted against the target quotas, as opposed to being caught as bycatch and discarded (by regulation it previously had to be discarded). This resulted in an immediate reduction of the GOA halibut Prohibited Species Cap from 750 metric tons annually to around 150 metric tons annually (Oliver and Pautzke 1997). Likewise, improved safety is inherent in the program; instead of having to fish intensely under any weather conditions, fishermen can choose their fishing weather considering the seasons, grounds, and size and sea worthiness of their vessel.

In addition, IFQs have reduced gear conflicts and fishing mortality due to lost gear within the sablefish and halibut fisheries by reducing the intense competition for grounds in a short time. Product quality and price has also increased under the IFQ Program, as fishermen have more time to cater to the fresh fish market. At the time of the Council decision, analysts estimated that the total annual benefits of the IFQ program would range from $30.1 to $67.6 million.

Subsequent regulations were proposed following the final rule for Amendments 15/20, to refine various portions of the regulations implementing the IFQ Program and make the program more responsive to the conservation and management goals specified in the Magnuson-Stevens Act. Some of the changes were intended to clarify ambiguous regulations, and others were new provisions designed to make the program more effective. The comprehensive list of regulatory provisions added or amended is contained in the final rule (60 FR 87).

BSAI Amendment 16 Interim Harvest Levels, Revise Prohibited Species Catch Limits for Crab and Halibut and Apportion by Fishery and Season, Fishing Gear Restrictions, Define Overfishing, Implement Vessel Incentive Program

Dates: BSAI Amendment 16 (GOA Amendment 19) was adopted by the Council in June 1990. NMFS published a proposed rule on September 18, 1990 (55 FR 38347) and a final rule implementing the approved portions of Amendment 16 on January 24, 1991 (56 FR 2700). Effective date of implementation was January 18, 1991. The amendment was revised to include a vessel incentive program, and the interim final rule was published on May 10, 1991 (56 FR 21619), effective May 6, 1991 through June 5, 1991.

Purpose and Need: A number of management measures were bundled together in Amendment 16, including PSC bycatch management, procedures for specifying TAC, and gear restrictions. Management measures designed to control the bycatch of crab and halibut in the domestic and joint venture groundfish fisheries in the Bering Sea/Aleutian Islands Area (BSAI) were implemented as the result of Amendment 12a. These management measures expired at the end of 1990. The Council felt that without management measures to control bycatch, the levels of red king crab, *C. bairdi* Tanner crab, and Pacific halibut bycatch would be too high, and there were no incentives for vessel operators to reduce their bycatch. The main purpose of this amendment was to better manage PSC bycatch in non-directed fisheries.

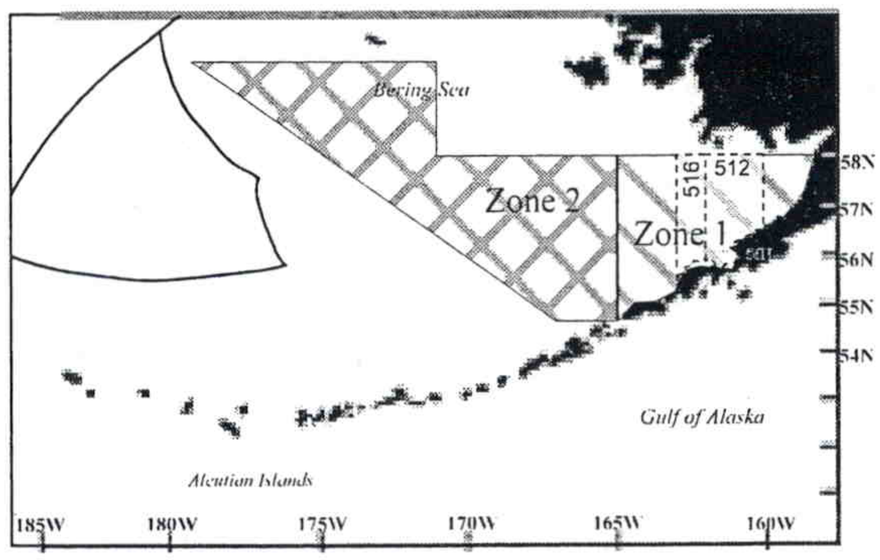
Because of insufficient time to modify regulations between the end of the December Council meeting and January 1 of a new fishing year, this amendment was developed to establish interim TACs so that the fishery would open on January 1. Prior to this amendment, changes to gear definitions or other restrictions required an FMP amendment to change. In order to respond more rapidly to changes in the fishery, the purpose of this action was to allow gear restrictions to be accomplished through a regulatory amendment. An overfished definition was added to the FMP because revised "Guidelines for Fishery Management Plans" (the "602 Guidelines") required each FMP to include an objective and measurable definition of overfishing for each stock or stock complex under management.

Regulation Summary: The Amendment contained 8 approved management measures as follows:

1. Modified PSC limits and bycatch limitation zones for halibut, bairdi crab, and red king crab in the BSAI;
2. Apportioned PSC limits into bycatch allowances for trawl fishery categories;
3. Allowed seasonal allocation of halibut and crab PSC;
4. Established procedures for interim TAC specifications
5. Established fishing gear restrictions (definition of pelagic trawl, biodegradable panels & halibut excluders on pot gear); and
6. Established definitions of overfishing.

Later revisions to the amendment included addition of a vessel incentive program, which would issue civil penalties (fines) to vessels that exceeded seasonal fixed bycatch rate standards for halibut and crab taken in specified target fisheries.

Analysis: A 213-page EA/RIR/IRFA (final draft dated July 31, 1990) was prepared for this amendment. In the original draft, three primary alternatives including the status quo were considered: (1) the status quo which allows the 12a provisions to expire at the end of 1990; (2) a one year extension of the 12a provisions; and (3) a one year or indefinite extension of Amendment 12a provisions modified to add PSC cap apportionments for the Domestic Annual Processing (DAP) rock sole and deep-water trawl (Greenland turbot/sablefish)



Location of the crab bycatch limitation zones.

Continued

fisheries, permit seasonal allowances of PSC limits, and provide for sanctions against vessels whose bycatch rates for red king crab, C. bairdi Tanner crab or halibut significantly exceed a fishery average. The analysis was revised several times to address other issues, including the vessel incentive program.

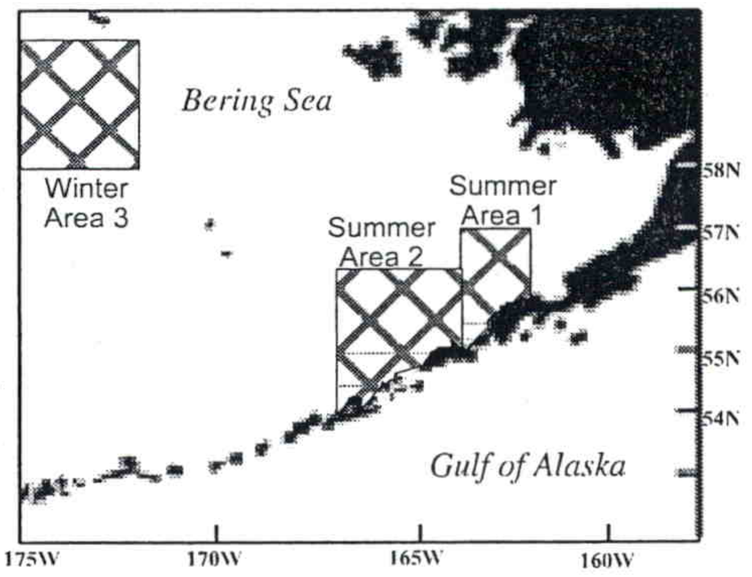
Results: Portions of the proposed amendment (i.e. the penalty box program) were disapproved by the Secretary. In response, revisions to this amendment were made in BSAI Amendment 16a and in Amendment 19/24.

BSAI Amendment 16a Establish Herring Prohibited Species Catch Limits and Herring Savings Areas, Specify Allocation of Pollock Total Allowable Catch to Bottom Trawl

Dates: Amendment 16a was adopted by the Council in September 1990. NMFS published a proposed rule on April 15, 1991 (56 FR 15063) and a final rule on July 18, 1991 (56 FR 32984). Effective dates of implementation were July 12 and August 12, 1991 for different parts of the regulations.

Purpose and Need: Amendment 16a was designed to address management of herring bycatch and other bycatch taken in domestic trawl fisheries. In particular, it defined the "hot spot authority," intended to give the Regional Director flexibility to close specific small areas inseason when bycatch rates were high. This also allowed for limitation of the pollock TAC to gears other than pelagic trawl gear, and established a prohibited species limit for herring. Herring in the eastern Bering Sea had declined from a peak in the mid 1980's, and unconstrained bycatch in trawl fisheries had jumped to high levels relative to exploitable biomass in 1989. This was a cause for concern because when the bycatch mortality was added to the mortality due to the directed inshore fishery, exploitation rates exceeded the State's harvest policy for herring . The 'hot spot' authority was proposed to reduce prohibited species bycatch rates and to provide fishermen a greater opportunity to harvest groundfish TAC prior to reaching established PSC limits. A limitation on bottom trawling for pollock was included in the amendment to reduce the amount of crab and halibut bycatch in this fishery.

Regulation Summary: Amendment 16a established prohibited species bycatch limits for Pacific herring taken as bycatch in trawl fisheries. The annual PSC limit was set at 1% of the annual biomass of eastern Bering Sea herring, and is apportioned among trawl fishery categories. Attainment of any apportionment triggers closure of herring savings areas to that fishery. The Herring Savings Areas are described as follows:



Location of the Herring Savings Areas.

(1) Summer Herring Savings Area 1 means the part of the Bering Sea subarea that is south of 57° N. latitude and between 162° and 164° W longitude from 12:00 noon Alaska Local Time (ALT) June 15 through 12:00 noon ALT July 1 of a fishing year.

(2) Summer Herring Savings Area 2 means the part of the Bering Sea subarea that is south of 56°30' N. latitude and between 164° and 167° W. longitude from 12:00 noon ALT July 1 through 12:00 noon ALT August 15 of a fishing year.

(3) Winter Herring Savings Area means that part of the Bering Sea subarea that is between 58° and 60° N. latitudes and between 172° and 175° W. longitudes from 12:00 noon ALT September 1 through 12:00 noon ALT March 1 of the succeeding fishing year.

The Regional Director may promulgate an inseason closure of an area (for up to 60 days) to reduce prohibited species bycatch rates. A number of factors must be considered when implementing any 'hot spot' closure.

Also, Amendment 16a allows the Regional Director, in consultation with the Council, to limit the amount of pollock that may be taken with trawls other than pelagic trawls. The Council's recommendations are to be available to the public for comment under the annual TAC specification process.

Analysis: A 47-page EA/RIR (final draft dated March 1, 1991) plus tables, was prepared for this amendment. There were four alternatives, including the status quo, for herring savings areas considered. The alternatives not chosen would have established smaller or larger winter savings areas. Options for trigger limits included 1%, 2%, 4%, and 8%. The alternative chosen was for the lowest PSC limit (1%) and an intermediate sized winter savings area.

Continued

Results: Herring bycatch has been controlled so that the 1% level has not been exceeded. Nevertheless, herring biomass in the eastern Bering Sea remains at moderate levels. Few, if any, hot spot actions have been taken by the Regional Director. The pollock fishery was required to use only pelagic trawl gear with implementation of Amendment 57.

BSAI Amendment 17 Renew Walrus Islands Closures, Experimental Permits, Establish Bogoslof District

Dates: Amendment 17 was adopted by the Council in August 1991. NMFS published a proposed rule on December 4, 1991 (56 FR 63487) and a final rule on March 26, 1992 (57 FR 10430). Effective date of implementation was April 24, 1992, except for certain sections effective April 1, 1992.

Purpose and Need: The purpose of the amendment was to address several conservation issues in one package:

1. Authorize experimental fishing permits:
An FMP amendment is proposed whereby the Regional Director, in consultation with the Council and Alaska Fishery Science Center, may issue experimental fishing permits to persons for purposes of obtaining information necessary to promote fishery conservation and management of the fisheries.

2. Establish Walrus Islands groundfish fishing closures:
An FMP amendment is proposed which would institute protective measures for the Walrus Islands in northern Bristol Bay, by reducing the potential disturbance problems caused by vessel activity in the vicinity of haulout areas. The 12-mile buffer zone created in 1989 will expire at the end of 1991.

3. Establish the Bogoslof District:
An FMP amendment is proposed which would create a separate statistical subarea around Bogoslof Island. This measure would allow for the establishment of a separate TAC for pollock in this subarea, thereby providing regulatory protection of Aleutian Basin pollock during spawning to help rebuild the Aleutian Basin pollock stock.

4. Definition of a groundfish pot:
A regulatory amendment is proposed that would define a groundfish pot to differentiate it from king crab and Tanner crab pots. The intent of this action was to address potential enforcement problems of potential crab fishing under the guise of groundfish fishing.

Regulation Summary: Amendment 17 prohibits all vessels federally permitted to fish for groundfish from entering the walrus haulout closure areas from April 1 through September 30. These areas include the EEZ within 12 miles of islands named Round Island and The Twins, and around Cape Peirce.

Amendment 17 allows the NMFS Regional Director, after consulting with the Director of the Alaska Fishery Science Center and with the Council, to authorize for limited experimental purposes, the target or incidental harvest of groundfish that would otherwise be prohibited. The amendment also established the Bogoslof Area.

Analysis: A 71-page EA/RIR/IRFA (final draft dated May 14, 1991) was prepared for this amendment. Five management actions were evaluated under this amendment package. The number of alternatives considered under each action were as follows: experimental fishing permits (2), walrus haulout buffer zones (3), rescind GOA area 68 (2), establish the Bogoslof District in the Bering Sea (2), and pot gear restrictions (4). The alternative not adopted for the walrus haulouts would have established a larger groundfish fishing closure from Cape Constantine to Cape Pierce, which would have prohibited the fleet from a productive fishing area for yellowfin sole. This alternative was not chosen because it would have resulted in forgone ex-vessel revenues of up to $14 million per year, and would have resulted in higher halibut and crab bycatch rates by pushing the fleet to outside areas. Regarding pot gear restrictions, the alternatives not chosen would have conflicted with State regulations or would have required fishermen to have separate pots for groundfish and crab.

Results: Since the amendment was approved, the Aleutian Basin pollock stock has not recovered from overfishing by international fleets in the Donut hole, which occurred in the mid to late1980s. Numerous experimental fishing permits have been issued to test gear modifications, observer sampling, methodology, bycatch mortality reduction techniques, etc.

BSAI Amendment 18 Inshore/Offshoure Allocations for Pollock, Establish Catcher Vessel Operational Area, Designate Western Alaska Community Development Quota for Pollock

Dates: Amendment 18 was adopted by the Council in June 1991 along with Amendment 23 to the FMP for the groundfish of the Gulf of Alaska. NMFS published a proposed rule on December 20, 1991 (56 FR 66009). The final rule was issued June 3, 1992, and the effective date of implementation was June 1, 1992 (57 FR 23321). The revised final rule was issued December 24, 1992 (57 FR 61326).

Purpose and Need: Amendment 18 developed out of a concern to prevent preemption of resources by one industry sector over another. Substantial processing of pollock by several catcher/processor vessels contributed to an early closure of the pollock fishery in the Shelikof Strait area in 1989, effectively preventing inshore components from realizing their anticipated economic benefit from processing pollock. Upon industry request, the Council considered the issues of coastal community development and shoreside preference at its June 1989 meeting and adopted the Fishery Planning Committee's suggested management alternatives for analysis. The problem statement adopted by the Council identified the issue as a resource allocation problem and stated that specific processing allocations for the inshore and offshore sectors established at the beginning of a fishing year would resolve the preemption problem and allow operators to better plan their harvesting and processing activities for the year.

To address this problem, the Council determined the need to establish inshore/offshore allocations of pollock and Pacific cod in the GOA, and pollock in the BSAI. In addition, the amendments would establish a Catcher Vessel Operational Area (CVOA) in the Bering Sea, which would limit access to pollock within the area to catcher vessels delivering to inshore or offshore processors. These amendments also established the Western Alaska Community Development Quota (CDQ) program pollock allocations, to provide Western Alaska communities with long-term employment and access to the fisheries. The primary purpose of Amendments 18 and 23 was to protect the inshore component of the fishery from preemption by the offshore fleet. The amendments provided an interim solution for the inshore component, which includes small coastal communities that are highly dependent on fishing to maintain economic stability. While the amendments did not directly address overcapitalization in the fisheries, the approval by the Council specifically expressed an intent to develop and implement a more comprehensive, long-term limited access program.

Regulation Summary: The alternative adopted and approved defined the inshore and offshore components of the fisheries. BSAI Amendment 18 was only partially approved, allocating 35% of the 1992 non-roe pollock season TAC to the inshore component, and the remaining 65% to the offshore component. The portion that was not approved would have further allocated pollock through 1995: (the inshore allocation would have increased to 40% in 1993 and 45% in both 1994 and 1995). A NMFS economic review indicating a large net loss to the Nation as a result of this action provided the rationale for disapproval by the Secretary of Commerce. (Analysis of adjoining GOA Amendment 23 indicated a net benefit; therefore, that amendment was approved in full. The GOA inshore component was allocated 90% of the Pacific cod TAC and 100% of the pollock TAC for each fishing year.) While catcher/processors from the offshore component would not be able to conduct directed pollock fishing in the GOA, they would be allowed appropriate bycatch amounts. Amendment 18 also established the CVOA south of 56° N. latitude and between 163° and 168° W. longitudes and the Community Development Quota program. As a result of the CDQ program, 7.5 percent of the BSAI pollock TAC was reserved for CDQ fisheries (a nonspecific reserve) at the beginning of the year, and that amount would be reduced as allocations are made to community development projects.

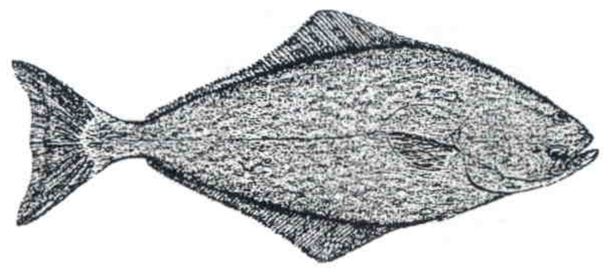
Analysis: An extensive final SEIS/RIR/IRFA (dated March 1992) and a 265-page appendix containing community profiles were prepared for these amendments. Eight alternatives including the status quo were considered. The alternatives not chosen would have implemented traditional management tools or formed an allocation system with a different basis, such as vessel class, species, or at the individual vessel level. The alternative chosen was broadened to include development of a Comprehensive Fishery Rationalization Program, of which inshore/offshore allocations would be a part.

Continued

Results: After the partial amendment was approved, in September 1992 the Council submitted revised BSAI Amendment 18 to NMFS for review. NMFS approved pollock allocations of 35% for pollock processing by the inshore component and 65% by the offshore component for each of the years 1993-95. These allocations resulted in a redistribution of fish from one sector (offshore) to another (onshore), and provided for stability and business planning advantages for both sectors. Stability in dependent coastal communities was also enhanced by this amendment. Allocations to the western Alaska CDQ program provided the economic base and opportunity for 56 Alaskan coastal communities to become integral participants in the BSAI commercial fisheries, through direct revenues from the pollock allocation and development of fisheries infrastructures.

BSAI Amendment 19 Establish Prohibited Species Catch Limits for Non-Trawl Fisheries, Revise Trawl Fishery Categories for Prohibited Species Catch Accounting, Delay Fisheries Start Date, Expand Vessel Incentive Program

Dates: BSAI Amendment 19 (GOA Amendment 24) was adopted by the Council in December, 1991. NMFS published the final rule on September 23, 1992 (57 FR 43926). Effective date of implementation was September 30, 1992.



Purpose and Need: Amendment 19 was initiated to further address bycatch issues that were raised under Amendments 16 to the BSAI FMP and 21 to the GOA FMP. The purpose of this amendment was to control and reduce halibut bycatch mortality in the Alaska groundfish fisheries in response to the international, social, and economic conflicts between U.S. and Canadian halibut fishermen and U.S. groundfish fishermen that take halibut as bycatch.

Regulation Summary: Amendments 19/24 established three FMP amendment management measures. These are as follows: 1) For 1992, reduce the Pacific halibut prohibited species catch (PSC) limit established for BSAI trawl gear from 5,333 metric tons (mt) to 5,033 mt, but retain the primary halibut PSC limit at 4,400 mt; 2) For 1992, establish a 750 mt Pacific halibut bycatch mortality limit for BSAI fixed gear; and 3) Establish FMP authority to develop and implement regulatory amendments that allow for time/area closures to reduce prohibited species bycatch rates (revised "hotspot authority"). In addition to the above FMP amendments, the following amendments to current regulations were adopted:

(1) Revise BSAI fishery definitions for purposes of monitoring fishery specific bycatch allowances and assigning vessels to fisheries for purposes of the vessel incentive program;
(2) Revise the management of BSAI trawl fishery categories for PSC accounting;
(3) Expand the vessel incentive program to address halibut bycatch rates in all trawl fisheries;
(4) Delay the season opening date of the BSAI and GOA groundfish trawl fisheries to January 20 of each fishing year to reduce salmon and halibut bycatch rates;
(5) Further delay the season opening date of the GOA trawl rockfish fishery to the Monday closest to July 1 to reduce halibut and chinook salmon bycatch rates; and
(6) Change directed fishing standards to further limit halibut bycatch associated with bottom trawl fisheries.

Analysis: A 111-page EA/RIR/IRFA (final draft dated April 10, 1992) was prepared for this amendment. The analysis was broken down into different management actions, and alternatives for each were evaluated separately. The number of alternatives (including the status quo) considered varied for each management measure.

Results: Since the amendment was approved, bycatch of crab and halibut has been controlled to stay within the PSC limits. PSC catch limits have been apportioned among different trawl fisheries in the BSAI, and fisheries have been closed when their respective apportionments/seasonal allowances were reached. Catch of groundfish (particularly flatfish) has been foregone due to these restrictions. Few vessels have been cited for violations of the vessel incentive program. PSC management was again revisited in following amendments, such as BSAI Amendment 25.

BSAI Amendment 20 Steller Sea Lion Buffer Zones

Dates: BSAI Amendment 20 (GOA Amendment 25) was adopted by the Council in September 1991. NMFS published the proposed rule on November 18, 1991 (56 FR 58214), and the final rule on January 23, 1992 (57 FR 2683). Effective date of implementation was January 20, 1992.

Purpose and Need: Amendment 20 was proposed to allow regulations to be implemented to afford marine mammals additional protection, particularly Steller sea lions. Steller sea lions were listed as threatened under the Endangered Species Act on November 26, 1990 (55 FR 49204). Although the ultimate cause of the Steller sea lions decline remains unknown, Steller sea lions had been incidentally taken in fishing gear, intentionally killed and harassed by fishermen, and may have competed with commercial fisheries for food resources. The purpose of this amendment was to reduce the likelihood that commercial groundfish removals would deplete Steller sea lion prey abundance in key habitats, as well as to reduce incidental take of Steller sea lions.

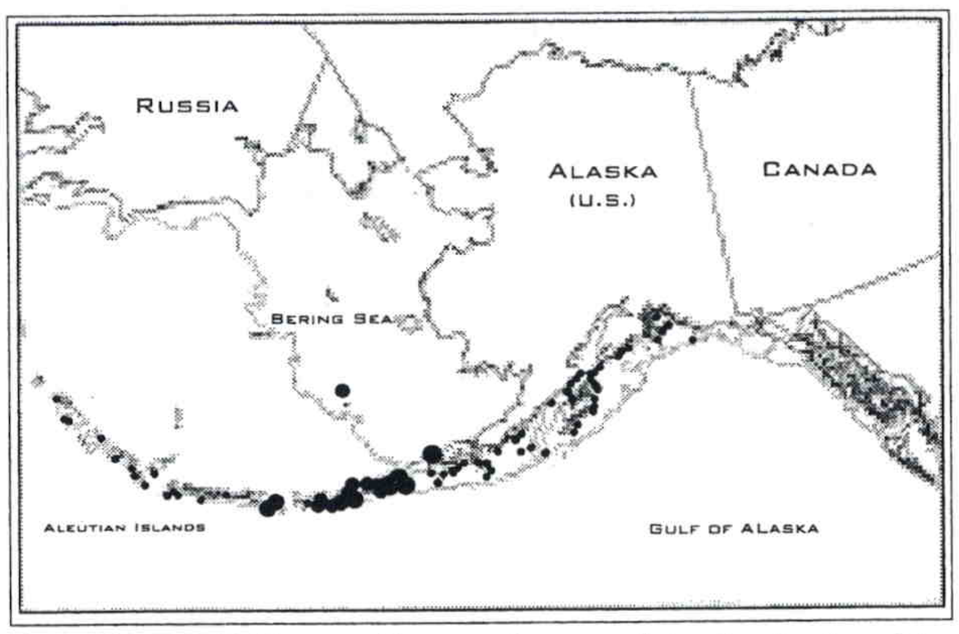
Regulation Summary: Regulations authorized by Amendment 20 implemented the following measures:

1) Areas are closed year-round to fishing by vessels using trawl gear within 10 nautical miles of key Steller sea lion rookeries located in the GOA and BSAI management areas.
2) Areas are closed within 20 nm of five sea lion rookeries to directed pollock fisheries during the "A" season. These rookeries are Sea Lion Rocks, Akun Island, Akutan Island, Seguam Island, and Agligadak Island
3) In the GOA, the specified total allowable catch for pollock in the combined western/central area is further divided among three pollock management districts: Area 61 (170°-159° W. longitudes), Area 62 (159°-154° W. longitudes), and Area 63 (154°-147° W. longitudes). The Shelikof Strait district was eliminated. To prevent excessive accumulation of unharvested portions in any quarterly allowance of the pollock TAC, a limit of 150 percent of the initial quarterly allowance in each pollock management district was established.

Analysis: A 29 page EA/RIR/IRFA was prepared for the trawl closure area section and a 10 page EA/RIR/IRFA was prepared for the section revising GOA districts (final drafts undated, but near October 30, 1991). Five alternatives including the status quo were considered for the trawl closure section and two alternatives were considered for the GOA districts section of the Amendment. The other alternatives not chosen would have established larger time/area closures (20 nm year-round, 10 nm in summer with 20 nm winter extensions, 20 nm summer with 60 nm winter extensions). The alternative chosen (10 nm year-round rookery closures) represented an approximation of the average summer foraging range (average was 8 miles; maximum of 21 miles) for the six female Steller sea lions with pups tagged and tracked.

Results: Many subsequent actions have been taken to minimize the impacts of fisheries on Steller sea lions. On March 12, 1993, NMFS extended the no-trawl zone around Ugamak Island out to 20 nm during the pollock roe fishery (58 FR 13561). Amendment 28 to the BSAI FMP subdivided the Aleutian Islands region into 3 districts to reduce localized depletion of Atka mackerel. Critical habitat for Steller sea lions was designated on August 27, 1993 (58 FR 45269). Amendment 45 to the GOA groundfish FMP further subdivided the areas for pollock fishing; these were further modified by regulatory amendment in June (63 FR 31939). A regulatory amendment implemented in 1999 seasonally apportioned the AI Atka mackerel TAC into two seasons, incrementally shifted the allowable catch outside of Steller sea lion critical habitat area, and added a 20 nm no-trawl zone around Sequam rookery.

In 1997, the western population (west of 144° longitude) of Steller sea lions was listed as endangered under the Endangered Species Act. In April 1998, plaintiffs (Greenpeace, the



Location of Steller sea lion rookery and haulouts closed to pollock fishing in 1999.

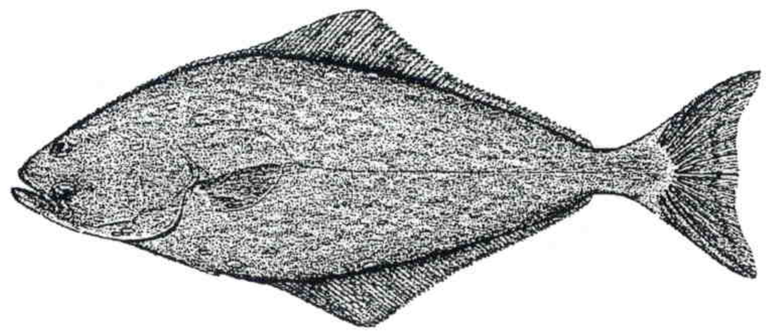
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American Oceans Campaign, and the Sierra Club) filed suit against NMFS challenging the FMPs under both the Endangered Species Act and the National Environmental Protection Act. In December 1998, NMFS issued a Biological Opinion that the Alaska pollock fisheries proposed for the years 1999 to 2002 were likely to jeopardize the continued existence of Steller sea lions and modify its critical habitat. As a result, numerous management actions were taken via emergency rule and standard rule-making to temporally and spatially disperse the pollock fisheries, and establish numerous no-trawl zones around rookeries and haulouts.

BSAI Amendment 21 Framework Halibut Prohibited Species Catch Limits Including Authority to Specify by Fishery Category or Season

Dates: Amendment 21 was adopted by the Council in June 1992, and approved by NMFS on February 9, 1993. NMFS published a final rule on March 18, 1993 (58 FR 14524). Effective date of implementation was March 17, 1993.

Purpose and Need: The purpose of the amendment was to control halibut bycatch in groundfish fisheries. Halibut bycatch limits for trawl and non-trawl gear fisheries that were established for 1992 under Amendment 19 were scheduled to expire at the end of 1992. Without further regulatory action, no halibut bycatch restrictions would be in effect for BSAI non-trawl fisheries in 1993 and beyond, and the halibut bycatch limit for trawl gear fisheries would revert back to the 1991 level of 5,333 metric tons.



There were two other problems addressed in the amendment. First, the trawl PSC limit was previously established in terms of bycatch, not bycatch mortality. Therefore, it did not address directly the management goal of controlling bycatch mortality and limited the methods available to fishermen to meet that goal. Second, the PSC limits could only be changed with an FMP amendment. This can be a cumbersome and lengthy process and may prevent timely and efficient changes to the PSC limits as the biological, economic, and social factors that determine the appropriate PSC limits change.

Regulation Summary: Amendment 21 implemented the following measures:

1. Establish halibut bycatch limits in terms of halibut mortality rather than halibut bycatch;
2. Establish halibut bycatch mortality limits for trawl and non trawl fisheries in regulations rather than in the FMP to allow for changes in bycatch mortality limits through a regulatory amendment process rather than an FMP amendment; and
3. Establish FMP authority to annually apportion the non-trawl halibut bycatch mortality limit among fisheries and seasons as bycatch allowances. This authority would be similar to FMP provisions for annual specification of bycatch allowances of prohibited species catch limits among trawl fisheries.

Consistent with this amendment, regulations established a 3,775 mt halibut bycatch mortality limit for trawl gear fisheries and a 900 mt halibut bycatch mortality limit for non-trawl fisheries.

Analysis: A 94-page EA/RIR/IRFA (final draft dated November 3, 1992) was prepared for this amendment. Six alternatives including the status quo were considered. The other alternatives that were not chosen would have established halibut bycatch limits only (not mortality based), or established fixed bycatch mortality limits for trawl fisheries in the FMP or regulations. In addition, three options for bycatch and mortality limits were analyzed. The alternative chosen established halibut bycatch limits in terms of mortality, allowed the PSC limits to be changed by regulatory amendment, allowed apportionment and seasonal allowances to be specified, and allowed some non-trawl fisheries (e.g., pot fisheries) to be exempt from the non-trawl PSC limits.

Results: Since the amendment was approved, halibut bycatch mortality limits have not been exceeded. Further, fishermen have developed ways to reduce halibut mortality (e.g., careful release, deck sorting) to better achieve OY in the groundfish fisheries. Note that the halibut bycatch mortality limit for trawl gear was reduced by 100 mt with implementation of Amendment 57.

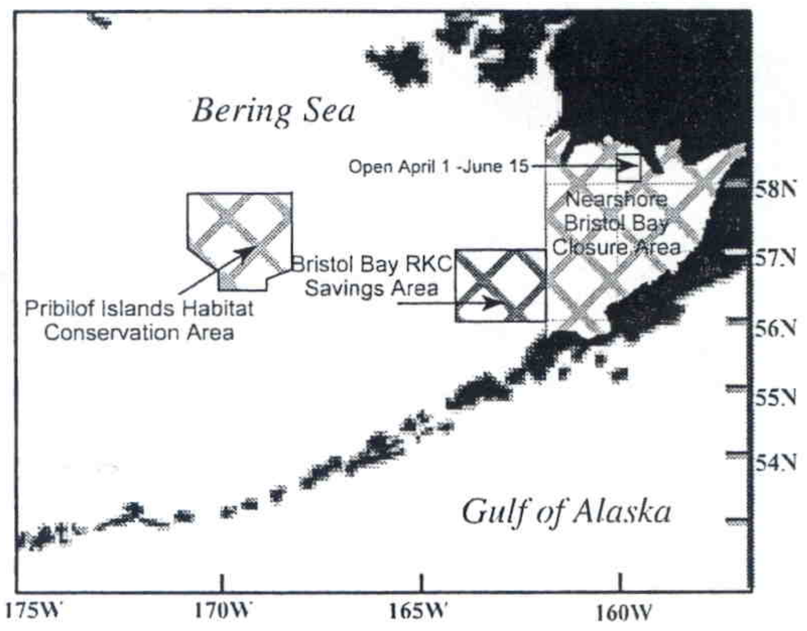
BSAI Amendment 21a Pribilof Islands Habitat Conservation Area

Dates: Amendment 21a was adopted by the Council in April 1994, and approved by NMFS on December 12, 1994. NMFS published a proposed rule on October 17, 1994 (59 FR 52277), and the final rule on January 20, 1995 (60 FR 4110). Effective date of implementation was January 20, 1995.

Purpose and Need: The purpose of the amendment was to eliminate trawl activities in areas of importance to blue king crab and Korean hair crab stocks so that these stocks may build to and be maintained at exploitable levels. In addition, the amendment would reduce bycatch of juvenile halibut and crab, and mitigate any unobserved mortality or habitat modification that occurred due to trawling.

Regulation Summary: All trawling is prohibited at all times in the EEZ within the area bounded by a straight line connecting the following pairs of coordinates in the following order:

(57° 57.0', 168° 30.0')
(56° 55.2', 168° 30.0')
(56° 48.0', 169° 2.4')
(56° 34.2', 169° 2.4')
(56° 30.0', 169° 25.2')
(56° 30.0', 169° 44.1')
(56° 55.8', 170° 21.6')
(57° 13.8', 171° 0.0')
(57° 57.0', 171° 0.0')
(57° 57.0', 168° 30.0')



Location of trawl closure areas to protect red and blue king crab habitats.

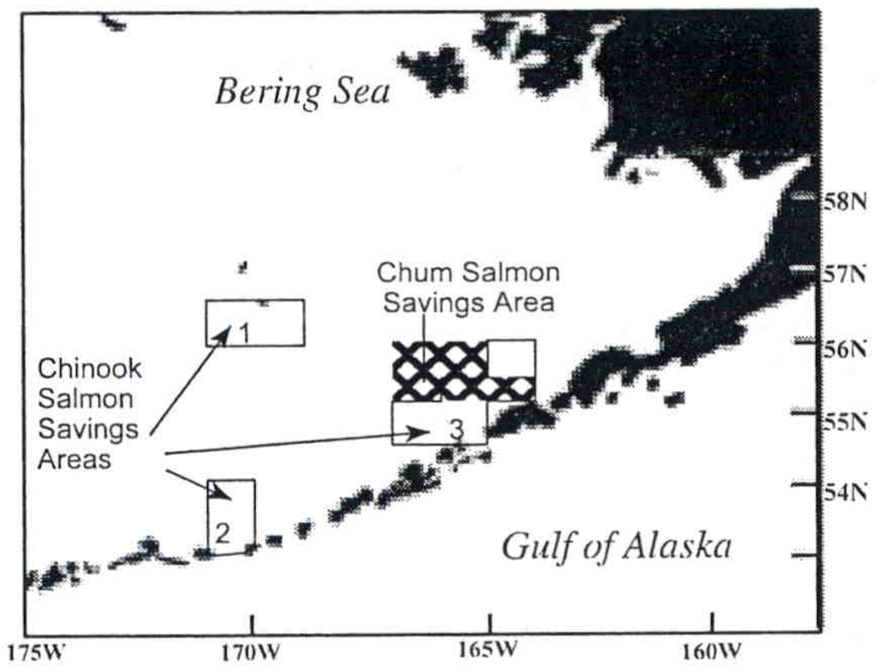
Analysis: A 106-page EA/RIR (final draft dated September 12, 1994) was prepared for this amendment. Eleven alternatives including the status quo were considered. The other alternatives that were not chosen would have established different area closure configurations or established a closure based on a trigger level of crab bycatch. Through spatial display of NMFS annual trawl surveys; foreign, JV, and domestic groundfish observer data; and the directed commercial crab catch, the analysis provided an understanding of blue king crab habitat, trawl fishing effort and the distribution or feeding areas of other marine species. Analysis of this information was used to delineate an area for closures that provides trawl access to the majority of groundfish resources in the Pribilof Islands area, yet affords habitat protection for blue king crab. The boundary selected does not encompass the entire range of blue king crab in the area, but does surround the habitat with highest blue king crab concentrations. Included in the boundary is habitat vital to juvenile blue king crab, populations of red king crab, populations of Korean hair crab, and some of the area important to foraging sea birds and marine mammals. The boundary in Alternative 8 was selected to allow trawl access to the edge of the 100 m contour and the groundfish resources to the east and north of the Pribilof Islands. The boundary was also drawn with straight edges and as few corners as possible in order to facilitate ease of closure enforcement.

Results: Since the amendment was approved, most crab stocks have declined. Blue king crab declined from a recent peak in 1995 (8.4 million crabs) to very low levels (3.2 million crabs). Hair crabs similarly declined from 11.8 million crabs in 1995 to only 5.6 million crabs in 1999. Other crab stocks (e.g., Tanner and snow crabs) utilizing the conservation area have declined over the time period as well and are now considered overfished. Pribilof Island red king crabs have increased and are well above target biomass.

BSAI Amendment 21b Chinook Salmon Savings Areas

Dates: Amendment 21b was adopted by the Council in November 1995. NMFS published final rule on November 29, 1995 (60 FR 61215). Effective date of implementation was January 1, 1996.

Purpose and Need: Salmon are a target species in directed salmon fisheries, but are taken as incidental bycatch in groundfish trawl fisheries. The objective of the amendment was to provide the Council with the means to control chinook salmon bycatch in the BSAI groundfish trawl fisheries. Chinook salmon bycatch control measures were thought to be needed for two reasons. First, many chinook salmon stocks are fully utilized, and uncontrolled bycatch constitutes an additional, unaccounted for allocation of the resources. Second, uncontrolled bycatch levels exceeding recent highs may lead to conservation problems for Alaskan and Canadian chinook salmon populations. During the previous 10 years, several major river systems had experienced low levels of returns, particularly the Nushagak, Yukon, and Kuskokwim rivers.



Location of the chinook and chum salmon savings areas in the BSAI.

Regulation Summary: Amendment 21b established measures to control the amount of chinook salmon taken as bycatch in BSAI trawl fisheries. Specifically, the alternative adopted would close three areas in the BSAI to all trawling when 48,000 chinook salmon were taken as bycatch. The chinook salmon savings areas are shown in the adjacent figure. A closure will remain in effect from the time the trigger is reached until April 16, when the areas would reopen to trawling for the remainder of the year.

Analysis: A 203-page EA/RIR/IRFA (final draft dated August 16, 1995) was prepared for this amendment. Three primary alternatives including the status quo were considered. There were 8 different area closure options, two bycatch limit options, and three seasonal closure options. The other primary alternative that was not chosen would have established a time/area closure but without a PSC limit that triggered a closure. In selecting the preferred alternative, the Council recognized that a PSC limit of 48,000 chinook salmon would not constrain groundfish fisheries in most years, but would allow for closures in areas and times of historic high salmon bycatch.

Results: Although more than 48,000 chinook salmon were taken over the course of a year in 1996, 1997, and 1998, closure of the area has not been triggered because the cap was not exceeded prior to April 15. Total number of chinook salmon taken annually as bycatch in BSAI groundfish fisheries is shown in the adjacent table. In February 1999, the Council adopted Amendment 58, which reduced the chinook salmon bycatch trigger level to 29,000 chinook salmon (with year-round accounting) and refined the closure areas based on more recent data.

Despite these actions, chinook salmon populations in western Alaska remain in relatively poor shape, and have not yet recovered to earlier levels.

Number of chinook salmon taken as incidental bycatch in BSAI trawl fisheries, 1989-1999.

Year	Chinook Salmon
1989	40,354
1990	13,990
1991	35,766
1992	37,372
1993	45,964
1994	43,636
1995	23,079
1996	63,179
1997	50,218
1998	58,966
1999	12,918
2000	7,497
2001	38,270
2002	37,555

BSAI Amendment 22 Establish Trawl Gear Test Zones

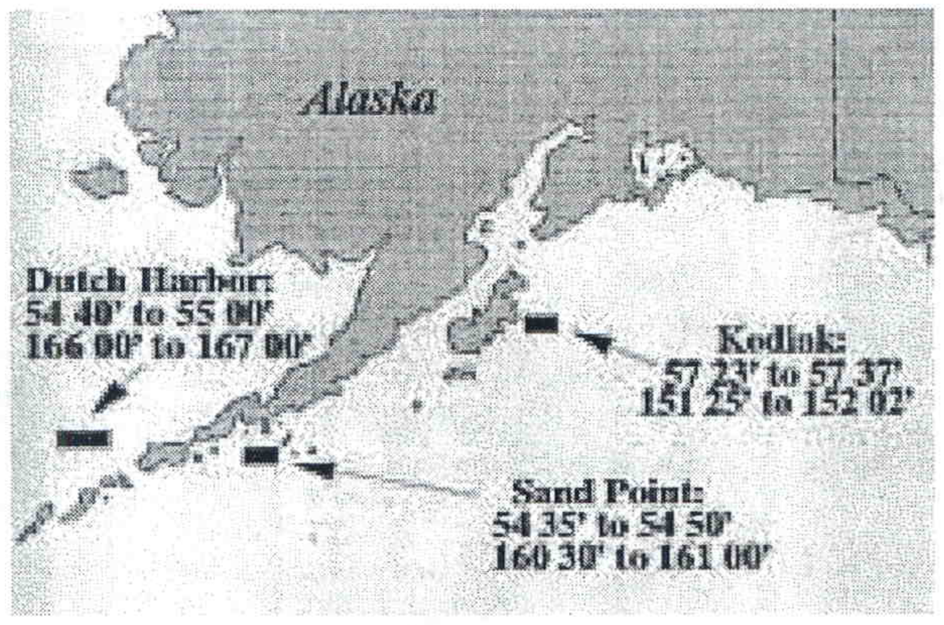
Dates: BSAI Amendment 22 and GOA Amendment 27 were adopted by the Council in April 1992. NMFS published a proposed rule on December 14, 1992 (57 FR 59702) and a final rule on January 22, 1993 (58 FR 5660).

Purpose and Need: The purpose of the amendment was to provide trawl fishermen an opportunity to test their trawl fishing gear when the GOA or BSAI is otherwise closed to trawling. Until 1992, the GOA and BSAI were open to trawling for most of the year, and fishermen were able to test gear in preparation for a season opening. However, in 1992, new regulations delayed the opening of the trawl season from January 1 to January 20 to reduce the bycatch rates of chinook salmon and Pacific halibut. The purpose of this amendment was to allow fishermen to test their gear and begin fishing efficiently at the beginning of a season, reducing lost fishing time that might result from gear problems.

Regulation Summary: Amendment 22 allows the Secretary to promulgate regulations establishing areas where specific types of fishing gear may be tested, to be available for use when the fishing grounds are closed to that gear type. Specific gear test areas contained in regulations that implement the FMP were allowed by regulatory amendment. These gear test areas would be established in order to provide fishermen the opportunity to ensure that their gear is in proper working order prior to a directed fishery opening. The test areas must conform to the following conditions:

(1) Depth and bottom type must be suitable for testing the particular gear type.
(2) Must be outside State waters.
(3) Must be in areas not normally closed to fishing with that gear type.
(4) Must be in areas that are not usually fished heavily by that gear type.
(5) Must not be within a designated Steller sea lion protection area at any time of the year.

The rule implementing this amendment established three trawl test areas: Dutch Harbor (54 °40' to 55° 00' N; 166° 00' to 167° 00' W), Sand Point (54 °35' to 54° 50' N; 160° 30' to 161° 00' W), and Kodiak (57 °23' to 57° 37'N; 151° 25' to 152° 02'W). The regulation further required that the trawl cod end must be left unzipped so as not to retain fish, that groundfish may not be onboard, and that the time used to test gear would not contribute to observer coverage requirements.



Location of trawl test zones in the Alaska EEZ.

Analysis: A 13-page EA/RIR/IRFA (final draft dated September 1, 1992) was prepared for this amendment. Two alternatives including the status quo were considered.

Results: Since the amendment was approved, fishermen have been able to test their gear when trawl fishing is otherwise prohibited and no subsequent changes to the areas have been made.

BSAI Amendment 23 Moratorium

Dates: The final version of BSAI Amendment 23 was adopted by the Council in December, 1994. NMFS published a proposed rule for BSAI Amendment 23 and GOA Amendment 28, and Crab Amendment 5 on May 12, 1995 (60 FR 25677). The final rule was published on August 10, 1995 (60 FR 40763). Effective date of implementation for most sections of the amendment was September 11, 1995.

Purpose and Need: In 1987, concerned with excess harvesting capacity in the groundfish, crab, and halibut fisheries of the BSAI and GOA, the Council established a committee to examine the problem of overcapitalization. Upon concluding that allocation conflicts and overcapitalization would worsen under the current open access system, the committee recommended a limited access management approach for these three fisheries. Concerned with the potential for speculative entry into the fisheries during discussions of management alternatives, NMFS published a control date notice of February 9, 1992. Anyone not having previously participated in the fisheries before that date would not be assured future access to the fisheries should a limited access system be adopted.

The purpose of this amendment was to provide for an interim measure to slow significant increases in the harvesting capacity of the groundfish and crab fishing fleets until a Comprehensive Rationalization Plan (CRP) could be implemented. The CRP, which continues to be developed by the Council, is intended to resolve the overall issue of overcapitalization on a long-term basis, and transition the fisheries from an open access management system to a more market-based, limited access system. Without the regulatory ability to institute a moratorium, the Council feared that potentially unlimited new entry into the fishery would exacerbate overcapitalization and hinder the ultimate development of a successful CRP. The anticipated short-term effects of the amendment included increasing economic benefits to fishermen and reducing the risk of overfishing.

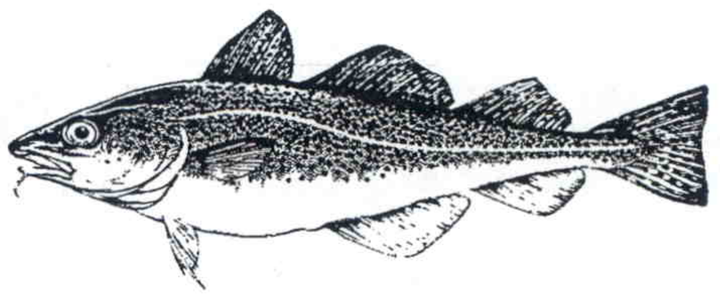
Regulation Summary: After several proposed moratoriums, the final rule required a moratorium permit for vessels within specific vessel categories that harvest groundfish and BSAI crab resources off Alaska. Generally, a vessel qualified for a moratorium permit if it made a legal landing of any moratorium species during the qualifying period of January 1, 1988 through February 9, 1992. In addition, a vessel that made a legal landing during the qualifying period, in either a groundfish or crab fishery, but not both, can cross over as a new vessel in the fishery in which it did not made a legal landing in the qualifying period provided: 1) it uses the same gear type in the new fishery as it used to qualify for the moratorium in the other fishery; or 2) it made a legal landing in the crossover fishery during the qualifying period and it uses only the same gear type it used in that period.

Analysis: A 22-page supplemental analysis (final draft dated February 1995) was prepared for the final resubmittal of the proposed moratorium for these amendments, which were originally approved by the Council in 1992. The supplemental analysis outlined the changes from the original moratorium proposal: revision of the qualification period, halibut and sablefish qualification, consideration of current participation, crossovers, and the appeals process. The analysis also indicated that the revised moratorium would allow 4,144 unique vessels in the crab and groundfish fisheries, about 1,800 more than the current participant fleet but significantly less than the 15,709 unique vessels that participated in the fisheries since 1978 that had the potential to re-enter if no action was taken.

Results: Since the amendment was approved, the Council has implemented the License Limitation Program (LLP) to limit entry into the groundfish and crab fisheries off of Alaska. As anticipated, the LLP (Amendment 60 to the BSAI FMP/Amendment 58 to the GOA FMP/Amendment 10 to the BSAI Crab FMP) replaced the vessel moratorium established in these amendments starting in the 2000 fishing season. For general licenses, the base qualifying period established was January 1, 1988, through June 27, 1992, approximately four months longer than the moratorium qualification period, in order to be consistent with the Council's published cutoff date for qualification under the Comprehensive Rationalization Plan. The LLP also required an area endorsement for the BSAI or the GOA, to provide for present participation in the fisheries (the qualifying period being January 1, 1992 through June 17, 1995). The moratorium established by Amendments 23 and 28 limited speculative entry into the fisheries while the LLP was being developed and approved, and kept the overcapitalization situation from worsening during development of the long-term Comprehensive Rationalization Plan. In addition, the moratorium qualifications could be transferred to other vessels (provided that the length of the new vessel was the same or less than the original), and so helped provide a basis for the LLP transfer process.

BSAI Amendment 24 Pacific Cod Allocation by Gear Type and Season

Dates: Amendment 24 was adopted by the Council in June 1993. NMFS published a proposed rule to implement Amendment 24 on October 27, 1993 (58 FR 57803). The final rule was published on January 28, 1994 (59 Notice 4009). Effective date of implementation was February 28, 1994.



Purpose and Need: The amendment was proposed in response to socioeconomic concerns of the fishing industry and the need for stability in the trawl gear and fixed gear (longline, pot, and jig) fleets that target Pacific cod. The fishery was exhibiting numerous overcapitalization problems such as compressed fishing seasons, high bycatch and waste, gear conflicts, and an overall reduction in benefit from the fishery. At the April 1993 meeting, the Council developed a problem statement that focused on resolving overcapitalization in the BSAI Pacific cod fishery. In June, the Council recommended three management measures to be implemented through 1996: 1) allocation of the BSAI Pacific cod initial Total Allowable Catch (TAC) among the jig gear, fixed (longline and pot) gear, and trawl gear fleets; 2) seasonally apportion the amount of Pacific cod TAC allocated to vessels using longline or pot gear; and 3) provide the authority to reallocate Pacific cod from the trawl sector to the longline and pot sectors, and vice versa, if NMFS determines that one gear group or the other will not be able to harvest its full allocation. The part of the jig gear harvest that is expected to go unharvested would also be reallocated to the trawl and longline or pot sectors.

The Council's action was intended to provide industry and community stability by directly allocating to gear groups approximately the average percent of Pacific cod taken with these gear types during the years 1991-1993. While the fixed and trawl gear fleet were allocated about their average catch, the amendment allowed for a substantial increase in the share of the fixed gear catch taken with jig gear. This was intended to increase participation of small, shore-based vessels. Without explicit gear allocations, the Pacific cod fishery would continue to operate under an open access situation, and the amount of cod taken by each gear group would be based on how well individual vessels compete among gear groups. A direct allocation combined with seasonal apportionment in the fixed gear sector was expected to provide the potential for each gear group to increase the average benefits received from the harvest of Pacific cod.

Regulation Summary: Amendment 24 was proposed to authorize the explicit allocation of BSAI Pacific cod among vessels using trawl, hook-and-line or pot gear, and jig gear through 1996. The alternative adopted and approved allocated the BSAI Pacific cod TAC to the jig gear (2%), hook-and-line or pot gear (44%) and trawl gear (54%) fleets. The action also authorized the seasonal apportionment of the Pacific cod TAC for hook-and-line and pot gear, creating three four-month seasons. In addition, the regulation allowed for the reallocation of Pacific cod from the trawl sector to the longline and pot sectors, and vice versa, if NMFS determines that one gear group or the other will not be able to harvest its full allocation.

Analysis: A 77-page EA/RIR/IRFA (final draft dated October 1993) and a separate volume of nine appendices were prepared for this amendment. Two types of changes were considered: the direct allocation to gear groups and the seasonal apportionment of the fixed gear BSAI Pacific cod allocation. The analysis determined that the preferred alternative would provide stability in terms of the distribution of catch between the trawl and non-trawl fisheries. improve the current situation by reducing salmon and other prohibited species bycatch rates, and provide information to develop more effective management measures in the future.

Results: The BSAI Pacific cod allocations resulting from Amendment 24 were approved through 1996. At the December 1995 Council meeting, it was noted that while the action provided the necessary stability to the various gear sectors, significant regulatory, economic, and biological changes had occurred in the Pacific cod fishery since the amendment was implemented in 1994. These changes were incorporated into the original analysis with a specific focus on prohibited species mortality, impacts on habitat, and cod discards by the different gear sectors. In June 1996, the Council approved Amendment 46 to continue allocations of the Pacific cod TAC, revising the allocation as follows: 51% to fixed gear, 47% to trawl gear, and 2% to jig gear. Most recently, the Council approved BSAI Amendment 64 (October 1999), to further split the BSAI Pacific cod fixed gear allocation between freezer longline, catcher longline and pot vessels.

BSAI Amendment 25 Adjust Trawl Prohibited Species Catch Limits for Halibut

Dates: Amendment 25 was adopted by the Council in December 1992 along with regulatory amendments that affect the use of prohibited species catch (PSC) observer data. NMFS published a proposed rule to implement Amendment 25 on January 19, 1994 (59 FR 2817). Effective date of implementation was May 20, 1994. (59 FR 18757; April 20, 1994.)

Purpose and Need: Amendment 25 was proposed to eliminate the primary Pacific halibut PSC limit that, when reached, closes Bycatch Limitation Zones 1 and 2H of the Bering Sea. Originally, under Amendment 12a to the BSAI FMP, a 4,400 mt primary halibut PSC limit and a 5,333 mt secondary limit were established for specified BSAI trawl fisheries. When the primary limit was reached, Zones 1 and 2H were closed to directed fishing for specified groundfish species by vessels using non-pelagic trawl gear. When the secondary limit was reached, the entire BSAI was closed to directed trawl fishing for specified groundfish species. The intent was to reduce halibut bycatch rates experienced by the trawl fisheries without prohibiting the groundfish trawl fisheries access to the entire BSAI groundfish resource.

Amendment 12a expired December 31, 1990 and was replaced by Amendment 16, which maintained the existing PSC limits during 1991. Amendment 16 was eventually replaced by Amendment 19, which was effective only for the 1992 fishing year and reduced the secondary limit to 5,033 mt. (This action was eventually superceded by Amendment 21, which simply converted the PSC limits from catch limits to mortality limits.) As a result, the smaller difference between the primary and secondary limits made it difficult for NMFS to monitor the primary limit in a manner to allow closures before the secondary limit was reached; therefore, most trawl closures ensuing from bycatch restrictions were implemented under the secondary limit. At this point, the effectiveness of a primary PSC limit to reduce halibut bycatch came into question. NMFS was finding that initial closure of Bycatch Limitation Zones actually often increased bycatch rates by forcing fisheries to move to areas with lower groundfish catch per unit effort and higher halibut bycatch rates.

Amendment 25 was proposed to respond to the concerns about the usefulness of the primary PSC limit and its potential for exacerbating halibut bycatch rates in the BSAI trawl groundfish fisheries. The intent was to eliminate the primary PSC limit and use only the overall (secondary) halibut bycatch mortality limit established for the BSAI trawl fisheries. This action was necessary to promote the management and conservation of halibut and other fish resources as specified in the objectives of the Magnuson-Stevens Act and the FMPs, and to better meet the original intent of Amendment 12a.

Regulation Summary: The approved alternative eliminated the primary PSC limit, but did not affect the overall halibut bycatch mortality limit (3,775 mt) for the BSAI trawl fisheries.

The action also implemented regulatory amendments which 1) prohibited discards of salmon taken as bycatch in the BSAI groundfish trawl fisheries until a NMFS-certified observer determines the number of salmon and collects any necessary data; and 2) established the authority to release to the public vessel-specific observer data on bycatch of prohibited species in the BSAI and GOA groundfish fisheries.

Analysis: A 21-page EA/RIR (final draft dated December 1993) was prepared for this amendment. Three alternatives including the status quo were considered. One alternative addressed the elimination of the primary PSC limit and the other alternative addressed the regulatory amendments proposing the mandatory retention of salmon and authorized release of observer data on prohibited species bycatch. The analysis determined that both alternatives would improve the current situation by reducing salmon and other prohibited species bycatch rates and providing information to develop more effective management measures in the future.

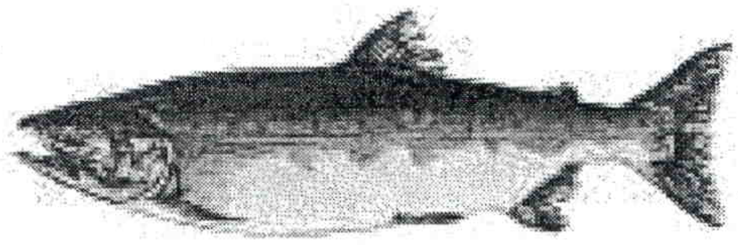
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Results: Since the amendment was approved, trawl halibut bycatch mortality has decreased slightly, as has the overall trawl bycatch mortality limit. The following are the trawl halibut bycatch mortality rates in the BSAI groundfish fisheries since the amendment was approved in 1994 (NMFS 2000):

Year	Total Halibut Mortality (mt)	Total Halibut Cap (mt)
1999	3,460	3,492
1998	3,432	3,492
1997	3,574	3,775
1996	3,766	3,775
1995	3,753	3,775

BSAI Amendment 26 Salmon Retention for Food Banks

Dates: BSAI Amendment 26 (GOA Amendment 29) was adopted by the Council in September 1994. NMFS published a final rule on July 24, 1996 (61 FR 38354). Effective date of implementation was July 19, 1996. Selection of an authorized distributor for donated salmon was announced on August 16, 1996 (61 FR 42591).



Purpose and Need: The Alaska groundfish fisheries result in incidental fishing mortality of Pacific salmon. Vessel operators participating in these fisheries typically use trawl, hook-and-line, or pot gear. Trawl gear operations account for most of the groundfish catch, harvesting 92 percent and 94 percent of the groundfish catch during 1992 and 1993, respectively. Trawl gear fisheries for Alaska groundfish also account for more than 99 percent of the salmon bycatch by the Alaska groundfish fisheries. These fish are dead when brought on board a vessel and must be returned to Federal waters as prohibited species once a NMFS-certified observer has determined the number of salmon and completed the collection of any biological or scientific data.

The incidental salmon mortality experienced in the groundfish fisheries is one of several competing uses of the fully utilized salmon resource. Salmon also are used as catch and bycatch in directed commercial, subsistence, and sport salmon fisheries and as bycatch in other non-salmon and non-groundfish fisheries. Salmon used as bycatch in the groundfish fisheries and in other fisheries can exacerbate the management problem associated with the allocation of salmon among escapement goals set by Alaska State management policy and the terminal salmon fisheries. The groundfish fisheries may result in reduced escapement or harvest in the salmon fisheries, thereby imposing a cost on other salmon users.

Amendment 21would authorize the voluntary retention and processing of salmon taken as bycatch in the Alaska trawl fisheries for donation to needy individuals. The intent of this action was to reduce bycatch and waste and potentially provide the opportunity to collect additional data that would support a more long-term solution to the salmon bycatch problem.

Regulation Summary: The Salmon Donation Program authorizes the distribution of Pacific Salmon taken as bycatch in the groundfish trawl fisheries in the groundfish fisheries off Alaska to economically disadvantaged individuals through NMFS authorized distributor selected by the Regional Director in accordance with federal regulations implemented under the FMP.

Analysis: A 24-page EA/RIR (final draft dated March 1996) was prepared for this amendment. Three alternatives including the status quo were considered. Under the status quo alternative, all bycaught salmon would be retained until a NMFS-certified observer has determined the number of salmon and collected any biological or scientific data. Salmon could not be retained for reasons other than the collection of biological or scientific data and ultimately must be discarded in Federal waters as a prohibited species. The other alternative not chosen would have mandated that every salmon taken in the Alaska groundfish trawl fisheries be retained, processed for human consumption, and donated to a nonprofit foodbank organization. Because NMFS's authority under the Magnuson - Stevens Act to directly regulate harvesting and processing fishery resources is limited to the EEZ, this alternative was not developed further but instead provided a qualitative comparison with the other alternatives.

Results: The Salmon Donation Program was implemented in 1996 after two years of assessment under several experimental fishing permits. Based on the results from the Salmon Donation Program, it appears that the program was effective at reducing bycatch waste without increasing total bycatch and that the program merits expansion. Since the amendment was approved, many fishing companies have voluntarily participated in the donation program. Through 1998, the authorized distributor, Northwest Food Strategies, has distributed over 3 million pounds (approximately 12 million meals) of donated salmon and halibut to needy people.

BSAI Amendment 27 Research Plan/Observer Program (not implemented)

Dates: BSAI Amendment 27 (GOA Amendment 30) was adopted by the Council in June 1992, then reconsidered and adopted as revised in December 1993. NMFS published a proposed rule on May 6, 1994 (59 FR 23664) and a final rule on September 6, 1994 (59 FR 46126). Effective date of implementation was October 6, 1994. Amendment 1 (which delayed implementation until 1997) to the research plan was announced on December 26, 1995 (60 FR 66755).

Purpose and Need: Amendments 13 and 18 to the groundfish FMPs authorized a comprehensive domestic fishery observer program. The 1990 and 1991 observer program required specific levels of observer coverage which varied with size of fishing vessel and quantity of fish processed by floating and shoreside processors. These requirements were established because it was recognized that living marine resources could not be effectively managed without the types of information that were either available only or most efficiently through an observer program.

The observer program required that owners and operators of vessels and shoreside processing facilities participating in the groundfish fishery arrange for and pay for the cost of placing observers aboard their vessels and at their shoreside processing facilities beginning in January, 1990. Each vessel or processor required to have observer coverage is responsible for the cost of obtaining the required observers from a certified contractor. The cost averaged between $5,800 and $7,100 per observer month in 1991. There were three problems identified for this method of paying for observer coverage. It was not an equitable system in that some operations payed for 100% coverage and others did not pay anything, it limited the ability of the NMFS to effectively manage the observer program, and it may have resulted in a conflict of interest that could reduce the credibility of observer data. It also based observer coverage levels on a simple vessel length criterion, which likely does not result in the most efficient, appropriate coverage across all fisheries. The Research plan was designed to address these problems. Industry support for such a change is demonstrated by the willingness and ability of the industry to convince Congress to amend the Act to allow the North Pacific Fisheries Research Plan to be established and paid for by a broad-based system of user fees. The proposed plan was to be applicable to the groundfish, halibut, and BSAI crab fisheries.

Regulation Summary: The Magnuson-Stevens Act authorized the Council and the Secretary to establish a North Pacific Fisheries Research Plan which: (1) requires that observers be stationed on fishing vessels and at fish processing facilities, and (2) establishes a system of fees to pay for the cost of implementing the research plan. The Research Plan, as adopted under this amendment, contained four objectives and elements that included observer employment and contracts, observer duties, data collection and transmission, annual determination of coverage levels by fishery, in-season changes to coverage levels, establishment of an observer oversight committee, coordination between the NMFS groundfish and ADF&G shellfish observer programs, a fee assessment (up to 2% of ex-vessel value of harvested fish), and details on fee collection and contingency plans in case of funding shortfalls.

Analysis: A 26-page EA/RIR (final draft dated March 22, 1994), together with a lengthy (100+ pp.) appendix section, was prepared for this amendment. Three alternatives including the status quo were considered. Under the status quo alternative, the authority to establish a research plan would not be used, existing observer coverage requirements and contracting arrangements would be used, and no observer program would be implemented for the halibut fishery. The alternative adopted provided for a research plan, and attendant fee on landings, to address problems identified with the existing observer program.

Results: Though the amendment was approved, it was never fully implemented. Instead, implementation was delayed one year, then replaced with a modified pay-as-you-go system adopted under Amendments 47/47. Start-up fees were collected by NMFS in the first year of implementation (1995), but the Council repealed the Research Plan due to various concerns, including the possibility that the fee would not cover all necessary coverage levels. Fees were refunded following the repeal of the Plan. An Observer Committee has been convened to examine fee plan alternatives and is currently evaluating possible options.

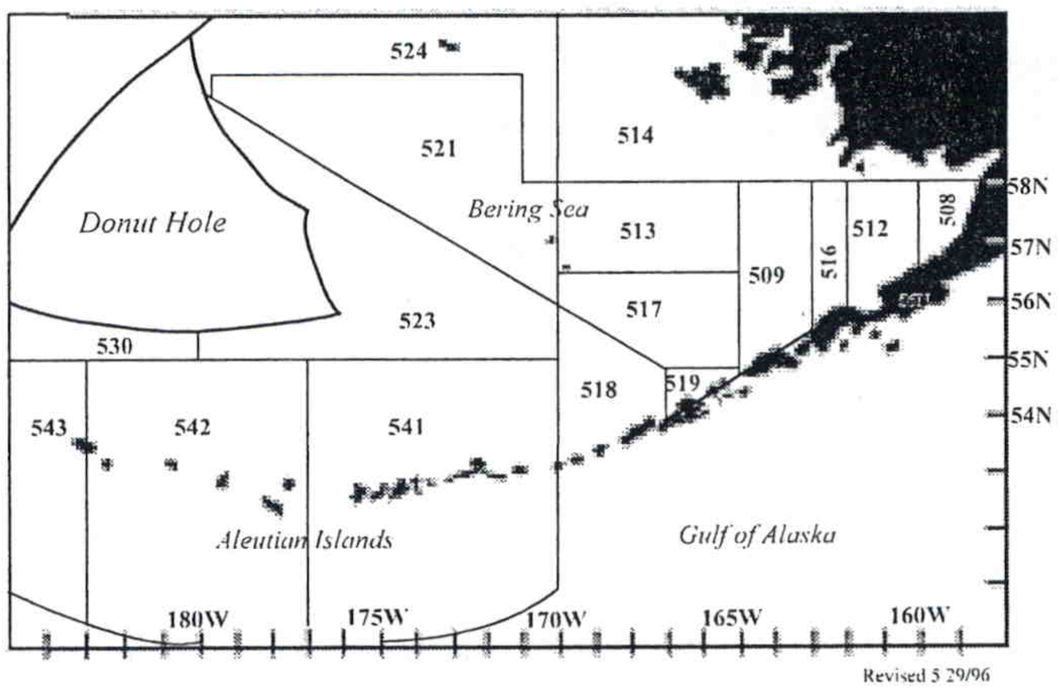
BSAI Amendment 28 Divide Aleutian Islands into Regulatory Areas

Dates: Amendment 28 was adopted by the Council in January 1993. NMFS published a proposed rule on April 23, 1993 (58 FR 21695), and a final rule on July 13, 1993 (58 FR 37660). Effective date of implementation was August 11, 1993.

Purpose and Need: A groundfish species or species group may be apportioned to the entire BSAI, or to smaller areas defined in the FMP or implementing regulations, provided that sufficient biological information exists with which to establish acceptable biological catches (ABCs) for the areas of interest. Prior to this amendment, the Aleutian Islands area was not subdivided under the FMP. Therefore, groundfish ABCs and catch limits could not be apportioned to smaller areas within the Aleutian Islands (AI) region. For some species, particularly Atka mackerel, fishing effort had traditionally occurred in the eastern end of the AI, nearest Dutch Harbor. This situation can result in undesirable effects of highly concentrated effort, such as the potential for localized depletion of groundfish, intensified competition with marine predators for fishery resources, and greater possibility of habitat degradation. The purpose of this amendment was to allow ABCs and TACs to be allocated into smaller areas in the AI region, thereby spreading out fishing effort over a larger area.

Regulation Summary: Under Amendment 28, the Aleutian Islands region was split into three management districts at 177° W longitude and 177° E longitude. The eastern, central, and western AI districts are shown in the adjacent figure and are denoted as statistical areas 541, 542, and 543.

Analysis: A 93-page EA/RIR (final draft dated June 8, 1993) was prepared for this amendment. Three alternatives including the status quo were considered. Besides the status quo, the other alternative that was not chosen would have split the AI into only two districts with the dividing line at 177° E longitude. The alternative chosen was more conservative in that defining smaller areas for ABC and TAC allocation may reduce the potential for localized depletion and competition with marine mammals.



Statistical and regulatory areas for the Bering Sea and Aleutian Islands groundfish fisheries.

Results: Since the amendment was approved, ABCs and TACs for Atka mackerel and Pacific Ocean Perch have been allocated among the three AI districts based on biomass distribution.

BSAI Amendment 29 Salmon Bycatch Accounting (withdrawn)

Dates: Amendment 29 was evaluated by the Council in June and September 1993.

Purpose and Need: The purpose of this amendment was to reduce salmon bycatch in trawl fisheries. The incidental salmon fishing mortality experienced in the groundfish fisheries is one of several competing uses of the fully utilized salmon resource. Salmon are also used as catch and bycatch in directed commercial, subsistence, and sport salmon fisheries and as bycatch in other non-salmon fisheries. The groundfish fisheries may result in reduced escapement or harvest in the salmon fisheries, thereby imposing a cost on other salmon users.

If sufficient incentives exist for a vessel operator to move to another area or take other action to reduce the possibility of continued high bycatch rates, then incidence of repeated high salmon bycatch rates on a haul by haul basis may be curtailed. Nonetheless, some salmon bycatch is unavoidable in the groundfish trawl fisheries, as a degree of unpredictability is associated with salmon bycatch. Difficulties may exist for individual vessel operators to take action that will predictably reduce salmon bycatch rates on a haul by haul basis. The purpose of this amendment is to reduce salmon bycatch by holding individual vessel operators responsible for the amount of salmon bycatch their vessel takes.

Regulation Summary: The amendment was never adopted and the vessel incentive portion was never implemented. NMFS expressed reservations about obtaining statistically valid estimates of salmon bycatch amounts for use in enforcing a vessel incentive program. Additionally, there were concerns raised about establishing a haul by haul vessel incentive program because the possibility of a vessel randomly encountering large numbers of salmon in a single haul, as well as vessels that deliver unsorted cod ends to shoreside operations. In both cases, violators would be unable to take action to avoid a violation. Notwithstanding these issues, it was felt that significant staff resources would need to be shifted to monitor salmon bycatch, enforce, and prosecute salmon bycatch violators.

Given the difficulties presented in establishing a regulatory solution to individual vessel bycatch accounting, amendment development was put on hold while industry representatives developed their own voluntary program named the Salmon Foundation. Participants assessed themselves a $20 fee per chinook and raised a total of $120,000 in 1994. The purpose of the Foundation was to use income generated from salmon bycatch assessment payments to develop a salmon bycatch avoidance program for the BSAI trawl fisheries and to fund research on stock origin of salmon taken as bycatch. After the Council adopted the time area closures in April 1995, the industry stopped the bycatch assessment fees, so the research monies were spent and the Foundation dissolved.

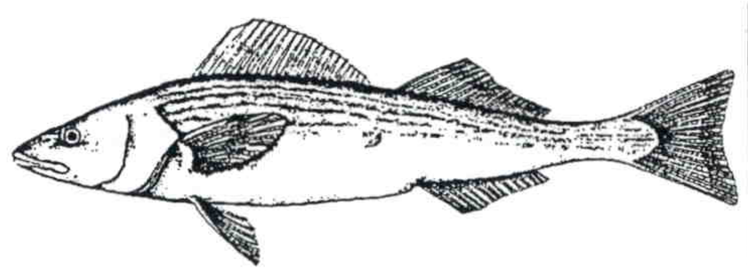
Analysis: A 45-page EA/RIR/FRFA (public review draft dated May 14, 1993) plus a 39-page addendum was prepared for this amendment. Two primary alternatives including the status quo, together with five options for Alternative 2 were considered. The options considered would implement a salmon vessel incentive program similar to the halibut program (bycatch standards with compliance based on observer samples), and various configurations of a salmon incentive program that is independent of observer sampling procedures. The suboptions of an observer independent program included counting all salmon, extrapolation based on product recovery or landed weights, and mandatory retention of salmon for observer counting.

Results: The amendment was never approved. Portions of the salmon bycatch control initiatives were adopted under Amendment 21b (time/area closures for chinook salmon), Amendment 35 (time area closures for chum salmon), and Amendment 26 (voluntary retention of salmon for foodbanks). Also, regulations were implemented that authorize disclosure of vessel specific observer information on prohibited species bycatch.

BSAI Amendment 30 Increase Community Development Quota Allocation for Sablefish

Dates: BSAI Amendment 30 (GOA Amendment 34) was adopted by the Council in April 1994. NMFS published the proposed rule on May 31, 1994 (59 FR 28048). The final rule was published August 24, 1994 (59 FR 43502). Effective date of implementation was September 23, 1994.

Purpose and Need: A 12% limit for allocation to individual CDQ applicants was placed in the FMPs for the BSAI and the GOA and in the implementing regulations in 1992. The purpose of the original 12% limit was to prevent monopolization of CDQ sablefish allocations and ensure an adequate distribution of benefits from the CDQ program. The 12% limit was set in the development phase, when there were potentially 55 communities initially determined to qualify. Had the limit been set too high, communities would have expended resources unnecessarily to compete for large portions of a limited sablefish reserve. Subsequently, the 55 communities formed six geographical groups, in order to pool their efforts in producing Community Development Plans and managing the CDQ harvest. The six groups are: Aleutian Pribilof Island Community Development Association; Bristol Bay Economic Development Corporation; Central Bering Sea Fisherman's Association; Coastal Villages Fisheries Cooperative; Norton Sound Economic Development Corporation; and Yukon Delta Fisheries Development Association. The reduction in the number of CDQ groups, combined with the 12% limit, resulted in an inability to allocate the entire CDQ reserve (6 groups x 12% = 72% of CDQ reserve). This amendment raised the allocation limit of the sablefish CDQ reserve from 12% to 33% in the FMP for the BSAI, so that the total sablefish CDQ reserve could be allocated, providing for a more efficient use of the public resource. Full allocation is also consistent with the Council intent and the resource management objectives of the Magnuson -Stevens Act. Amendment 34 to the FMP for the GOA corrected the inadvertent inclusion of the CDQ program in the FMP by removing and reserving section 4.4.1.1.8.



The sablefish CDQ program was designed to promote the revitalization of rural communities in Western Alaska by providing those communities access to nearby fishery resources. The purpose of the amendment is to further the Council intent of the program by fully allocating the CDQ reserve.

Regulation Summary: The alternative adopted and approved raised the sablefish Community Development Quota allocation limit for qualified applicants from 12% to 33% in order to allow total allocation of the sablefish CDQ reserve; removed the inadvertent inclusion of the CDQ program in the FMP for the GOA; and expanded the types of evidence that may be used to verify vessel leases for the halibut and sablefish individual fishing quota program. It was emphasized that this action did not change the amount of sablefish available for harvest by persons participating in the Pacific halibut and sablefish IFQ program.

Analysis: A 20-page Regulatory Impact Review (final draft dated March 1994) was prepared for this amendment. Two alternatives including the status quo were considered. The status quo did not require an environmental assessment because it was previously analyzed in the environmental documentation for the Individual Fishing Quota program, of which the CDQ program is a part. The status quo would require the communities to apply individually, and not as the six groups they had already formed. The proposed alternative would raise the sablefish allocation limit to 33%, and therefore fully allocate the CDQ reserve and more efficiently use the resource. The alternative chosen was also shown to be less obtrusive than the current process, in that groups formed for distribution can apply in their present form and alleviate excessive and needless competition between the 55 communities.

BSAI CDQ Sablefish Allocations and Landings

Year	Total Catch (pounds)	Total Allocation (pounds)	Percent of Allocation Landed
1995	593,833	1,080,449	55
1996	416,686	639,334	65
1997	490,002	639,334	77
1998	416,107	742,950	56

Continued

Results: The result of Amendment 30 is that the CDQ reserve is fully allocated and harvested. The 2000 CDQ sablefish allocation was 1,127,873 pounds in the BSAI which equaled 20% of the fixed gear total allowable catch. Since approval of Amendment 30, the CDQ allocation has been harvested as indicated in the box below.

BSAI Amendment 31 Sablefish Individual Fishing Quota Share Blocks

Dates: The amendment was approved by the Council in September 1993, along with GOA Amendment 35 and a regulatory amendment affecting the Pacific halibut fishery in and off the State of Alaska. NMFS published the proposed rule for Amendment 31 on June 28, 1994 (59 FR 33272). Effective date of implementation for most sections was November 7, 1994 (59 FR 51135; October 7, 1994).

Purpose and Need: The IFQ program, implemented in 1995, assigned the privilege of harvesting a percentage of the sablefish and halibut quota (in the form of quota shares) to specific individuals with a history of harvest in the fisheries. Quota shares (QS) could be transferred, allowing people who did not receive an initial allocation to buy into the fishery. Concern over the potential for excessive consolidation of quota shares, the projected reduction of the longline fleet, and the social and economic effects on coastal communities, shore-based processors, and fishermen, was the impetus for Amendment 31. Amendment 31 implemented the Modified Block Proposal, which was intended to reduce the maximum potential consolidation relative to the existing IFQ program by significantly increasing the theoretical minimum number of quota share holders and thereby easing the transition from open access to IFQs.

The purpose of this amendment was to provide for the long-term productivity of the sablefish and halibut fisheries, as specified in the Magnuson-Stevens Act and the Halibut Act. In addition to sustaining the health of the fisheries, the Council needed to address the issue of protecting small producers, part-time participants, and entry-level participants who tend to disappear because of potential excessive consolidation under an IFQ program. The amendment is intended to protect the viability of these small entities without interfering with the opportunities currently available under the IFQ program for larger operations.

Regulation Summary: The Modified Block Proposal provided that initial allocations of QS that represent less than 20,000 lb of IFQ in the implementation year will be issued as a block, 2) QS that represents 20,000 lb or more of IFQ in the implementation year will be "unblocked", and 3) QS in a block cannot be separated and must be transferred as a block. Fishermen can own up to two blocks of halibut and two blocks of sablefish QS in each area, but persons holding any amount of unblocked QS are limited to one block of QS per area. A sweep-up provision allowed fishermen to combine small amounts into fishable amounts: halibut blocks can be combined to a sum of less than 1,000 lbs and sablefish blocks can be combined until the sum reaches 3,000 lbs. The amendment also clarified that blocked and unblocked quota share would be transferable subject to the approval of the NMFS Regional Director. Because the Modified Block Proposal created the potential that some QS would become non-transferable because the size would exceed the quota share use limits established in prior regulations (50 CFR 676.22 (e)(f)); the alternative also allowed for the transfer of a quota share block exceeding the use limits by providing that one block could be divided into two blocks.

Analysis: A 283-page EA/RIR/IRFA (final draft dated May 25, 1994) was prepared for this amendment and adjoining GOA Amendment 35. The analysis reported that without a block amendment (no action), the IFQ program could potentially reduce the number of halibut and sablefish quota share fishermen to 200 and 100, respectively. Three separate block proposals were considered to ameliorate this problem. The two alternatives that were not chosen would have created unique, variable size blocks or partial blocks that could be transferred across catcher vessel classes, resulting in increased search and transaction costs of persons who want to sell or buy additional quota share. The alternative chosen also allows persons to purchase relatively small amounts of unblocked quota share, but lowers the associated transaction costs.

Results: Amendment 31 created both blocked and unblocked quota shares based on the 1994 quota. As anticipated, there has been some consolidation of quota share to fewer persons than received quota share by initial issuance, but significantly less so than if the block proposal had not been added. The total number of initial issuees (unique number of people) in the halibut fishery in 1995 was 4,827, reduced to 3,795 by the end of 1998. The total number of issuees in the sablefish fishery was 1,048, reduced to 919 by the end of 1998. The number of unique vessels landing halibut and sablefish before the IFQ program was 3,450 and 1,139 in 1994, and by 1998 the number of vessels was reduced to 1,601 and 449, respectively.

BSAI Amendment 32 Transfer of Sablefish Community Development Quota Compensation Quota Shares

Dates: BSAI Amendments 32 and 36 were approved by the Council in January 1995. NMFS published a proposed rule for BSAI Amendment 32 (GOA Amendment 36) on October 13, 1995 (60 FR 53331). The final rule was published January 24, 1996 (61 FR 1844). Effective date of implementation was February 23, 1996.

Purpose and Need: The Community Development Quota (CDQ) program was proposed in conjunction with the IFQ program for sablefish and halibut management. The CDQ program apportioned designated percentages of the annual fixed gear total allowable catch (TAC) of sablefish and halibut to eligible Western Alaska communities, intending to provide near-shore communities with long-term, stable employment and access to the fishery resource. Apportioning part of the fixed gear TAC to communities reduced the amount of that TAC available for harvest by persons receiving annual allocations of IFQ. As a result, CDQ compensation quota shares (QS) were issued as partial compensation to persons who received (reduced) quota shares in CDQ areas.

Two problems were identified that inhibited the current transfer of CDQ compensation quota shares. Firstly, most CDQ compensation QS would be issued in allocations of less than 20,000 lbs and therefore would be blocked under the non-severable block provision (see BSAI Amendment 31/GOA Amendment 35). The block provision was added to the IFQ program to prevent excessive consolidation of fishing privileges. Blocked quota share, especially small blocks such as the CDQ compensation QS, is difficult to market because of the two-block limit. The second problem is that the IFQ program allowed transfer of quota shares only within the same vessel category, to prevent significant consolidation into large vessel operations. However, residents of CDQ areas traditionally employed smaller vessels than non-residents who received initially issued QS in the CDQ areas, making it difficult for residents of CDQ areas to increase their holdings as they must purchase larger vessels as well as initially issued QS in the larger vessel categories.

Amendments 32/36 were proposed to relieve the unintended consequences of the IFQ transfer restrictions, which are contrary to the original purpose of providing CDQ compensation quota shares. Relieving transfer restrictions on initial recipients of CDQ compensation QS effectively increases the remunerative value of those shares and facilitates the full utilization of the allocated resources managed under the IFQ program.

Regulation Summary: The amendment exempted some CDQ compensation QS from the block provision and allowed for a one year period of relief (one-time transfer) from the restriction against transferring CDQ compensation QS across vessel length categories. Regulations state that if a person is issued CDQ compensation QS for an area where the person already has regular QS, then their CDQ compensation QS is combined with their existing QS and is either "blocked" or "unblocked" depending on the sum total of their QS (this makes much of the CDQ compensation QS unidentifiable after issuance). If a person is issued CDQ compensation QS for an area in which the person doesn't have other QS, the QS is left unblocked. The exemption does not include Category "A" vessels (vessels of any length authorized to process IFQ species).

Analysis: A 21-page Regulatory Impact Review (final draft dated January 1995) was prepared for this amendment. Including the status quo, two alternatives addressing the block provision and three alternatives addressing the transfer across vessel length classes were considered. The option that was not chosen would have allowed "pooling" of quota shares with other compensation share holders, as opposed to exempting CDQ compensation QS from the block provision in perpetuity. With regard to transfer across vessel length classes, the other alternative not chosen would have allowed a one-time trade across vessel classes as defined by a transaction involving initially issued large vessel QS in CDQ areas and small vessel CDQ compensation QS in non-CDQ areas. The alternative chosen is more flexible by not defining the type of transaction allowed.

Results: Since the amendment was approved, coastal communities that rely on the small vessel fleet have benefitted by having IFQ in more accessible areas. The action did not significantly change the overall character of the fleet because CDQ compensation quota share accounted for only 3.5% of the total amount of quota share issued in the non-CDQ areas of the Gulf of Alaska. A report examining the distribution of all QS by block status shows that 69.2% of the QS in the BSAI was blocked at the end of 1998. In the Gulf of Alaska, percentage of blocked QS ranged from 7.6% in the Central Gulf to 20.1% in the Western Gulf. In addition, the amount of swappable CDQ compensation QS–catcher vessel QS that can be fished on any size vessel until its first transfer–declined sharply by year-end 1998, even though there were very few actual swaps of this type of QS to other vessel categories. Most of the decline came from regular transfers, where CDQ compensation QS also loses its swappable status. Over the 1995-98 time period there were only five swaps in Southeast area, four in West Yakutat, and three each in the Central and Western Gulf.

BSAI Amendment 33 Limited Processing of Non-Individual Fishing Quota Species

Dates: Amendments 33 and 37 were approved by the Council in October 1995. NMFS published a proposed rule that would implement BSAI Amendment 33 (GOA Amendment 37) on April 2, 1996 (61 FR 14547). The final rule was published June 27, 1996 (61 FR 33382). Effective date of implementation was July 26, 1996.

Purpose and Need: The IFQ program was designed to promote the conservation and management objectives of the Magnuson-Stevens Act and Northern Pacific Halibut Act. The program was implemented in 1995 and assigned the privilege of harvesting a percentage of the sablefish and halibut quota to specific individuals with a history of harvest in the fisheries. Persons receive an annual allocation of IFQ and are authorized to harvest IFQ species.

Included in the IFQ program is a provision prohibiting the processing (freezing) of fish, other than IFQ halibut or sablefish, on board a harvesting freezer vessel if, along with that fish, IFQ sablefish were harvested by a person who has catcher vessel quota shares of sablefish. The Council's intent in allowing the use of catcher vessel quota share on freezer vessels was to increase the fishing opportunities of IFQs held by crew members. The prohibition on freezing non-IFQ species came out of a Council concern that, if the owners of large, industrial-type processing vessels could harvest IFQ species with IFQ assigned to vessel categories B, C, and D while processed fish are on board, these operators could acquire the majority of the "catcher vessel" quota share that would normally be harvested by smaller boats without processing capabilities. These smaller vessels usually use shoreside local processors in coastal communities. The Council did not want to dramatically change the character of the fisheries and deprive coastal communities of the revenue generated by small vessel deliveries of IFQ species.

The combination of allowing catcher vessel quota share to be used on freezer vessels with the prohibition on processing non-IFQ species resulted in unanticipated waste of non-IFQ species caught incidentally to sablefish. Persons are required to retain all Pacific cod and rockfish caught incidentally to IFQ sablefish. Pacific cod and rockfish have a shorter "shelf life" than sablefish, and a typical sablefish fishing trip is too long to maintain sufficient quality of incidentally caught non-IFQ fish. Without the ability to freeze the non-IFQ species, the fish was often landed in poor condition, decreasing the market value of the fish significantly.

The purpose of Amendments 33 and 37 was to address the lost revenue and waste that occurs because fish other than IFQ halibut and sablefish are discarded, or if not discarded, become a low quality product, due to the prohibition on processing fish other than IFQ halibut and sablefish. The amendments were necessary to allow fuller use of the fishery resources in and off of Alaska.

Regulation Summary: The alternative adopted and approved authorized the processing of fish other than IFQ halibut or IFQ sablefish on board the harvesting vessel by persons authorized to harvest IFQ sablefish based on an annual allocation of IFQ assigned to vessel categories B or C. This authorization is not extended to persons authorized to harvest IFQ halibut, due to the fact that halibut is characteristically prosecuted by local vessels that do not have onboard processing capabilities. Several modifications were also made to the regulations implementing the IFQ program in order to accommodate the new provision. In addition, while non-IFQ species could be frozen onboard, the freezing of IFQ sablefish caught with catcher vessel quota share on a freezer vessel would continue to be prohibited.

Analysis: A 14-page EA/ RIR (final draft dated March 8, 1996) was prepared for these amendments. The analysis determined that the proposal would not have a significant economic impact on a substantial number of small entities, and would not adversely effect shore-based plants because most of the bycatch of non-IFQ species would be discarded as the period of marketability of unprocessed product is typically exceeded. Two alternatives including the status quo were considered. The alternative chosen allows for the freezing of non-IFQ species when catcher vessel quota share is used on freezer vessels.

Results: In 1996, only thirty-eight sablefish quota share recipients in the freezer vessel category were eligible to use catcher vessel quota share from the 188 quota share holders in the less than 60 feet vessel class and 763 quota share holders in the greater than 60 feet vessel class. Allowing non-IFQ species caught incidentally to IFQ sablefish to be frozen onboard freezer longliners has significantly enhanced product quality and has allowed for the recovery of revenue otherwise lost to discards. The following is an

Continued

estimate of commercial non-IFQ species landed by weight, for each 100 mt of sablefish landed in the BSAI longline sablefish fishery in 1999: 33 mt of Greenland turbot, 14 mt of rockfish, 2 mt of Pacific cod, and 4 mt of shortraker/rougheye (1999 Blend data). This equates to approximately half the weight of the targeted IFQ sablefish harvest–fish which would have potentially been discarded or in non-marketable condition had the prohibition on processing continued.

BSAI Amendment 34 Atka Mackerel Jig Allocation

Dates: Amendment 34 was adopted by the Council in June 1997. NMFS published the final rule on December 31, 1997 (62 FR 68228). Effective date of implementation was January 30, 1998.

Purpose and Need: The purpose of this amendment was to provide more opportunity for a local small-vessel jig gear fleet to fish for Atka mackerel in late spring and summer months without direct competition from the large, high-capacity trawl fleet that typically harvests the Eastern BSAI Atka mackerel TAC early in the fishing year. Jig gear harvests of Atka mackerel have been constrained to late spring and summer months in the BS near the port of Dutch Harbor because of the physical limitations of a small boat fleet. In 1997, the directed fishery for Atka mackerel in the Eastern BSAI was closed February 4. Atka mackerel became a prohibited species on February 28 when the fast-paced trawl fisheries harvested the TAC. As a result, the jig gear fleet did not have an opportunity to fish for this species in 1997. Based on Alaska Department of Fish and Game (ADF&G) fish tickets, 15 and 19 vessels using jig gear in the BS harvested 36 and 13 metric tons (mt) of Atka mackerel in 1994 and 1995, respectively. These amounts equate to 0.22 percent and 0.09 percent of the Atka mackerel harvest in the Eastern BSAI during these 2 years. Information from jig gear fishermen indicates that most of the Atka mackerel harvested by the jig gear fleet is used as bait in the jig gear fishery for Pacific cod, although interest exists to develop a fresh fish product for this species.

Regulation Summary: The Council adopted Amendment 34 to the FMP at its June 1997 meeting in response to concerns about the fast-paced nature of the Atka mackerel trawl fishery and the resulting preemption of the small-scale jig gear fishery. The Council's action would allocate up to 2 percent of the Atka mackerel TAC specified for the Eastern AI/BS to vessels using jig gear. The Council also voted to specify the jig gear allocation annually during the groundfish specifications process based on recent and anticipated harvests. This action was taken in consideration of the small amount of Atka mackerel annually harvested in recent years and to respond to trawl industry concerns about allocating more Atka mackerel to the jig gear fleet than could be harvested. Amendment 34 allowed for a ramp up provision, such that 1-percent of the Eastern AI/BS Atka mackerel TAC would be allocated to vessels using jig gear to begin the program. Once the jig gear fleet proved it could harvest that amount of TAC, the allocation could be increased to 2%.

Analysis: A 35-page EA/RIR/FRFA (final draft dated November 1997) was prepared for this amendment. Three alternatives including the status quo were considered. The other alternative that was not chosen would have established a jig gear only fishery for Atka mackerel in the eastern AI and Bering Sea. The alternative chosen allowed vessels using jig gear to harvest more Atka mackerel than they had previously ever harvested, but still allowed most of the TAC to be harvested, thereby minimizing impacts to vessels targeting mackerel with other gear.

Results: Since the amendment was approved, the jig gear fishery has not harvested any Atka mackerel TAC to speak of. The adjacent table shows the harvest of Atka mackerel in the Eastern Aleutian Islands / Bering Sea area in recent years.

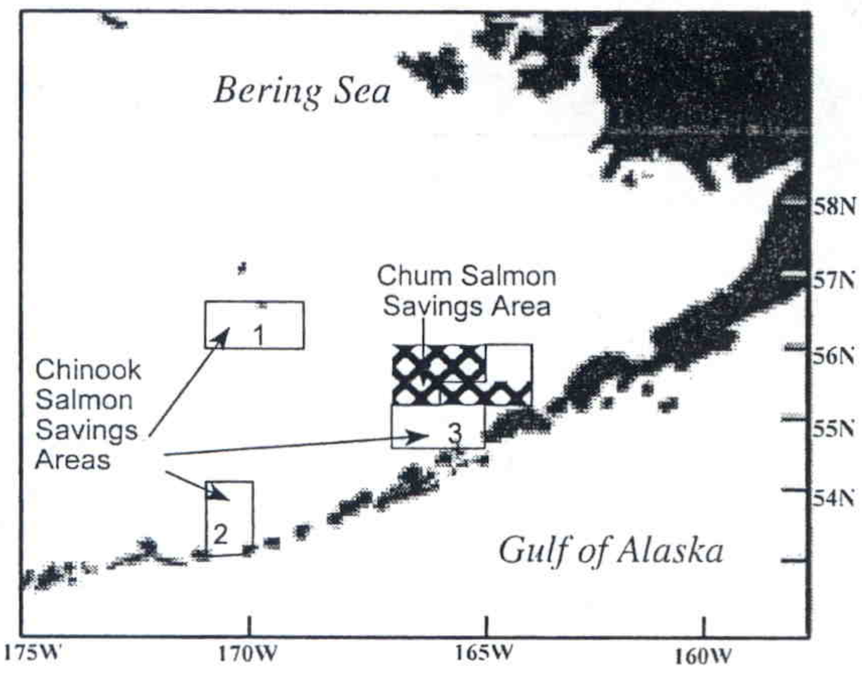
Catch (mt) of Atka mackerel by gear type in the eastern Aleutian Islands and Bering Sea, 1994-1999.

Year	Jig	Trawl	Longline	Pot
1994	36	15,350	41	6
1995	13	14,069	46	80
1996	0	28,091	28	54
1997	0	16,242	26	50
1998	0	12,219	36	15
1999	0	16,231	6	11

BSAI Amendment 35 Chum Salmon Savings Area

Dates: Amendment 35 was adopted by the Council in January 1995. The proposed rule was published April 25, 1995 (60 FR 20253), and the final rule was published on July 5, 1995 (60 FR 34904). Effective date of implementation was August 1, 1995.

Purpose and Need: Salmon are a target species in salmon fisheries, but are taken as incidental bycatch in groundfish trawl fisheries. The objective of the alternatives considered in the analysis is to provide the Council with the means to control chum salmon bycatch in the BSAI groundfish trawl fisheries. Chum salmon bycatch control measures were thought to be needed for two reasons. First, many chum salmon stocks are fully utilized, and uncontrolled bycatch constitutes an additional, unaccounted for allocation of the resources. Second, uncontrolled bycatch levels exceeding recent highs may lead to conservation problems for Alaskan chum salmon populations. During the previous 10 years, several major river systems had experienced low levels of returns, particularly the Nushagak, Yukon, and Kuskokwim rivers.



Location of the chinook and chum salmon savings areas in the BSAI.

Regulation Summary: Amendment 35 established measures to control the amount of chum salmon taken as bycatch in BSAI trawl fisheries. Specifically, the alternative adopted would close an area in the BSAI to all trawling from August 1 though August 31 (the time of year when bycatch is highest). In addition, the area would remain closed or re-close after September 1, upon the attainment of a bycatch limit of 42,000 "other" salmon taken within the catcher vessel operational area (CVOA), through October 14. The chum salmon savings areas is the area bounded by a straight line connecting the following pairs of coordinates in the order listed:

56°00'N., 167°00'W.;
56°00'N., 165°00'W.;
55°30'N., 165°00'W.;
55°30'N., 164°00'W.;
55°00'N., 164°00'W.;
55°00'N., 167°00'W.;
56°00'N., 167°00'W.

Number of chum salmon taken as incidental bycatch in BSAI trawl fisheries, 1989-1999. Note that >95% of the "other" salmon is chum salmon.

Year	Other Salmon
1989	5,545
1990	16,661
1991	31,987
1992	38.919
1993	243,246
1994	94,508
1995	21,780
1996	77,926
1997	67,536
1998	69,237
1999	46,624

Analysis: A 132-page EA/RIR/IRFA (final draft dated March 21, 1995) was prepared for this amendment. Four alternatives including the status quo were considered, along with seven options for closure areas. The other alternatives not chosen would have established a year-round closure in hotspot areas, or changed the starting date for the pollock 'B' season. The alternative chosen allowed for a time/area closure that would be expected to have high bycatch of chum salmon, and allowed for continuation of the closure if salmon bycatch remained high.

Results: Although more than 42,000 chum salmon were taken over the course of a year from 1995 through 1999, closure of the area has not been triggered because the cap was not attained within the CVOA during the accounting period. Total number of chum salmon taken annually as bycatch in BSAI groundfish fisheries is shown in the adjacent table.

Despite these actions, salmon populations in western Alaska remain in relatively poor shape, and have not yet recovered to earlier levels.

BSAI Amendment 36 Establish Forage Fish Category

Dates: BSAI Amendment 36 (GOA Amendment 39) was adopted by the Council in April 1997. NMFS published the proposed rule on December 12, 1997 (62 FR 65402) and the final rule on March 17, 1998 (63 FR 13009). Effective date of implementation was April 16, 1998.

Purpose and Need: Forage fish are generally small, abundant fishes that are preyed upon by marine mammals, seabirds and commercially important groundfish species. Forage fish perform a critical role in the complex ecosystem functions of the BSAI and the GOA by providing the transfer of energy from the primary or secondary producers to higher trophic levels. Significant declines in marine mammals and seabirds in the BSAI and GOA have raised concerns that decreases in the forage fish biomass may contribute to the further decline of marine mammal, seabird and commercially important fish populations. Forage fish are the principal diet of more than two thirds of Alaskan seabirds. In addition, many seabirds can subsist on a variety of invertebrates and fish during nonbreeding months but can only raise their nestlings on forage fish. Small forage fish such as capelin, herring, sandlance and eulachon also have been recognized as important prey items for a variety of marine mammal species including: Northern fur seal, Steller sea lion, harbor seal, spotted seal, bearded seal, humpback whale and fin whale.

Regulation Summary: Amendment 36 defined a forage fish species category and authorized that the management of this species category be specified in regulations in a manner that prevents the development of a commercial directed fishery for forage fish which are a critical food source for many marine mammal, seabird and fish species. Forage fish species are not included in a target species category. Management measures for the forage fish category will be specified in regulations and may include prohibitions on directed fishing, limitations on allowable bycatch retention amounts, or limitations on the sale, barter, trade or any other commercial exchange, as well as the processing of forage fish in a commercial processing facility.

The forage fish species category would include all species of the following families:

Osmeridae (eulachon, capelin and other smelts),
Myctophidae (lanternfishes),
Bathylagidae (deep-sea smelts),
Ammodytidae (Pacific sand lance),
Trichodontidae (Pacific sand fish),
Pholidae (gunnels),
Stichaeidae (pricklebacks, warbonnets, eelblennys, cockscombs and shannys),
Gonostomatidae (bristlemouths, lightfishes, and anglemouths),
and the Order Euphausiacea (krill).

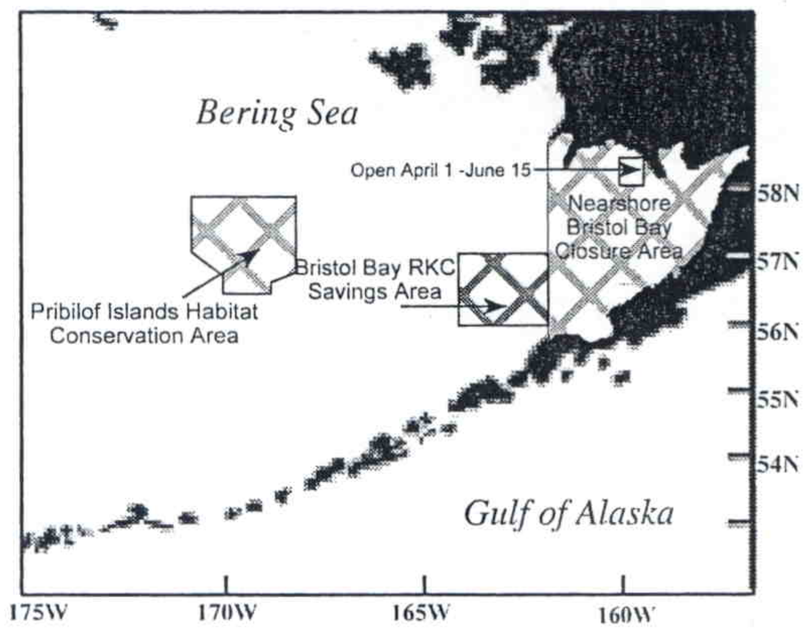
Analysis: A 59-page EA/RIR (final draft dated January 1998) was prepared for this amendment. Two alternatives including the status quo were considered, along with four options for the non-status quo alternative. The options not chosen would have put forage fish in the other species category or the prohibited species category. The alternative chosen would protect forage fish by prohibiting a directed fishery and the sale and barter of forage fish. The preferred alternative would also reduce waste by allowing retention (up to a maximum retainable bycatch amount as set in regulations) and processing (into fishmeal) those forage fish caught incidentally in groundfish fisheries.

Results: No commercial fishery has been allowed to develop on forage fish in the Exclusive Economic Zone off Alaska.

BSAI Amendment 37 Modify Red King Crab Prohibited Species Catch Limits, Establish Bristol Bay Red King Crab Savings Area and Nearshore Bristol Bay Trawl Closure Area, Increase Observer Coverage

Dates: Amendment 37 was first adopted by the Council in September 1995, then rescinded and re-adopted as revised in June 1996. The final rule was published on December 16, 1996 (61 FR 65985). Effective date of implementation was January 1, 1997.

Purpose and Need: The 1995 NMFS bottom trawl survey indicated that exploitable biomass of Bristol Bay red king crab is at about one-fifth record levels. The stock was at its lowest level since the fishery was closed after the first stock collapse in 1983. In 1994 and 1995, Bristol Bay was closed to red king crab fishing because the number of female red king crab had declined below the threshold of 8.4 million crab. In addition, the annual trawl surveys indicated little prospect for increased recruitment of mature males or females, and low female spawning biomass. The purpose of Amendment 37 was to reduce the impacts of groundfish fisheries on the red king crab stock, thus assisting recovery of this crab stock .



Location of trawl closure areas to protect red and blue king crab habitats.

Regulation Summary: Amendment 37 implemented the following measures:

(1) A year round bottom trawl closure in the Bristol Bay Red king Crab Savings Area to directed fishing for groundfish by vessels using non-pelagic trawl gear. The southern edge of the Savings Area between 56° and 56°10 N. lat., however, would open if a guideline harvest level for Bristol Bay red king crab is established. A portion of the annual PSC limit would be specified for the subarea;

(2) A year round closure to all trawling in the nearshore waters of Bristol Bay, with the exception that a portion of this area- between 159° and 160°W. long. and between 58° and 58°43' N. lat. - would remain open to trawling during the period April 1 to June 15 each year;

(3) Increased observer coverage on all vessels, including vessels using pot, jig, and longline gear fishing for groundfish in the Savings Area and on trawl vessels fishing in the seasonal open area of the Bristol Bay nearshore waters closure; and

(4) Adjustments to the Zone 1 PSC limit for red king crab taken in trawl fisheries. The PSC limit would be specified annually based on the abundance and biomass of Bristol Bay red king crab, as shown in the adjacent table.

PSC limits for red king crabs in trawl fisheries (in # of crabs).

Crab Abundance	PSC Limit
Below threshold or 14.5 million lbs of effective spawning biomass (EBS)	35,000
Above threshold, but below 55 million lbs of EBS	100,000
Above 55 million lbs of EBS	200,000

Analysis: A 268-page EA/RIR/IRFA (final draft dated June 21, 1996) was prepared for this amendment. Three primary management measures were analyzed, each having at least three alternatives, including the status quo, as well as several options. The other alternatives and options not chosen would have defined slightly different time/area closures, and established PSC limits of 180,000 crabs or a PSC limit that fluctuated annually with crab abundance. The alternative chosen was more conservative because a larger area may offer more protection.

Number of red king crab taken in Zone 1 as incidental bycatch in BSAI trawl fisheries, 1994-1999.

Year	Crabs
1994	232,933
1995	32,615
1996	18,449
1997	46,918
1998	38,224
1999	83,024

Continued

Results: Since the amendment was approved, bycatch of red king crab has been greatly reduced, and the Bristol Bay red king crab stock has rebuilt to levels that supported directed crab fisheries in 1996-1999, but is again declining due to lack of recruitment. In 1998, the Council adopted a provision to reduce the bycatch limit by an additional 3,000 red king crab as part of the regulation prohibiting the use of bottom trawl gear for pollock fisheries (Amendment 57).

BSAI Amendment 38 Extend Inshore/Offshore Pollock Allocations, Reauthorize Pollock Community Development Quota Program, Modify the Catcher Vessel Operational Area

Dates: NMFS published a proposed rule to amend the BSAI and GOA FMPs on September 18, 1995 (60 FR 48087). Upon Council approval in June 1995, the final rule for BSAI Amendment 38 and GOA Amendment 40 was published on December 12, 1995 (60 FR 63654). Effective date of implementation was January 1, 1996.

Purpose and Need: Amendments 38 and 40 extended the provisions of Amendment 18 to the BSAI FMP and Amendment 23 to the GOA FMP, which expired on December 31, 1995. Amendments 18 and 23 (57 FR 23321; June 3, 1992) set inshore and offshore processor allocations of pollock in the BSAI and pollock and Pacific cod in the GOA, respectively, as a response to an early closure in 1989 when several catcher/processors harvested substantial amounts of pollock in the BSAI and GOA and forced an early closure of the GOA pollock fishery. Amendment 18 allocated 35% of the 1992 non-roe pollock season TAC to the inshore sector, and the remainder to the offshore sector. Shortly after, a 35-65% inshore/offshore split was set in a revised amendment for the years 1993-1995. Amendment 23 provided for an allocation of 90% of the Pacific cod TAC and 100% of the pollock TAC in the GOA to the inshore sector. In addition, the Catcher Vessel Operational Area (CVOA) and the Community Development Quota (CDQ) program in the BSAI were established. The CVOA limited access to pollock within the area to catcher vessels delivering to either inshore or offshore processors. The CDQ program allocated 7.5% of the BSAI pollock TAC to CDQ fisheries.

Amendments 38 and 40 were necessary to extend the inshore/offshore allocations set in Amendments 18 and 23 through December 31, 1998. The purpose of the amendments was to keep the fishery from turning back into the "free-for-all" it represented previously. Since the original inshore/offshore allocation, the Council had been working toward developing a long-term, comprehensive plan for rationalizing all the groundfish and crab fisheries in and off of Alaska. By the end of 1995, when it was evident that the plan would not be ready for implementation before the inshore/offshore allocations expired, the Council determined it was necessary to extend the provisions of Amendments 18 and 23 for an additional three years in order to maintain stability in the industry, facilitate further development of the comprehensive management regime, and allow for the realization of the goals and objectives of the pollock CDQ program.

In addition to the original need for this action, there was an industry request to move the western CVOA boundary eastward, based on the fact that part of the CVOA was not being used by catcher vessels delivering to inshore processors, and the area was not critical for protected species.

Regulation Summary: The provisions of BSAI Amendment 18 became the basis of Amendment 38, and the provisions of GOA Amendment 23 became the basis for Amendment 40. Thus, in the BSAI the apportionments of pollock in each subarea and season would be allocated 35% for processing by the inshore sector and 65% by the offshore sector. In the GOA, the apportionment of pollock would be allocated entirely for processing by the inshore sector, and the apportionment of Pacific cod would be allocated 90% for the inshore sector, 10% for the offshore sector. The amendments also reauthorized the CDQ pollock program with a few minor changes to the regulations. The only two substantive changes from the original plan amendments were: 1) movement of the western CVOA boundary 30 minutes to the east, and 2) allowing catcher/processors to use the CVOA if the pollock quota for processing by the inshore sector had already been harvested for the year.

Analysis: A 268-page EA/RIR/IRFA (final draft dated August 1, 1995) and several appendices were prepared for this amendment. Two alternatives were considered: 1) No action, and 2) continuation of the current program for a period of three additional years (1996-1998), including the pollock CDQ program as an unseverable element of the overall package. The analysis reiterated the Council's intent not to consider alternative inshore/offshore allocation percentages, as that would likely require significant new and complex economic analyses, create unnecessary delays in implementing an allocation scheme, and be inconsistent with the overall intent to develop a more long-term solution through the Comprehensive Management Plan process.

Results: This amendment simply retained the existing inshore/offshore pollock processing allocations for an additional three year period, through 1998. Stability within and among industry sectors, and associated communities and participants, was maintained by this amendment.

BSAI Amendment 39 Establish a License Limitation Program, Multi-Species Community Development Quota Program

Dates: NMFS published a proposed rule for Amendment 39 to the BSAI FMP on August 15, 1997 (62 FR 43866). The amendment was adopted with Amendment 41 to the GOA FMP and Amendment 5 to the Commercial King and Tanner Crab Fisheries FMP. NMFS published the final rule on October 1, 1998 (63 FR 52642). Effective date of implementation was January 1, 1999, except for some parts effective January 1, 2000.

Purpose and Need: In 1992, the Council committed to rationalize the groundfish and crab fisheries and begin development of a Comprehensive Rationalization Plan (CRP). The CRP was prompted by concerns that expansion of the domestic harvesting fleet, in excess of that needed to efficiently harvest the optimum yield, was burdening compliance with the Magnuson-Stevens Act and severely deteriorating the economic benefits derived from the crab and groundfish fisheries. The Council examined several management alternatives including, license limitation programs, individual fishing quotas (IFQs), and more traditional measures, and determined that a limited entry program had the most potential to address the immediate overcapitalization problems of the industry. As a result, the Council approved the License Limitation Program (LLP) in 1995, recognizing the need for further rationalization in the future.

The overall purpose of the LLP is to help resolve the competing and oftentimes conflicting needs of the domestic fisheries that developed under open access and to close the gap between fishing capacity and the available fishery resource. The LLP limits the number, size, and specific operation of vessels fishing crab and groundfish in the BSAI and GOA based on historical participation. During the design and refinement of the LLP, the Vessel Moratorium Program (VMP) was implemented to provide industry stability and curtail interim increases in fishing capacity. The intent was for the LLP to replace the VMP upon implementation.

Amendment 39 also expanded the Community Development Quota (CDQ) Program by including in CDQ allocations a percentage of the total allowable catch (TAC) of groundfish and crab species in the BSAI that was not previously included in the existing CDQ programs for pollock, halibut, and sablefish.

Regulation Summary: The final rule limited access to the commercial groundfish fisheries in the BSAI and GOA and commercial crab fisheries in the BSAI, except for demersal shelf rockfish east of 140° W. longitude and sablefish managed under the IFQ program. The rule provided for the following: issuance of a single type of groundfish license; LLP is not applicable to waters of the State of Alaska; licenses would be issued to current owners (as of 6/17/95) of qualified vessels; licenses would be designated as catcher vessel or catcher/processor and with one of three vessel length classes; the crab and groundfish base qualifying period is 1/1/88-6/27/92 and the groundfish area endorsement qualifying period is 1/1/92-6/17/95; endorsement areas are defined as Aleutian Islands, Bering Sea, Western Gulf, Central Gulf, and Southeast Outside, or state waters shoreward of those endorsement areas; landing requirements for general license and area endorsement qualifications by vessel class; and additional provisions addressing crossover vessels, transfers, and vessel linkages. The rule also included in CDQ allocations 7.5% of the TAC of groundfish and crab in the BSAI that was not originally included in the CDQ programs for pollock, halibut, and sablefish.

Analysis: A final EA/RIR (dated September 1997) and several supplemental analyses considered the status quo and a general license limitation alternative. Out of a comprehensive list of elements and options the Council considered during the debates on LLP, the analysis identified one option for each component of a license limitation program to create the preferred alternative described above in the final rule. A supporting document also analyzed the differences between the vessel moratorium program and the license limitation program passed by the Council. The vessel moratorium was more liberal in terms of qualification criteria and the areas a vessel could fish. Under the moratorium a vessel was only required to make one landing of a qualifying species between 1/1/88 and 2/9/92, and having met that criteria the moratorium permit holders could fish groundfish in any federal waters off Alaska. Therefore, because the LLP had dual qualification criteria, many fewer vessels were expected to qualify than did for the moratorium.

Continued

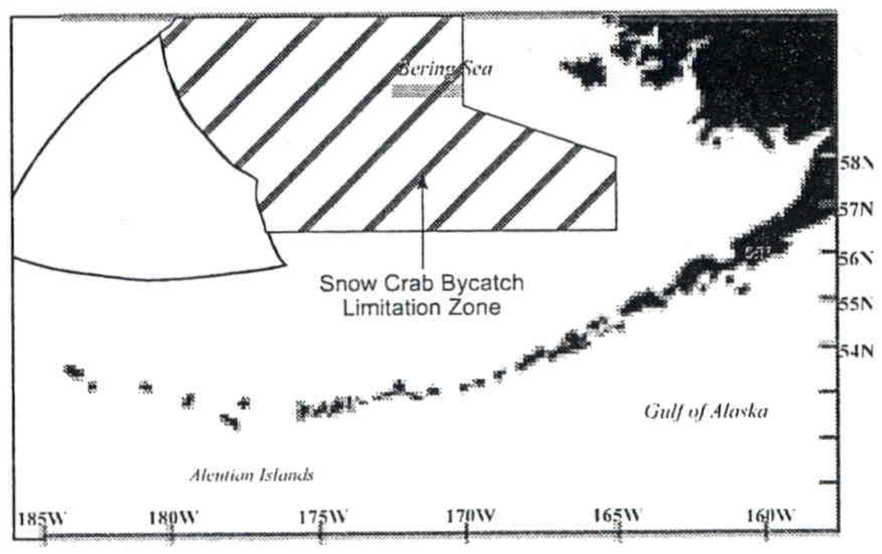
Results: The LLP went into effect on January 1, 2000, thus an evaluation of the program and the final number of license holders is not yet available. The LLP continues to be refined through subsequent amendments. The Council recently approved BSAI Amendment 60, GOA Amendment 58, and BSAI Crab Amendment 10 which amended the LLP to include: a crab recency requirement of one landing during 1/1/96-2/7/98 in addition to the general license and area endorsement qualifications; a requirement that the vessel name is included on the license; license designations for the type of gear authorized to harvest LLP groundfish as either "trawl" or "non-trawl" gear (or both); and a requirement that the vessel itself would be a specific characteristic of the license and could not be severed (i.e., the license could not be used on any other vessel). In addition, Amendment 67 to the BSAI FMP was approved by the Council in April 2000. This amendment requires a Pacific cod species and gear endorsement to fish in the BSAI fixed gear Pacific cod fishery, including recent participation criteria for the period 1995-1999, in addition to the general license and area endorsement qualifications.

BSAI Amendment 40

Establish Opilio Prohibited Species Catch Limits and Bycatch Limitation Zones

Dates: Amendment 40 was adopted by the Council in December 1996. The proposed rule was published August 13, 1997 (62 FR 43307), and the final rule was published December 22, 1997 (62 FR 66829). Effective date of implementation was January 21, 1998.

Purpose and Need: Recruitment of Bering Sea *C. opilio* (snow crab) stock was at a relatively low level, based on NMFS bottom trawl survey data. The 1996 *C. opilio* season produced only 64.6 million lb for the 235 vessels participating. This was the lowest catch since 1984. Survey data from 1996 indicated that adult males were abundant, but females and pre-recruits were becoming less abundant. The groundfish fisheries incidentally catch crab. An objective of the FMP is to minimize the impact of groundfish fisheries on crab and other prohibited species while providing for rational and optimal use of the region's fishery resources. All gear types used to catch groundfish have some potential to incidentally catch crab, but the large majority of crab bycatch occurs in trawl fisheries for flatfish. Byatch limits for *C. opilio* had never been established for Bering Sea trawl fisheries. The objective of this amendment was to control snow crab bycatch in trawl fisheries and provide some protection for the snow crab stock.



Location of the C. opilio bycatch limitation zone.

Regulation Summary: Under Amendment 40 of the BSAI Groundfish FMP, PSC limits for snow crab ©. *opilio*) taken in groundfish fisheries are based on total abundance of *opilio* crab as indicated by the NMFS standard trawl survey (NPFMC 1996). The snow crab PSC cap is set at 0.1133% of the Bering Sea snow crab abundance index, with a minimum PSC of 4.5 million snow crab and a maximum of 13 million snow crab. Snow crab taken within the "C. Opilio Bycatch Limitation Zone" (COBLZ) accrue towards the PSC limits established for individual trawl fisheries. Upon attainment of a snow crab PSC limit apportioned to a particular trawl target fishery, the COBLZ would be closed to directed fishing for species in that trawl fishery category, except for pollock with nonpelagic trawl gear. The COBLZ within the EEZ is an area defined as that portion of the Bering Sea Subarea north of 56°30' N. latitude that are west of a line connecting the following coordinates in the order listed:

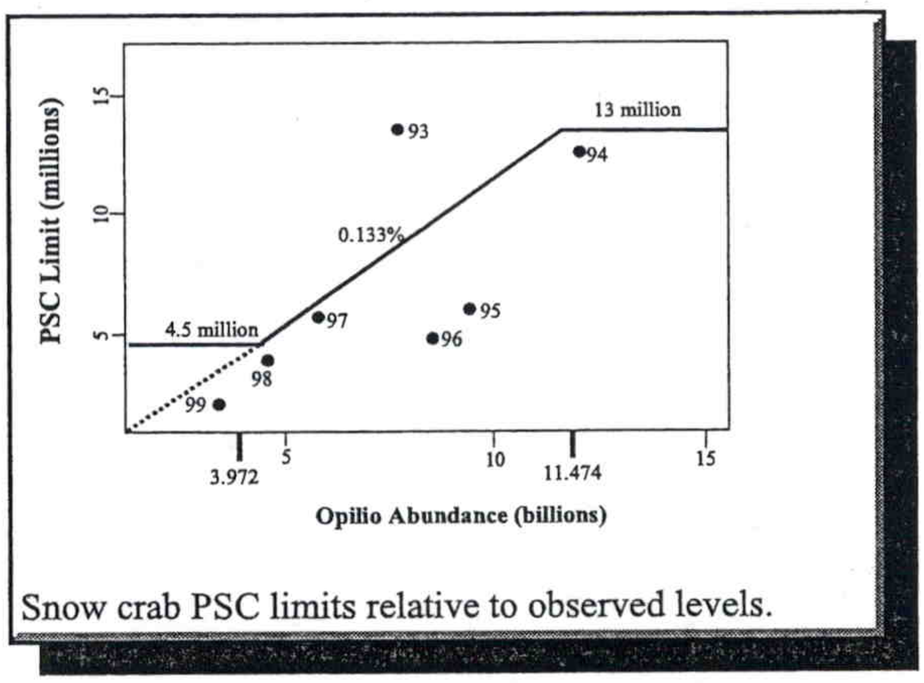
56°30' N. lat.,	165°00' W. long.
58°00' N. lat.,	165°00' W. long.
59°30' N. lat.,	170°00' W. long.

and north along 170°00' W. longitude to its intersection with the U.S.-Russian Boundary.

Analysis: A 44 page EA/RIR/IRFA (final draft dated October 2, 1997) was prepared for this amendment. Four alternatives including the status quo were considered. The other alternatives and options that were not chosen would have established a fixed PSC limit of 6 million or 11 million crab, or a PSC limit that fluctuated with abundance at all stock sizes. The alternative chosen incorporated fixed limits at high and low stock sizes, and fluctuating levels at intermediate stock sizes.

Results: Since the amendment was approved, bycatch of *C. opilio* crab has been greatly reduced. In 1998, the Council adopted a provision to reduce *C. opilio* crab bycatch by an additional 150,000 crab as part of the regulation prohibiting the use of bottom trawl gear for pollock fisheries (Amendment 57).

The *C. opilio* crab stock was deemed "overfished" on September 24, 1999, because the survey estimate of spawning stock biomass fell below the minimum spawning stock threshold established for this crab stock. The Council is developing a rebuilding plan that considers reducing the PSC limit at low stock sizes.



Snow crab PSC limits relative to observed levels.

BSAI Amendment 41 Reduced Bairdi Prohibited Species Catch Limits

Dates: Amendment 41 was adopted by the Council in September 1996. The proposed rule was published on January 2, 1997 (62 FR 85), and the final rule was published on March 24, 1997 (62 FR 13839). Effective date of implementation was April 23, 1997.

Purpose and Need: The Bering Sea Tanner crab ©. *bairdi*) stock was measured to be at near historically low levels, based on NMFS bottom trawl survey data. The fishery was also in trouble. The 1995 Tanner crab season produced only 4.5 million lb (2017 mt) for the 196 vessels participating. This amount was the lowest catch since the fishery reopened in 1988. Preliminary 1996 survey data indicated that the stock decline would continue. Tanner crab PSC limits for trawl fisheries established under Amendment 10 were 1,000,000 crab in zone 1 and 3,000,000 crab in zone 2. The objective of this amendment was to reduce Tanner crab bycatch in trawl fisheries, particularly at low stock sizes, to assist in recovery of this stock.

PSC limits for C. bairdi Tanner crab established by Amend. 41.

Species	Zone	Crab Abundance	PSC Limit
Tanner Crab	Zone 1	0-150 million crabs	0.5% of abundance
		150-270 million crabs	750,000
		270-400 million crabs	850,000
		over 400 million crabs	1,000,000
Tanner Crab	Zone 2	0-175 million crabs	1.2% of abundance
		175-290 million crabs	2,100,000
		290-400 million crabs	2,550,000
		over 400 million crabs	3,000,000

Regulation Summary: The alternative adopted and approved under Amendment 41 provides for the annual specification of the revised PSC limits based on the total estimated abundance of *C. bairdi* as shown in the adjacent table. *C. bairdi* taken as bycatch within the zones accrue towards the PSC limits established for individual trawl fisheries. Upon attainment of a PSC limit apportioned to a particular trawl target fishery, that fishery is prohibited from fishing within the specified zone. Note that in 1998, the Council adopted a provision to reduce opilio crab bycatch by an additional 50,000 *C. bairdi* crab as part of the regulation prohibiting the use of bottom trawl gear for pollock fisheries.

Analysis: A 41-page EA/RIR/IRFA (final draft dated November 20, 1996) was prepared for this amendment. Three alternatives including the status quo were considered. The other alternative that was not chosen would have reduced the PSC limits to a fixed level regardless of stock size (900,000 crab in Zone 1 and up to 2,100,000 crab in Zone 2). The alternative chosen was more conservative in that defining a larger area may offer more protection.

Number of C. bairdi crabs taken as incidental bycatch in BSAI trawl fisheries, 1994-1999.

Year	Zone 1	Zone 2
1994	748,848	1,709,724
1995	900,036	1,288,895
1996	840,389	969,103
1997	821,173	1,062,618
1998	564,320	901,134
1999	360,200	494,360

Results: Since the amendment was approved, bycatch of Tanner crab has been reduced. Nevertheless, the Tanner crab stock continued to decline, and was deemed "overfished" on March 3, 1999 because the survey estimate of spawning stock biomass fell below the minimum spawning stock threshold established for this crab stock. In October 1999, the Council adopted a rebuilding plan for this stock, but determined that bycatch limits established under Amendment 41 were sufficiently conservative.

BSAI Amendment 42 Individual Fishing Quota Vessel Buy Down

Dates: Amendment 42 to the BSAI (GOA 42) FMP was initiated by the Council in 1995. The proposed rule was published on June 25, 1996 (61 FR 32767) and the final rule, on August 22, 1996 (61 FR 43312). Effective date of implementation was August 16, 1996.

Purpose and Need: During the first year of fishing under the Individual Fishing Quota (IFQ) Program in 1995, IFQ fishermen reported that the prohibition against using or transferring QS across vessel categories limited their ability to improve the profitability of their operations. Many fishermen had received QS that represented far fewer pounds than their catch history prior to the IFQ program. Small boat fishermen reported the scarcity of medium- and large-size QS blocks (≥5,000 lb (2.3 mt)) available to smaller vessels and requested that the Council enable them to purchase shares from QS holders in larger vessel size categories. Also, category B vessel operators reported difficulties in using or marketing small category B blocks and requested the opportunity either to downsize operations or to sell smaller QS blocks to owners of smaller vessels.

Amendment 42 was intended to relieve certain restrictions in the IFQ Program by increasing the flexibility of QS use and transfer while maintaining the management goals of the IFQ Program and to provide small boat fishermen with more opportunities to improve the profitability of their operations.

Regulation Summary: Amendment 42 and a regulatory amendment to the IFQ Program for fixed gear Pacific halibut and sablefish fisheries in and off Alaska allowed QS initially assigned to a larger vessel category to be used on smaller vessels, while continuing to prohibit the use of QS or its associated IFQ assigned to smaller vessel categories on larger vessels. QS will continue to be assigned to vessel categories by existing criteria at Sec. 679.40(a)(5) (I) through (vi) and will retain original vessel category assignments. However, halibut and sablefish QS and their associated IFQ assigned to vessel Category B, can be used on vessels of any size and halibut QS assigned to vessel Category C likewise can be used on vessels of categories C and D. The regulations continue to prohibit the use of QS and IFQ on vessels larger than the maximum length on average (LOA) of the category to which the QS was originally assigned. It does not apply to halibut in IFQ regulatory areas 2C or to sablefish east of 140°. W. long. Halibut QS assigned to vessel Category B in IFQ regulatory areas 2C and sablefish QS east of 140° W. long. are prohibited from use on vessels less than or equal to 60 ft (18.3 m) LOA except in QS blocks equivalent to less than 5,000 lb (2.3 mt) based on the 1996 Total Allowable Catch (TAC).

Analysis: A 31-page analysis (Secretarial review draft dated August 5, 1996) examined two alternatives to the status quo. The Council ultimately recommended an alternative that included an exemption for Southeast Alaska. Allowing the "buydown" to occur only for category B blocks < 5,000 lb in Southeast still benefits crewmen and small vessel owners who would be able to use small category B blocks on smaller vessels without affecting the market price of category B medium and large blocks and unblocked QS.

Results: Amendment 42 is assumed to have attained its goal of increasing the availability of QS's to owners of smaller vessels, however, no systematic evaluation has been performed.

BSAI Amendment 43 Increase Individual Fishing Quota Vessel Buy Down

Dates: Amendments 43/43 to the BSAI and GOA FMPs were initiated by the Council in 1995. The proposed rule was published on September 27, 1996 (61 FR 50797) and the final rule on December 26, 1996 (61 FR 67962). Effective date of implementation was December 20, 1996.

Purpose and Need: This amendment along with a regulatory amendment to effect the same regulatory change for halibut was deemed necessary to increase the consolidation ("sweep-up") levels for small quota share (QS) blocks for Pacific halibut and sablefish managed under the IFQ program. The IFQ longline industry reported that current sweep-up levels do not equal the harvest of a viable fishing trip and proposed a moderate increase in these levels to allow greater amounts of QS to be swept-up into economically "fishable" amounts, without overly increasing consolidation or allowing the creation of large-sized blocks. This action is intended to maintain consistency with the objectives of the IFQ program (i.e., prevent excessive consolidation of QS, maintain diversity of the fishing fleet, and allow new entrants into the fishery), while increasing the program's flexibility by allowing a moderately greater amount of QS to be "swept-up" into larger amounts that can be fished more economically.

Regulation Summary: Amendment 43 increased the sweep-up levels for small QS blocks for Pacific halibut and sablefish from a 1,000 lb (0.45 mt) maximum for Pacific halibut and 3,000 lb (1.4 mt) maximum for sablefish to a 3,000 lb (1.4 mt) maximum and a 5,000 lb (2.3 mt) maximum, respectively. Two other changes were recommended to accompany these increases:

1) The base year TAC for determining the pounds would be the 1996, rather than 1994, TAC which was used for the first sweep-up levels;
2) Once QS levels are established for the appropriate regulatory areas based on the 1996 TAC, those QS levels would be fixed and codified. This would eliminate any confusion as to the appropriate sweep-up level in pounds, which would fluctuate with changes in the annual TAC.

Sablefish	Halibut
(I) Southeast Outside district: 33,270 QS	(I) Area 2C: 19,992 QS
(ii) West Yakutat district: 43,390 QS	(ii) Area 3A: 27,912 QS
(iii) Central Gulf area: 46,055 QS	(iii) Area 3B: 44,193 QS
(iv) Western Gulf area: 48,410 QS	(iv) Subarea 4A: 22,947 QS
(v) Aleutian Islands subarea: 99,210 QS	(v) Subarea 4B: 15,087 QS
(vi) Bering Sea subarea: 91,275 QS	(vi) Subarea 4C: 30,930 QS
	(vii) Subarea 4D: 26,082 QS
	(viii) Subarea 4E: 0 QS

The maximum number of QS units that may be consolidated into a single QS block in each IFQ regulatory area is shown in the above table.

Analysis: A 32-page analysis (Secretarial review draft dated November 27, 1996) included a range of alternatives of setting the sweep-up level at 1,000, 3,000, and 5,000 lb for halibut and 3,000, 5,000, and 7,000 lb for sablefish. The Council rejected the status quo levels (the lowest) and the highest levels. The analysis concluded that a moderate increase in the sweep-up levels would likely increase the transfer of very small, blocked QS to crew and small boat fishermen who seek to increase their holdings. While some price increases in small block shares might have occurred, a price differential was projected to remain between smaller and larger QS blocks. If the ability to transfer and consolidate small blocks would increase, then the number of unfished blocks would decrease.

At much larger sweep-up levels than currently allowed, the price differential between blocked and unblocked shares was projected to be lost. The effectiveness of the Block Program may be reduced at large sizes since large blocks and unblocked shares have been reported to sell at roughly the same price and would eliminate entry level QS. Price structure goals of the Block Program would be lost, as well. The differential pricing of larger blocked and unblocked QS would be further exacerbated by the paucity of financing for the IFQ industry at the time, particularly for crew and new entrants without capital or assets.

Continued

Results: Relatively few sweep-up transactions occurred in 1995 and 1996. Following implementation of Amendment 43, the number of sweep-up transactions increased substantially related to the higher sweep-up limits. In 1998, the number decreased to levels closer to those similar to 1995 and 1996. In total, the number of sweepable blocks declined by 693 for halibut and 151 for sablefish from 1995 through 1998.

BSAI Amendment 44 Overfishing Definitions

Dates: Amendments 44/44 to the BSAI and GOA FMPs were adopted by the Council in June 1996. The notice of approval for this amendment was published on January 17, 1997 (62 FR 2656). Effective date of implementation was January 9, 1997.

Purpose and Need: In response to the national standards established in the Magnuson Act and advisory guidelines, the Council developed an objective and measurable definition of overfishing and, in 1991, implemented that definition under Amendments 16 (BSAI) and 21 (GOA) to the FMPs. In the years since implementation of that definition, fishery scientists had the opportunity to evaluate the efficacy of these definitions of ABC and overfishing. In light of that experience and with the increased understanding of the reference fishing mortality rates used to define ABCs and overfishing, fishery scientists had raised several concerns about the definitions and the extent to which they reflect and account for levels of uncertainty about fish populations. Consequently, NMFS's Overfishing Definitions Review Panel and the Council's Scientific and Statistical Committee recommended redefining ABC and overfishing to facilitate more conservative, risk-averse management measures when stock size and mortality rates are not fully known. The purpose of this Amendment was to revise the ABC and overfishing definitions to be consistent with these recommendations.

Regulation Summary: Amendments 44/44 provided for more conservative definitions of ABC and OFL. The fishing mortality rate used to calculate ABC was capped by the overfishing rate. The maximum allowable fishing rates were prescribed through a set of 6 tiers which are listed in descending order of preference, corresponding to descending information availability. These tiers are shown in the adjacent table. Harvest rates used to establish ABCs are reduced at low stock size levels, thereby allowing rebuilding of depleted stocks. If the biomass of any stock falls below Bmsy or $B_{40\%}$ (the long-term average biomass that would be expected under average recruitment and $F=F_{40\%}$), the fishing mortality is reduced relative to stock status. This serves as an implicit rebuilding plan should a stock fall below a reasonable abundance level.

Analysis: A 60-page EA (final draft dated January 6, 1997) was prepared for this amendment. Two alternatives including the status quo were considered. The alternative chosen was more conservative for several reasons. First, the overfishing rate varies with biomass. Second, the ABC fishing rate is reduced when biomass is below levels that produce maximum sustainable yields. Lastly, more caution is incorporated into establishing fishing rates when less information is available; this is particularly true of tier 1.

Tiers used to determine ABC and OFL for BSAI groundfish stocks under Amendment 44.

(1) Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.
1a) Stock status: $B/B_{MSY} > 1$
$F_{OFL} = m_A$, the arithmetic mean of the pdf
$F_{ABC} \le m_H$, the harmonic mean of the pdf
1b) Stock status: $a < B/B_{MSY} \le 1$
$F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le m_H \times (B/B_{MSY} - a)/(1 - a)$
1c) Stock status: $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(2) *Information available: Reliable point estimates of B,* B_{MSY}, F_{MSY}, $F_{30\%}$, and $F_{40\%}$.
2a) Stock status: $B/B_{MSY} > 1$
$F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%})$
$F_{ABC} \le F_{MSY}$
2b) Stock status: $a < B/B_{MSY} \le 1$
$F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%}) \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$
2c) Stock status: $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(3) *Information available: Reliable point estimates of B,* $B_{40\%}$, $F_{30\%}$, and $F_{40\%}$.
3a) Stock status: $B/B_{40\%} > 1$
$F_{OFL} = F_{30\%}$
$F_{ABC} \le F_{40\%}$
3b) Stock status: $a < B/B_{40\%} \le 1$
$F_{OFL} = F_{30\%} \times (B/B_{40\%} - a)/(1 - a)$
$F_{ABC} \le F_{40\%} \times (B/B_{40\%} - a)/(1 - a)$
3c) Stock status: $B/B_{40\%} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(4) *Information available: Reliable point estimates of B,* $F_{30\%}$, and $F_{40\%}$.
$F_{OFL} = F_{30\%}$
$F_{ABC} \le F_{40\%}$

(5) *Information available: Reliable point estimates of B and natural mortality rate M.*
$F_{OFL} = M$
$F_{ABC} \le 0.75 \times M$

(6) *Information available: Reliable catch history from 1978 through 1995.*
OFL= the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information
$ABC \le 0.75 \times OFL$

Results: The amendment resulted in lower (more conservative) ABCs; consequently, total allowable catch levels were reduced for many species. The definitions adopted under Amendments 44/44 were further revised under Amendments 56/56.

BSAI Amendment 45 Permanently Extend Community Development Quota Allocation

Dates: Amendment 45 was adopted by the Council in June 1998. The final and interim emergency rules were published on January 26, 1999 (64 FR 3877). Effective date of implementation was January 21, 1999.

Purpose and Need: The allocation of pollock TAC to the CDQ program from 1992 through 1998 had been instrumental in providing the revenues, employment, and training benefits to achieve the Council's goals of helping western Alaska communities to develop and support commercial fishery activities that result in ongoing, regionally based commercial fisheries or related businesses. The 1996 amendments to section 305 of the Magnuson-Stevens Act require the Council and the Secretary to "establish a western Alaska community development quota program under which a percentage of the total allowable catch of any Bering Sea fishery is allocated to the program." An amendment to the FMP was necessary to continue the allocation of pollock to the CDQ program.

Amendments 18 and 38 authorized the allocation of 7.5% of pollock total allowable catch (TAC) in the Bering Sea and Aleutian Islands (BSAI) to the Western Alaska Community Development Program for the groundfish and crab fisheries for three years periods between 1993 and 1998. Amendment 45:

1) permanently extended the CDQ allocation which was to sunset December 31, 1998;
2) removed the pollock CDQ program from the inshore/offshore section of the FMP and reorganized three separate CDQ-related sections of the FMP;
3) increased the pollock allocation to 10% through December 31, 2004 to comport with the provisions of the American Fisheries Act of 1998.

Regulation Summary: Ten percent of pollock and 7.5% of all other groundfish and crab TACs are set aside for the Western Alaska CDQ program.

Analysis: A 146-page analysis (Secretarial review draft dated December 1, 1998) considered the economic impacts of the first 6 years of the pollock CDQ program in western Alaska. The analysis estimated that 249 entities are affected by regulations governing the BSAI pollock fishery, of which 130 are small entities. Sixty-five Alaska villages near the Bering Sea formed six CDQ groups and established partnerships with fishing corporations. Five communities whose residents participate in the BSAI pollock fisheries but are not eligible for the CDQ program, 140 trawl catcher vessels, 31 trawl catcher/processors, three motherships, and eight shoreside processing plants were also affected.

The EA/RIR/IRFA estimates that in 1997, over 200 people from CDQ communities were employed directly in the pollock harvesting and processing industry, and a total of about 1,200 CDQ program related jobs had been created. These jobs are in CDQ program management (6 % of jobs), pollock harvesting and processing (27 %), other fisheries harvesting and processing (50 %), and other employment (17 %).

NMFS considered two alternatives to minimize economic impacts on the small entities negatively affected by this action. The first alternative would be to allocate 3.5 % of pollock TAC to the CDQ reserve. Although this alternative would benefit the small entities not receiving CDQ allocation, the benefits accruing to the (then) 56 CDQ communities would have been considerably less. Those communities have limited opportunities for generating income and investment such that the reduction from 7.5 % to 3.5 % reserve would have likely produced significant negative economic impacts on these small entities. The second alternative would have let the present reserve of 7.5 % of pollock TAC expire at the end of 1998. This action would result in a further shift of impacts from one set of small entities to another. It would benefit the non-CDQ participants in the fishery while cutting revenues of the CDQ groups.

Continued

Results: The pollock CDQ allocations have led to training and employment opportunities for community residents. Since the inception of the program in 1992, the program has provided approximately 1,000 jobs annually for Western Alaska residents. Total wages exceeded $30 million during the 1992-1999 period. The CDQ program has also contributed to infrastructure development projects within the region as well as loan programs and investment opportunities for local fishermen. The six CDQ groups have earned over $20 million per year from contracts with their industry partners that harvest the pollock CDQ quotas on behalf of the CDQ groups. The value of the CDQ groups' equity ownership in fishing vessels, on-shore development projects, loan portfolios, and Individual Fishing Quota holdings has increased an average of 37 % per year since 1992, and totaled approximately $64 million in 1997.

BSAI Amendment 46 Pacific Cod Allocation II

Dates: Amendment 46 was adopted by the Council in June 1996. NMFS published a proposed rule to implement Amendment 46 to the Fishery Management Plan for the groundfish of the BSAI on August 22, 1996 (61 FR 43325). The final rule was published on November 20, 1996 (61 FR 59029). Effective date of implementation was January 1, 1997.

Purpose and Need: Amendment 46 was proposed to extend the management measures authorized by Amendment 24 beyond 1996. Amendment 24 authorized the explicit allocation of BSAI Pacific cod among vessels using trawl, hook-and-line or pot gear, and jig gear. The amendment also authorized the seasonal apportionment of the amount of Pacific cod allocated to vessels using hook-and-line or pot gear and the reallocation of the unused portion of one gear's allocation to other gear types.

Amendment 24 was proposed in response to socioeconomic concerns of the fishing industry and the need for stability in the trawl gear and fixed gear (longline, pot, and jig) fleets. The fishery was exhibiting numerous overcapitalization problems such as compressed fishing seasons, high bycatch and waste, gear conflicts, and an overall reduction in benefit from the fishery. At the April 1993 meeting, the Council developed a problem statement that focused on resolving overcapitalization in the BSAI Pacific cod fishery, and in June recommended the Amendment 24 management measures to be implemented through 1996. The alternative approved allocated the BSAI Pacific cod TAC to the jig gear (2%), hook-and-line or pot gear (44%) and trawl gear (54%) fleets.

The Council's action was intended to provide industry and community stability by directly allocating to gear groups approximately the average percent of Pacific cod taken with these gear types during 1991-1993. In addition, the intent of the seasonal apportionment in the fixed gear sector was to allow for a first and third season fishery when halibut bycatch rates, product quality, and markets are most advantageous. Upon the expiration of Amendment 24, the Council began an analysis to extend the allocations. At the December 1995 Council meeting, it was noted that while the action provided the necessary stability to the various gear sectors, significant regulatory, economic, and biological changes had occurred in the Pacific cod fishery since the amendment was implemented in 1994. These changes were incorporated into the original analysis with a specific focus on reducing prohibited species mortality, impacts on habitat, and cod discards by the different gear sectors. The analysis examined a range of possible allocations, and the Council then tasked an industry-based negotiating committee to agree on a new allocation regime that would be acceptable to all sectors of the fishery. The final percentages were chosen based on the current harvest percentage taken by the trawl and fixed gear sectors under current halibut PSC limits while retaining the 2% allocation for jig gear.

Regulation Summary:

1) BSAI Pacific cod TAC Apportionments: Trawl sector: 47% (The trawl apportionment will be split between catcher vessels and catcher processors 50/50.); Fixed gear sector: 51%; Jig gear sector: 2%
2) Roll-overs: On September 15 of each year, the Regional Director shall reallocate 100% of any projected unused amount of the Pacific cod allocated to jig vessels to the fixed gear vessels. If, during a fishing year, the Regional Director determines that vessels using trawl gear or hook-and-line or pot gear will not be able to harvest the entire amount of Pacific cod allocated to those vessels, then NMFS shall reallocate the projected unused amount of Pacific cod to vessels using the other gear type(s).
3) Halibut PSC Mortality Caps: The trawl halibut PSC mortality cap for Pacific cod will be no greater than 1,600 mt. The hook-and-line gear halibut PSC mortality cap for Pacific cod will be no greater than 900 mt.
4) Review: No sunset provision, but the Council will review this agreement in four years following the date of implementation.

Analysis: A 173-page EA/RIR (final draft dated October 1996) was prepared for this amendment. Six alternative allocation splits, including no action, were considered. While the specific allocation preferred by the negotiating group and approved by the Council was not explicitly identified in the analysis, it was well within the range of alternatives considered. Thus, the Council had sufficient information on the impacts of the alternative to make a decision.

Results: The allocations established in Amendment 46 have continued to stabilize the BSAI cod fishery as the Council continues on the path towards comprehensive rationalization. However, since the amendment was passed, there have been further allocation and limited entry measures imposed on the BSAI Pacific cod fishery by Amendments 64, 67 and 77.

BSAI Amendment 47 Third Party Observer Program (withdrawn)

WITHDRAWN - At the December 1997 meeting the Council was scheduled to take action approving an alternative observer program structure - a Joint Partnership Agreement (JPA) between NMFS and the Pacific States Marine Fisheries Commission (PSMFC), which would have established PSMFC as a third party procurement point for observers. This was being considered as a replacement for the repealed Research Plan (Amendment 30), in an effort to address conflict of interest and other issues in the existing pay-as-you-go program structure. Due to legal concerns of PSMFC this amendment was not approved by the Council and was never forwarded for Secretarial review. Instead, the existing pay-as-you-go program was extended for an additional time period, through year 2000. Currently, NMFS and Council staff are working on revised program structure alternatives, including a fee-based plan, and the current program will be extended through 2002.

BSAI Amendment 48 Total Allowable Catch Streamlining

Dates: Amendment 48 was approved by the Council in October 2003, but has not been formally submitted for Secretarial review.

Purpose and Need: The Council and NMFS acknowledged the need to revise the existing TAC specification process to meet the following objectives:

1) manage fisheries based on the best available information;
2) make adjustments to TAC amounts to respond to new information or conservation concerns;
3) comply with NEPA, ESA, and RFA provisions while minimizing unnecessary disruption to fisheries;
4) provide adequate opportunity for public review and comment on new information leading to annual TAC recommendations; and
5) promote administrative efficiency while minimizing public confusion regarding proposed and interim specifications.

Regulation Summary: The preferred alternative adopted by the Council is to establish harvest specifications for 18 months (Year 1 and first half of Year 2) for BSAI and GOA groundfish. For setting pot and hook-and-line sablefish specificaitons, the Council recommended a modified rulemaking process. If a second proposed rulemaking is required for the final specifications, the pot and hook-and-line sablefish specifications would be issued by final rulemaking. A second proposed rule may be needed for the final specifications if they are not a logical outgrowth from the proposed rule. Also, the amendment deleted references to foreign fisheries in the FMPs, and updated descriptions of the fisheries.

Analysis: A 188-page analysis (public review draft dated September 2003) was prepared for this amendment. 5 alternative were considered: 1) no action, 2) eliminate publication of interim specifications, and issue proposed and final specifications prior to the start of the fishing year, 3) issue proposed and final harvest specifications based on an alternate fishing year schedule, 4) use stock assessment projections for biennial harvest specifications, for the BSAI and GOA set the annual harvest specifications based on the most recent stock assessment and set harvest specifications for the following year based on projected OFL and ABC values, 5) 18 month harvest specifications with December rulemaking decision. Three stand-alone options were also considered, A) abolish TAC reserves, and B) update portions of the FMP. The Council chose alternative 5 as its preferred alternative, and adopted option B.

Results: The BSAI and GOA Plan Teams first proposed streamlining the groundfish specifications process in 1996. The Council initiated Amendments 48 to the BSAI and GOA FMPs in December 1996 to address administrative and public notice issues. The Council's preferred action to rollover harvest specifications from one year to the next was approved in June 1998. ABCs, TACs, and PSC amounts would remain unchanged from year to year until revised in a final rule. In July 1999, the NMFS Regional Administrator notified the Council that the Council's preferred alternative was not in compliance with the National Environmental Policy Act, the Administrative Procedures Act, and the Regulatory Flexibility Act. The revised amendment has not yet been implemented.

BSAI Amendment 49 Improved Retention / Improved Utilization Program

Dates: Amendment 49 was approved by the Council in September 1996. The proposed rule was published on June 26, 1997 (62 FR 34429). The final rule was published December 3, 1997 (62 FR 63880). Effective date of implementation was January 3, 1998. Amendment 49 to the GOA FMP was implemented as separate rulemaking.

Purpose and Need: To reduce discards, the Council adopted an improved retention and utilization program (IR/IU) for all groundfish target fisheries. This action was deemed necessary to address one of the Council's comprehensive fishery management goals, adopted in 1984, to "minimize the catch, mortality, and waste of non-target species and reduce the adverse impacts of one fishery on another." The Council also recognized that fish caught as bycatch in one fishery represent an allocation away from any target fishery for the bycatch species. In addition, a priority objective of the FMP is to "provide for the rational and optimal use, in a biological and socioeconomic sense, of the region's fisheries resources as a whole."

The IR/IU program was intended to improve utilization and effective control/reduction of bycatch and discards in the fisheries off Alaska to address the following problems:

1) bycatch and discard loss of groundfish, crab, herring, salmon, and other non-target species;
2) economic loss and waste associated with the discard mortality of target species harvested but not retained for economic reasons;
3) inability to provide for a long-term, stable fisheries-based economy due to loss of fishery resources through wasteful fishing practices;
4) the need to promote improved retention and utilization of fish resources by reducing waste of target groundfish species to achieve long-term sustainable economic benefits to the nation.

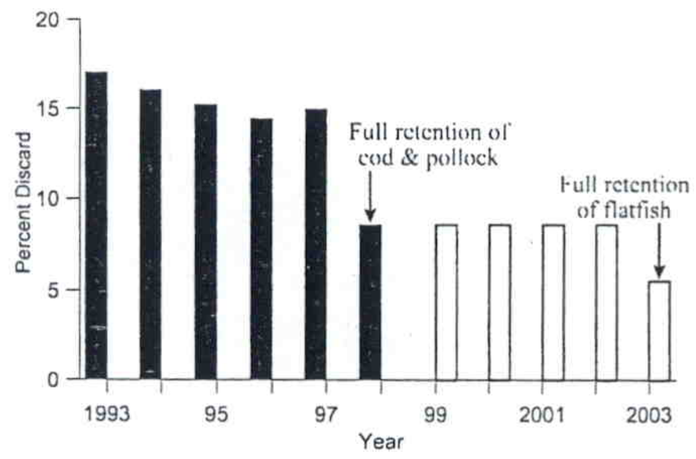
Regulation Summary: Amendment 49 required all vessels fishing for groundfish in the BSAI to retain all pollock and Pacific cod beginning January 1, 1998, and all rock sole and yellowfin sole beginning January 1, 2003. It established a 15-percent minimum utilization standard for all at-sea processors.

Analysis: A 200-page analysis (Secretarial review draft dated September 3, 1997) reviewed a variety of bycatch reduction plans that had been discussed by the Council since 1993. While other alternatives were discussed, primary focus was given to these three alternative programs:

1) individual fishing quotas for groundfish species;
2) a "Harvest Priority" program that would provide for quota set-asides for vessels exhibiting low bycatch rates of non-target species;
3) retention and utilization mandates, with built-in incentives for fishing operations to avoid unwanted species.

In the 1997 Bering Sea/Aleutian Islands groundfish fisheries, a total of 258,000 mt of groundfish was discarded, equating to about 15% of the total groundfish catch. The analysis determined that pollock, Pacific cod, rock sole, and yellowfin sole represent approximately 76 percent of the total discards of allocated groundfish in the BSAI groundfish fisheries. The Council concluded that by requiring 100 percent retention of these four species, initially pollock and Pacific cod, and subsequently yellowfin and rock sole, the Council's objective of "substantially reducing discards of unprocessed groundfish" in these fisheries could be achieved.

Results: Beginning in 1998, 100% retention of pollock and Pacific cod was required, regardless of how or where it was caught. Only fish not fit for human consumption can be legally discarded. This measure has dramatically reduced overall discard of groundfish. For example in 1997, about 22,100 mt of cod (8.6% of the cod catch) and 94,800 mt of pollock (8.2% of the pollock catch) were discarded. In 1998, discard amounted to only 4,300 mt of cod (2.2%) and 16,200 mt of pollock (1.6%). Bering Sea



Total discard rates of Alaska groundfish, all areas and species combined, 1993-1998, projections through 2003.

Continued

and Aleutian Islands rock sole and yellowfin sole retention will be required beginning in 2003; the delay will allow for development of new markets and gear technological responses by the vessels engaged in these fisheries. These retention requirements are expected to reduce overall discard rates (all species) from about 15% to about 5%.

The implementation of IR/IU for rock sole and yellowfin sole has been repealed in 2003 (see Amendment 75).

BSAI Amendment 50 Halibut Donation Program

Dates: Amendment 50 was adopted in April 1997 and implemented in June 1998, after administrative difficulties were addressed in the design of the program initiated in 1993. It expanded the existing Salmon Donation Program (SDP) to create a Prohibited Species Donation (PSD) program that would include halibut as well as salmon. The final rule for BSAI and GOA Amendments 50/50 (63 FR 32144) was published on June 12, 1998. The effective date of implementation was July 13, 1998 (63 FR 32144). This rule was effective only for a limited period ending December 31, 2000, to allow the Council to assess its success. (In June 2000 the Council permanently extended the program with a built-in, periodic review, but no sunset.)

Purpose and Need: Approximately 6,500 metric tons of halibut were taken incidentally to the Alaska groundfish fisheries during 1999. Vessels participating in these fisheries typically use trawl, hook-and-line, or pot gear, with trawl gear accounting for most of the groundfish catch and halibut bycatch. A portion of this bycatch is landed dead at shoreside processing facilities and must be returned to Federal waters for disposal as a prohibited species. The Council's intent was to:

(1) reduce regulatory discards and protein waste in the groundfish trawl fisheries;
(2) provide additional opportunity to collect biological samples or scientific data; and
(3) support an industry initiative to reduce regulatory discards and provided a healthy alternative to the diets of needy people.

The purpose of this amendment was to reduce the waste of dead, but wholesome, fish, and in doing so provide public benefit by allowing fish that would otherwise be discarded to be retained for processing and delivery to food bank organizations. Any costs associated with this recommended action would be borne by the voluntarily participating shoreside processors and the NMFS authorized distributor.

Regulation Summary: This action authorized the voluntary donation of Pacific halibut taken as bycatch in specified groundfish trawl fisheries off Alaska to economically disadvantaged individuals. Under the prohibited species donation program, NMFS expanded the existing salmon donation program to also authorize distributions by tax-exempt organizations through a NMFS-authorized distributor. The program is limited to dead halibut landed by trawl catcher vessels to shoreside processors.

Analysis: The Council discourages the discard of incidental catches of fish as wasteful. Managing halibut incidentally caught in the groundfish fisheries as a prohibited species is an appropriate short term bycatch measure. Except under the prohibited species donation program, retention of prohibited species captured while harvesting groundfish is prohibited to prevent covert targeting on these species. The prohibition removes the incentive that groundfish fishermen might otherwise have to target on the relatively high valued prohibited species, and thereby, results in a lower incidental catch. It also eliminates the market competition that might otherwise exist between domestic halibut fishermen and groundfish fishermen who might land halibut in the absence of the prohibition.

A 20-page analysis (Secretarial review draft dated September 12, 1997) determined that no changes in fishing activities that would affect the amount of groundfish harvested nor the amount of halibut taken as bycatch in the Alaska trawl fisheries was expected by the preferred alternative. The total burden to processors resulting from the preferred alternative could not be estimated because participation would be voluntary; however, based on information acquired through the SDP, costs were estimated at approximately 20 cents per pound for donated halibut.

Results: Waste of salmon and halibut has been reduced by allowing bycatch to be donated to food banks. The food banks in turn distribute the fish to needy people in the northwestern United States. Many fishing companies voluntarily participate in the donation program. Through 1998, over 3 million pounds of donated salmon have produced an estimated 12 million meals for needy persons. To date, two of three plants in Dutch Harbor have donated halibut. Although limited to no more than 50,000 lb, the actual donated amount was 21,196 lb in 1998 and 4,476 lb in 1999. Inconsistency in reporting and enforcement may have led to the decline in participation in 1999.

BSAI Amendment 51 Extend the Catcher Vessel Operational Area

Dates: Amendment 51 was approved by the Council in June 1998. NMFS published a proposed rule to amend the BSAI and GOA Groundfish FMPs on October 29, 1998 (63 FR 57996). The final rule for BSAI Amendment 51 and GOA Amendment 51 was published on January 25, 1999 (64 FR 3653). Effective date of implementation was January 20, 1999.

Purpose and Need: The TACs for pollock in the BSAI and for pollock and Pacific cod in the GOA have been allocated between the inshore and offshore components of the groundfish fisheries since 1992. Amendments 51/51 were proposed to extend the provisions of Amendment 38 to the BSAI FMP and Amendment 40 to the GOA FMP, which expired on December 31, 1998. Amendments 38 and 40 previously extended BSAI Amendment 18 and GOA Amendment 23, respectively. The original amendments set processor allocations of the pollock TAC in the BSAI and pollock and Pacific cod processor allocations in the GOA, as a response to an early closure in 1989 when several catcher/processors harvested substantial amounts of pollock in the BSAI and GOA and forced an early closure of the GOA pollock fishery. The amendments allocated 35% to the inshore and 65% to the offshore processing sector of the BSAI pollock fishery, and allocated 90% of the cod and 100% of the pollock to the inshore processing sector in the GOA. The Catcher Vessel Operational Area (CVOA) and the Community Development Quota (CDQ) program were also established. The CVOA limited access to pollock within the area to catcher vessels delivering to either inshore or offshore processors. The CDQ program allocated 7.5% of the BSAI pollock TAC to CDQ fisheries.

At its meeting in June 1998, the Council took final action to adopt Amendments 51/51 to the FMPs. By proposing these FMP amendments, the Council intended to change the inshore/offshore allocations in the BSAI but continue the existing allocations in the GOA. However, on October 21, 1998, the President signed the American Fisheries Act (AFA) into law (Pub. L. 105-277). The AFA, among other things, allocated the BSAI pollock TACs differently than the Council had recommended. The Council held a special meeting November 10-13, 1998, in part to discuss the effects of AFA on its inshore/offshore proposal and other management programs. In light of the AFA, the Council recommended specific changes to its Amendment 51/51 proposal, and on December 15, 1998, NMFS partially approved BSAI Amendment 51 and fully approved GOA Amendment 51. The decision not to approve parts of BSAI Amendment 51 is consistent with the Council's intent for achieving consistency with the AFA as expressed at its meeting in November 1998.

Section 206 of the AFA specifically mandates an allocation of 10% of the pollock TAC to a directed fishing allowance for the CDQ program plus an additional allocation of pollock for incidental catches in all non-pollock fisheries. Of the remaining pollock TAC, the law stipulates the following allocations: 50% to the inshore component, 40% to the offshore component (catcher processors), 10% to the offshore component (motherships). The effective period of the inshore/offshore allocations specified in the AFA is January 1, 1999, through December 31, 2004 (sec. 206 and 213).

Regulation Summary: As adopted by the Council in June 1998, the BSAI amendment contemplated four changes to the current inshore/offshore allocation regime. In light of the AFA, the BSAI inshore/offshore pollock allocations were disapproved, and the only change (partially) approved related to the Catcher Vessel Operational Area (CVOA). The original Amendment 51 would have changed the existing CVOA rules by excluding from the CVOA all catcher vessels that deliver pollock to the offshore component (catcher/processors and motherships). Motherships had previously been allowed to operate within the CVOA, receiving and processing pollock harvested by catcher vessels. Catcher/processor vessels had not been allowed to harvest pollock in the CVOA during the B season. In recommending the CVOA portion of Amendment 51, the Council attempted to create parity between motherships and catcher/processor vessels. NMFS approved all of the proposed amendment maintaining the CVOA with the exception of that component. This is because the AFA specifies separate allocations of the pollock TACs for the mothership and catcher/processor sectors, thereby achieving the parity intended by the Council. Hence, the exclusion of catcher vessels from the CVOA that deliver to the offshore component was an unnecessary duplication of an AFA provision, and as such, was inconsistent with National Standard 7. Note that although the approved CVOA provisions are effectively the same as they were for 1996-98, further restrictions on fishing in the CVOA were implemented in 1999 to mitigate the effects of pollock fishing on Steller sea lions and their critical habitat, within which much of the CVOA lies.

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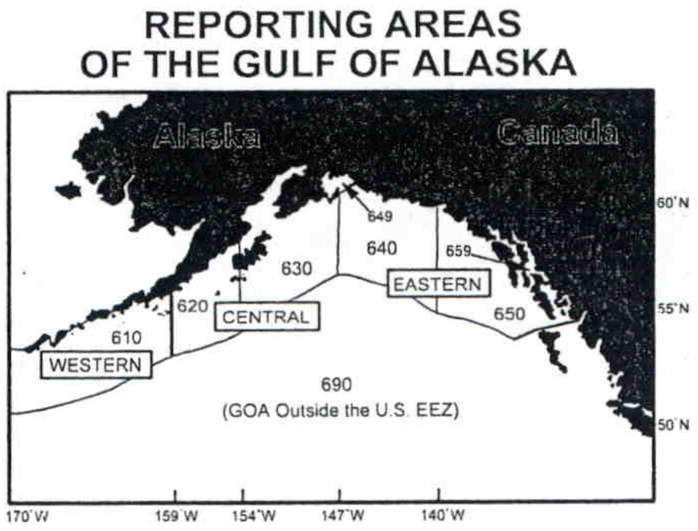
Analysis: A 299-page EA/RIR/IRFA (final draft dated December 9, 1998) was prepared for Amendment 51/51. Five alternatives were considered, including: the no action alternative; a rollover of the existing inshore/offshore program; several options to revise the BSAI pollock processing inshore/offshore percentages; a set-aside for catcher vessels less than 125' length overall; and a set-aside for catcher vessels less than 155' length overall. The Council's preferred alterative was to allocate 39% of the BSAI pollock TAC inshore and 61% offshore (after CDQs are deducted from the BSAI TAC), and to maintain the current GOA allocations of 90% Pacific cod and 100% pollock to the inshore sector. The Council also adopted a 2.5% set-aside for BSAI catcher vessels less than 125' length overall delivering to processors in the inshore sector. While the Council's preferred BSAI allocation split was not a specified alternative, it was well within the range of BSAI allocation percentages evaluated in the analysis–the analysis evaluated options to allocate 25%, 30%, 40%, and 45% of the BSAI pollock TAC to the inshore sector. With the passage of the AFA, however, the portions of the amendment stipulating BSAI pollock allocations became immaterial, thus only the GOA portions of the amendment and the provisions relevant to the CVOA were approved.

Results: The major provisions of this amendment (primarily the percentage allocations of the TAC for pollock processing) were disapproved given the passage of the AFA. The AFA instituted a different allocation among sectors, and instituted a fundamentally different management program for BSAI pollock including the formation of fishery cooperatives (see Amendment 61/61).

BSAI Amendment 52 Vessel Registration Program (tabled)

Dates: The Council initiated an analysis of two complementary management actions in Amendments 52 to the BSAI and GOA FMPs in December 1997 and approved it in February 1998. A plan amendment to authorize NMFS to establish a vessel registration program for "at risk" fisheries that met certain criteria has been tabled because of changes in the fisheries as a result the American Fisheries Act and Amendment 61. Only a regulatory amendment for a stand down for trawl vessels transiting between the BSAI and GOA was submitted to the Secretary and approved. The final rule for BSAI and GOA Amendments 52/52 was published on September 11, 1998 (63 FR 48641). Effective date of implementation for the standdown was September 8, 1998.

Purpose and Need: Management of the inshore pollock and Pacific cod fisheries of the Western and Central (W/C) Regulatory Area of the Gulf of Alaska (GOA) had become increasingly difficult. The risk of harvest overruns had grown due to TAC amounts that are small relative to the potential fishing effort. The problem has been most acute in the Western Regulatory Area due to the constant potential pressure that numerous large catcher vessels based in the Bering Sea (BS) could cross into the GOA to participate in pollock and Pacific cod openings that have relatively small TACs. NMFS lacked a pre-season vessel registration program that could gauge potential effort in these fisheries prior to openings, and inseason catch information in these fisheries was neither timely nor accurate enough to allow adequate management.



The objective of Amendment 52 was to create a vessel registration program to require vessels to announce their participation in either the BSAI or GOA pollock and Pacific cod fisheries before the fishery commenced. This action is necessary to prevent unexpected shifts of fishing effort between BSAI and GOA fisheries that can lead to overharvests of total allowable catch (TAC) in the Western and Central Regulatory Areas of the GOA. It is intended to further the stated goals and objectives of the BSAI and GOA FMPs.

Regulation Summary: Under a vessel registration program, NMFS would establish criteria to determine which fisheries would require registration. Based on these criteria, NMFS would create a roster of "registration fisheries" that would be announced at the beginning of each year and supplemented as necessary on an inseason basis throughout the year. Criteria for establishing a registration requirement for a fishery could include:

1) the size of the TAC amount or PSC limit specified for the fishery relative to the degree of interest in that fishery,
2) a fishery for which the TAC or PSC limit was exceeded by a significant amount in the previous year and the current year's quota and expected effort are similar,
3) a fishery for which the above two criteria may not apply but an expanded interest has developed inseason, and
4) a "mop-up" fishery.

Vessel operators would be required to register with NMFS a certain number of days before beginning directed fishing in a registration fishery and penalties would be established for non-compliance.

Analysis: A 25-page EA/RIR/IRFA (public review draft dated January 1998) was prepared for this amendment. Two complementary management actions were considered by the Council, in addition to the status quo alternative. The analysis concluded that the fleet as a whole would benefit if NMFS is able to manage "at risk" fisheries so that quotas are more fully harvested and the overhead costs associated with re-crewing and transiting to the fishing grounds for short term "mop-up" openings could be avoided. A registration requirement would reduce the flexibility of vessel operators to enter and leave fisheries at will. In some cases, this could pose costs for certain operations if they realize mid-course that they would prefer to be participating in a short term fishery for which they have not registered. Nevertheless, while a registration requirement for certain "at risk" fisheries will increase the constraints on the fleet, it will serve to increase the ability of NMFS to manage such fisheries to obtain optimum yield and provide the greatest net benefit to the nation.

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Results: Due to higher priorities, the vessel registration program was not developed by NMFS. As a result of the American Fisheries Act of 1998, the structure of the pollock fisheries in the BSAI has been significantly altered, obviating the need for the vessel registration program as originally envisioned by the Council. A broader vessel registration program in conjunction with electronic reporting requirements may be developed in the future.

BSAI Amendment 53 Shortraker/Rougheye Rockfish Allocation in Aleutian Islands by Gear

Dates: Amendment 53 was adopted by the Council in February 1999. The final rule for this amendment was published on July 28, 1998 (63 FR 40190). Effective date of implementation was July 22, 1998.

Purpose and Need: Shortraker rockfish and rougheye rockfish (SR/RE) are commercially valuable species which are managed together as a complex. However, amounts available to the commercial fisheries are limited by a relatively small total allowable catch (TAC) amount that is fully needed to support incidental catch or bycatch needs in other groundfish fisheries. As a result, the directed fishery for SR/RE typically is closed at the beginning of the fishing year. Bycatch of SR/RE is highest in the Pacific ocean perch (POP) and Atka mackerel trawl fisheries, but SR/RE also are taken in non-trawl fisheries.

In 1997, unanticipated high harvest rates of SR/RE in the POP and Atka mackerel trawl fisheries undermined the effectiveness of inseason management and resulted in harvest amounts that exceeded the acceptable biological catch. Estimates of SR/RE bycatch through mid-1997 indicated that the overfishing level would be reached if fisheries that took these species in the AI were not closed. As a result, NMFS prohibited the retention of Atka mackerel, Pacific cod, and rockfish by vessels using trawl gear and retention of Pacific cod and Greenland turbot by vessels using hook-and-line gear. Thus, although overfishing concerns stemmed primarily from the bycatch of SR/RE in the POP and Atka mackerel trawl fisheries, non-trawl fisheries that also take incidental amounts of these rockfish also were closed, or threatened with closure, to prevent overfishing of SR/RE. These overfishing closures disrupted fishing plans and resulted in a loss of economic opportunity for the trawl and non-trawl fishing industry. To get at this problem, separate maximum retainable bycatch (MRB) percentages were established for SR/RE that would minimize the impact that "topping off" behavior may have on the rate at which the SR/RE TAC is reached. "Topping off" occurs when vessel operators alter fishing operations to catch more of these species up to the amount under MRB constraints. To minimize this practice, a separate MRB percentage was established for SR/RE of 7 percent relative to certain deepwater species (primarily POP) and 2 percent relative to all other species except arrowtooth flounder, which cannot be used as a species against which SR/RE may be retained.

In spite of the proposed MRB percentages, overall bycatch amounts of SR/RE still could pose concern because the TAC amounts annually specified for SR/RE are small in comparison to the high volume POP and Atka mackerel trawl fisheries. Consequently, representatives of the trawl and non-trawl industries recommended that the Council adopt an FMP amendment to allocate SR/RE between gear groups.

Regulation Summary: At its February 1998 meeting, the Council approved Amendment 53 to the FMP. After subtraction of reserves, this amendment would allocate 30 percent of the remaining SR/RE TAC to non-trawl gear and 70 percent of the remaining SR/RE TAC to trawl gear.

Analysis: A 27-page EA/RIR (final draft dated June 1998) was prepared for this amendment. Two alternatives including the status quo were considered. The alternative adopted and approved was based on an industry recommended allocation of SR/RE TAC between trawl and non-trawl vessels, which was intended to provide an allocation to the non-trawl fleet in excess of actual relative harvest in recent years. Trawl industry representatives endorsed this split, recognizing that trawl bycatch rates likely will decrease as a result of the proposed reduction in the MRB percentages for SR/RE. A gear allocation based solely on historical catch between gear groups would not adequately account for the fact that non-trawl fisheries have been preempted in the past by closures resulting from trawl bycatch of SR/RE. The gear-specific allocation of SR/RE will allow more effective management of SR/RE in both fisheries and minimize the potential for over harvest of the SR/RE TAC.

Table showing catch of shortraker and rougheye rockfish in the Aleutian Islands region, by gear type.

Year	Trawl	Longline	Pot
1994	764	159	3
1995	459	99	0
1996	771	189	0
1997	946	96	0
1998	414	269	0
1999	340	144	0

Continued

Results: Since the amendment was approved, more SR/RE has been landed by vessels using longline gear, and less by those using trawl gear. Also, the inseason management issues relative to unanticipated effort in this fishery have been resolved.

BSAI Amendment 54 Individual Fishing Quota Indirect Ownership and Use Caps

Dates: The Council approved Amendments 54 to the BSAI and GOA FMPs in October 1998. The final rule implementing this action was issued April 29, 2002 (67 FR 20915). Effective date of implementation was May 29, 2002.

Purpose and Need: During the 1995-97 IFQ seasons, NMFS broadly interpreted the FMP and regulatory language to allow persons holding initial allocation QS to hire skippers to fish their IFQ on vessels owned by other "persons," provided that the QS holder could show a corporate association to the owner of the vessel. This policy allows individual QS holders to hire skippers to fish their IFQ on vessels owned by corporations or partnerships in which the individual QS holders are shareholders or partners. The policy also allows corporations or partnerships holding QS to fish the collectively held QS on a vessel owned by individuals who are shareholders or partners in the corporation or partnership. At the beginning of the 1997 IFQ season, NMFS announced to the IFQ fleet that this policy of broadly interpreting the term "person" as it pertains to IFQ hired skipper provisions would continue until the Council could clarify its original intent. Two other clarifying FMP language changes were also included in this action.

Three actions proposed for this plan amendment were:
(1) Revise the FMP to allow a QS holder's association to a vessel owner, through corporate or other collective ties, to substitute for the QS holder's vessel ownership *per se* for purposes of hiring a skipper to fish the QS holder's IFQ. (This document analyzes a proposal to revise the current FMP language and pertinent regulations to authorize a QS holder's indirect vessel ownership, through corporate or other collective ties, to serve as a substitute for direct vessel ownership *per se* for purposes of the IFQ program's hired skipper provisions.)

(2) Revise the definition of "a change in the corporation or partnership" in the FMPs to include language specific to estates. Estates are included under the definition of the term "Person" in the FMPs and 50 CFR 679.2 as "corporations, partnerships, associations, or other entities." The FMPs and IFQ implementing regulations require that upon any change in a corporation, partnership, or other entity that holds QS the QS transfer to a qualified individual. A "change" in a corporation, partnership, or other entity is defined as the addition of a shareholder or partner to the corporation, partnership, or collective entity. This definition is not applicable to estates, because estates are not collective entities which may acquire additional shareholders, partners, or members. Nevertheless, because an estate's QS would not automatically transfer to an heir once the estate is probated, the FMPs and IFQ regulations need to define the point at which estates must transfer their QS to a qualified individual.

(3) Change sablefish use limits from percentages of the total number of QS units in the QS pool for each area to a specific number of QS units. In June 1996, the Council approved a regulatory amendment to increase the Bering Sea (Area 4) halibut use caps from ½ percent to the QS equivalents of 1 ½ percent based on 1996 QS pools. This amendment also revised the halibut use limits to be expressed as a fixed number of QS units rather than as a percentage, in order to provide QS holders with a more stable reference for measuring their holdings against area use caps. Sablefish IFQ use limits are set in the FMPs. Consequently, the regulatory change to the halibut use limits could not at the same time change the calculation of sablefish use limits to a fixed number of QS units for consistency. This FMP amendment would effect that revision to calculate the sablefish in QS units based on the appropriate percentage of the 1996 QS pools. This change would standardize the application of use caps for both halibut and sablefish fisheries and would provide the same level of predictability for sablefish QS holdings as currently exists for halibut QS.

Analysis: A 20-page EA/RIR/IRFA (Secretarial Review draft dated January 2001) was prepared for this amendment. Three separate management actions were considered. One status quo and one proposed alternative were considered for each action.

Results: The amendment was implemented in 2002.

BSAI Amendment 55 Define Essential Fish Habitat

Dates: NMFS published Essential Fish Habitat (EFH) guidelines as interim final rule on December 19, 1997 (62 FR 66531). Amendment 55 was adopted by the Council in June 1998 along with EFH amendments for other FMPs (groundfish, salmon, scallops, crab). The final rule for BSAI and GOA Amendments 55/55 was published on April 26, 1999 (64 FR 20216). Effective date of implementation was January 20, 1999.

Purpose and Need: The Magnuson -Stevens Act was amended in 1996 by the Sustainable Fisheries Act. The new Act mandated that any FMP must include a provision to describe and identify essential fish habitat (EFH) for the fishery, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat. Essential fish habitat has been broadly defined by the Act to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". All eight regional councils are required to amend their fishery management plans by October 1998 to:

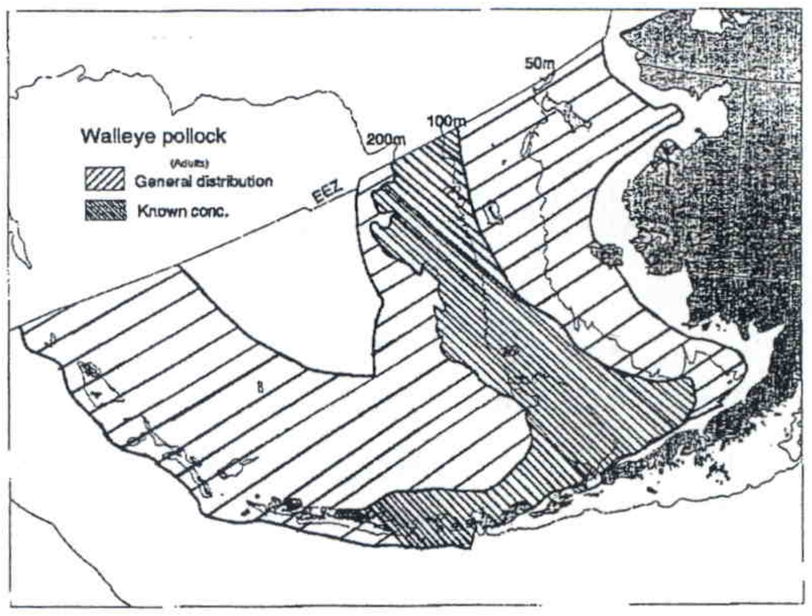
- identify and describe EFH for species managed under a fishery management plan;
- describe adverse impacts to that habitat from fishing activities and non-fishing activities;
- recommend conservation and enhancement measures necessary to help minimize impacts, protect, and restore that habitat; and
- include conservation and enhancement measures necessary to minimize to the extent practicable, adverse impacts from fishing on EFH.

The purpose of this amendment is to provide for improved long-term productivity of the fisheries, to allow NMFS and the Council to be more proactive in protecting habitat areas, and by alerting other federal and state agencies about areas of concern. Federal agencies engaging in activities that may adversely affect EFH must consult with NMFS regarding those activities. NMFS must, and the Council may, make suggestions on how to mitigate any potential habitat damage. The Council will be required to comment on any project that may adversely affect salmon habitat or habitat of any other anadromous fish (smelt, steelhead, etc.).

Regulation Summary: The alternative adopted and approved defined EFH as all habitat within a general distribution for a species life stage, for all information levels and under all stock conditions. A general distribution area is a subset of a species range. For any species listed under the Endangered Species Act, EFH includes all areas identified as "critical habitat". EFH was described in text, tables, and maps. Habitat areas of particular concern were identified as living substrates in shallow and deep waters, and freshwater habitats used by anadromous fish.

Analysis: A 364-page EA (final draft dated January 1999) and a background assessment report were prepared for this amendment. Three alternatives including the status quo were considered. The other alternative that was not chosen would have defined EFH only as areas of high concentration for each life stage. The alternative chosen was more conservative in that defining a larger area may offer more protection.

Results: Since the amendment was approved, NMFS has been sued by a coalition of plaintiffs (Earthjustice Legal Defense Fund, Center for Marine Conservation, National Audubon Society, and others) who allege that the EFH amendment failed to meet statutory requirements (did not analyze the effects of fishing on habitat, and did not impose practicable measures to minimize impacts of fishing gear) and violated the National Environmental Policy Act (NEPA).



Example of EFH distribution map.

Continued

In February 2000, the Council reviewed the first draft analysis for management measures that would identify additional habitat areas of particular concern (HAPC) types and areas, and take additional measures to protect HAPC from potential effects caused by fishing activities. Alternative management actions that were considered included making HAPC biota (e.g., mussels, kelp, sponges) a prohibited species, and prohibiting bottom fishing in areas shown to have concentrations of Gorgonian coral, which have been shown to be long lived (500 yrs), vulnerable to fishing gear, and important habitat for rockfish. Based on public testimony, and input from its advisory committees, the Council voted to split the amendment and associated analysis into two parts. Part one, which the Council adopted as final action in April 2000, prohibits the commercial harvest, sale and processing of sponges and corals. Part two of the HAPC amendments, which will require a longer time line, will be to develop a more comprehensive and iterative process for HAPC identification and habitat protection involving researchers, stakeholders, and management agencies.

BSAI Amendment 56 Revised Overfishing Definitions

Dates: Amendments 56/56 to the BSAI and GOA FMPs were adopted by the Council in June 1998. The notice of approval for this amendment was published on March 8, 1999 (64 FR 10952). Effective date of implementation was January 27, 1999.

Purpose and Need: The 1996 amendments to the Magnuson-Stevens Act defined the terms "overfishing" and "overfished" to mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield (MSY) on a continuing basis. Additionally, it requires that all FMPs specify objective and measurable criteria for identifying when the fishery is overfished and, in the case of a fishery which is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing and rebuild the fishery. The Magnuson-Stevens Act further required regional fishery management councils to submit amendments, by October 11, 1998, that would bring fishery management plans into compliance.

The Magnuson-Stevens Act and the revised guidelines indicate that MSY, treated as a target strategy under the current FMP definition of overfishing, should represent a limit rather than a target. This means that "limit" harvest strategies (such as the rules used to specify overfishing levels [OFL]) should result in a long-term average catch that approximates MSY, and that "target" harvest strategies (such as the rules used to specify ABC) should result in catches that are substantially more conservative than the limit. Because tiers 2-4 of the current FMP definition could be interpreted as treating MSY as a target rather than as a limit, Amendment 56 revised tiers 2-4 by changing the default fishing mortality rate value from $F_{30\%}$ to the more conservative estimate of $F_{35\%}$.

Regulation Summary: Amendment 56 revised the ABC and overfishing definitions set under Amendment 44 to be more precautionary. Like Amendment 44, the maximum allowable rates are prescribed through a set of six tiers which are listed below in descending order of preference, corresponding to descending order of information availability. For most tiers, ABC is based on $F_{40\%}$, which is the fishing mortality rate associated with an equilibrium level of spawning per recruit (SPR) equal to *40%* of the equilibrium level of spawning per recruit in the absence of any fishing. To further minimize the possibility of catches jeopardizing a stock's long term productivity, there is a buffer established between ABC and OFL. Amendment 56 modified the OFL definition from $F_{30\%}$ to $F_{35\%}$ for stocks having tiers 2-4 information.

Tiers used to determine ABC and OFL for BSAI groundfish stocks under Amendment 56.

(1) Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.

1a) *Stock status:* $B/B_{MSY} > 1$
$F_{OFL} = m_A$, the arithmetic mean of the pdf
$F_{ABC} \le m_H$, the harmonic mean of the pdf

1b) *Stock status:* $a < B/B_{MSY} \le 1$
$F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le m_H \times (B/B_{MSY} - a)/(1 - a)$

1c) *Stock status:* $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(2) *Information available: Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{30\%}$, and $F_{40\%}$.*

2a) *Stock status:* $B/B_{MSY} > 1$
$F_{OFL} = F_{MSY}$
$F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%})$

2b) *Stock status:* $a < B/B_{MSY} \le 1$
$F_{OFL} = F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - a)/(1 - a)$

2c) *Stock status:* $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(3) *Information available: Reliable point estimates of B, $B_{40\%}$, $F_{30\%}$, and $F_{40\%}$.*

3a) *Stock status:* $B/B_{40\%} > 1$
$F_{OFL} = F_{35\%}$
$F_{ABC} \le F_{40\%}$

3b) *Stock status:* $a < B/B_{40\%} \le 1$
$F_{OFL} = F_{35\%} \times (B/B_{40\%} - a)/(1 - a)$
$F_{ABC} \le F_{40\%} \times (B/B_{40\%} - a)/(1 - a)$

3c) *Stock status:* $B/B_{40\%} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(4) *Information available: Reliable point estimates of B, $F_{30\%}$, and $F_{40\%}$.*
$F_{OFL} = F_{35\%}$
$F_{ABC} \le F_{40\%}$

(5) *Information available: Reliable point estimates of B and natural mortality rate M.*
$F_{OFL} = M$
$F_{ABC} \le 0.75 \times M$

(6) *Information available: Reliable catch history from 1978 through 1995.*
OFL= the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information
ABC ≤ 0.75 × OFL

Analysis: A 24-page EA (final draft dated June 23, 1998) was prepared for this amendment. Two alternatives including the status quo were considered. The alternative chosen was more conservative in that it consistently treats MSY as a limit rather than a target.

Results: These definitions are currently being used in the annual quota specifications process.

BSAI Amendment 57 Pollock Bottom Trawl Gear Prohibition, Reduce Crab and Halibut Prohibited Species Catch Limits

Dates: Amendment 57 was adopted by the Council in June 1998. The proposed rule for this amendment was published on December 29, 1999 (64 FR 73003). Effective date of implementation was March 1999.

Purpose and Need: The Magnuson -Stevens Act was amended in 1996 by the Sustainable Fisheries Act. The new Act emphasized the importance of reducing bycatch to maintain sustainable fisheries. National Standard 9 of the Magnuson-Stevens Act mandates that conservation and management measures shall minimize bycatch, to the extent practicable, and shall minimize mortality where bycatch cannot be avoided. The objective of Amendment 57 is to reduce bycatch in the BSAI pollock fishery.

Regulation Summary: Amendment 57 prohibited the use of non-pelagic trawl gear when participating in the BSAI pollock fisheries. The definition of a pelagic trawl is relatively complex, whereas non-pelagic trawls are all other trawls not meeting the pelagic trawl definition. Regulations that define pelagic trawl gear are listed in the accompanying table. In addition, regulations prohibit any vessel engaged in directed pollock fishing from having 20 crabs larger than 1.5 inches carapace width onboard the vessel at any time. Crabs were chosen for the standard because they inhabit the seabed, and if caught, provide proof that a trawl has been in contact with the bottom. Vessels fishing for CDQ pollock were exempted from the non-pelagic trawl gear prohibition.

Amendment 57 also reduced the bycatch limits for halibut and crab due to the bottom trawl prohibition. Halibut bycatch mortality was reduced by 100 mt, and the PSC allowance for red king crabs was reduced by 3,000 animals, for *C. bairdi* crabs by 50,000 animals, and for *C. opilio* crabs by 150,000 animals. For *C bairdi* crabs, the limit was lowered by 20,000 in Zone 1 and by 30,000 in Zone 2.

Analysis: A 72-page EA/RIR/IRFA (final draft dated November 1999) was prepared for this amendment. Two alternatives including the status quo were considered. In addition, three options for PSC reductions were evaluated. The alternative chosen prohibited the use of bottom trawls for pollock fishing as FMP language, and the option chosen resulted in the most reduced bycatch of halibut and crabs.

Results: The trawl fisheries were prosecuted under lower crab and halibut PSC bycatch limits in 1999 and 2000.

Definition of pelagic and nonpelagic trawl gear.
(§ 672.2 *Parts 5 and 7)*

(5) Nonpelagic trawl means a trawl other than a pelagic trawl;
(6) .....
(7) Pelagic trawl means a trawl that:
(I) Has no discs, bobbins, or rollers;
(ii) Has no chafe protection gear attached to the foot rope or fishing line;
(iii) Except for the small mesh allowed under paragraph (7)(ix) of this definition:
(A) Has no mesh tied to the fishing line, head rope, and breast lines with less than 20 inches (50.8 cm) between knots, and has no stretched mesh size of less than 60 inches (152.4 cm) aft from all points on the fishing line, head rope, and breast lines and extending past the fishing circle for a distance equal to or greater than one half the vessel's length overall; or
(B) Has no parallel lines spaced closer than 64 inches (162.6 cm), from all points on the fishing line, head rope, and breast lines and extending aft to a section of mesh, with no stretched mesh size of less than 60 inches (152.4 cm), extending aft for a distance equal to or greater than one half the vessel's LOA;
(iv) Has no stretched mesh size less than 15 inches (38.1 cm) aft of the mesh described in paragraph (7)(iii) of this definition for a distance equal to or greater than one half the vessel's length overall;
(v) Contains no configuration intended to reduce the stretched mesh sizes described in paragraphs (7)(iii) and (iv) of this definition;
(vi) Has no flotation other than floats capable of providing up to 200 pounds (90.7 kg) of buoyancy to accommodate the use of a net-sounder device;
(vii) Has no more than one fishing line and one foot rope for a total of no more than two weighted lines on the bottom of the trawl between the wing tip and the fishing circle;
(viii) Has no metallic component except for connectors (e.g., hammerlocks or swivels) or net-sounder device aft of the fishing circle and forward of any mesh greater than 5.5 inches (14.0 cm) stretched measure;
(ix) May have small mesh within 32 feet (9.8 m) of the center of the head rope as needed for attaching instrumentation (e.g., net-sounder device); and
(x) May have weights on the wing tips;

Regulation on Trawl Performance Standard (679.7.14).

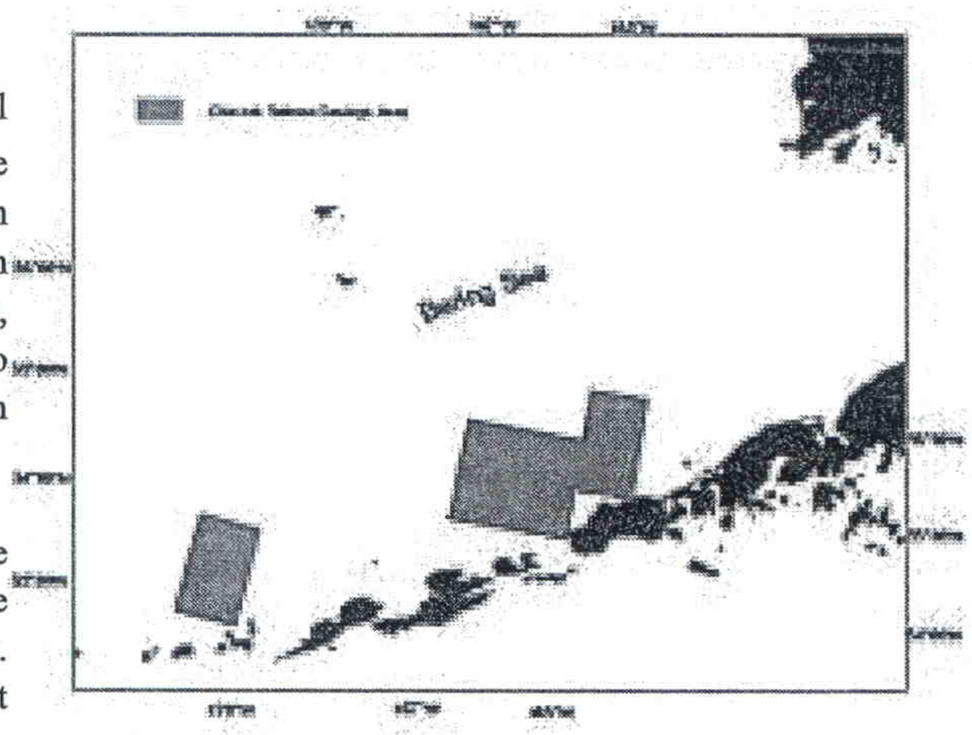
It is unlawful for any person to ... use a vessel to participate in a directed fishery for pollock with trawl gear and have on board the vessel, at any particular time, 20 or more crabs of any species that have a width of more than 1.5 inches (38 mm) at the widest dimension when directed fishing for pollock with nonpelagic trawl gear is closed.

BSAI Amendment 58 Reduced Chinook Salmon Prohibited Species Catch Limits, Modify Chinook Salmon Savings Area

Dates: Amendment 58 was adopted by the Council in February 1999. NMFS published a notice of availability on November 4, 1999 (64 FR 60157) and a proposed rule on December 21, 1999 (64 FR 71390). NMFS gave final approval on February 2, 2000.

Purpose and Need: Chinook salmon bycatch control measures, originally implemented under Amendment 21b, were thought to be needed for two reasons. First, many chinook salmon stocks are fully utilized, and uncontrolled bycatch constitutes an additional, unaccounted for allocation of the resources. Second, uncontrolled bycatch levels exceeding recent highs may lead to conservation problems for Alaskan and Canadian chinook salmon populations.

In 1996, the Magnuson -Stevens Act was amended in 1996 by the Sustainable Fisheries Act. The new Act emphasized the importance of reducing bycatch to maintain sustainable fisheries. National Standard 9 of the Magnuson-Stevens Act mandates that conservation and management measures shall minimize bycatch, to the extent practicable, and shall minimize mortality where bycatch cannot be avoided. The objective of Amendment 58 is to reduce chinook salmon bycatch in the BSAI groundfish fisheries.



Location of the chinook salmon savings areas in the BSAI, as modified by Amendment 58.

Regulation Summary: Amendment 58 reduced the amount of chinook salmon allowed to be taken as bycatch in BSAI trawl fisheries. Specifically, the adopted alternative did the following (1) reduced the chinook salmon PSC bycatch limit from 48,000 to 29,000 chinook salmon over a 4-year period, (2) implemented year-round accounting of chinook salmon bycatch in the pollock fishery, beginning on January 1 of each year, (3) revised the boundaries of the Chinook Salmon Savings Areas, and (4) set new closure dates. In the event the limit is triggered before April 15, the Chinook Salmon Savings Area closes immediately. The closure would be removed on April 16, but would be reinitiated September 1 and continue through the end of the year. If the limit were reached after April 15, but before September 1, then the areas would close on September 1. If the limit were reached after September 1, the areas would close immediately through the end of the year.

Analysis: A 238-page E A/RIR/IRFA (final draft dated September 29, 1999) was prepared for this amendment. Five primary alternatives including the status quo were considered along with several options for seasonal allocation, area closures, and applicable fisheries. The alternatives not chosen would have established a time/area closure but without a PSC limit that triggered a closure, or established a closure based on an annual limit of 36,000 salmon. The preferred alternative was the most conservative in that it reduced the PSC limit to only 29,000 chinook salmon taken in the pollock fisheries.

Results: Total number of chinook salmon taken annually as bycatch in BSAI groundfish fisheries is shown in the adjacent table.

Number of chinook salmon taken as incidental bycatch in BSAI trawl fisheries, 1989-1999.

Year	Chinook Salmon
1989	40,354
1990	13,990
1991	35,766
1992	37,372
1993	45,964
1994	43,636
1995	23,079
1996	63,179
1997	50,218
1998	58,966
1999	12,918
2000	7,497
2001	38,270
2002	37,555

BSAI Amendment 59 Moratorium Extensions

Dates: On November 13, 1998, NMFS published the proposed rule for Amendment 59 to the Fishery Management Plan (FMP) for the Groundfish of the BSAI, Amendment 57 to the FMP for Groundfish of the GOA, and Amendment 9 to the FMP for the Commercial King and Tanner Crab Fisheries in the BSAI (63 FR 63442). Amendments 59, 57 and 9 were approved jointly by the Council in June 1998. The final rule was published on January 25, 1999 (64 FR 3651). Effective date of implementation was January 19, 1999.

Purpose and Need: In 1987, concerned with excess harvesting capacity in the groundfish, crab, and halibut fisheries of the BSAI and GOA, the Council established a committee to examine the problem of overcapitalization. Upon conclusion that allocation conflicts and overcapitalization would worsen under the current open access system, the committee recommended a limited access management approach for these three fisheries. Concerned with the potential for speculative entry into the fisheries during discussions of management alternatives, the Council adopted Amendment 23 to the BSAI FMP and Amendment 28 to the GOA FMP, which required a moratorium permit for vessels within specific vessel categories that harvest groundfish and BSAI crab resources off Alaska. Generally, a vessel qualified for a moratorium permit if it made a legal landing of any moratorium species during the qualifying period of January 1, 1988 through February 9, 1992.

The purpose of Amendments 23 and 28 was to provide for an interim measure to slow significant increases in the harvesting capacity of the groundfish and crab fishing fleets until additional measures, such as the License Limitation Program (LLP) could be implemented. The LLP is part of a developing Comprehensive Rationalization Plan intended to resolve the overall issue of overcapitalization on a long-term basis, and transition the fisheries from an open access management system to a more market-based, limited access system. Without a moratorium, the Council feared that potentially unlimited new entry into the fishery would exacerbate overcapitalization and hinder the ultimate development of a successful Comprehensive Rationalization Plan.

The original amendments instituting the moratorium (Vessel Moratorium Program) were scheduled to expire on December 31, 1998. The License Limitation Program, intended to replace the Vessel Moratorium Program , would not be in effect until January 1, 2000. Therefore, regulatory action was necessary to extend the moratorium in order to eliminate the one year lag time between the expiration of the moratorium and the beginning of the LLP.

Regulation Summary: The final rule simply extended the Vessel Moratorium Program and the existing moratorium permits through December 31, 1999. The regulation also provided that no person could apply for a new moratorium permit after the original moratorium program expiration date of December 31, 1998, unless the application was based on a moratorium qualification that was used as a basis for obtaining a moratorium permit issued on or before that date.

Analysis: A 10-page RIR (final draft dated August 1998) was prepared for Amendments 59, 57, and 9. Two alternatives were considered: 1) allowing the Vessel Moratorium Program to expire (no action alternative), and 2) extending the program for one year. The analysis determined that although all of the impacts of a one-year lapse between the moratorium program and the LLP were not known, one potentially significant impact could be speculative entry into the affected fisheries by persons who would not qualify to fish under the moratorium program or the LLP. Because allowing new entry would exacerbate overcapitalization and the race for fish, the analysis determined that the no action alternative was inconsistent with the overall intent of comprehensive rationalization. The preferred alternative extended the moratorium for one year, allowing time for NMFS to complete the design and implementation of the LLP.

Results: As anticipated, the LLP to limit entry into the groundfish and crab fisheries off of Alaska went into effect January 1, 2000, effectively replacing the Vessel Moratorium Program (The authorization for the LLP is contained in BSAI Amendment 60/GOA Amendment 58/BSAI Crab Amendment 10). For general licenses, the base qualifying period established was January 1, 1988, through June 27, 1992, approximately four months longer than the moratorium qualification period, in order to be consistent with the Council's published cutoff date for qualification under the Comprehensive Rationalization Plan. The LLP also required an area endorsement for the BS, AI or the GOA, to provide for present participation in the fisheries (the qualifying period being January 1, 1992 through June 17, 1995). The moratorium established by Amendments 23 and 28 and extended by Amendments 59, 57, and 9 limited speculative entry into the fisheries while the LLP was being developed and approved, and kept the overcapitalization situation from worsening.

BSAI Amendment 60 Adjustments to License Limitation Program

Dates: Amendment 60 was approved by the Council in October 1998. The final rule implementing the amendment was published in 2001.

Purpose and Need: Following the approval of the original LLP program, industry members requested that the Council revise several of the provisions and qualification criteria, including adding a recent participation criteria for crab. BSAI Amendment 60, GOA Amendment 58, and BSAI Crab Amendment 10 encompass a package of changes focusing primarily on further capacity reductions and transferability restrictions, to tighten up the License Limitation Program before implementation.

Regulation Summary: Five changes were adopted and approved under these amendments: 1) a requirement that the vessel itself would be a specific characteristic of the license and could not be severed (i.e., the license could not be used on any other vessel); 2) license designations for the type of gear authorized to harvest LLP groundfish as either "trawl" or "non-trawl" gear (or both); 3) rescission of the Community Development Quota (CDQ) exemption and thus the requirement that CDQ vessels hold a crab or groundfish license; 4) the addition of a crab recency requirement which requires one landing during 1/1/96-2/7/98 in addition to the general license and area endorsement qualifications; and 5) allowance of limited processing (1 mt) for vessels <60' LOA with catcher vessel designations. The most significant addition under these amendments was the recent participation requirement of at least one landing in the king and Tanner crab fisheries between January 1, 1996 and February 7, 1998, which applied only to the base qualifying period under the crab LLP.

Analysis: A 203-page EA/RIR/IRFA (final draft dated July 1999) was prepared for these amendments. Six proposed actions were analyzed along with the status quo for each alternative, and the five changes outlined above were adopted. The change that was not approved would have clarified the Council's intent that catch history transfers be recognized, except those occurring after June 17, 1995, and where the owner of the vessel at that time was unable to document a vessel under Chapter 121, Title 46, U.S.C. NOAA General Counsel advised the Council that this action may violate foreign reciprocity agreements listed in the Magnuson-Stevens Act; therefore, the Council decided not to proceed with this proposed action.

Results: Amendment 60 is expected to reduce the number of vessels eligible to participate in the overcapitalized crab fisheries, and provide further capacity restrictions in the groundfish fisheries.

BSAI Amendment 61 American Fisheries Act Implementation

Dates: Amendment 61 was approved by the Council in June 1999, and implemented by NMFS via two emergency rules: (1) AFA permit requirements published on January 5, 2000, with an effective date of December 30, 1999, and (2) all other provisions of the AFA published on January 28, 2000 with an effective date of January 21, 2000. Amendment 61 implements the AFA for 2001 and beyond, and was partially approved by the Secretary of Commerce on February 29, 2003. The original language of the amendment included an expiration date of December 31, 2004, which was consistent with the original AFA language. This language has since been revised, and in order to ensure consistency with the Act, the expiration date was disapproved.

Purpose and Need: In October 1998 the U.S. Congress passed the American Fisheries Act to achieve the following primary objectives: (1) remove excess capacity in the offshore pollock sector through the retirement of 9 factory trawlers (through a combination of appropriated funding and a loan to the onshore sector); (2) establish U.S. ownership requirements for the harvest sector vessels; (3) establish specific allocations of the BSAI pollock quota as follows - 10% to the western Alaska CDQ program, with the remainder allocated 50% to the onshore sector, 40% to the offshore sector, and 10% to the mothership sector; (4)identify the specific vessels and processors eligible to participate in the BSAI pollock fisheries; (5) establish the authority and mechanisms by which the pollock fleet can form fishery cooperatives; and, (6) establish specific measures to protect the non-AFA (non-pollock) fisheries from adverse impacts resulting from the AFA or pollock fishery cooperatives.

In addition, the AFA included provisions for the North Pacific Fishery Management Council to enact measures as necessary to further protect non-AFA fisheries from adverse impacts resulting from the AFA and pollock fishery cooperatives. In addition to implementing the prescribed portions of the AFA, Amendment 61 contains various specific protective measures developed by the Council which limit the pollock industry's participation in other fisheries - these are referred to as 'sideboards'.

Regulation Summary: Regulations establish the sector allocations of pollock, define the eligible vessels and processors, define the vessel/processor co-op linkages (which vessels are eligible for which co-ops), make allocations of the pollock TAC among each of the co-ops, and define the sideboard amounts of crab and non-pollock groundfish (based on historical share) that can be harvested and processed by the AFA operators, in both the BSAI and the GOA.

Analysis: The original analysis for Amendment 61, upon which the emergency rules are based, is 320 pages plus several appendices. That analysis focuses on alternatives for establishing sideboard limits for the AFA harvesters and processors, and also examines alternatives for the structure of inshore sector co-ops (the relationship between harvest vessels and the shore plants to which they deliver pollock). Primarily, the alternatives analyzed cover a wide range of options for determining the amount of the sideboard limits for each sector, whether such sideboards are applied at the sector level vs individual vessel/plant level, and whether and to what extent there may be exemptions from the sideboards. The analysis also examines the ownership structure of the pollock industry to determine the entities and companies to which sideboards will be applied. Implementation and monitoring aspects of the various alternatives are also considered. The EIS will further examined these the prescribed measures of the AFA, including the specific sector allocations and limited entry aspects of the Act.

Results: The AFA was fully implemented in 2000 via the emergency rules, with permanent implementing regulations (through at least 2004) in 2002. Several issues continue to consume a significant amount of NMFS and Council resources, with various changes and regulatory amendments in the pipeline. Included are further consideration of the issues of inshore co-op structure, processing sideboards for crab and groundfish, recalculation of sideboard amounts, and consideration of further exemptions from sideboards. One indirect impact of the AFA is that other industry sectors are now pushing for co-op style management in their fisheries, through either Congressional mandate or through the Council process.

BSAI Amendment 62 Single Geographic Location and Inshore/Offshore Language Changes (proposed, approved by Council October 2002)

Dates: As of February 20, 2003, the a proposed rule has not yet been published by NMFS regarding Amendment 62 to the Fishery Management Plan for the groundfish of the Bering Sea/Aleutian Islands. The Council identified the preferred alternatives at the June 2002 and October 2002 meetings.

Purpose and Need: Single geographic location restriction originated in Amendment 18/23, the initial inshore/offshore allocation. The restriction applied to floating processors processing targeted pollock and GOA Pacific cod. A processing vessel could leave specified inshore location to process other species of groundfish, but if they processed pollock or GOA Pacific cod, the processing vessel would have to return to its original location were it processed these species at the beginning of the season. In October of 1998, the American Fisheries Act was signed into law. The Act, among other things, established specific allocations of the BSAI pollock quota to onshore, offshore and motherships and established the authority and mechanisms by which the pollock fleet could form fishery cooperatives. As a result of these allocations and allowance for cooperatives, some in the industry approached the Council to revise the single geographic restriction from one year to one week. In October 2001, the Council requested staff to provide an analysis of the single geographic location restriction revision. Revising the single geographic location restriction would provide greater flexibility for AFA-qualified inshore floating processors during a fishing year allowing these floaters to process targeted BSAI pollock in more than one geographic location.

The inshore/offshore portion of this amendment would remove obsolete and inconsistent language in the Groundfish FMP. With the passage of AFA, inshore/offshore language in the FMP was superseded. As a result, inshore/offshore language currently contained in the FMP is obsolete or no longer consistent with AFA.

Regulation Summary: The Council selected as a preferred alternative in October 2002 to allow AFA inshore floating processors to relocate in state waters in the Bering Sea directed pollock fishery between reporting weeks, but would be allowed to change locations a maximum of four times per calendar year. In addition, AFA inshore floating processors would be required to process all GOA pollock and Pacific cod in the same location at which they processed these species in 2002. The Council selected preferred alternatives for inshore/offshore revisions in June 2002. The preferred alternatives would remove obsolete inshore/offshore language from the FMP and update the CVOA to accommodate AFA-related changes. At the same time, the Council also selected the preferred alternatives for inshore/offshore language changes for the GOA.

Analysis: 61-page EA (draft dated February 14, 2002) was prepared for this amendment. The analysis included options for single geographic location and inshore/offshore revisions. Two options, including status quo, were considered for single geographic location revisions. Five options, including status quo, were considered for the inshore/offshore revisions. Two of these option addressed issues in the Gulf of Alaska Groundfish FMP.

Results: The Council took final action on a preferred alternative for single geographic location in October 2002 and inshore/offshore portion of Amendment 73 in June 2002. The amendment package has been submitted for preliminary NMFS review.

BSAI Amendment 64 Pacific Cod Fixed Gear Allocations

Dates: Amendment 64 was adopted by the Council in October 1999. NMFS published a notice of availability and requested public comment regarding BSAI Amendment 64 to the Fishery Management Plan for the groundfish of the BSAI on April 11, 2000 (65 FR 19354). A proposed rule (65FR34133) was published on May 26, 2000, and a final rule was published on August 24, 2000 (65FR51553). NMFS approved Amendment 64 on July 13, 2000.

Purpose and Need: Amendment 64 was developed to further refine the BSAI fixed gear Pacific cod allocation established in BSAI Amendment 46. Amendment 46, approved by the Council in June 1996, effectively allocated the BSAI Pacific cod Total Allowable Catch (TAC) to the jig gear (2%), fixed gear (51%), and trawl gear (47%) sectors.

The fixed gear fishery is fully utilized in the BSAI, and competition has been increasing for a variety of reasons, including increased market value of cod products, a declining cod TAC, and the recent decline of the opilio crab stock. Amendment 64 is based on a problem statement which focuses on the need to stabilize the BSAI fixed gear cod fishery and protect those who have made significant long-term investments and are dependent on the fishery from others who have limited history and wish to increase their participation in the fishery. The action is intended to help stabilize the fixed gear fleet until comprehensive rationalization can be completed for the groundfish fisheries of the BSAI.

Although the fixed gear (hook-and-line or pot gear) fleet has a direct allocation of 51% of the fixed gear Pacific cod TAC, a further split was deemed necessary to stabilize the growing hook-and-line and pot fleets. If approved, the amendment would establish separate Pacific cod directed fishing allowances for different sectors of vessels using hook-and-line or pot gear. Under the proposed amendment, the Pacific cod fixed gear TAC (excluding the amount of BSAI Pacific cod taken as incidental catch in other directed groundfish fisheries by fixed gear vessels) would be allocated as indicated:

Hook-and-line catcher processors	**80%**
Hook-and-line catcher vessels	**0.3%**
Pot gear vessels	**18.3%**
Catcher vessels (hook-and-line or pot) less than 60 feet length overall	**1.4%**

The allocation approved by the Council reflects the approximate average harvest of the fixed gear TAC by each sector since the mid-1990s. In effect, hook-and-line and pot vessels less than 60 feet would first utilize the 0.3% and 18.3% allocations open to all length classes of their gear group, respectively, and then utilize the 1.4% allocation when those fisheries close. Managing the allocations in this way is consistent with the Council's desire to provide fishing opportunities for smaller catcher vessels, ensuring that Pacific cod is available to the smaller catcher vessels even after the larger vessels in their gear sector have taken their allocation.

Regulation Summary: The regulations establish the allocations specified above as well as require that any unharvested portion of the catcher vessel hook-and-line and the <60' pot and hook-and-line vessel quota that is projected to remain unused will be reallocated to the hook-and-line catcher processors in September. In addition, any unused jig and trawl quota will be apportioned among the hook-and-line catcher processors (95%) and pot vessels (5%) according to the actual harvest of rollovers from 1996 - 1998. Bycatch of Pacific cod in other fixed gear fisheries is subtracted from the overall fixed gear allocation before the allocations for the directed fisheries are set. Amendment 64 expires December 31, 2003, based on the reasoning that three years is sufficient time to address the issue of increasing competition in the BSAI cod fishery before reconsidering the issue in light of other proposed impending changes, including proposed BSAI Pacific cod fixed gear and species endorsements on permits issued under the license limitation program (see BSAI Amendment 67).

Analysis: A 76-page EA/RIR/IRFA (final draft dated March 2000) was prepared for this amendment. Two alternatives including the status quo were considered. While the specific allocation percentages chosen by the Council were not independently analyzed, the percentages chosen fall within the range of the alternatives considered. Therefore, the Council felt they had sufficient information to judge the relevant impacts of selecting their preferred allocation percentages.

Results: The allocations under Amendment 64 became effective September 1, 2000.

BSAI Amendment 66 Remove squid from CDQ program, define directed fishing for pollock

Dates: Amendment 66 was adopted by the Council in June 1999 and approved on August 30, 2000.

Purpose and Need: The incidental catch of squid in the 1997 and 1998 pollock CDQ fisheries indicated that, at least in some years, the CDQ groups would catch their squid CDQ allocation of 148 mt before they harvested the full amount of their pollock CDQ allocations. Although the squid bycatch was significantly lower in 1999 than in previous years, under existing CDQ catch monitoring and accounting regulations, squid bycatch in the CDQ fisheries could constrain the catch of pollock CDQ. As long as squid remains a CDQ species the CDQ groups will be prohibited from exceeding their squid CDQ allocation even if this amount of squid CDQ is caught before the CDQ groups harvest all of their pollock CDQ. If the CDQ groups continue to fish for pollock CDQ after they reach their squid CDQ allocation, they likely would catch additional squid and increase their squid CDQ overage. Therefore, to avoid facing enforcement action due to a squid CDQ overage, the CDQ groups would have to stop pollock CDQ fishing before they reached their pollock CDQ allocation. If the CDQ groups are unable to fully harvest their pollock CDQ allocations, returns to the CDQ group in pollock royalty revenues will decrease. Although NMFS removed squid as a CDQ species in 1999 under an emergency interim rule, an FMP amendment and proposed and final rule-making is needed to permanently remove squid as a CDQ species.

Addressing the problems identified as a result of allocating 7.5% of the squid TAC to the CDQ Program would respond specifically to requirements under National Standard 1 and National Standard 2 (50 CFR 600.310). National Standard 1 requires that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the U.S. fishing industry. Continuing to allocate squid to the CDQ Program may prevent achieving OY from the BSAI pollock fishery if the CDQ groups could not harvest their full allocation of pollock. National Standard 8 requires that conservation and management measures shall take into account the importance of fishery resources to fishing communities. Continuing to allocate squid to the CDQ Program may prevent the CDQ groups from achieving the full value of their pollock CDQ allocation. This allocation, in part, provides important financial and employment resources for the CDQ communities.

Regulation Summary: The amendment removed squid from the CDQ program, and ceased the 7.5% CDQ allocation of squid.

Analysis: A 41-page analysis was prepared for this amendment, with two alternatives: the status quo, and the preferred alternative.

Results: The amendment has been implemented.

BSAI Amendment 65 Habitat Areas of Particular Concern: Harvest Control Measures (postponed)

Dates: NMFS published essential fish habitat (EFH), including habitat areas of particular concern (HAPC) guidelines as an interim final rule on December 19, 1997 (62 FR 66531). Amendment 65 was adopted by the Council in April 2000.

Purpose and Need: The Magnuson -Stevens Act was amended in 1996 by the Sustainable Fisheries Act. The new Act mandated that any FMP must include a provision to describe and identify essential fish habitat (EFH) for the fishery, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat. Essential fish habitat has been broadly defined by the Act to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity".

Amendment 55 defined EFH as all habitat within a general distribution for a species life stage, for all information levels and under all stock conditions. Habitat areas of particular concern (HAPC) were identified as living substrates in shallow and deep waters, and freshwater habitats used by anadromous fish. Habitat areas of particular concern (HAPC) are those areas of special importance that may require additional protection from adverse effects. HAPC is defined on the basis of its ecological importance, sensitivity, exposure, and rarity of the habitat.

The purpose of amendment 65 is to provide for improved long-term productivity of the fisheries by controlling harvest on invertebrates (corals, sponges, mussels, rockweed and kelp), which provide important habitat for fish, but have the potential to be developed into large-scale commercial fisheries.

Regulation Summary: At the February 2000 meeting, the Council reviewed an initial draft of a proposed amendment that would consider identifying additional HAPC, and two management measures to protect HAPC from fishing effects. The first measure considered would potentially prohibit directed fishing for certain HAPC biota (corals, sponges, kelp [including rockweed] and mussels). The second measure would establish several marine protected areas where Gorgonian corals are found in abundance. Gorgonian corals have been shown to be important shelter for rockfish and other fish species, are very long lived, easily damaged by fishing gear, and slow to recover from damage. Based on public testimony, and input from its advisory committees, the Council voted to split the amendment and associated analysis into two parts. Part one, which the Council took final action on in April, would allow for control on the harvest of HAPC biota, based on the following problem statement.

> The Council recognizes that some invertebrates (corals, sponges, mussels, rockweed and kelp), which provide important habitat for fish have the potential to be developed into large-scale commercial fisheries. The Council currently has little or no controls on the harvesting of these invertebrates. Adopting management measures as a precautionary approach would allow the Council to control any commercial fishery that might develop.

Analysis: A 67-page EA (draft dated March 6, 2000) was prepared for this amendment. Three alternatives including the status quo were considered. The alternatives include establishing HAPC biota as a prohibited species, or establishing a new HAPC category to allow for a controlled fishery to develop. Various options would allow some HAPC species (e.g., coral and sponges) to be prohibited from harvest, while allowing controlled fisheries to occur on the remaining species (e.g., kelp and mussels).

Results: The Council took final action on a preferred alternative in April 2000. Sponges and coral were placed in the prohibited species category. Commercial harvest, sale, and processing of coral and sponges will be prohibited. Retention for personal use will be allowed. Due to the court case on Essential Fish Habitat (see Amendment 55), the HAPC amendment was put on hold. Council and Agency staff are currently preparing an analysis of HAPC.

BSAI Amendment 67 Pacific Cod Species and Gear Endorsements to License Limitation Program License

Dates: Amendment 67 was adopted by the Council in April 2000. NMFS published a proposed rule regarding BSAI Amendment 67 to the Fishery Management Plan for the groundfish of the BSAI on October 1, 2001 (66 FR 49908). A final rule was published on April 15, 2002 (67 FR 18129). The action was effective starting May 15, 2002, except for the provision requiring the cod endorsement, which was effective January 1, 2003.

Purpose and Need: In June 1995, the Council approved the License Limitation Program (LLP) for vessels operating in Federal waters off Alaska's coast (BSAI Amendment 39/GOA Amendment 41). Vessels began fishing under that program on January 1, 2000. Since the LLP was approved, changes in the fixed gear fisheries prompted industry to petition the Council to further allocate Pacific cod in the BSAI among the various sectors of the fixed gear fleets. BSAI Amendment 64, adopted at the October 1999 Council meeting, encompassed these changes and established separate Pacific cod directed fishing allowances for different sectors of vessels using hook-and-line or pot gear. The Pacific cod Total Allowable Catch (excluding the amount of BSAI Pacific cod taken as incidental catch in other groundfish fisheries by fixed gear vessels) was allocated as follows: 80% to freezer longline vessels; 0.3% to longline catcher vessels; 18.3% to pot gear vessels; and 1.4% to catcher vessels (longline or pot) less than 60 feet length overall. Amendment 64 was approved by NMFS on July 13, 2000.

Participants in the BSAI fixed gear cod fishery include longline and pot fishermen with extensive catch histories. However, given the economics of the current cod fishery, persons may wish to bring vessels into the fishery that have little or no history in the BSAI cod fishery. Public testimony and implementation of the original LLP has shown that there is considerable latent capacity in the fixed gear Pacific cod fishery, especially in the pot fleet (many vessels are qualified under the LLP but to date have not participated to a great degree in the cod fishery) and freezer longline fleet. This action is in response to concerns that the stability of this fully utilized fishery is threatened by new entrants, driven in part by recent increases in the market value of cod and the decline of the opilio crab resource. At the April 1999 meeting, the Council initiated an analysis to add a Pacific cod endorsement to BSAI fixed gear licenses as a follow-up amendment to the recent allocations.

Amendment 67 establishes participation and harvest requirements for a BSAI cod endorsement for fixed gear vessels in the directed commercial BSAI Pacific cod fishery. It is intended to limit entry into the fishery by substantial numbers of fixed gear vessels that have not participated, or have not participated at a level that could constitute significant dependence on the fishery, in the past. Without the action, a potential of 67 catcher processors and 365 catcher vessels could prosecute the fixed gear Pacific cod fishery under the LLP. This is approximately fifty-seven more vessels than have participated in the fishery to any degree since 1995.

Regulation Summary: The preferred alternative identified by the Council consists of different qualification criteria for freezer longliners, longline catcher vessels, pot catcher processors, and pot catcher vessels, as outlined below. Additional provisions addressing the combining of catch histories, hardships, multiple endorsements, and bait landings are detailed in the regulations.

Vessel Type	Participation Years	Harvest Requirement
Freezer longline vessels	Any one year 1996-1999	270 mt in any one year
Longline catcher vessels	No action for vessels <60 feet LOA	
	Vessels >60 feet: any one year 1995-1999	7.5 mt in any one year*
Pot catcher processors	Any two years 1995-1998	300,000 lbs in each two years
Pot catcher vessels	No action for vessels <60 feet LOA	
	Vessels >60 feet: any two years 1995-1999	>100,000 lbs in each two years

*Jig landings of cod (by vessels of any length) count towards qualification for the endorsement as if they had been made with longline gear.

Analysis: A 105-page EA/RIR/IRFA and appendix (public review draft dated March 2000) were prepared for this amendment. The analysis outlined several participation and harvest options for each gear sector of the fixed gear fleet, as well as the no action alternative. The analysis also noted that while the official number of LLP qualified vessels was not yet finalized at the time of review, the analysis presented both the maximum number of qualifying vessels under the recent participation criteria and the estimated number of LLP qualified vessels to provide a comprehensive look at the effect of limiting entry into the fishery. The Council considered a wide range of alternatives, and the chosen alternative was well within the range of alternatives analyzed.

Continued

Results: The Council took final action on a preferred alternative in April 2000, and the final rule was published April 15, 2002. Beginning in January 2003, a Pacific cod endorsement, specific to the non-trawl gear used by the vessel, must be specified on a person's LLP groundfish license for that person to participate in the hook-and-line or pot gear BSAI Pacific cod fisheries. Hook-and-line and pot vessels <60' LOA are exempt from this requirement.

BSAI Amendment 68 Pacific Cod Pot Gear Allocations (withdrawn)

Dates: Withdrawn. The Council reviewed the analysis and voted to take no action on Amendment 68 at the June 2002 meeting. Given that decision, the amendment package was not forwarded for Secretarial review.

Purpose and Need: In June 1995, the Council approved the License Limitation Program (LLP) for vessels operating in Federal waters off Alaska's coast (BSAI Amendment 39/GOA Amendment 41). Vessels began fishing under that program on January 1, 2000. Since the LLP was approved, changes in the fixed gear fisheries prompted industry to petition the Council to further allocate Pacific cod in the BSAI among the various sectors of the fixed gear fleets. BSAI Amendment 64, adopted at the October 1999 Council meeting, encompassed these changes and established separate Pacific cod directed fishing allowances for different sectors of vessels using hook-and-line or pot gear. The Pacific cod Total Allowable Catch (excluding the amount of BSAI Pacific cod taken as incidental catch in other groundfish fisheries by fixed gear vessels) was allocated as follows: 80% to freezer longline vessels; 0.3% to longline catcher vessels; 18.3% to pot gear vessels; and 1.4% to catcher vessels (longline or pot) less than 60 feet length overall. Amendment 64 was approved by NMFS on July 13, 2000.

At the time the Council approved Amendment 64, it acknowledged that a further split between the pot catcher processor sector and pot catcher vessel sector may be necessary to ensure the historical harvest distribution between the pot sectors in the BSAI Pacific cod fishery. Concern was expressed that the pot sector needed the stability of a direct gear allocation, much like was done for the hook-and-line sector under Amendment 64. However, because the public had not been noticed that this action would be taken under Amendment 64, the Council decided to delay action specific to the pot sector and include the proposal in a follow-up amendment (Amendment 68). The following problem statement was adopted for the analysis of the effects of Amendment 68:

> The catcher processor and catcher vessel pot fisheries for Pacific cod in the BSAI are fully utilized. Competition for this resource has increased for a variety of reasons, including increased market value of cod products and a declining ABC/TAC.
>
> Pot catcher processors who have made significant long-term investments, have long catch histories, and are significantly dependent on the BSAI cod fisheries need protection from pot catcher vessels who want to increase their Pacific cod harvest. This requires prompt action to promote stability in the BSAI pot cod fishery until comprehensive rationalization is completed.

Analysis: A 79-page EA/RIR/IRFA (public review draft dated June 2002) was prepared for this amendment. The analysis outlined two primary alternatives: 1) no action, or 2) establish separate direct allocations to the pot catcher processor and pot catcher vessel sectors in the BSAI Pacific cod fishery. Six options were provided under Alternative 2 to determine a method by which to determine the split between the pot sectors, based on combinations of years of catch history from 1995-1999. In addition, the analysis contained options to determine whether to also apportion reallocated quota the pot sector may receive annually from the trawl and jig sectors between pot catcher processors and pot catcher vessels. Suboptions were also included to determine how to reallocate any quota projected to remain unused by the pot sectors on an annual basis.

Results: The Council voted to take no action on Amendment 68. The amendment would have further split the18.3% of the fixed gear Pacific cod TAC allocated to the pot fleet under Amendment 64 according to recent catch histories from 1995 - 1999. The Council decided to take no action, partly due to the potential implications of the Pacific cod endorsement required under BSAI Amendment 67 which will be effective January 1, 2003. The Council also noted that BSAI Amendment 64, which established the BSAI Pacific cod allocations to the fixed gear sectors, including the 18.3% allocated to pot vessels, expires December 31, 2003. Therefore, continuing or modifying the allocations of Pacific cod among the hook-and-line and pot gear sectors in the BSAI after that date will require Council and Secretarial approval of a new amendment. This amendment (BSAI Amendment 77) was initiated by the Council in December 2002 and includes alternatives and options to establish separate allocations between the pot sectors. Final action is scheduled for June 2003.

BSAI Amendment 69 American Fisheries Act Inshore Co-operative Contracts with Catcher Vessels Outside Co-operative

Dates: The Council approved a preferred alternative for Amendment 71 in June 2001. A proposed rule was published on June 2, 2002 (67 FR 44794), and the amendment was approved on October 3, 2002.

Purpose and Need: The purpose of the amendment was to provide greater harvest flexibility to members of inshore pollock cooperatives. If a member of a cooperative cannot or does not wish to harvest their portion of the cooperative's pollock allocation, and a satisfactory contract cannot be executed with other members of the cooperative, then with the permission of the cooperative and their associated processor, they may contract with another inshore catcher vessel to harvest their pollock allocation.

Regulation Summary: The amendment allowed inshore cooperatives to contract with AFA inshore cooperative member vessels outside of their cooperative. If an inshore AFA cooperative catcher vessel owner notifies its cooperative that the cooperative member's catcher vessels will be unavailable to harvest pollock during all or any portion of a pollock season, the cooperative may, with the permission of their associated processor, contract with other AFA eligible inshore catcher vessels that are members of another inshore cooperative to harvest pollock to which the cooperative is entitled.

Any pollock delivered by a catcher vessel pursuant to this provision shall not affect the cooperative eligibility of the catcher vessel. Therefore, only the harvest of its own cooperative's allocation will count towards determining where it delivered the majority of its pollock in a year.

Analysis: A 38-page analysis was prepared, that considered two alternatives: the status quo and the preferred alternative, as described above.

Results: The amendment was implemented and has allowed greater flexibility.

BSAI Amendment 70 Steller Sea Lion Protection Measures (withdrawn)

Dates: The amendment was approved by the Council in October 2001, along with GOA Amendment 70. NMFS published regulations as an emergency rule for 2002 fisheries on January 8, 2002 (67 FR 956) and extended them through December 31 (67 FR 34860). A proposed rule for the permanent regulations has not yet been published. NMFS decided to implement the Steller sea lion protection measures by regulations rather than plan amendment.

Purpose and Need: The western population of Steller sea lions declined by over 70% since the 1960s, and was listed as endangered in 1997 (62 FR 24345). One hypotheses to explain the continued decline of the western stock of Steller sea lions was nutritional stress due to competition with fisheries for prey. The 11/30/00 Biological Opinion concluded that fisheries for walleye pollock, Pacific cod and Atka mackerel being managed under the fisheries regulations in effect in the year 2000, jeopardized the survival and recovery of Steller sea lions and adversely modified their critical habitat. The 2000 Biological Opinion included a reasonable and prudent alternative (RPA) that included, among other things, areas closed to trawling, which if implemented in its entirety, would have had substantial adverse impacts to the fishing industry and fishing communities. Federal legislation (Public Law 106-554) allowed for a phase-in of the RPA for the 2001 fisheries while the Council developed an alternative approach which would allow fisheries to operate in such a manner that would not jeopardize the continued existence of Steller sea lion and would prevent adverse modification of their critical habitat.

Regulation Summary: The preferred alternative implements the restricted and closed area approach. This alternative is the RPA detailed in the November 30, 2000, Biological Opinion. Essential elements of this approach are: 1) to establish large areas of critical habitat where fishing for pollock, Pacific cod, and Atka mackerel is prohibited, 2) to restrict catch levels in remaining critical habitat areas, 3) seasonally apportion catches, 4) to establish a modified harvest control rule that prohibits directed fishing should pollock, cod, or mackerel stocks fall below 20% of the unfished level, and 5) a vessel monitoring system requirement for all vessels (except jig gear) participating in these fisheries.

Analysis: A 2,206 page EIS/RIR/IRFA (final draft dated November 2001) was prepared for this amendment. Five alternatives were considered including no action, a low and slow approach (from draft programmatic SEIS), a restricted and closed area approach (from the 11/2000 RPA), an area and fishery specific approach (from RPA Committee) and a critical habitat catch limit approach (based on measures in place in 2000). A map packet, containing poster sized maps that show the closure areas proposed for each alternative, was also provided. The analysis the preferred alternative would avoid jeopardy and adverse modification while at the same time, have the least negative social and economic impacts to fishermen, processors, and communities.

Results: Amendment 70 was implemented as a regulatory amendment, and not a plan amendment. The Biological Opinion on the preferred alternative, dated October 19, 2001, was challenged in US District Court. A list of trailing amendments was proposed when the Council took final action in October 2001. Two of these amendments (prohibition of AI pollock fishery, and pot gear exemptions for Cape Barnabus and Caton Island haulouts) have been analyzed.

BSAI Amendment 71 Community Development Quota Policy and Administrative Changes (proposed, approved by Council June 2002)

Dates: The Council approved a preferred alternative for Amendment 71 in June 2002. The amendment package has not yet been forwarded for Secretarial review.

Purpose and Need: In 1992, the Council approved the Community Development Quota (CDQ) Program to provide communities in western Alaska a fair and reasonable opportunity to participate in the BSAI groundfish fisheries, to expand their participation in salmon, herring, and other nearshore fisheries, and to help alleviate the growing social and economic crises within these communities. The CDQ Program is managed jointly by NMFS and the State of Alaska and currently 65 communities participate. Under Federal regulations, the eligible communities have formed six non-profit corporations (CDQ groups). The program is allocated a specific percentage of the total allowable catch for each Bering Sea fishery, which is further allocated among the CDQ groups. The CDQ groups manage and administer the CDQ allocations, investments, and economic development projects for the benefit of their member communities.

At the time the Council approved the CDQ Program, it established that the program was to provide the means for starting or supporting commercial fisheries business activities to support fisheries-related economies in these communities. Since implementation in 1992, the groups have matured significantly and gained valuable experience in managing their fisheries and related investments. This level of experience and the subsequent desire for increased autonomy by the groups spurred concerns with the general administration and government oversight of the program. In addition, recommendations from the National Research Council and proposed Congressional legislation introduced similar issues to be addressed by the Council, including that of relaxing the requirement that all CDQ revenues must be spent on fisheries-related projects. As the Council recognized the program's rapid growth and evolving nature, it determined that an evaluation of some of the general policy issues related to the program was warranted. The Council formed a CDQ Policy Committee to identify issues of concern and propose alternatives for analysis. Based on the committee's recommendations, the following issues were analyzed in Amendment 71:

Issue 1: Determine the process through which CDQ allocations are made
Issue 2: Periodic or long-term CDQ allocations
Issue 3: Define the role of government in oversight of the CDQ Program
Issue 4: CDQ allocation process - Type of quotas
Issue 5: CDQ allocation process - The evaluation criteria
Issue 6: Extent of government oversight (definition of a CDQ project)
Issue 7: Allowable investments by CDQ groups (fisheries-related restriction)
Issue 8: Other administrative issues

Analysis: A 217-page RIR/IRFA and appendices (public review draft dated May 15, 2002) were prepared for this amendment. The analysis outlined several alternatives, options, and suboptions for each of the eight issues listed above. The analysis of alternatives was guided by the problem statement, which stated that some of the policy and administrative aspects of the program may need to be restructured to adapt to changes, or may need to be clarified in Federal regulations, so that they will best suit the long-term goal of the program. Among the alternatives analyzed were options to modify the original statement of purpose of the CDQ Program, which is "to allocate CDQ to eligible western Alaska communities to provide the means for starting or supporting commercial fisheries business activities that will result in an ongoing, regionally-based fisheries-related economy," to include a secondary purpose of strengthening the non-fisheries related economy in the region.

Continued

Results: The Council's preferred alternative on Amendment 71 included the following: 1) further define the allocation process in Federal regulations, including an expanded State hearing and public comment process; 2) establish a fixed allocation cycle of 3 years, with a provision allowing the State to reallocate mid-cycle under extraordinary circumstances; 3) amend the BSAI FMP to limit the government's responsibility in the program to six specific elements; 4) revise and condense the evaluation criteria used to make the allocations and publish them in Federal regulations; 5) clarify that government oversight extends to subsidiaries controlled by the CDQ groups, as defined by >50% interest and effective management control; 6) allow each CDQ group to annually invest up to 20% of its previous year's pollock royalties in non-fisheries related economic development projects within the CDQ region; 7) amend the overall purpose of the program to include a secondary purpose of strengthening the non-fisheries related economies in the region; and 8) simplify the quota transfer and alternative fishing plan process. In addition, NMFS added provisions to formally identify in Federal regulations the process for appealing a Federal administrative determination (i.e., a CDQ group's appeal of an allocation decision). The proposed amendment package has not yet been forwarded for Secretarial review.

BSAI Amendment 72 Individual Fishing Quota Vessel Clearance and Record-keeping and Reporting Changes

Dates: The Council approved the amendment in April 2002. The proposed rule was published on October 14, 2002 (67 FR 65941) and the final rule on June 6, 2003. The amendment was implemented effective August 28, 2003.

Purpose and Need: The Council initiated an analysis of proposed changes to implementation and enforcement aspects of the sablefish IFQ program.

Regulation Summary: The Council eliminated the vessel clearance requirement, but still required a verbal 'departure report' for IFQ sablefish vessels. The action also eliminated the processor shipment report, instead requiring that IFQ species be reported on the Product Transfer Report.

Analysis: A 37-page analysis was prepared to support these IFQ changes, with no alternatives to these actions other than the status quo.

Results: The amendment changed Record-keeping and reporting requirements for the IFQ sablefish fishery.

BSAI Amendment 73 Additional Sideboards Measures for Winter Pacific Cod (postponed indefinitely)

Dates: Amendment 73 was postponed indefinitely by the Council in February 2003.

Purpose and Need: The purpose for this amendment is to provide greater protection to non-AFA trawl vessels targeting BSAI Pacific cod during the months of January and February. With implementation of the AFA in 2000, a portion of the AFA trawl fleet that had traditionally fished the pollock 'A' season are now able to shift their pollock shares to more efficient trawlers within the same cooperative. Potentially, this frees up some of the AFA vessels to target other BSAI groundfish such as Pacific cod during January and February. The concern is over impacts to the non-AFA vessels that have traditionally fished Pacific cod during the January and February period and may be subject to increased competition as a result of implementation of the AFA. The potential impacts of this increased level of competition include factors such as decreased catch per unity of effort resulting in longer fishing times per trip, reductions in catch and a need to venture further out into the Bering Sea with resulting increased dangers to smaller vessels during January and February.

Regulation Summary:. Options under consideration for Amendment 73 are: (1) status quo; (2) limiting access to the directed trawl fishery for Pacific cod in January and February to cod exempt AFA vessels and to open access vessels which have a history of economic dependency upon the fishery; (3) allocate catch to non-AFA vessels which meet the criteria in Alternative 1; (4) require cooperatives to use measures to limit the numbers or size of vessels on the winter cod grounds to ensure non-AFA vessels do not get preempted; and (5) limiting access to the directed trawl fishery in statistical area 655430 to qualified open access catcher vessels, cod exempt AFA vessels, and non-exempt AFA trawl catcher vessels up to a daily average of 10 from January 20 to February 25th. Exceeding the daily average would result in non-exempt AFA trawl catcher vessels being restricted from targeting Pacific cod in the NMFS Cod Fishery Interaction Study (Cape Sarichef Test Area) the following year from January 20 to February 25th.

Analysis: A 68-page EA (draft dated January 16, 2003) was prepared for this amendment. Five alternatives are under consideration including status quo. The analysis examined historical participation of trawl vessels targeting Pacific cod during January and February and throughout the remainder of the year in three areas, statistical area 655430, area 517, and the Bering Sea. The analysis also examined impacts of the alternatives on AFA vessels and non-AFA vessels.

Results: Amendment 73 was postponed indefinitely by the Council in February 2003. In its postponement of action, the Council acknowledged that the AFA cooperatives in the years following 2000 have reduced their effort on the winter cod grounds to levels seen before the AFA. Given that the AFA cooperatives have reduced their effort, the Council opted to postpone action until such time as competition from AFA vessels increases on the winter cod grounds to the point of significantly impacting the non-AFA vessels.

BSAI Amendment 75 Repeal of Increased Retention / Increased Utilization Program Flatfish Requirement

Dates: Amendment 75 was adopted by the Council in June 2002, and partially approved by the Secretary on May 29, 2003. The amendment approved by the Council would have delayed implementation until June 1, 2004, however because of the adverse impact on small entities demonstrated in the analysis, and the lack of evidence to demonstrate that the situation would have changed by the proposed implementation date, the Secretary disapproved the delayed implementation.

Purpose and Need: In September 1996, the Council adopted Amendment 49, which required all vessels fishing for groundfish in the BSAI management area to retail all pollock and Pacific cod beginning January 3, 1998 and retain all rock sole and yellowfin sole beginning January 1, 2003. The Council adopted an improved retention and utilization program (IR/IU) for all groundfish target fisheries to reduce discards. This action was deemed necessary to address one of the Council's comprehensive fishery management goals, adopted in 1984, to "minimize the catch, mortality, and waste of non-target species and reduce the adverse impacts of one fishery on another." The Council also recognized that fish caught as bycatch in one fishery represent an allocation away from any target fishery for the bycatch species. In addition, a priority objective of the FMP is to "provide for the rational and optimal use, in a biological and socioeconomic sense, of the region's fisheries resources as a whole."

The IR/IU program was intended to improve utilization and effective control/reduction of bycatch and discards in the fisheries off Alaska to address the following problems:

1) bycatch and discard loss of groundfish, crab, herring, salmon, and other non-target species;
2) economic loss and waste associated with the discard mortality of target species harvested but not retained for economic reasons;
3) inability to provide for a long-term, stable fisheries-based economy due to loss of fishery resources through wasteful fishing practices;
4) the need to promote improved retention and utilization of fish resources by reducing waste of target groundfish species to achieve long-term sustainable economic benefits to the nation.

Recognizing the potential significant adverse economic impacts on a substantial number of small entities, the Council initiated an analysis of possible mitigating measures which would provide some balance between the NPFMC's original intent of IR/IU and the need to minimize the negative effects of IR/IU regulations on small entities.

Regulation Summary: Amendment 75 repeals the implementation of IR/IU regulations for flatfish. In addition, trailing amendments will be analyzed. Amendment 79 will establish a minimum groundfish retention rate, and Amendment 81 will establish Prohibited Species Bycatch Reduction Cooperatives. Another trailing amendment would have established a regulatory process for the routine review of flatfish discards in the BSAI and GOA fisheries and the exemption of fisheries with less than 5 percent discards of IR/IU flatfish from flatfish retention and utilization rules, however this amendment was dropped following partial disapproval of Amendment 75.

Analysis: A 120-page analysis (Secretarial review draft dated February, 2003) was prepared for Amendment 75. Four alternatives were considered: 1) allow the existing IR/IU regulations for flatfish in the BSAI and GOA to be implemented beginning in 2003 (no action alternative); 2) revise IR/IU regulations for flatfish to allow some discards of the IR/IU flatfish species ranging from 50 to 90 percent; and 3) delay implementation of IR/IU regulations for flatfish and includes three trailing amendments–Amendment A (PSC Cooperatives), Amendment B (flatfish bycatch limits) and Amendment C (minimum groundfish retention standards).

The analysis revealed that IR/IU rules for flatfish under the status quo will impact direct operational costs on certain sectors of the groundfish fleet that probably cannot be offset (in whole or in part) by expected revenues generated by the sale of the additional catch required to be retained.

Results: IR/IU is not required for the shallow-water flatfish fishery.

BSAI Amendment 76 Increased Retention / Increased Utilization Flatfish Exemptions (not submitted)

NOT SUBMITTED - Amendment 76 was begun as a trailing amendment to Amendment 75, a proposal that would exempt those vessels that caught less than 5% flatfish bycatch from the IR/IU shallow water flatfish requirement. Upon the partial disapproval of Amendment 75 by the Secretary, the entire IR/IU requirement for shallow water flatfish was repealed, therefore this amendment was no longer necessary.

BSAI Amendment 77 Pacific Cod Fixed Gear Allocations

Dates: The Council approved Amendment 77 in June 2003. NMFS published a proposed rule on July 15, 2003, and a final rule on November 12, 2003. It was implemented effective January 1, 2004.

Purpose and Need: Amendment 77 was initiated to retain or modify the allocations of BSAI Pacific cod to the fixed gear sectors that were first established under BSAI Amendment 64. Amendment 64 expires on December 31, 2003. This amendment was developed to further refine the BSAI fixed gear Pacific cod allocation established in BSAI Amendment 46. Amendment 46, approved by the Council in June 1996, effectively allocated the BSAI Pacific cod Total Allowable Catch (TAC) to the jig gear (2%), fixed gear (51%), and trawl gear (47%) sectors.

The fixed gear fishery is fully utilized in the BSAI, and competition has been increasing for a variety of reasons, including increased market value of cod products and the recent decline of the opilio crab stock. Amendment 77 is based on a problem statement similar to that of Amendment 64, which focuses on the need to stabilize the BSAI fixed gear cod fishery and protect those who have made significant long-term investments and are dependent on the fishery from others who have limited history and wish to increase their participation in the fishery. The action is intended to help stabilize the fixed gear fleet until comprehensive rationalization can be completed for the groundfish fisheries of the BSAI. A second problem statement identifies the same concern for protecting the relative catch distribution between pot catcher processors and pot catcher vessels. Under Amendment 64, pot vessels share an allocation of 18.3 percent of the total fixed gear Pacific cod TAC.

Although the fixed gear (hook-and-line or pot gear) fleet has a direct allocation of 51% of the fixed gear Pacific cod TAC, a further split was deemed necessary to stabilize the growing hook-and-line and pot fleets. Amendment 64 established the allocations shown in the box below, based closely on Pacific cod catch histories (excluding discards and cod quota reallocated from the jig and trawl sectors) of each sector from 1995 - 1998, with a separate allocation for hook-and-line and pot vessels <60' LOA.

In effect, hook-and-line and pot vessels less than 60 feet first utilize the 0.3% and 18.3% allocations open to all length classes of their gear group, respectively, and then utilize the 1.4% allocation when those fisheries close. Managing the allocations in this way is consistent with the Council's desire to provide fishing opportunities for smaller catcher vessels, ensuring that Pacific cod is available to the smaller catcher vessels even after the larger vessels in their gear sector have taken their allocation.

Hook-and-line catcher processors	**80 %**
Hook-and-line catcher vessels	**0.3%**
Pot gear vessels	**18.3%**
Catcher vessels (hook-and-line or	

Analysis: A 169-page EA/RIR/IRFA (public review draft dated May 9, 2003) was prepared for this amendment. Four primary alternatives are proposed: 1) No action; 2) Status quo - continue the allocations as established under Amendment 64; 3) Modified status quo - establish allocations based on catch histories from each sector from 1995 - 1999; and 4) Pot split - establish separate allocations for the pot catcher processor and pot catcher vessel sectors. In addition, there are several options to address Pacific cod quota that is reallocated from the jig and trawl sectors to the fixed gear sector in the fall, as well as quota that is projected to remain unused in one or more of the fixed gear sectors. Although the analysis included an option to sunset the Council's action on this amendment five years from the date of implementation, this option was not included in the amendment.

Results: The amendment was implemented for the 2004 fishing season.

GOA Amendment 79 Improved Retention, Improved Utilization Groundfish Retention Standards (proposed)

Dates: The amendment was approved by the Council in April 2004. The amendment has not yet been submitted for secretarial review.

Purpose and Need: The purpose of the groundfish retention standard (GRS) is to create a standard for retention of groundfish for the BSAI groundfish fishery. The standard, which under the preferred alternative would be phased in through 2008, codifies the Council's solution to the problem of excessive discards of groundfish in the BSAI. The GRS specifically addresses the mandate in the MSA to reduce discards to the extent practicable.

Regulation Summary: The preferred alternative, selected in June 2003, would phase in the GRS over a four year period beginning in 2005, starting at 65 percent and increasing to 85 percent. This allows time for those vessels with lower retention rates to adjust their operations in order to accommodate the higher retention rates. Under the preferred alternative only HT-CPs ≥ 125' LOA would be required to comply with the GRS—which would be determined and enforced at the end of the year. In 2002, the overall groundfish retention rate of HT-CP vessels ≥ 125 ft. was 71 percent. Provided these catch and retention rates are maintained, the 2005 GRS will have only a minimal effect on the fleet—only three vessels would need to improve their retention rates. However, given the fleet average of 71 percent, nearly all of the regulated vessels would need to improve their retention rate to meet the 2008 GRS of 85 percent. Table 1 also shows the additional tons that would have to be retained to meet the phased-in standards—by 2008 nearly 20,000 additional tons would be retain.

Analysis: A 149-page analysis was prepared for this amendment. Alternatives considered included: 1) status quo (no action), 2) more restrictive GRS, 3) less restrictive GRS, and 4) phase-in of GRS.

Results: The amendment has not yet been implemented.

BSAI Amendment 81 Revised Management Policy

Dates: The amendment was approved by the Council in April 2004. The amendment has not yet been submitted for secretarial review.

Purpose and Need: In the 25 years since its implementation, over sixty amendments have been made to the FMP, and fishery and environmental conditions have changed significantly. The Council and NMFS conducted a programmatic review of the FMPs, and considered alternative management policies to determine the impacts of the groundfish fisheries on the human environment and to set the future direction of groundfish fishery management.

Regulation Summary: The preferred alternative adopted by the Council revises the management policy of the GOA FMP. The revised management policy includes 45 objectives for fishery management, categorized under the headings *Prevent Overfishing, Promote Sustainable Fisheries and Communities, Preserve the Food Web, Manage Incidental Catch and Reduce Bycatch and* Waste, *Avoid Impacts to Seabirds and Marine Mammals, Reduce Impacts to Habitat, Promote Equitable and Efficient Use of Resources, Increase Alaska Native Consultation,* and *Improve Data Quality, Monitoring, and Enforcement.*

Analysis: A 7,000 page analysis of the impacts of the BSAI and GOA groundfish fisheries, the *Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement* was prepared in support of this amendment. The analysis contains four alternatives, in addition to the preferred alternative: 1) no action (status quo), 2) a more aggressive harvest strategy, 3) a more precautionary harvest strategy, 4) a highly precautionary harvest strategy.

Results: The amendment has not yet been implemented.

Amendments to the Fishery Management Plan for Gulf of Alaska Groundfish Fishery

Prepared by the staff of the
North Pacific Fishery Management Council

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APPENDIX D

Gulf of Alaska Fisheries Management Plan Amendment Summaries

Amendments to the Fishery Management Plan for the Gulf of Alaska Groundfish Fishery

This document contains 1-page descriptions of the amendments to the Fishery Management Plan for the Gulf of Alaska Groundfish Fishery (GOA FMP), through 2003. The GOA FMP was implemented effective December 1, 1978. The Final EIS and RIR were published in September 1977.

Amendment Number	Amendment Title	Date of Final Rule	Supporting Analysis
1	Extension of the FMP Time Period	1978	EA
2	Joint Venture Reserve	1978	EA
3	Foreign Apportionment of Pacific Cod in Chirikof Area	1978	EA
4	Removal of Gear and Area Restrictions, Adust Optimum Yield, Reduce Regulatory Areas	1979	EA
5	Establish Species Category for Grenadiers	1979	EA
6	Reduction of Domestic Annual Harvest	1979	?EA
7	Extend the Fishery Management Plan, Adjust Optimum Yield, Establish Species Category for Thornyhead Rockfish, Domestic Reporting Requirements	1979	EA
8	Remove Fishery Management Plan Expiration Date, Establish Management Categories, Establish Districts for Sablefish Management, Require Biodegradable Panels on Pots, Adjust Reserve Schedule	1980	EA
9	Close Kodiak Gear Area to Foreign Trawl	1981	EA
10	Reduce Pacific Ocean Perch Catch, Foreign Trawl Closures in Southeast Alaska	1982	EA
11	Adjust Pollock and Sablefish Optimum Yield, Create Sablefish Management Districts in Eastern Gulf of Alaska, DAP/JVP Framework Adjustments	1983	EA, RIR, IRFA
12	Pot Gear Prohibition for Sablefish (withdrawn)	–	–
13	Increase Pollock Optimum Yield, Adjust Pollock Management Areas	1984	EA, RIR, FRFA, supplement
14	Sablefish Gear, Area and Seasonal Allocation, Demersal Shelf Rockfish Management, Optimum Yield Reductions, Halibut Prohibited Species Catch Framework, Habitat Policy, Catcher/ Processor Reporting Requirements	1985	EA, RIR, FRFA
15	Revise Fishery Management Plan Policy, Kodiak Bottom Trawl Closures, Optimum Yield and Total Allowable Catch/ Prohibited Species Catch Framework, Catcher/Processor Reporting Requirements	1987	EA, RIR, FRFA
16	Catcher/Processor Reporting Requirements, Redefine Species Management Categories	1988	EA, RIR, FRFA
17	Permit Requirements	1989	EA, RIR, FRFA
18	Domestic Observer Program, Renew Kodiak Crab Closures, Establish Shelikof District, Reporting Requirements	1989, 1990	EA, RIR, FRFA

Amendment Number	Amendment Title	Date of Final Rule	Supporting Analysis
19	Regulate Pollock Roe Stripping, Seasonal Allowance Schedule for Pollock	1991	EA, RIR, FRFA
20	Establish Sablefish Individual Fishing Quotas	1993	EIS, incl RIR & FRFA, supplement
21	Interim Harvest Levels, Fishing Gear Restrictions, Apportion Halibut Prohibited Species Catch by Gear and Season, Modify Demersal Shelf Rockfish Authorization Language, Define Overfishing, Implement Vessel Incentive Program	1991	EA, RIR, FRFA
22	Experimental Fishing Permits, Rescind Management District	1992	EA, RIR, FRFA
23	Inshore/Offshore Allocation for Pollock and Pacific Cod	1992	EIS, incl RIR & FRFA, supplement
24	Delay Season Start Date, Expand Vessel Incentive Program	1992	EA, RIR, FRFA
25	Steller Sea Lion Buffer Zones, Modify Pollock Management Districts	1992	EA, RIR, FRFA
26	Permanent Kodiak Crab Protection Zones	1993	EA, RIR
27	Establish Trawl Gear Test Zones	1993	EA, RIR, FRFA
28	Moratorium	1995	EA, RIR, FRFA, supplement
29	Salmon Retention for Food Banks	1996	EA, RIR
30	Research Plan/Observer Plan (not implemented)	1994	EA, RIR
31	Establish Separate Target Category for Atka Mackerel	1993	EA
32	Pacific Ocean Perch Rebuilding Plan	1994	EA, RIR, IRFA
33	Kodiak Pelagic Trawl Closures (withdrawn)	–	–
34	Remove Fishery Management Plan Reference to Community Development Quota Program	1994	–
35	Sablefish Individual Fishing Quota Share Blocks	1994	EA, RIR, FRFA
36	Transfer of Sablefish Community Development Quota Compensation Shares	1996	RIR
37	Limited Processing of Non-Individual Fishing Quota Species	1996	EA, RIR
38	Revised Pacific Ocean Perch Rebuilding Plan	1996	EA
39	Establish Forage Fish Category	1998	EA, RIR
40	Extend Inshore/Offshore Pollock and Pacific Cod Allocations	1995	EA, RIR, IRFA
41	Establish License Limitation Program	1998	EA, supplement
42	Individual Fishing Quota Vessel Buy Down	1996	EA, RIR, FRFA
43	Increase Individual Fishing Quota Sweep Up Levels	1996	EA, RIR
44	Overfishing Definitions	1997	EA
45	Pollock Trimester Allowances	1996	EA, RIR
46	Remove Black and Blue Rockfishes from Fishery Management Plan	1998	EA, RIR

Amendment Number	Amendment Title	Date of Final Rule	Supporting Analysis
47	Third Party Observer Program (withdrawn)	–	–
48	Total Allowable Catch Streamlining (proposed, approved by the Council October 2003)	–	EA, RIR, IRFA
49	Improved Retention / Improved Utilization Program	1997	EA, RIR, FRFA
50	Halibut Donation Program	1998	EA, RIR, FRFA
51	Extend Inshore/Offshore Pollock and Pacific Cod Allocations	1999	EA, RIR, IRFA
52	Vessel Registration Program (tabled)	–	–
53	Full Retention of Demersal Shelf Rockfish (withdrawn)	–	–
54	Individual Fishing Quota Indirect Ownership and Use Caps	2002	RIR
55	Define Essential Fish Habitat	1999	EA
56	Revised Overfishing Definitions	1999	EA
57	Moratorium Extensions	1999	RIR
58	Adjustments to License Limitation Program, Eastern GOA Trawl Ban	2001	EA, RIR, IRFA, FRFA
59	Sitka Pinnacles Marine Reserve	2000	EA, RIR, IRFA, FRFA
60	Cook Inlet Bottom Trawl Ban	2002	EA, RIR, FRFA
61	Extend Inshore/Offshore Allocations for Pollock and Pacific Cod, Institute American Fisheries Act Fisheries Sideboards for Gulf of Alaska Groundfish Fisheries	2002	EIS, incl RIR & FRFA
62	Inshore/Offshore Language Revision (proposed, approved by Council October 2002)	–	EA, RIR, IRFA
63	Move Skates to Target Species	2004	EA, IRFA
64	Individual Fishing Quota Vessel Clearance and Recordkeeping and Reporting Changes	2003	EA, RIR, FRFA
65	Habitat Areas of Particular Concern: Harvest Control Measures (postponed)	–	–
66	Community Quota Share Purchase	2004	EA, RIR, IRFA
67	(unassigned)	–	–
68	(unassigned)	–	–
69	(unassigned)	–	–
70	Steller Sea Lion Protection Measures (withdrawn)	–	–
71	(unassigned)	–	–
72	Improved Retention / Improved Utilization Program Flatfish Exemptions (proposed, approved by the Council April 2003)	–	EA, RIR, IRFA
73	Revisions to Essential Fish Habitat (proposed)	–	EIS, RIR, IRFA

Amendment Number	Amendment Title	Date of Final Rule	Supporting Analysis
74	Revised Management Policy (proposed, approved by Council April 2004)	–	PSEIS
75	Housekeeping Updates to the FMP	–	–

GOA Amendment 1 Extension of the FMP Time Period

Dates: NMFS published a proposed rule for Amendment 1 to the Fishery Management Plan (FMP) for the groundfish of the Gulf of Alaska on August 7, 1978 (43 FR 34825). The notice of availability for the draft Environmental Impact Statement (EIS) was published in the Federal Register on July 18, 1977, and notice of the final EIS was published on October 28, 1977.

Purpose and Need: The original FMP for the Gulf of Alaska (GOA) was prepared by the Council and published by the Secretary of Commerce on April 21, 1978 (43 FR 17242). The FMP established the conservation and management measures for both the foreign and domestic groundfish fisheries in the GOA under the authority of the Fishery Conservation and Management Act (Magnuson-Stevens Act). Proposed regulations were published on April 21, 1978 (43 FR 17013 for foreign vessels; 43 FR 17242 for U.S. vessels). The FMP only managed fisheries in the GOA during 1978.

The purpose of Amendment 1 was to:

1) extend the timeframe of the FMP so that the management measures would be in effect through October 31, 1979; and
2) change the fishing year to November 1-October 31.

In addition, this amendment extended the optimum yields (OYs) and total allowable level of foreign fishing (TALFF), without change, through October 31, 1979.

Regulation Summary: The regulation revised the original FMP only slightly, extending the measures through October 31, 1979, to coincide with a fishing season start of November 1.

Analysis: An impact analysis was developed which evaluated the overall impact of this amendment on the fishery resource, economic and social factors, and physical environment. The analysis determined that the amendment is necessary to continue the plan and maintain the current OY and TALFF.

Results: The amendment maintained the OY and TALFF through October 31, 1979.

GOA Amendment 2 Joint Venture Reserve

Dates: NMFS published a notice of approval and proposed rule for Amendment 2 on October 6, 1978 (43 FR 46349). The final rule was published December 1, 1978, and the effective date was December 1, 1978 (43 FR 56238).

Purpose and Need: The original FMP for the Gulf of Alaska (GOA) was prepared by the Council and published by the Secretary on April 21, 1978 (43 FR 17242). Among other things, the FMP established the amount of fish set aside as reserve, to ensure that an adequate supply of fish was available for potential harvest by U.S. vessels in joint venture operations (the sale of U.S. caught fish to foreign processors). The original FMP also established a procedure for apportioning amounts of fish from the reserve to the total allowable levels for foreign fishing (TALFFs) during the fishing year.

Amendment 2 was proposed to 1) increase the amount of pollock held in reserve to 133,800 mt, with appropriate increases in the reserves of species taken incidental to fishing for pollock, and 2) modify the method used to determine the portion of each species' optimum yield (OY) set aside as reserve. The action established a special joint venture reserve wherein: TALFF = (0.8 OY) - domestic annual harvest - special joint venture reserve. The intent was to re-evaluate the remaining 20% of the OY and the joint venture reserves beginning January 2, 1979, and reallocate to the domestic or foreign fisheries following reassessment of U.S. development, both in terms of joint venture operations and delivery to U.S. shore-based processors.

With such a large piece of the fishery held in reserve, the Council also wanted to ensure that the fishery was apportioned effectively so that optimum yield (OY) could be reached and the fishery fully utilized. Amendment 2 provided that 25% of the initial reserve would be allocated to the TALFF every two months, unless it was determined by NMFS that the U.S. fleet could harvest all of the remaining reserve in the fishing year. This amendment stemmed from the difficulty of accurately predicting U.S. harvesting capacity when new joint ventures continued to be initiated. By establishing reserve amounts of fish for domestic harvest that could eventually be available to the foreign fleet, the possibility of overfishing or disrupting the foreign fisheries mid-season would be diminished, providing greater assurance that optimum yield would be achieved.

Regulation Summary: The regulation increased the amount of pollock held in reserve to 133,800 mt, with appropriate increases in the reserves of species taken incidental to fishing for pollock, and established the special joint reserve and stipulated the method for calculating the foreign allowance, wherein: TALFF = (0.8 OY) - domestic annual harvest - special joint venture reserve. The regulation also provided for 25% of the initial reserve to be allocated to the TALFF every two months, unless it was determined that the U.S. fleet could harvest all of the remaining reserve in the fishing year. That determination would be based on: 1) reported U.S. catch and effort by species and area; 2) projected U.S. catch and effort by species and area; and 3) projected and utilized processing capacity of U.S. fish processors. The regulation also stipulated that if part of the scheduled 25% apportionment to the TALFFs was withheld and the U.S. fleet failed to achieve the anticipated harvest levels in the next period, the amount of fish previously withheld would be made available to the TALFFs on the next bimonthly date.

Analysis: Two alternative solutions to the 25% bimonthly apportionment of the reserve to the TALFF were considered: 1) establishing a high, initial U.S. capacity estimate with lower TALFFs; or 2) establishing a low U.S. capacity with higher TALFFs. The first alternative was rejected on the basis that if the initial U.S. harvest capacity was greatly overestimated, there would not be adequate time to amend the FMP to increase the TALFF in order to achieve optimum yield. The second alternative was rejected on the basis that if the initial U.S. harvest capacity was underestimated, a relatively high TALFF could result in overfishing or disruption of the foreign fishery if an abrupt closure was deemed necessary. The preferred alternative allowed more flexibility to reach the optimum yield and prevent overfishing, depending on anticipated and reported U.S. harvest levels.

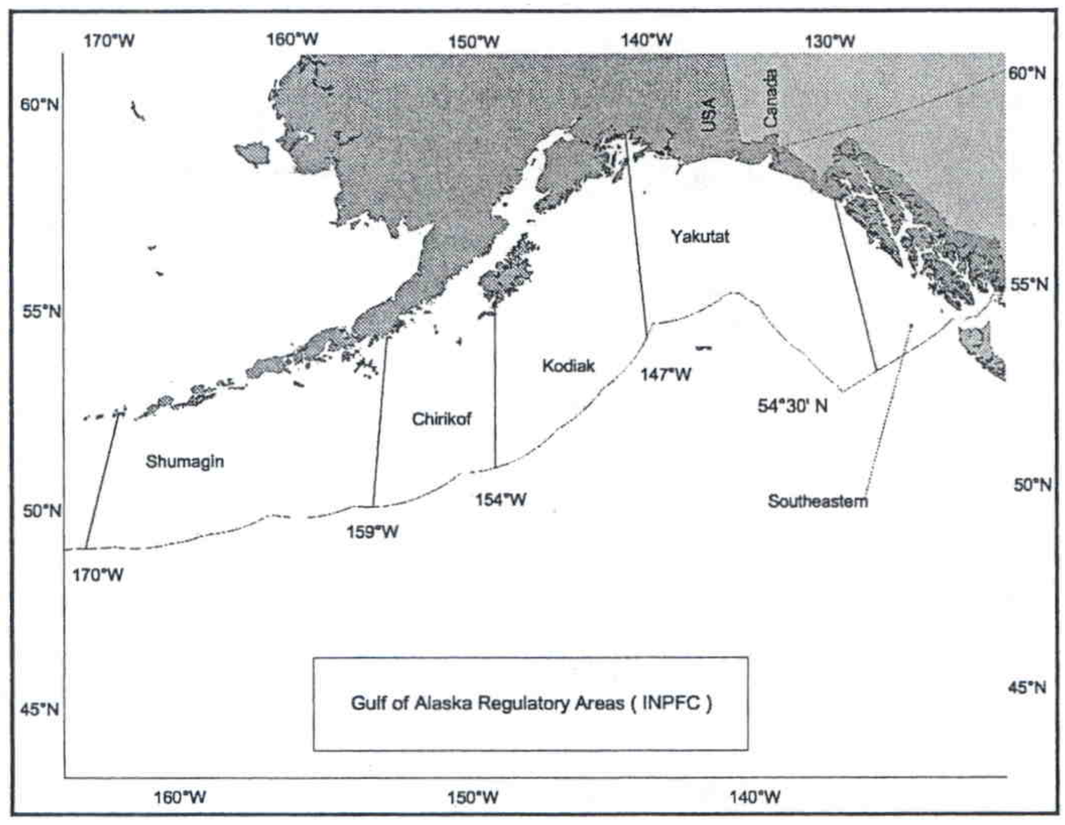
Results: The amendment allowed for sufficient flexibility to apportion the reserve and maintain a TALFF that would achieve the OY, prevent overfishing, allow for joint ventures to continue, and provide for an expanding domestic fleet.

GOA Amendment 3 Foreign Apportionment of Pacific Cod in Chirikof Area

Dates: The Council approved Amendment 3 on September 8, 1978. The proposed rule was published on October 13, 1978 (43 FR 47222) and a final rule was published on December 1, 1978 (43 FR 56238), effective January 1, 1979.

Purpose and Need: The original FMP subdivided the Chirikof statistical area into two segments at 157° W. The total allowable level for foreign fishing (TALFF) for Pacific cod in the entire Chirikof area was established at 1,500 mt, which was further split to 600 mt and 900 mt for the western and eastern subdivisions, respectively. The foreign quota split between segments of the Chirikof area was based on the proportion of the area in each segment. For example, 40% of the total Chirikof area is west of the subdividing line, therefore 40% of the total quota for the area was allocated to that segment (40% of 1,500 mt = 600 mt). The division was originally established to limit the amount of Pacific cod taken by foreign longliners, since longline fishing was not allowed in the eastern segment of the Chirikof area. Amendment 2 was proposed to remove the subdivision quotas but maintain the 1,500 mt total quota, thereby allowing the foreign longline fleet to take the entire Chirikof TALFF for Pacific cod west of 157° W longitude.

The amendment was intended to allow an increase in the amount of Pacific cod taken by foreign longliners, within the confines of the overall quota for Chirikof. Since longline gear is more selective than trawl gear, allowing an increase in longline harvest was expected to reduce the amount taken by trawlers, and thus reduce the incidental catch of other species including halibut and shellfish.



Regulation Summary: The implementing regulations allowed for the foreign longline fleet to take the entire Chirikof TALFF for Pacific cod (1,500 mt), and any apportioned reserves in that fishing area, in the Chirikof fishing area west of 157° W. longitude.

Analysis: Three alternative actions to the preferred alternative were considered, including no action. The other two alternatives not chosen entailed: 1) moving the subdividing line east of 157° W to enlarge the western segment, and 2) allocating allowable catches and percentage of reserves to the eastern and western segments of the Chirikof area on other than a proportional basis. Moving the subdividing line was rejected because it would increase the longline quota and produce potential gear conflicts with domestic and foreign trawlers. Changing the allowable catch percentages was rejected because there was no supporting evidence to refute an assumption of a uniform distribution of Pacific cod throughout the Chirikof area. The preferred alternative was chosen because it decreased bycatch of other species and because no information existed to indicate that the Pacific cod distribution was so localized that this action would deplete the stock west of 157° W longitude.

Results: The amendment allowed for a greater portion of the foreign Chirikof quota to be taken by the longline fleet.

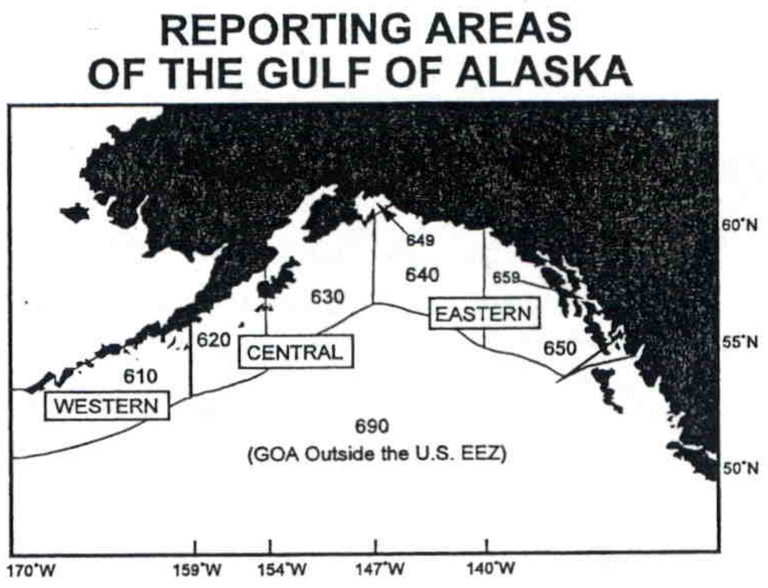
GOA Amendment 4 Removal of Gear and Area Restrictions, Adjust Optimum Yield, Reduce Regulatory Areas

Dates: The proposed rule for Amendment 4 to the Fishery Management Plan (FMP) for the groundfish of the Gulf of Alaska was published on July 9, 1979 (44 FR 40099). NMFS published a final rule on August 27, 1979 (44 FR 50042). The effective date was August 22, 1979.

Purpose and Need: The original FMP for the Gulf of Alaska was effective April 21, 1978 (43 FR 17242). After a year of practical experience implementing the management measures in the plan, the Council identified several omissions and superfluous provisions in the plan. The purpose of Amendment 4 was to fix these small omissions and to correct excessive or redundant provisions that were originally included to protect the halibut fishery but were later found to be unnecessary.

Regulation Summary: The regulations implemented the following provisions:

1) Reduce the number of fishing areas in the GOA from five to three (Western, Central, Eastern), to reduce the regulatory burden on the fisheries while still preventing localized depletion.
2) Allow foreign fishing within the 3-12 mile zone between 169° and 170° W longitude to correct an omission in the FMP.
3) Remove the restriction which allowed only 25% of the total allowable level of foreign fishing (TALFF) to be taken from December 1 to May 31. The restriction was proved unnecessary since foreign trawl operations use pelagic trawls in the winter.
4) Allow foreign longlining for sablefish seaward of 400 meters (instead of 500 meters) from May 1 to September 30 in the area between 140° and 170° W longitude. Because incidental halibut catch by longliners is low during the summer, this change increased areas for foreign nations to catch sablefish while adequately protecting halibut stocks.



5) Permit a directed longline fishery for Pacific cod between 140° and 157° W longitude seaward of 12 miles, except during the U.S. halibut season. By encouraging longlining instead of trawling for Pacific cod, the incidental mortality of halibut would be reduced.
6) Exempt foreign vessels from the requirement that fishing by all vessels of a nation in a fishing area cease when the allocation for any species has been taken. The exemption does not apply if the allocation reached is for a target species of the longliners. This was to prevent the foreign longline fishery from being closed by the foreign trawl fishery.
7) Increase the squid optimum yield to 5,000 mt (from 2,000 mt) to allow a sufficient incidental catch for foreign nations.
8) Increase the Atka mackerel optimum yield to 26,800 mt (from 24,800 mt), based on new data indicating higher historical catches.
9) Remove the domestic one-hour tow restriction. This was deemed unnecessary protection for halibut given the separate incidental catch quota on halibut for domestic fisheries.
10) Remove the domestic requirement for the use of off-bottom trawls from December 1- May 1. This measure was also considered unnecessary for halibut protection.
11) Require domestic permits to be renewed annually and domestic reporting (fish tickets) to be submitted within 7 days (instead of 3 days). This would make the Federal and State regulations consistent.

Analysis: Two alternative actions to the preferred alternative were considered, including no action. The other alternative not chosen would have imposed more restrictions on the foreign and domestic fleets and retained regulations that were unnecessary. Based on revised stock assessments, new observer information, and new foreign and domestic fishery data, the proposed actions were considered the best overall balance between biological considerations and social and economic impacts.

Results: Many of the management measures provided for in the original FMP were designed to protect the halibut resource and fishery. After experiencing how the fisheries operated under the plan for a year, it was evident that several provisions could be removed without compromising halibut conservation goals. New data and practical experience indicated that instituting the above changes would allow for a less burdensome regulatory environment for fishermen.

GOA Amendment 5 Establish Species Category for Grenadiers

Dates: The notice of availability and proposed rule for Amendment 5 to the Fishery Management Plan (FMP) for the groundfish of the Gulf of Alaska was published on July 20, 1979 (44 FR 42738). The final rule was published September 18, 1979, effective date was September 12, 1979 (44 FR 54064).

Purpose and Need: Amendment 5 was prompted by a previously unrealized bycatch of grenadiers in the longline fishery for sablefish. Grenadiers, otherwise known as rattails for their slim, pointed appearance, are an abundant, deepwater fish caught incidental to other deepwater roundfish. Although grenadiers are not a commercially valuable species, by 1979 they had comprised as high as 66% of the total foreign sablefish catch in the Gulf of Alaska and were recognized as a significant bycatch problem.



Grenadier (genus Coryphaenoides)

The original FMP identified three separate species categories: 1) prohibited; 2) specific species or species complexes; and 3) other species. The FMP would place grenadiers in the "Other Species" category, which had a Maximum Sustainable Yield/Optimum Yield (MSY/OY) of 16,200 mt as a whole. Including the grenadier catch in the total catch assessed for "Other Species" that are also taken incidentally in the longline and trawl fisheries would cause the fisheries to quickly exceed the "Other Species" MSY/OY and potentially close the directed fisheries before the allocation for the target species was reached. Amendment 5 would establish a new, distinct category for grenadiers with a separate MSY/OY.

The Council, noting the need for a long-term solution, also began developing a fourth FMP species category that would include all fish caught incidental to other species and not used commercially for any purpose. Eventually this category would include grenadiers, as well as about 20 other vertebrate and invertebrate species of no commercial value. However, because the viability of the foreign fisheries was immediately threatened, the Council viewed Amendment 5 as a timely, short-term solution that could be implemented while a fourth category was being developed.

Regulation Summary: Amendment 5 created a new species category specifically for grenadiers with a separate domestic annual harvest, total allowable level of foreign fishing, and MSY/OY of 13,200 mt. The MSY/OY was based on the recorded average grenadier catch for the previous twelve years. Since the grenadier population was not considered in the development of the OY for the "Other Species" category, that category's OY remained the same. The deletion of grenadiers from the "Other Species" category was published in a separate rule on June 29, 1979 (44 FR 37937).

Analysis: Two alternative actions to the preferred alternative were considered, including no action. The other alternative not chosen would have created a new species category comprised of fish for which there is no commercial value and which are discarded at sea. This alternative was rejected primarily because of the time constraints imposed; the foreign fisheries demanded immediate relief were they to continue to prosecute the target fisheries without the threat of an early closure due to incidental grenadier catch. This alternative remained favorable as a long-term solution, while the preferred action would remedy the current situation.

Results: The amendment created a new species category in the FMP for grenadiers, and thus reduced the threat of an early closure in the foreign longline and trawl fisheries. Grenadiers were placed in the non-specified category under Amendment 8. The "other species" management category has further evolved over time, complicating the management measures associated with these species. Currently, the other species category includes octopus, sharks, skates, and sculpins. In 1998, a final rule was published which created a "Forage Fish" category beginning in 1999. Smelts, eelpouts, and non-osmerid fishes were placed in the forage fish category. While the catches of these groups were not previously assessed against the "Other Species" quota, they have been estimated in the assessment in the past (GOA SAFE 1999).

Substantial grenadier catches are still reported in all GOA areas, reflecting the distribution of observed deepwater longline fisheries. They continue to warrant additional attention in the sablefish longline fisheries, with estimated catch weights in this fishery alone exceeding those of the entire other species category in each year.

GOA Amendment 6 Reduction of Domestic Annual Harvest

Dates: The final regulations for Amendment 6 to the Fishery Management Plan (FMP) for the groundfish of the Gulf of Alaska was published on September 27, 1979 (44 FR 55589). NMFS published the final rule on November 7, 1979 (44 FR 64410). The effective date was November 1, 1979.

Purpose and Need: The original FMP for the Gulf of Alaska (GOA) (43 FR 17242; April 21, 1978) set domestic annual harvest (DAH) estimates, Optimum Yields (OY), and the total allowable level of foreign fishing (TALFF) in order to balance fishing effort between domestic and foreign fleets, including joint venture operations. After the FMP had been in place a full year, new data was available from NMFS on 1) the total domestic harvest through April 1979, and 2) the processors' intentions to process during the remainder of the fishing year. This information made it possible to adjust downward the domestic annual harvests, by species and regulatory area in the GOA, and commensurately increase the TALFFs for all groundfish species, so that the fishery could be fully utilized.

Regulation Summary: The regulations lowered the estimates of domestic annual harvest and reallocated the surplus to the TALFF, increasing the 1978 TALFF by 27,700 mt for all species of groundfish combined. Specifications by species are provided in the table below.

Total Allowable Level of Foreign Fishing in the GOA Groundfish	(mt)
Pacific cod	29,300
Flounders	32,025
Atka mackerel	26,775
Pacific Ocean perch	22,750
Pollock	157,200
Rockfishes	6,675
Grenadiers	11,868
Sablefish	8,805
Squid	4,975
Other species	15,570

Results: The regulations adjusted the domestic annual harvest and corresponding TALFF to reflect the best information available from the observers and domestic processors, and allowed for a fully utilized groundfish fisheries in the Gulf of Alaska.

GOA Amendment 7 — Extend the Fishery Management Plan, Adjust Optimum Yield, Establish Species Category for Thornyhead Rockfish, Domestic Reporting Requirements

Dates: The proposed rule for Amendment 7 to the Fishery Management Plan (FMP) for the groundfish of the Gulf of Alaska (GOA) was published on September 7, 1979 (44 FR 52284). NMFS published a final rule on November 7, 1979 (44 FR 64410). The effective date was November 2, 1979.

Purpose and Need: The original GOA FMP (43 FR 17242; April 21, 1978) set domestic annual harvest (DAH) estimates, Optimum Yields (OY), and the total allowable level of foreign fishing (TALFF) in order to balance fishing effort between domestic and foreign fleets. During the first year of implementation, reporting accuracy improved and new catch data was available from NMFS on the total domestic harvest and processing capabilities. Because implementing regulations for Amendment 1 stipulated that the FMP was only effective through November 1979, another amendment was needed to extend the FMP for the next fishing year. Certain stock assessment data was not available prior to the expiration of the current plan, so the amendment would simply rollover the optimum yields in the original plan (as amended), with a few minor exceptions.

New data from the 1977 and 1978 trawl surveys and 1979 Soviet surveys indicated increasingly abundant stocks of Pacific cod, much higher than the estimates used to set the 1978 optimum yield (OY). The domestic trawl surveys estimated maximum sustainable yield (MSY) at 88,000 mt, and the Soviet surveys estimated 67,600 mt. On that basis, the Council recommended an increase in the Pacific cod OY from the current 34,800 mt. Previous estimates for Atka mackerel, based on Soviet hydroacoustic surveys, were also low compared to new data from Soviet trawl surveys. Thus, the Council recommended that the Atka mackerel OY also be increased.

Industry had recommended the Council establish a Gulf-wide OY for thornyhead rockfish (genus *Sebastolobus*), a species historically taken incidental to the foreign sablefish longline fishery. The species was not previously reported as thornyhead rockfish (a.k.a. "idiot" rockfish) or assessed against the "other rockfish" category, so new reporting of the substantial bycatch of idiot rockfish meant foreign harvesters were quickly meeting the relatively small "other rockfish" quota and were threatened with early closure. The final concern addressed in Amendment 7 dealt with joint venture operations and the need to improve the equitable distribution of the catch between foreign and domestic processors.

Regulation Summary: The regulations implemented the following six provisions:

1) Extend the FMP through October 31, 1980;
2) Implement the provisions of the Processor Preference Amendment (PL 95-354), which would establish a mechanism to periodically review and reassess the domestic annual harvest and the reserve to TALFF;
3) Increase the Pacific cod OY from 34,800 mt to 60,000 mt and increase the Atka mackerel OY from 26,800 mt to 28,700 mt;
4) Create a new category and a Gulf-wide OY of 3,750 mt for thornyhead rockfish;
5) Establish that the Council will consider, on a case-by-case basis, the possibility of time and area closures to joint venture operations to allow a domestic processor to process the catch; (note: this provision was disapproved by the Secretary)
6) Create new domestic reporting requirements to facilitate better estimates of domestic annual harvesting and processing capabilities.

Analysis: Three alternative actions to the preferred alternative were considered, including no action. Taking no action would have ceased all fishing because the current plan expired October 31, 1979. Another alternative would have maintained the current optimum yields, an option deemed unacceptable in light of new biological information. The third alternative not chosen would have imposed more restrictive regulations on the foreign and domestic fleets, without appreciable benefit to the resource or the U.S. fishery. The preferred actions would remove unnecessary regulations while maintaining a conservative management regime and providing for both domestic expansion and the needs of foreign fisheries.

Results: The amendment extended the management actions in the FMP and increased the optimum yields for two species, allowing for a larger harvest but remaining biologically conservative. The Council also adopted provisions that would better safeguard the expanding domestic harvesters and processors, and started considering additional closures to joint ventures so that new domestic processors could be fully utilized. These were incremental changes that would begin to replace the foreign effort with domestic effort.

GOA Amendment 8 — Remove Fishery Management Plan Expiration Date, Establish management Categories, Establish Districts for Sablefish Management, Require Biodegradable Panels on Pots, Adjust Reserve Schedule

Dates: GOA Groundfish FMP Amendment 8 was adopted by the Council in May 1980. NMFS published the proposed rule on September 11, 1980, and a final rule on November 5, 1980, effective November 1, 1980 (45 FR 73486).

Purpose and Need: This omnibus amendment was designed to conform the Gulf of Alaska groundfish plan to the newly adopted Bering Sea plan, enhance management, and protect incidentally caught species. The establishment of four species categories was designed to allow more flexible treatment of species caught incidentally to the target species. Information on squid, rockfish, and several other species was found insufficient to warrant optimum yields for the three main regulatory areas in the Gulf so their management was changed to Gulf-wide. Sablefish management also needed changes because the growing U.S. fishery tended to fish in too localized an area off Southeast. The Eastern area thus was divided into three smaller areas to spread the fishery out. Requiring biodegradable panels reduced ghost fishing by lost sablefish pots.

The purpose of modifying the timing of reserve releases was to allow for increased catches by domestic fisheries. The 20% of OY reserve for each species of groundfish enabled managers to provide fish to domestic fishermen if they needed it, or release it to the foreigners if the domestic fisheries did not need it. The new schedule of releases was designed to give domestic fishermen more time to demonstrate their needs.

Regulation Summary: The amendment included six measures:

1) Change plan management year to January 1-December 31 and remove plan expiration date;
2) Set Gulfwide OY for squid, thornyhead rockfish, other rockfish, and other species;
3) Establish four species categories: target species, other species, unallocated species, and nonspecified species;
4) Establish three regulatory districts for sablefish management- Yakutat, Southeast Outside, and Southeast Inside;
5) Adjust reserve release schedule to 40% in April, 40% in June, 20% in August; allow transfer of domestic allocations to foreign Total Allowable Level of Foreign Fishing (TALFF); and
6) Require biodegradable panels on sablefish pots.

A seventh measure which would have authorized the Regional Director to issue field orders to resolve gear conflicts between foreign and domestic fishermen, was disapproved by NMFS for lack of specificity on January 11, 1982.

Analysis: An 8-page environmental assessment was prepared for this plan amendment. Each of the alternatives was briefly compared to the status quo at the time. Very little was done in the way of economic analysis of the alternatives.

Results: Parts 1 and 2 mainly were administrative changes that facilitated management of the fisheries. Part 3 replaced three categories with four to alleviate operational problems with fishermen having to report non-target species in the "other species" category. Under that system there was a threat of closure of the groundfish fishery when one of those species of no commercial value was present in high abundance. The term "unallocated species" replaced the term "prohibited species". This category later was changed back to "prohibited species' and included crab, herring, salmon and other species that must be avoided, and if caught, must be returned to the sea immediately. The sablefish management areas subsequently were revised to further divide the Yakutat area, but other than that remain mostly intact. The schedule for the release of the 20% reserve was used until the mid-1980s. With the withdrawal of foreign fleets from 1986 on, the reserves were released mainly at the first of the season when the final groundfish specifications are set. Though the use of sablefish pots was banned subsequently in the Gulf of Alaska, biodegradable panels are required in all groundfish and crab pot gear used elsewhere.

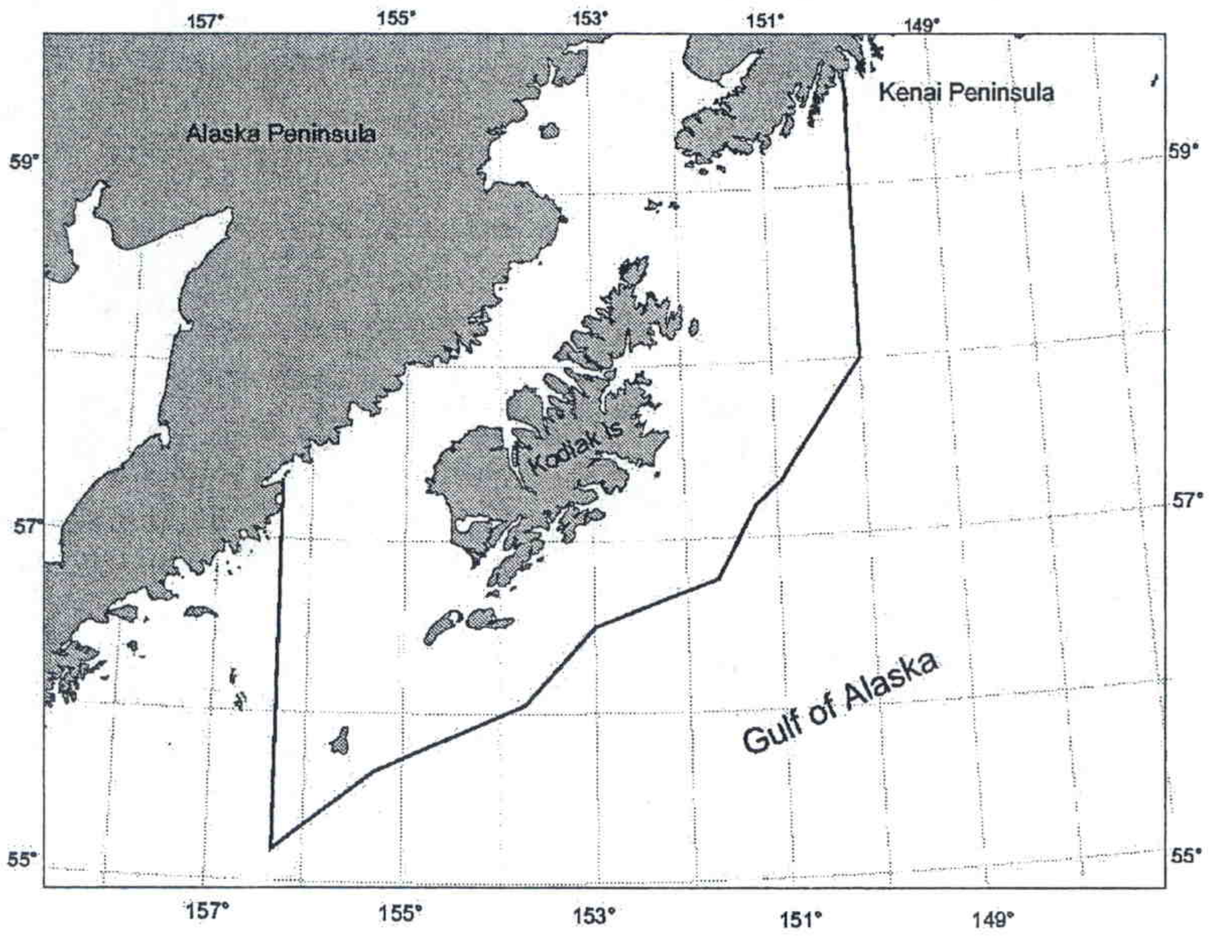
GOA Amendment 9 Close Kodiak Gear Area to Foreign Trawl

Dates: GOA Groundfish FMP Amendment 9 was adopted by the Council in July 1980. NMFS published the proposed rule on July 9, 1981, and a final rule on October 6, 1981, effective October 2, 1981 (46 FR 49128).

Purpose and Need: Although there were six small areas around Kodiak Island (the "Kodiak Gear Areas") closed to foreign trawling from August 10 to June 1, domestic crab fishermen testified at numerous hearings that the loss of gear to foreign trawlers and the fear of future losses on the crab fishing grounds outside the small closed areas still were problems. This was a problem only with the foreign fleets because the domestic trawlers avoided domestic crab gear by coordinating their activities with the crab fleet.

Regulation Summary: The amendment replaced six small fixed gear areas around Kodiak with a larger, single closed area to prevent gear conflicts between foreign trawlers and U.S. crab fishermen and to prevent preemption of crab grounds during the crab season by foreign trawlers. It remained closed from 2 days ahead of the Kodiak king crab season, normally September 15th through February 15th.

The Kodiak Gear Area (a.k.a. Lechener Line) is bounded as indicated at right.



Analysis: A 4-page environmental assessment was prepared for this plan amendment. Two alternatives to the status quo were studied. A modification of the Kodiak Gear Area to permit unrestricted foreign trawling in two areas east and south of Trinity Island was rejected because the area contained significant numbers of king crab.

Results: This closure, also known as the "Lechner Line" for the biologist that proposed its boundary, remained in place while foreign trawlers still worked the grounds off Kodiak. Foreign trawling ceased in the Gulf of Alaska after 1985.

GOA Amendment 10 Reduce Pacific Ocean Perch Catch, Foreign Trawl Closures in Southeast Alaska

Dates: GOA Groundfish FMP Amendment 10 was adopted by the Council in February 1981. NMFS published the proposed rule on December 7, 1981 (46 FR 59565), and a final rule on June 2, 1982, effective June 1, 1982 (47 FR 23936).

Purpose and Need: Pacific ocean perch (POP) stocks were subject to intense foreign fishing that began in 1962 and 1963, peaking with harvests of over 340,000 mt in 1965. In the late 1970s, foreign harvests of POP were under 15,000 mt and the stocks remained severely overfished. The purpose of Amendment 10 was to rebuild the POP stock and to protect domestic halibut fisheries in southeast Alaska. Foreign trawlers fishing in Southeast Alaska waters were taking incidental catches of halibut, a prohibited species for trawlers, but a major target fishery for domestic longline fishermen.

Regulation Summary: The amendment reduced the acceptable biological catch for POP from 29,000 mt in the Eastern Regulatory Area, to 875 mt, the OY from 14,400 mt to 875 mt, and allowed domestic and foreign fisheries 500 mt and 200 mt, respectively, for bycatch purposes. Federal waters east of 140° W were closed to all foreign fishing, and only pelagic trawling with recording netsonde devices was allowed in waters between 140° and 147° W all year. All domestic fishing sanctuaries east of 140°W were consequently deleted as they were no longer necessary.

Analysis: A 9-page environmental assessment was prepared for this plan amendment. The reduction in POP ABC and OY was designed to help the POP stocks recover. The closures to all foreign trawling east of 140° W, and to non-pelagic trawling between 140° and 147° W was designed to protect the halibut resource and reduce gear conflicts between foreign and domestic fishermen. The 1978-79 average incidental halibut catch by foreign fleets was 967 mt, or about 24% of the domestic directed harvest, with an ex-vessel value of nearly $4 million in the Eastern Regulatory Area. Additionally, there were recorded incidents of conflicts between foreign trawlers and domestic longline fishermen that had to be resolved. The Alaska Longline Fishermen's Association estimated that in 1980 alone, gear conflicts with foreign trawlers resulted in losses between $2,500 and $20,000 each.

Results: These closures and adjustments to the POP harvest specifications helped set the stage for later rebuilding of the perch stocks and reduced incident bycatch of halibut. The trawling restrictions on foreign vessels off Southeast were very significant at the time and represented one more step along the way to complete Americanization of Gulf of Alaska fisheries. No foreign vessels caught or processed fish in the Gulf of Alaska after 1988.

GOA Amendment 11 Adjust Pollock and Sablefish Optimum Yield, Create Sablefish Management Districts in Eastern Gulf of Alaska, DAP/JVP Framework Adjustments

Dates: GOA Groundfish FMP Amendment 11 was adopted by the Council in July 1982. NMFS published the proposed rule on July 1, 1983, and a final rule on September 21, 1983, effective October 16, 1983 (48 FR 43044).

Purpose and Need: Domestic fisheries for pollock were expanding rapidly in the Gulf of Alaska because of foreign joint venture opportunities. Domestic harvest expanded from only 1,900 mt in 1980 to 17,000 mt in 1981, to more than 75,000 mt in 1982. Lengthy plan amendments were needed at the time to make changes in allocations of fish to domestic and joint venture fishermen, and flexibility was needed for the Regional Administrator to reapportion reserves and domestic allocations to foreign fishermen if it was projected that domestic fishermen could not harvest it. The regional administrator also needed some flexibility to impose closures for conservation reasons on foreign fleets as had already been done for domestic fisheries. And finally, agencies needed to have good catch reporting, particularly from large factory trawlers that were capable of leaving the state to deliver their processed product elsewhere.

Regulation Summary: The amendment made the following changes:

1. Increased OY for pollock in the Central Area of the Gulf from 95,200 mt to 143,000 mt;
2. Divided the Yakutat district into east Yakutat (137°-140° W) and West Yakutat (140°-147° W) for sablefish management;
3. Reduced OY for sablefish from 12,300 mt to a range of 7,730-8,900 mt and apportioned it among the regulatory areas and districts;
4. Established a framework procedure for Regional Administrator to annually determine domestic (DAP) and joint venture (JVP) components of domestic annual harvest (DAH) for each species OY;
5. Eliminated the domestic non-processed (bait and personal consumption) component of DAH, combining it within the purely domestic component, DAP;
6. Increased flexibility of Regional Administrator to reapportion reserves and surplus DAH to foreign fishing (TALFF);
7. Authorized Regional Administrator to impose time-area closures on foreign nations to conserve resources; and
8. Imposed radio/telephone catch reporting requirements on domestic vessels leaving State waters to land fish outside Alaska.

Analysis: A 21-page environmental assessment and 33-page regulatory impact review were completed on this amendment. The OY for pollock was increased to 143,000 mt, the midpoint of the MSY range of 95,200 mt to 191,000 mt for the Central Regulatory area. The sablefish OY was reduced and apportioned by smaller area to respond to conservation concerns and hasten rebuilding of the stocks. The introduction of the framework mechanism for changing DAP and JVP responded directly to the rapid pace of development in those domestic fisheries. The use of plan amendments was too slow a process. Bait and personal consumption were not being monitored and were better included in DAP rather than remaining a separate category. Authority for the Regional Administrator to reapportion unused domestic set-asides to foreign fisheries would ensure fuller use of OY. The Regional Administrator had authority to impose conservation closures on domestic fishermen. This amendment just established similar consistent authority for the foreign fisheries. This amendment ensured that all catches were reported, even those bound to leave the state for landings elsewhere.

Results: This omnibus amendment provided for increased pollock catch to match the needs of the growing domestic industry, and reduced sablefish harvests for conservation purposes. It increased the ability of the Regional Administrator to respond to needs of the domestic fisheries, while promoting fuller use of OY. Additionally, it enhanced the agency's ability to monitor catch.

GOA Amendment 12 Pot Gear Prohibition for Sablefish (withdrawn)

Dates: Amendment 12 was adopted by the Council in July 1982. No record of a proposed or final rule was available, as the amendment was withdrawn after adoption of Amendment 14.

Purpose and Need: Amendment 12 addressed two potential problems in the Southeast sablefish fishery:
(1) conservation and restoration of the depressed sablefish fishery; and
(2) fishing grounds preemption and wastage of the existing sablefish resource.

Regulation Summary: Amendment 12 prohibited the use of pot longline gear for sablefish between 140°W longitude and Cape Addington.

Analysis: A 21-page RIR (draft dated April 1983) analyzed three alternatives: 1) the status quo; 2) make sablefish an exclusive hook and line fishery between 140°W longitude and Cape Addington (preferred action); and 3) do not include trawl gear in the proposed management measure. Pot gear was identified as less suitable for the area, given the bottom topography. Lost pot gear entangles hook and line gear, making both unretrievable and leading to ghost fishing. This situation led to a grounds preemption problem that resulted in pot longline gear being prohibited in southeast Alaska. Pot longline gear was used extensively in the mid-1970s, but was used to harvest less than one percent of sablefish between 1980-82. Since there was no existing or anticipated trawl fishery for sablefish in this area, a restriction on the use of trawl gear for sablefish was not adopted. However, later trawl gear was limited to sablefish bycatch in other directed groundfish trawl fisheries.

Results: Hook and line is the only allowed gear in the directed sablefish fishery. Amendment 14 prohibited the use of all pot gear in this fishery. An individual fishing quota program for sablefish was approved in 1988 and implemented in 1995 in both the GOA (Amendment 20) and BSAI (Amendment 15). Pot longline gear continues to be permitted for sablefish in the Bering Sea and Aleutian Islands.

GOA Amendment 13 Increase Pollock Optimum Yield, Adjust Pollock Management Areas

Dates: The amendment was approved by the Council in December 1983. The (corrected) proposed rule for Amendment 13 to the Fishery Management Plan (FMP) for the groundfish of the Gulf of Alaska was published May 23, 1984 (49 FR 21773). The final rule was published on July 17, 1984. The effective date was August 13, 1984 (49 FR 28853).

Purpose and Need: Amendment 13 was proposed to combine the Western and Central GOA regulatory areas into one unit for pollock management and increase the pollock optimum yield (OY) for the combined area. The amendment was based on new scientific information and analysis which indicated that: 1) the pollock resource would be managed more effectively and the possibility of over- or under-harvest would be minimized if the Western and Central areas were combined, and 2) the exploitable biomass of pollock and therefore the amount available for harvest have increased substantially for those areas and supports an increase in OY.

The amendment was necessary to allow the pollock resource in the Western and Central Gulf to be managed as one stock. It was intended to provide optimum harvest of the pollock resource and to prevent undue restriction and economic hardship to the domestic groundfish fishery, by allowing both the harvest of the increased surplus production of the pollock resource and the distribution of fishing effort according to pollock availability.

Regulation Summary: The final regulations contained the following two actions:

1) Adjusted the management of the pollock resource by combining the Western and Central Regulatory Areas of the Gulf of Alaska for managing the pollock fisheries only; and

2) Increased the optimum yield for the combined area from 200,000 mt to 400,000 mt.

Analysis: An RIR/IRFA was prepared for an emergency interim rule to implement Amendment 13. The emergency interim rule effected the action on March 23, 1984 (49 FR 10931) and was extended through September 18, 1984 (49 FR 24142). In addition to the status quo, the analysis evaluated the impacts of increasing the pollock OY. Projections of exploitable biomass of pollock in the Western and Central Gulf were made for 1984-1986 for five different levels of OY and four different recruitment scenarios.

Results: The pollock OY was increased to 400,000 mt for the Western/Central Gulf. Since the amendment was passed, the Western and Central regulatory areas have been separated and an allowable biological catch and total allowable catch (TAC) is set for each area. Exploitable biomass and catches of Gulf pollock have varied over the years, and major exploitable concentrations are found primarily in the Western and Central areas. In 2003, the Gulf-wide TAC was 54,350 mt, with the Western and Central areas apportioned 16,788 mt and 30,024 mt, respectively.

GOA Amendment 14 — Sablefish Gear, Area and Seasonal Allocation, Demersal Shelf Rockfish Management, Optimum Yield Reductions, Halibut Prohibited Species Catch Framework, Habitat Policy, Catcher/Processor Reporting Requirements

Dates: GOA Groundfish FMP Amendment 14 was adopted by the Council in May 1985. NMFS published the proposed rule on July 26, 1985, and a final rule on October 24, 1985, effective November 18, 1985 (50 FR 43193).

Purpose and Need: The sablefish fishery traditionally had been a foreign longline fishery off Alaska, but in the eastern Gulf of Alaska in the early 1980s, domestic longliners had increased their harvests rapidly as markets developed. With improvements in the market for sablefish, two new gear types, pots and sunken gillnets, entered the fishery in 1984. In addition, trawling by foreign joint ventures in the Central and Western Gulf also took sablefish. All these gears created an overcapacity problem in the domestic sablefish fishery, as well as gear conflicts between longliners and pot fishermen. This amendment was designed to address these excess capacity and grounds preemption problems. They decided that gear and area restrictions and apportionments to gear types would be most effective.

In the early 1980s, all Sebastes species other than Pacific ocean perch and four associated slope rockfish species were managed as "other rockfish" on a Gulf-wide basis, and yet a domestic fishery harvesting demersal shelf rockfish in the southeastern area was expanding very rapidly by 1984. Yelloweye and quillback rockfish were the primary targets of this longline fishery. Amendment 14 was designed to separate out and protect demersal shelf rockfish from the more general "other rockfish" category.

Other parts of Amendment 14 were designed to establish revised optimum yields for several species of groundfish; to establish a mechanism for timely reporting of catches by domestic catcher-processors which could stay at sea for long periods, and thus did not report as frequently as catcher vessels that landed their catch ashore and submitted fish tickets; to give more flexibility to managers in controlling halibut bycatch in the timely manner in the face of rapidly changing joint venture and domestic fisheries; to respond to a new habitat conservation policy of NMFS requiring more emphasis on habitat concerns in developing fishery management plans and amendments; and last, to delay the sablefish season opening to address resource allocation, fishermen safety and fish quality concerns.

Regulation Summary: The amendment made the following changes:

1. Established gear/area restrictions and OY apportionments to gear types for sablefish;
2. Established a Central Southeast Outside District with 600 mt OY for demersal shelf rockfish;
3. Changed OYs for pollock, Pacific ocean perch, other rockfish, Atka mackerel, and other species;
4. Established catcher/processor reporting requirements;
5. Implemented framework procedure for setting and revising halibut PSC limits;
6. Implemented NMFS habitat policy; and
7. Set seasons for hook and longline and pot sablefish fisheries.

Analysis: A 44-page environmental assessment, 75-page regulatory impact review (RIR) for sablefish management measures, and 65-page RIR for the remaining measures, were completed on this amendment. The most contentious issue was the allocation of sablefish to the longline fleet, one of the most heated decisions the Council had up until then. Longliners had taken the vast majority of the sablefish harvest of all gear types, particularly in the Eastern Gulf. The OY for sablefish was expected to increase in coming years, and prices and markets were good, so considerable additional capacity was expected to enter the fishery. The alternative chosen slowed the growth in capacity and diminished the possibility of gear conflicts and grounds preemption more than the other alternatives analyzed. The other measures in the amendment allowed for more flexibility in managing the groundfish fishery which was undergoing tremendous growth in domestic fisheries and displacement of foreign fleets in the Gulf of Alaska.

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Results: This omnibus amendment provided for the first allocations of a species among domestic fishermen, a management approach that would be used in other major species later on. Longliners were allocated 95% of the sablefish in the Eastern Area and trawlers received 5% for bycatch purposes. Pots were excluded the first year. In the Central Gulf, longliners were phased into an 80% allocation over two years, pots were phased out by the second year, and trawlers ended up with 20%. In the Western Gulf, pots were all phased out over four years, and longliners and trawlers split the harvest 80/20 after a 4-year phase-in. In approving the sablefish allocations, NMFS offered to publish a control date of September 26, 1985, the day of final approval, announcing that anyone entering the fishery after that date would not be guaranteed future participation should the Council develop an effort control regime. As it turned out, it took the Council and NMFS another ten years to develop and implement the individual fishing quota system by which the sablefish and halibut longline fisheries were managed starting in 1995. The sablefish season was changed from January 1 to April 1. The sablefish IFQ season is now tied to the start of the halibut IFQ season, which since implementation in 1995 has been March 15 - November 15.

Rockfish management was changed with the separation of the demersal shelf rockfish (DSR) species from other rockfish. Additionally, a new Central Southeast District was established for managing DSR and the State of Alaska was placed in charge of managing the area. The State regulations applied only to vessels registered under the laws of the State.

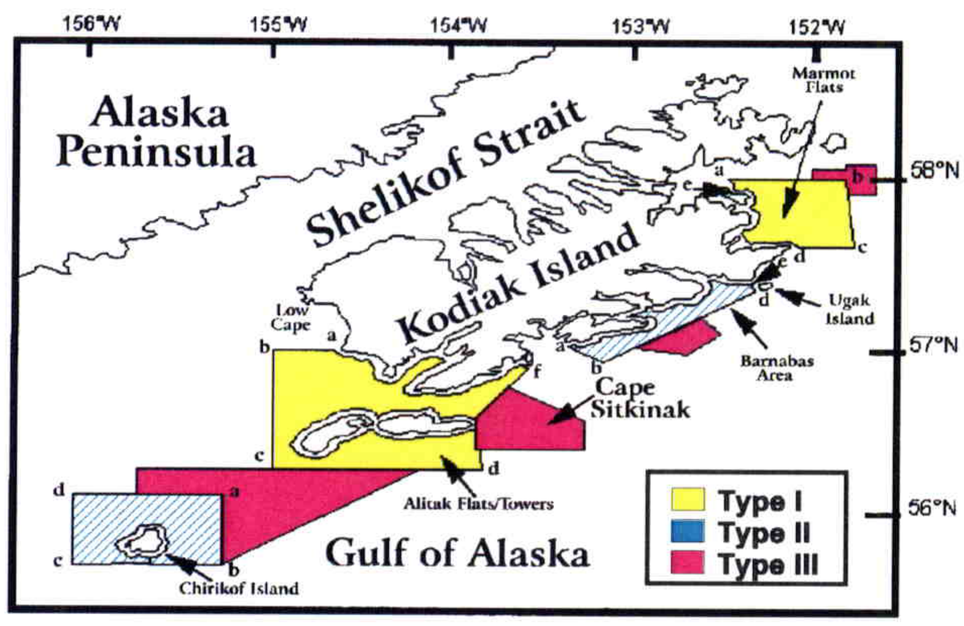
Prohibited species catch limits for halibut in the Gulf were placed in a framework procedure for setting limits for domestic and joint venture trawl fisheries. Plan amendments would no longer be needed to change PSC limits and the limits would be by area and by specific trawl group (domestic, joint venture, and foreign), rather than domestic and joint venture trawlers combined, so each fishery, not all, would suffer the consequences of taking too much bycatch. When the PSC limit is reached there would be a closure just to on-bottom trawling, not all trawling as under previous regulations. The limits would apply all year, not just from December 1 through May 31.

The new reporting requirements were applied to catcher/processors and motherships that keep their catch or fish received for 14 days or more. Those vessels were required to report every week, and also to report their position 24 hours before starting or stopping fishing in a regulatory area. A definition of "directed fishing" also was established.

GOA Amendment 15 — Revise Fishery Management Plan Policy, Kodiak Bottom Trawl Closures, Optimum Yield and Total Allowable Catch/ Prohibited Species Catch Framework, Catcher/Processor Reporting Requirements

Dates: An emergency interim rule for Amendment 15 was published March 12, 1986 (51 FR 8502) and it was subsequently extended June 9, 1986 (51 FR 20832). The proposed rule was published on December 12, 1986 (51 FR 44812), and the final rule on March 13, 1987 (52 FR 7868). A corrected version was published April 15, 1987 (52 FR 12183).

Purpose and Need: Four problems were identified in the GOA groundfish fisheries:
(1) inability to efficiently adjust harvest guidelines;
(2) inadequate reporting requirements;
(3) inadequate protection of king crab near Kodiak Island;
(4) inadequate inseason management authority.



Regulation Summary: Regulations designated:

(1) a multispecies OY as a Gulf-wide range of 116,000-800,000 mt, set a framework procedure to set target quotas for each species category, and set administrative procedures for setting PSC limits in the Gulf fishery;
(2) revised recordkeeping and reporting requirements such that at-sea catcher/processor and mothership vessels must submit weekly catch reports regardless of how long their catch was retained before landing;
(3) Type I, Type II and Type III areas for special bottom trawl restrictions to protect king crab. Type I areas have very high king crab concentrations and, to promote rebuilding of the crab stocks, are closed all year to all trawling except with pelagic gear. Type II areas have lower crab concentrations and are only closed to non-pelagic gear from February 15 through June 15. Type III areas are adjacent to Type I and II areas and have been identified as important juvenile king crab rearing or migratory areas. Type III areas become operational following a determination that a "recruitment event" has occurred. The Regional Administrator will classify the expanded Type III area as either Type I or II, depending on the information available. A "recruitment event" is defined as the appearance of female king crab in substantially increased numbers (when the total number of females estimated for a given district equals the number of females established as a threshold criterion for opening that district to commercial crab fishing). A recruitment event closure will continue until a commercial crab fishery opens for that district or the number of crabs drops below the threshold level for that district.

    The Alitak Flats/Towers and Marmot Flats areas are Type I areas, closed to non-pelagic trawls all year. Chirikof Island and Barnabas are Type II areas, closed to non-pelagic trawls from February 15 to June 15. These areas encompass 80% to 90% of the known female king crab stocks. When necessary, Type III areas will be closed by regulatory amendment; the Regional Administrator will specify which of the Type III areas are closed and whether the closure is for an entire year or only a portion of a year;
(4) authority to the Secretary of Commerce to make certain inseason changes to gear regulations, seasons, and harvest quotas.

Analysis: An EA/RIR/IRFA (final draft dated October 1986) was prepared for this amendment. Two alternatives (in addition to the status quo) were examined for actions 1, 3 and 4. One alternative to the status quo was examined for action 2.

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Results: The OY for the Gulf has remained unchanged, but the TAC's are adjusted annually based on updated information. Recordkeeping and reporting requirements have been further modified via regulatory amendments, however, weekly reporting by at-sea vessels is still required. Kodiak red king crab trawl closure areas were first implemented as Amendment 15 in 1987 with a three year sunset. These closure areas were renewed in Amendment 18, which was in effect for 1990-92. Amendment 26 extended the closures permanently. Nonetheless, GOA crab stocks in the vicinity of Kodiak Island remain depressed.

GOA Amendment 16 Catcher/Processor Reporting Requirements, Redefine Species Management Categories

Dates: Council approved Amendment 16 in September 1987. The proposed rule for Amendment 16 was published on December 21, 1987 (52 FR 48303). NMFS published a final rule on March 10, 1988 (53 FR 7756). Effective date was April 7, 1988. Amendment 11a to the BSAI FMP was adopted jointly.

Purpose and Need: Amendments 16 for the GOA and 11a for the BSAI were proposed in response to a need for better information from catcher/processors and mothership processor vessels in order to sufficiently address fishery management problems, enforce current regulations, and meet the conservation goals identified in the FMPs. The amendment intended to add the following to the currently required weekly catch reports by catcher/processors and motherships: information on the number of cartons and unit net weight of a carton of processed fish by species; a Product Transfer Report; and a Cargo Transfer/Offloading Log. The amendment also changed the public comment period, redefined the definition of prohibited species, and respecified the other three species categories for both the Gulf of Alaska and Bering Sea/Aleutian Islands FMP.

In addition, Amendment 16 instituted several other minor regulatory changes specific only to the Gulf of Alaska FMP.

Regulation Summary: The regulations implemented the following provisions to both the GOA and BSAI FMPs:

1) Augmented the current catcher/processor and mothership reporting requirements with at-sea transfer information, specifically, a Cargo Transfer/Off-Loading Log and Product Transfer Report;

2) Revised the definition of prohibited species to include Pacific salmonids, Pacific herring, Pacific halibut, king crab, Tanner crab, and steelhead trout. Respecified the other three categories:
    a) Target species–pollock, Pacific cod, flounders, rockfish, and sablefish
    b) Other species–Atka mackerel, squid, sculpins, sharks, skates, eulachon, smelts, capelin, and octopus
    c) Non-specified species–those species taken incidentally in the groundfish fisheries but are not managed by the FMP. No catch records are required;

3) Required the public comment period for proposed annual specifications and prohibited species catch limits to be 30 days following the date of filing of the notice for public inspection with the Office of the Federal Register.

In addition, several minor regulatory changes were included that apply only to the GOA FMP: 1) the term "target quotas" for groundfish was changed to "total allowable catches"; 2) general reorganization and editing; 3) the addition of a vessel safety section; and 4) removal of the reserve category for some species of groundfish.

Analysis: An EA/RIR/IRFA was prepared for Amendment 11a, which determined there was no significant environmental impact as a result of this action, but small entities may be affected.

Results: Since the amendment was passed, the four species categories have remained intact, and the "optimum yield" concept is applied to all except the prohibited species category. The prohibited species group has maintained the definition listed in the amendment. A single total allowable catch still exists for the other species group which currently includes squid, smelts, octopus, sharks, skates, and sculpins; Atka mackerel was moved to the target species group in 1993. In 1998, a final rule on forage fishes was published which removed smelts from the other species category and placed them in a separate "Forage Fish" category beginning in 1999.

GOA Amendment 17 Permit Requirements

Dates: Amendment 17 was adopted by the Council in June 1988. The proposed rule was published on September 6, 1988 (53 FR 34322) and the final rule was published on May 1, 1989 (54 FR 18519). Effective date of approved measures was May 26, 1989. Amendment 12 to the BSAI FMP was adopted jointly.

Purpose and Need: Under regulations implementing the FMPs for the BSAI and GOA, vessels that are harvesting or processing in the EEZ are required to have Federal permits and are subject to Federal regulations. One of the regulations states that catcher/processor and mothership processor vessels must submit weekly weight reports of groundfish caught and processed at sea. Regulations also require all catcher vessels, including catcher/processors, to submit fish ticket reports of groundfish catches to the Alaska Dept. of Fish & Game. NMFS was using these reports to determine the ongoing reapportionments of surplus groundfish to joint venture processors and to the total allowable level of foreign fishing (TALFF). Vessels not fishing in the EEZ (but may have been fishing in State waters or beyond the 200-mile limit), were not required to have a Federal permit and are thus not subject to the Federal reporting requirements. The regulatory loophole inherent in the language of the regulations is that vessels outside the EEZ could receive and process fish that were caught in the EEZ and would not be required to report them to NMFS.

The intent of the weekly reporting regulation was to receive information from all vessels harvesting or processing fish from the EEZ so that inseason management actions, such as time/area closures and reapportionments of surplus groundfish, could be done efficiently and effectively without surpassing the quota for each species. The Council recognized this loophole and approved Amendment 17, which re-worded the weekly reporting requirement to capture all vessels harvesting and receiving EEZ-caught fish.

Regulation Summary: Amendment 17 required that all vessels of the U.S. receiving EEZ-caught fish would have to hold a Federal permit and thus would have to comply with the weekly reporting requirements.

Analysis: A 133-page EA/RIR/IRFA (dated May 18, 1988) analyzed the proposal above and the status quo for the BSAI and GOA FMPs. A draft assessment specific to GOA Amendment 17 also analyzed an action that would both change the date or establish an additional sablefish longline season. This action was eventually separated into GOA Amendment 17a and not approved by the Council.

Results: Weekly reporting form the offshore processors enhanced monitoring of quotas and overall fishery performance.

GOA Amendment 18 Domestic Observer Program, Renew Kodiak Crab Closures, Establish Shelikof District, Reporting Requirements

Dates: GOA Groundfish FMP Amendment 18 (BSAI Amendment 13) was adopted by the Council in June 1989 and approved by the Secretary in November 1, 1989. A proposed rule (54 FR 36333) was published on September 1, 1989 and corrected on September 22, 1989 (54 FR 39022). A final rule implementing actions in Amendments 13/18 (54 FR 50386), except for the Observer Program, was published on December 6, 1989 and effective January 1, 1990. A final rule implementing the Observer Program (55 FR 4839) was published on February 12, 1990 and effective on February 7, 1990. A correction was filed on January 11, 1990 (55 FR 1036).

Purpose and Need: Since foreign fishing had been curtailed, NMFS needed to replace the foreign fisheries observer program with one to cover the domestic fishery. The purpose of a comprehensive data collection program for the domestic groundfish fishery is to provide adequate and reliable data on which to:

(1) base inseason and inter-season management decisions;
(2) efficiently carry out resource management; and
(3) measure fishery performance against existing and proposed management measures.

Additionally, the Shelikof Strait was identified to contain spawning populations of pollock, the Kodiak crab trawl closure areas were scheduled to sunset on December 31, 1989, Pacific halibut PSC limits were also set to expire in 1989.

Regulation Summary: Amendment 18 to the groundfish FMPs authorized a comprehensive domestic fishery observer program. The 1990 and 1991 Observer Plans required specific levels of observer coverage which varied with size of fishing vessel and quantity of fish processed by floating and shoreside processors. These requirements were established because it was recognized that living marine resources could not be effectively managed without the types of information that were either available only or most efficiently through an observer program.

The Observer Plans required that owners and operators of vessels and shoreside processing facilities participating in the groundfish fishery arrange for and pay for the cost of placing observers aboard their vessels and at their shoreside processing facilities beginning in January, 1990. Each vessel or processor required to have observer coverage is responsible for the cost of obtaining the required observers from a certified contractor. The cost averaged between $5,800 and $7,100 per observer month in 1991.

Amendment 18 also:

(1) established Shelikof Strait area as a management district;
(2) closed areas around Kodiak Island to bottom trawl gear;
(3) established for one year, interim Pacific halibut PSC limits for fixed gear (750 mt) and trawl gear (2,000 mt);
(4) deleted fishing season dates from the FMPs but retained them in regulation; and
(5) clarified authority to recommend TACs for additional or fewer target species within the "target species" category.

Analysis: A193-page EA/RIR/IRFA (final draft dated July 21, 1989) included the preferred alternative to the status quo for five of the six actions affecting GOA groundfish management. In approving its action to delete fishing seasons from the FMPs, the Council also considered a framework procedure for annually setting fishing seasons.

Results: The domestic observer program provides information for stock assessment and in-season management, including the ability to accurately assess catch and bycatch in the fisheries. This program provides information to make the North Pacific fisheries among the most tightly managed in the world. Three problems were later identified for observer coverage payment. It was not an equitable system in that some operations payed for 100% coverage and others did not pay anything, it limited the ability of the NMFS to effectively manage the observer program, and it may result in a conflict of interest that could reduce the credibility of observer data. The Research plan, under Amendment 30, was designed to address these three problems. Industry support for such a change is demonstrated by the willingness and ability of the industry to convince Congress and the President to amend the Act to allow the

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North Pacific Fisheries Research Plan to be established and paid for by a broad-based system of user fees. The proposed plan was to be applicable to the groundfish, halibut, and BSAI crab fisheries. Instead, implementation was delayed one year, then replaced with a modified pay-as-you-go system adopted under Amendments 47/47. Fees were collected by NMFS in the first year of implementation, which were later returned when the research plan was repealed.

The Kodiak closures are still in effect, as are the fixed and trawl gear halibut PSC levels (although the fixed gear level was dropped to 300 mt with implementation of the halibut IFQ program). The Shelikof Strait management district was rescinded in GOA Amendment 25, when pollock management in the Western/Central Area was divided into three districts.

GOA Amendment 19 Regulate Pollock Roe Stripping, Seasonal Allowance Schedule for Pollock

Dates:. GOA Amendment 19 (BSAI Amendment 14) was adopted by the Council in June 1990. NMFS published the final rule on January 7, 1991 (56 FR 492). Effective date of implementation was January 1, 1991.

Purpose and Need: Growth of the domestic harvesting and processing capacity of the domestic pollock fishery had created competition for the pollock TAC by 1990. Competition for pollock during the roe season is intensified due to the high value of the roe relative to other products. In addition, extraction of roe can be done faster than production of other pollock products. By roe stripping, fishermen can increase their share of the pollock TAC by quickly producing the most valuable product at the least cost. This amendment was intended to address the following problems:

(a) roe stripping is a wasteful use of the pollock resource;
(b) roe stripping causes an unintended allocation of pollock TAC among seasons and industry sectors;
(c) roe stripping may adversely affect the ecosystem;
(d) roe stripping may adversely affect the future productivity of the stock; and
(e) roe stripping increases the difficulty of accurately monitoring the pollock TAC for inseason management.

Regulation Summary: The amendment implemented rules that regulated the practice of stripping roe (eggs) from female pollock and discarding female and male pollock carcasses without further processing, and seasonally allocated the TAC of pollock. Season opening dates established were as follows for the GOA: January 1, April, July, and October, and for the BSAI: January 1 and June 1. To get at the issue of roe stripping, product recovery rate standards were established, which if exceeded would constitute a violation. The recovery rate standard established was 10 percent of the total round-weight equivalent of pollock and other pollock products onboard a vessel at any time during a fishing trip. To extrapolate round weight equivalents, the rule established product recovery rates as follows: fillet (18%), surimi (15%), mince (17%), meal (17%), and head&gut (50%).

Analysis: A 138-page EA/RIR/IRFA (final draft dated July 20, 1990) was prepared for this amendment. Five primary alternatives including the status quo were considered. The other alternatives that were not chosen would have just prohibited pollock roe-stripping, required full utilization of all pollock in pollock fisheries, or implemented seasonal allowances for pollock to reduce the amount harvested in the winter-early spring. Options for these alternatives included applying the regulations only to certain areas, and restricting the GOA pollock fishery to midwater gear only. The alternative adopted combined the elements of roe-striping and seasonal allowances for all areas.

Results: Since the amendment was approved, the practice of roe stripping has stopped. In 1993, regulations were further tightened to close loopholes that could have potentially undermined the intent of the roe stripping regulations (58 FR 57752). "Fishing trip" and "pollock roe" were better defined as were the pollock products that could be used to calculate retainable amounts of pollock roe. Full retention and utilization of pollock was required under Amendment 49.

GOA Amendment 20 Establish Sablefish Individual Fishing Quotas

Dates: NMFS published the proposed rule for BSAI Amendment 15 and GOA Amendment 20 on December 3, 1992 (57 FR 57130) with a corrected version published December 29, 1992 (57 FR 61870). These amendments were adopted jointly by the Council in 1991. The final rule implementing the amendments was published November 9, 1993 (58 FR 59375) with the effective date of implementation December 9, 1993. Actual program implementation was March 15, 1995, following application, appeals, and establishment of monitoring systems. Portions of the regulations were amended in subsequent final rules.

Purpose and Need: In 1987, the Council recognized a need to take management action with regard to the sablefish fishery because it was exhibiting significant problems created by a short-season, derby-style fishery. Over time, with the constant increase of new entrants in the fishery, the sablefish fixed gear fishing seasons had degenerated to several short seasons each year. Typical problems included allocation conflicts, gear conflict, deadloss from lost gear, increased bycatch and discard mortality, excess harvesting capacity, decrease in product wholesomeness, safety concerns, and economic instability in the fisheries and fishing communities. In December 1988, the Council decided that the status quo was unacceptable and expressed a desire to explore the limited access options of license limitation, Individual Fishing Quotas (IFQs), and annual fishing allotments in a draft EIS. In January 1990, the Council decided to focus on IFQ options as an alternative to the status quo. The IFQ approach was preferable in that it provided fishermen with the authority to decide how much and what type of investment they wished to make to harvest the resource (by guaranteeing a certain amount of catch at the beginning of the season and extending the season over a period of 8 months), while also addressing the problems created by a derby-style fishery. In addition, in early 1991, the Council found that the management problems in the fixed gear sablefish fishery also afflicted the halibut fishery, and therefore decided to consider a similar IFQ system for the halibut fishery. The intent was that a single IFQ program would apply to both fisheries.

The IFQ Program is a regulatory regime designed to promote the conservation and management of the halibut and sablefish fisheries, and to further the objectives of the Magnuson-Stevens Act and the Northern Pacific Halibut Act. The program essentially assigns the privilege of harvesting a percentage of the sablefish and halibut quota to specific individuals with a history of harvest in the fisheries. The rights given to each person are proportional to their fixed gear halibut and sablefish landings during the qualifying period determined by the Council and are represented as quota shares. Under this program, only persons holding quota shares are allowed to make fixed gear landings of halibut and sablefish in the regulatory areas identified.

Regulation Summary: The IFQ Program was approved for the Pacific halibut (via regulatory amendment) and sablefish fixed gear fisheries in the Federal waters of the BSAI and GOA, and these fisheries have been managed under the program since 1995. The regulations outline several key provisions of the program: initial allocation of quota shares (QS); vessel categories; transfer provisions; use and ownership provisions; the annual process for allocating quota shares; and the establishment of Community Development Quotas. The regulations state that legal landings of halibut or sablefish harvested with fixed gear had to occur at any time during 1988-1990 to qualify for an initial allocation of quota share. Generally, if a vessel owner or lessee is qualified, their initial quota share would be based on their highest total landing of halibut for any 5 years of the 7-year base period 1984-1990. For sablefish, the initial quota share would be based on the highest total landing of sablefish for any 5 years of the 6-year base period 1985-1990. Each person eligible to receive quota share would have it assigned to one of four vessel categories: "A"-freezer vessels of any length; "B"- catcher vessels greater than 60'; "C"- catcher vessels less than or equal to 60' for sablefish, or between 35'-60' for halibut; "D"- catcher vessels less than or equal to 35' for halibut. Initial quota share would be assigned to the vessel category that a person's most recent fixed gear landings of groundfish or halibut were caught by that vessel.

Analysis: A Supplemental Environmental Impact Statement/Environmental Impact Statement (final draft dated September 1992) and several appendices containing background information and an evaluation of the New Zealand Individual Transferrable Quota program were prepared for the initial review of the IFQ management alternative. Two alternatives were considered: 1) the status quo open access system characterized by fixed quotas for each regulatory area, and 2) IFQs. In addition, the document recognized the Council's previous determination that open access or more traditional management measures are not acceptable for the sablefish fishery. The Council rejected license limitation on the basis that it may not be possible to reduce the fleet size in an equitable manner, and because of the significant potential for the reduction in vessel number to be offset by an increase in fishing power per vessel. Annual fishing allotments that were also considered previously were deemed a more complicated management program that would not solve the race for fish. With the preferred IFQ alternative, the Council intended to acknowledge and reward long-term and

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consistent participation in the fisheries; those whose catch histories showed less dependence on and participation in the fisheries were supposed to receive relatively small amounts of quota share. However, the method by which initial quota shares were calculated also allowed for one to two years of poor performance in the fishery due to circumstances beyond a person's control.

Results: The fixed gear halibut and sablefish IFQ program continues to rationalize the fishery and is generally considered a successful market-based management system to address overcapitalization. Overall for the combined sablefish and halibut fisheries, an estimated total of 5,626 vessel owners received initial quota shares and 86.4% of the recipients were from Alaska. As expected, the number of quota share holders has decreased significantly over time. The fishing season was converted from several 24-hour period openers each year to an eight-month season from March 15 to November 15. Among some of the anticipated and realized benefits are bycatch reductions and safety improvements. Bycatch reduction was inherent in the program, due to the close interaction between sablefish and halibut fisheries. Much of the longline bycatch of halibut occurred in the sablefish fisheries, and many fishermen fish for both (and received IFQ for both). To the extent sablefish fishermen have halibut IFQ, this halibut is now retained and counted against the target quotas, as opposed to being caught as bycatch and discarded (by regulation it previously had to be discarded). This resulted in an immediate reduction of the GOA halibut Prohibited Species Cap from 750 metric tons annually to around 150 metric tons annually (Oliver and Pautzke 1997). Likewise, improved safety is inherent in the program; instead of having to fish intensely under any weather conditions, fishermen can choose their fishing weather considering the seasons, grounds, and size and sea worthiness of their vessel.

In addition, IFQs have reduced gear conflicts and fishing mortality due to lost gear within the sablefish and halibut fisheries by reducing the intense competition for grounds in a short time. Product quality and price has also increased under the IFQ Program, as fishermen have more time to cater to the fresh fish market. At the time of the Council decision, analysts estimated that the total annual benefits of the IFQ program would range from $30.1 to $67.6 million.

Subsequent regulations were proposed following the final rule for Amendments 15/20, to refine various portions of the regulations implementing the IFQ Program and make the program more responsive to the conservation and management goals specified in the Magnuson-Stevens Act. Some of the changes were intended to clarify ambiguous regulations, and others were new provisions designed to make the program more effective. The comprehensive list of regulatory provisions added or amended is contained in the final rule (60 FR 87).

GOA Amendment 21 — Interim Harvest Levels, Fishing Gear Restriction, Apportion Halibut Prohibited Species Catch by Gear and Season, Modify Demersal Shelf Rockfish Authorization Language, Define Overfishing, Implement Vessel Incentive Program

Dates: GOA Amendment 21 (BSAI Amendment 16) was adopted by the Council in June 1990. NMFS published a proposed rule on September 18, 1990 and a final rule implementing the approved portions of Amendment 16 on January 24, 1991 (56 FR 2700). Effective date of implementation was January 24, 1991. The amendment was revised to include a vessel incentive program, and the interim final rule was published on May 10, 1991 (56 FR 21619), which was effective May 6, 1991 through June 5, 1991.

Purpose and Need: A number of management measures were bundled together in this amendment, including PSC bycatch management, procedures for specifying TAC, and gear restrictions. The main purpose of this amendment was to better manage PSC bycatch in non-directed fisheries, particularly in the BSAI.

Because there is insufficient time between the end of the December Council meeting and January 1 of a new fishing year, this amendment was developed to establish interim TACs so that the fishery would open on January 1. Prior to this amendment, changes to gear definitions or other restrictions required an FMP amendment to change. In order to respond more rapidly to changes in the fishery, the purpose of this action was to allow gear restrictions to be accomplished through a regulatory amendment. Revised Guidelines for Fishery Management Plans (the "602 Guidelines"), required each FMP to include an objective and measurable definition of overfishing for each stock or stock complex under management.

Regulation Summary: The amendment contained 8 approved management measures; those pertaining to the GOA follow:

(1) Apportioned PSC limits into bycatch allowances for trawl fishery categories;
(2) Allowed separate apportionment of halibut PSC to hook and line and pot gear in the GOA;
(3) Allowed seasonal allocation of halibut and crab PSC;
(4) Established procedures for interim TAC specifications;
(5) Established fishing gear restrictions (definition of pelagic trawl, biodegradable panels & halibut excluders on pot gear);
(6) Modified authorization language that allows demersal shelf rockfish in SE Alaska to be managed by the State;
(7) Established definitions of overfishing.
(8) Modified PSC limits and bycatch limitation zones for halibut, bairdi crab, and red king crab in the BSAI

Later revisions to the amendment included addition of a vessel incentive program, which would issue civil penalties (fines) to vessels that exceeded seasonal fixed bycatch rate standards for halibut and crab taken in specified target fisheries.

Analysis: A 213-page EA/RIR/IRFA (final draft dated July 31, 1990) was prepared for this amendment. In the original draft, three primary alternatives to a BSAI measure described for BSAI Amendment 16 were considered. The analysis was revised several times to address other issues, including the vessel incentive program.

Results: Portions of the proposed amendment were disapproved by the Secretary. In response, revisions to this amendment were made in BSAI Amendment 16a and in Amendment 19/24.

GOA Amendment 22 Experimental Fishing Permits, Rescind Management District

Dates: GOA Groundfish FMP Amendment 22 (BSAI Amendment 17) was adopted by the Council in September 1990. NMFS published a proposed rule on December 4, 1991 (56 FR 63487) and a final rule on March 26, 1992 (57 FR 10430). Effective date of implementation was April 24, 1992, except for certain sections effective April 1, 1992.

Purpose and Need: The purpose of the amendment was to address several conservation issues in the GOA and BSAI in one package. Description summaries of the GOA proposals follow. Three changes to the BSAI FMP also established Walrus Island groundfish fishing closures, established the Bogoslof District in the Aleutian basin, and defined a groundfish pot.

1. Authorize experimental fishing permits:
An FMP amendment is proposed whereby the Regional Director, in consultation with the Council and Alaska Fishery Science Center, may issue experimental fishing permits to persons for purposes of obtaining information necessary to promote fishery conservation and management of the fisheries.

2. Rescind GOA statistical area 68:
An FMP amendment is proposed to delete statistical area 68 (East Yakutat District), because it is not needed for fishery conservation and management and is imposing, therefore, unnecessary recordkeeping and reporting costs.

Regulation Summary: This amendment allows the NMFS Regional Director, after consulting with the Director of the Alaska Fishery Science Center and with the Council to authorize for limited experimental purposes, the target or incidental harvest of groundfish that would otherwise be prohibited. The amendment also combined statistical area 68 with statistical area 65.

Analysis: A 71-page EA/RIR/IRFA (final draft dated May 14, 1991) was prepared for this amendment. Five management actions were evaluated under this amendment package. Two modified the GOA FMP. Two alternatives considered changes to GOA statistical area 68.

Results: A number of experimental fishing permits that have been proposed by both the groundfish industry, the agency, and the public have been approved by the Regional Administrator since implementation.

GOA Amendment 23 Inshore/Offshore Allocation for Pollock and Pacific Cod

Dates: NMFS published a proposed rule to implement GOA Amendment 23 and BSAI Amendment 18 on December 20, 1991 (56 FR 66009). The final rule was issued June 3, 1992, and the effective date of implementation was June 1, 1992 (57 FR 23321).

Purpose and Need: Amendments 18 and 23 developed out of a concern to prevent preemption of resources by one industry sector over another. Substantial processing of pollock by several catcher/processor vessels contributed to an early closure of the pollock fishery in the Shelikof Strait area in 1989, effectively preventing inshore components from realizing their anticipated economic benefit from processing pollock. Upon industry request, the Council considered the issues of coastal community development and shoreside preference at its June 1989 meeting and adopted the Fishery Planning Committee's suggested management alternatives for analysis. The problem statement adopted by the Council identified the issue as a resource allocation problem and stated that specific processing allocations for the inshore and offshore sectors established at the beginning of a fishing year would resolve the preemption problem and allow operators to better plan their harvesting and processing activities for the year.

The Council decided to include only pollock in the BSAI and Pacific cod and pollock in the GOA, in order to allow for more detailed analyses. After much discussion about the benefits of alternative measures to deal with the preemption problem, the Council reviewed the first draft SEIS/RIR/IRFA in April 1991, and adopted its preferred alternative in June 1991. The adjoining amendments to the BSAI and GOA FMPs would establish inshore/offshore allocations of pollock and Pacific cod in the GOA, and pollock in the BSAI. In addition, the amendments would establish a Catcher Vessel Operational Area (CVOA) in the Bering Sea, which would limit access to pollock within the area to catcher vessels delivering to inshore or offshore processors. These amendments also established the Western Alaska Community Development Quota (CDQ) program to provide Western Alaska communities with long-term employment and access to the fisheries. The primary purpose of Amendments 18 and 23 was to protect the inshore component of the fishery from preemption by the offshore fleet. The amendments provided an interim solution for the inshore component, which includes small coastal communities that are highly dependent on fishing to maintain economic stability. While the amendments do not directly address overcapitalization in the fisheries, the approval by the Council specifically expressed an intent to develop and implement a more comprehensive, long-term limited access program.

Regulation Summary: The alternative adopted and approved defined the inshore and offshore components of the fisheries. BSAI Amendment 18 was only partially approved, allocating 35% of the 1992 non-roe pollock season TAC to the inshore component, and the remaining 65% to the offshore component. The portion that was not approved would have further allocated pollock through 1995: the inshore allocation would have increased to 40% in 1993 and 45% in both 1994 and 1995. A NMFS economic review indicating a large net loss to the Nation as a result of this action provided the rationale for disapproval by the Secretary of Commerce. The GOA inshore component was allocated 90% of the Pacific cod TAC and 100% of the pollock TAC for each fishing year. While catcher/processors from the offshore component would not be able to conduct directed pollock fishing in the GOA, they would be allowed appropriate bycatch amounts.

Analysis: An extensive final SEIS/RIR/IRFA (dated March 1992) and a 265-page appendix containing community profiles were prepared for these amendments. Eight alternatives including the status quo were considered. The alternatives not chosen would have implemented traditional management tools or formed an allocation system with a different basis, such as vessel class, species, or at the individual vessel level. The alternative chosen was broadened to include development of a Comprehensive Fishery Rationalization Program, of which inshore/offshore allocations would be a part.

Results: Amendment 23 was approved in its entirety for the Gulf of Alaska, and resulted in 100% of the pollock quota and 90% of the Pacific cod quota (less bycatch amounts in other fisheries) being reserved for harvest by vessels delivering to onshore processors. This amendment was approved for a three-year period, through the end of 1995 (see Amendments 40 , 51, and 61 which extended these measures through 2004). The allocation implemented by this amendment provided protection and operational stability for harvesters and processors and the coastal communities in which they operated.

GOA Amendment 24 Delay Season Start Date, Espand Vessel Incentive Program

Dates: GOA Amendment 24 (BSAI Amendment 19) was adopted by the Council in December 1991. NMFS published the final rule on September 23, 1992 (57 FR 43926). Effective date of implementation was September 30, 1992.

Purpose and Need: The purpose of the amendment was to further address bycatch issues that were raised under Amendments 16 to the BSAI FMP and 21 to the GOA FMP. This amendment was aimed to control and reduce halibut bycatch mortality in the Alaska groundfish fisheries in response to the international, social, and economic conflicts between U.S. and Canadian halibut fishermen and U.S. groundfish fishermen that take halibut as bycatch.

Regulation Summary: Amendments 19/24 established three FMP amendment management measures. One pertained to the GOA FMP and its implementing regulations:

(1) Delay the season opening date of the GOA groundfish trawl fisheries to January 20 of each fishing year to reduce salmon and halibut bycatch rates;
(2) Further delay the season opening date of the GOA trawl rockfish fishery to the Monday closest to July 1 to reduce halibut and chinook salmon bycatch rates;
(3) Change directed fishing standards to further limit halibut bycatch associated with bottom trawl fisheries:
(4) Expand the vessel incentive program to address halibut bycatch rates in all trawl fisheries.

Analysis: A 111-page EA/RIR/IRFA (final draft dated April 10, 1992) was prepared for this amendment. The analysis was broken down into different management actions, and alternatives for each were evaluated separately. The number of alternatives (including the status quo) considered varied for each management measure.

Results: Since the amendment was approved, bycatch of crab and halibut has been controlled to stay within the PSC limits. PSC catch limits have been apportioned among different trawl fisheries in the BSAI, and fisheries have been closed when their respective apportionments/seasonal allowances were reached. Catch of groundfish (particularly flatfish) has been forgone due to these restrictions. Few vessels have been cited for violations of the vessel incentive program. PSC management was again revisited in following amendments, such as BSAI Amendment 25.

GOA Amendment 25 Steller Sea Lion Buffer Zones, Modify Pollock Management Districts

Dates: GOA Amendment 25 (BSAI Amendment 20) was adopted by the Council in September 1991. NMFS published a final rule on January 23, 1992 (57 FR 2683). Effective date of implementation was January 20, 1992.

Purpose and Need: The purpose of the amendment was to allow regulations to be implemented to afford marine mammals additional protection, particularly Steller sea lions. Steller sea lions were listed as threatened under the Endangered Species Act on November 26, 1990 (55 FR 49204). Although the ultimate cause of the Steller sea lions decline remains unknown, Steller sea lions had been incidentally taken in fishing gear, intentionally killed and harassed by fishermen, and may compete with commercial fisheries for food resources. The purpose of amendment 25 was to allow and implement regulations to reduce the likelihood that commercial groundfish removals would deplete Steller sea lion prey abundance in key habitats, as well as to reduce incidental take of Steller sea lions.

Regulation Summary: Regulations authorized by this amendment implemented the following measures:

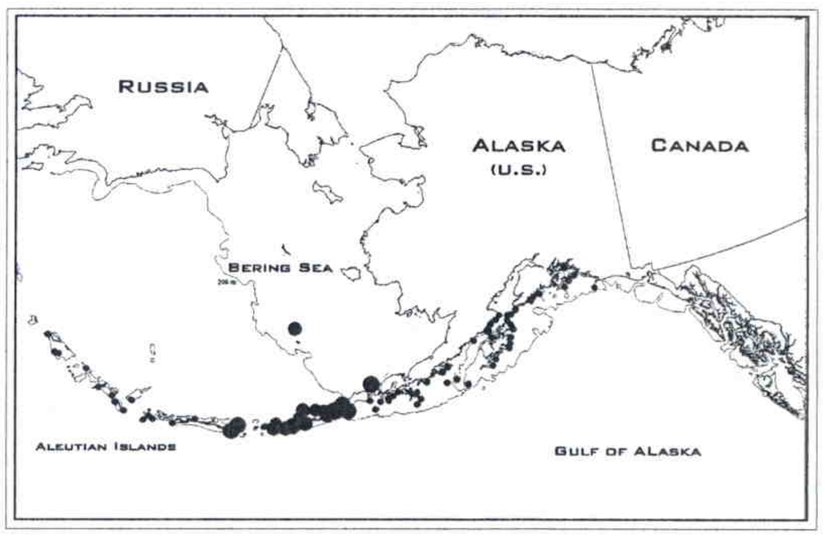
(1) Areas are closed year-round to fishing by vessels using trawl gear within 10 nautical miles of key Steller sea lion rookeries located in the GOA and BSAI management areas;

(2) Areas are closed within 20 nm of five sea lion rookeries to directed pollock fisheries during the "A" season. These rookeries are Sea Lion Rocks, Akun Island, Akutan Island, Seguam Island, and Agligadak Island;

(3) In the GOA, the specified total allowable catch for pollock in the combined western/central area is further divided among three pollock management districts: Area 61 (170°-159° W. longitudes), Area 62 (159°-154° W. longitudes), and Area 63 (154°-147° W. longitudes). The Shelikof Strait district was eliminated. To prevent excessive accumulation of unharvested portions in any quarterly allowance of the pollock TAC, a limit of 150 percent of the initial quarterly allowance in each pollock management district was established.

Analysis: A 29-page EA/RIR/IRFA was prepared for the trawl closure area section and a 10 page EA/RIR/IRFA was prepared for the section revising GOA districts (final drafts un dated, but near October 30, 1991). Five alternatives including the status quo were considered for the trawl closure section and two alternatives were considered for the GOA districts section of the Amendment. The other alternatives that were not chosen would have established larger time/area closures (20 nm year-round, 10 nm in summer with 20 nm winter extensions, 20 nm summer with 60 nm winter extensions). The alternative chosen (10 nm year-round rookery closures) represent an approximation of the average summer foraging range (average was 8 miles; maximum of 21 miles) for the six female Steller sea lions with pups tagged and tracked.

Results: Many subsequent actions have been taken to minimize the impacts of fisheries on Steller sea lions. On March 12, 1993, NMFS extended the no-trawl zone around Ugamak Island out to 20 nm during the pollock roe fishery (58 FR 13561). Amendment 28 to the BSAI FMP subdivided the Aleutian Islands region into 3 districts to reduce localized depletion of Atka mackerel. Critical habitat for Steller sea lions was designated on August 27, 1993 (58 FR 45269). Amendment 45 to the GOA groundfish FMP further subdivided the areas for pollock fishing; these were further modified by regulatory amendment in June (63 FR 31939). A regulatory amendment implemented in 1999 seasonally apportioned the AI Atka mackerel TAC into two seasons, incrementally shifted the allowable catch outside of Steller sea lion critical habitat area, and added a 20 nm no-trawl zone around Sequam rookery.



Location of Steller sea lion rookery and haulouts closed to pollock fishing in 1999.

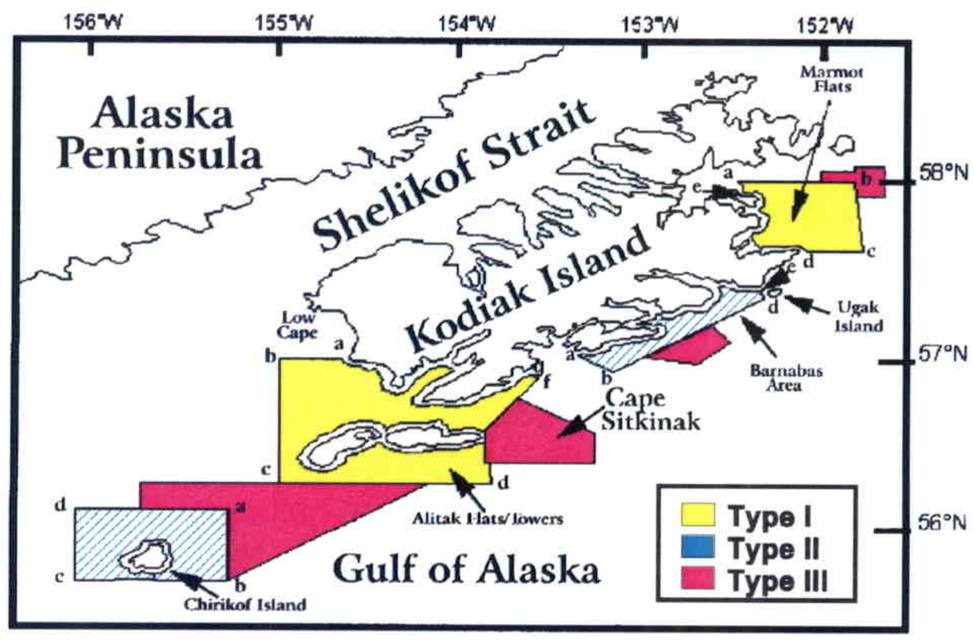
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In 1997, the western population (west of 144° longitude) of Steller sea lions was listed as endangered under the Endangered Species Act. In April 1998, plaintiffs (Greenpeace, the American Oceans Campaign, and the Sierra Club) filed suit against NMFS challenging the FMPs under both the Endangered Species Act and the National Environmental Protection Act. In December 1998, NMFS issued a Biological Opinion that the Alaska pollock fisheries proposed for the years 1999 to 2002 were likely to jeopardize the continued existence of Steller sea lions and modify its critical habitat. As a result, numerous management actions were taken via emergency rule and standard rulemaking to temporally and spatially disperse the pollock fisheries, and establish numerous no-trawl zones around rookeries and haulouts. The plaintiffs have further challenged NMFS on the adequacy of these reasonable and prudent alternatives.

GOA Amendment 26 Permanent Kodiak Crab Protection Zones

Dates: GOA Groundfish FMP Amendment 26 was adopted by the Council in June 1992. NMFS published the final rule on January 6, 1993 (57 FR 61585). Effective date of implementation was January 1, 1993.

Purpose and Need: The red king crab stock around Kodiak Island peaked in 1965, with landings of 94 million pounds, and then declined and remained at moderately low levels though the 1970's. No fishery has been allowed since 1982 in an attempt to rebuild the stock. While the cause for the decline of red king crab is not known, most researchers believe the decline can be attributed to a variety factors including overfishing, fish predation on king crab, and a warmer ocean environment. Fishery managers have enacted measures to provide an environment conducive to the recovery of the red king crab stock by minimizing impacts from other fisheries.



Trawl closure areas, designed to protect Kodiak red king crab, were first implemented as Amendment 15 in 1997 with a 3-year sunset. These closure areas were renewed as Amendment 18, which became effective in 1990. Because Amendment 18 also had a 3-year sunset, the management measure was scheduled to expire at the end of 1992. These restrictions were considered necessary because of the poor condition of the king crab resource off Kodiak and because trawl bycatch and mortality rates are highest during the spring months when king crab migrate inshore for reproduction. The molting period off Kodiak begins around February 15 and ends by June 15. The purpose of this amendment was to renew these closure areas to protect red king crab.

Regulation Summary: The regulation simply made the provisions of Amendment 18 permanent. The Council designated Type I, Type II and Type III areas for special bottom trawl restrictions to protect king crab. Type I areas have very high king crab concentrations and, to promote rebuilding of the crab stocks, are closed all year to all trawling except with pelagic gear. Type II areas have lower crab concentrations and are only closed to non-pelagic gear from February 15 through June 15. Type III areas are adjacent to Type I and II areas and have been identified as important juvenile king crab rearing or migratory areas. Type III areas become operational following a determination that a "recruitment event" has occurred. The Regional Administrator will classify the expanded Type III area as either Type I or II, depending on the information available. A "recruitment event" is defined as the appearance of female king crab in substantially increased numbers (when the total number of females estimated for a given district equals the number of females established as a threshold criterion for opening that district to commercial crab fishing). A recruitment event closure will continue until a commercial crab fishery opens for that district or the number of crabs drops below the threshold level for that district.

The Alitak Flats/Towers and Marmot Flats areas are Type I areas, closed to non-pelagic trawls all year. Chirikof Island and Barnabas are Type II areas, closed to non-pelagic trawls from February 15 to June 15. These areas encompass 80% to 90% of the known female king crab stocks.

When Type III areas are closed by regulatory amendment, the Regional Administrator will specify which of the Type III areas are closed and whether the closure is for an entire year or only a portion of a year.

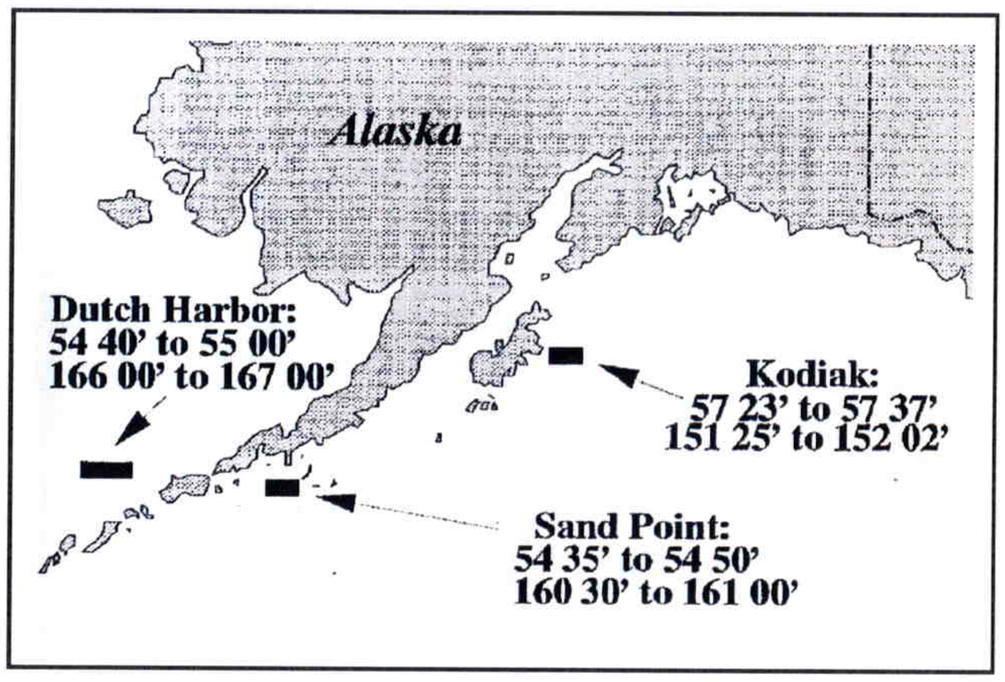
Analysis: An 18-page EA/RIR (final draft dated September 14, 1992) was prepared for this amendment. Three alternatives including the status quo were considered. Under the status quo alternative, the time/area closures would have expired at the end of 1992. The other alternative not chosen would have simply extended the closures for another three years. The alternative adopted made these closures permanent.

Results: Since the amendment was approved, GOA crab stocks in the vicinity of Kodiak Island remain depressed. The last good year class produced was in 1973-74. Recent surveys have failed to detect signs of rebuilding.

GOA Amendment 27 Establish Trawl Gear Test Zones

Dates: GOA Amendment 27 (BSAI Amendment 22) was adopted by the Council in April 1992. NMFS published a proposed rule on December 14, 1992 (57 FR 59072) and a final rule on January 23, 1993 (58 FR 5660). Effective date was January 15, 1993.

Purpose and Need: The purpose of the amendment was to provide trawl fishermen an opportunity to test their trawl fishing gear when the GOA or BSAI is otherwise closed to trawling. Until 1992, the GOA and BSAI were open to trawling for most of the year, and the industry was able to test gear in preparation for a season opening. However, in 1992, new regulations delayed the opening of the trawl season from January 1 to January 20 to reduce the bycatch rates of chinook salmon and Pacific halibut. This amendment allows fishermen to test their gear and begin fishing efficiently at the beginning of a season, reducing lost fishing time that might result from gear problems.



Location of trawl test zones in the Alaska EEZ.

Regulation Summary: This amendment allows the Secretary to promulgate regulations establishing areas where specific types of fishing gear may be tested, to be available for use when the fishing grounds are closed to that gear type. Specific gear test areas contained in regulations that implement the FMP, and changes to the regulations, will be done by regulatory amendment. These gear test areas would be established in order to provide fishermen the opportunity to ensure that their gear is in proper working order prior to a directed fishery opening. The test areas must conform to the following conditions:

(1) Depth and bottom type must be suitable for testing the particular gear type;
(2) Must be outside State waters;
(3) Must be in areas not normally closed to fishing with that gear type;
(4) Must be in areas that are not usually fished heavily by that gear type; and
(5) Must not be within a designated Steller sea lion protection area at any time of the year.

The rule implementing this amendment established three trawl test areas: Dutch Harbor (54°40' to 55° 00'N; 166° 00' to 167° 00W'), Sand Point (54°35' to 54° 50'N; 160° 30' to 161° 00'W), and Kodiak (57°23' to 57° 37'N; 151° 25' to 152° 02'W). The regulation further required that the trawl codend must be left unzipped so as not to retain fish, that groundfish may not be onboard, and that the time used to test gear would not contribute to observer coverage requirements.

Analysis: A 13-page EA/RIR/IRFA (final draft dated September 1, 1992) was prepared for this amendment. Two alternatives including the status quo were considered.

Results: Since the amendment was approved, fishermen have been able to test their gear when trawl fishing is otherwise prohibited.

GOA Amendment 28 Moratorium

Dates: NMFS published a proposed rule for GOA Amendment 28, BSAI Amendment 23, and Crab Amendment 5 on May 12, 1995 (60 FR 25677). The final rule was published on August 10, 1995 (60 FR 40763). Effective date of implementation for most sections of the amendment was September 11, 1995.

Purpose and Need: In 1987, concerned with excess harvesting capacity in the groundfish, crab, and halibut fisheries of the BSAI and GOA, the Council established a committee to examine the problem of overcapitalization. Upon concluding that allocation conflicts and overcapitalization would worsen under the current open access system, the committee recommended a limited access management approach for these three fisheries. Concerned with the potential for speculative entry into the fisheries during discussions of management alternatives, NMFS published a control date notice of February 9, 1992. Anyone not having previously participated in the fisheries before that date would not be assured future access to the fisheries should a limited access system be adopted.

The purpose of this amendment was to provide for an interim measure to slow significant increases in the harvesting capacity of the groundfish and crab fishing fleets until a Comprehensive Rationalization Plan (CRP) could be implemented. The CRP, which continues to be developed by the Council, is intended to resolve the overall issue of overcapitalization on a long-term basis, and transition the fisheries from an open access management system to a more market-based, limited access system. Without the regulatory ability to institute a moratorium, the Council feared that potentially unlimited new entry into the fishery would exacerbate overcapitalization and hinder the ultimate development of a successful CRP. The anticipated short-term effects of the amendment included increasing economic benefits to fishermen and reducing the risk of overfishing.

Regulation Summary: After several proposed moratoriums and revisions, the final rule required a moratorium permit for vessels within specific vessel categories that harvest groundfish and BSAI Area crab resources off Alaska. Generally, a vessel qualified for a moratorium permit if it made a legal landing of any moratorium species during the qualifying period of January 1, 1988 through February 9, 1992. In addition, a vessel that made a legal landing during the qualifying period, in either a groundfish or crab fishery, but not both, could cross over as a new vessel in the fishery in which it did not made a legal landing in the qualifying period provided: 1) it uses the same gear type in the new fishery as it used to qualify for the moratorium in the other fishery; or 2) it made a legal landing in the crossover fishery during the qualifying period and it uses only the same gear type it used in that period.

Analysis: A 22-page supplemental analysis (final draft dated February 1995) was prepared for the final resubmittal of the proposed moratorium for these amendments, which were originally approved by the Council in 1992. The supplemental analysis outlined the changes from the original moratorium proposal: revision of the qualification period, halibut and sablefish qualification, consideration of current participation, crossovers, and the appeals process. The analysis also indicated that the revised moratorium would allow 4,144 unique vessels in the crab and groundfish fisheries, about 1,800 more than the current participant fleet but significantly less than the 15,709 unique vessels that participated in the fisheries since 1978 that had the potential to re-enter if no action was taken.

Results: Since the amendment was approved, the Council has implemented the License Limitation Program (LLP) to limit entry into the groundfish and crab fisheries off of Alaska. As anticipated, the LLP (Amendment 60 to the BSAI FMP/Amendment 58 to the GOA FMP/Amendment 10 to the BSAI Crab FMP) replaced the vessel moratorium established in these amendments starting in the 2000 fishing season. For general licenses, the base qualifying period established was January 1, 1988, through June 27, 1992, approximately four months longer than the moratorium qualification period, in order to be consistent with the Council's published cutoff date for qualification under the Comprehensive Rationalization Plan. The LLP also required an area endorsement for the BSAI or the GOA, to provide for present participation in the fisheries (the qualifying period being January 1, 1992 through June 17, 1995). The moratorium established by Amendments 23 and 28 limited speculative entry into the fisheries while the LLP was being developed and approved, and kept the overcapitalization situation from worsening during development of the long-term Comprehensive Rationalization Plan. In addition, the moratorium qualifications could be transferred to other vessels (provided that the length of the new vessel was the same or less than the original), and so helped provide a basis for the LLP transfer process.

GOA Amendment 29 Salmon Retention for Food Banks

Dates: GOA Amendment 29 (BSAI Amendment 26) was adopted by the Council in September 1994. NMFS published final rule on July 24, 1996 (61 FR 38358). Effective date of implementation was July 19, 1996. Selection of an authorized distributor for donated salmon was announced on August 16, 1996 (61 FR 42591).

Purpose and Need: The Alaska groundfish fisheries result in incidental fishing mortality of Pacific salmon. Vessel operators participating in these fisheries typically use trawl, hook-and-line, or pot gear. Trawl gear operations account for most of the groundfish catch, harvesting 92 percent and 94 percent of the groundfish catch during 1992 and 1993, respectively. Trawl gear fisheries for Alaska groundfish also account for more than 99 percent of the salmon bycatch by the Alaska groundfish fisheries. These fish are dead when brought on board a vessel and must be returned to Federal waters as prohibited species once a NMFS-certified observer has determined the number of salmon and completed the collection of any biological or scientific data.

The incidental salmon mortality experienced in the groundfish fisheries is one of several competing uses of the fully utilized salmon resource. Salmon also are used as catch and bycatch in directed commercial, subsistence, and sport salmon fisheries and as bycatch in other non-salmon and non-groundfish fisheries. Salmon used as bycatch in the groundfish fisheries and in other fisheries can exacerbate the management problem associated with the allocation of salmon among escapement goals set by Alaska State management policy and the terminal salmon fisheries. The groundfish fisheries may result in reduced escapement or harvest in the salmon fisheries, thereby imposing a cost on other salmon users.

The action would authorized the retention and processing of salmon taken as bycatch in the Alaska trawl fisheries for donation to needy individuals. The intent of this action is to reduce bycatch and waste and potentially provide the opportunity to collect additional data that would support a more long-term solution to the salmon bycatch problem.

Regulation Summary: The Salmon Donation Program authorizes the distribution of Pacific Salmon taken as bycatch in the groundfish trawl fisheries in the groundfish fisheries off Alaska to economically disadvantaged individuals through NMFS authorized distributor selected by the Regional Director in accordance with federal regulations implemented under the FMP.

Analysis: A 24-page EA/RIR (final draft dated March 1996) was prepared for this amendment. Three alternatives including the status quo were considered. Under the status quo alternative, all bycaught salmon would be retained until a NMFS-certified observer has determined the number of salmon and collected any biological or scientific data. Salmon could not be retained for reasons other than the collection of biological or scientific data and ultimately must be discarded in Federal waters as a prohibited species. The other alternative not chosen would have mandated that every salmon taken in the Alaska groundfish trawl fisheries be retained, processed for human consumption, and donated to a nonprofit foodbank organization. Because NMFS's authority under the Magnuson-Stevens Act to directly regulate harvesting and processing fishery resources is limited to the EEZ, this alternative was not developed further but instead provided a qualitative comparison with the other alternatives.

Results: Since the amendment was approved, many fishing companies have voluntarily participated in the donation program. Through 1998, the authorized distributor, Northwest Food Strategies, has distributed over 3 million pounds (approximately 12 million meals) of donated salmon and halibut to needy people. Under Amendment 50, the donation program was expanded to include halibut.

GOA Amendment 30 Research Plan/Observer Plan (not implemented)

Dates: GOA Amendment 30 (BSAI Amendment 27) was adopted by the Council in June 1992, then reconsidered and adopted as revised in December 1993. NMFS published a proposed rule on May 6, 1994 (59 FR 23664) and a final rule on September 6, 1994 (59 FR 46126). Effective date of implementation was October 6, 1994. Amendment 1 (which delayed implementation until 1997) to the research plan was announced on December 26, 1995 (60 FR 66755).

Purpose and Need: Amendment 18 to the groundfish FMPs authorized a comprehensive domestic fishery observer program. The 1990 and 1991 observer programs required specific levels of observer coverage which varied with size of fishing vessel and quantity of fish processed by floating and shoreside processors. These requirements were established because it was recognized that living marine resources could not be effectively managed without the types of information that were either available only or most efficiently through an observer program.

The observer programs required that owners and operators of vessels and shoreside processing facilities participating in the groundfish fishery arrange for and pay for the cost of placing observers aboard their vessels and at their shoreside processing facilities beginning in January, 1990. Each vessel or processor required to have observer coverage is responsible for the cost of obtaining the required observers from a certified contractor. The cost averaged between $5,800 and $7,100 per observer month in 1991. There were three problems identified for this method of paying for observer coverage. It was not an equitable system in that some operations payed for 100% coverage and others did not pay anything, it limited the ability of the NMFS to effectively manage the observer program, and it may have resulted in a conflict of interest that could reduce the credibility of observer data. The Research plan was designed to address these three problems. Industry support for such a change is demonstrated by the willingness and ability of the industry to convince Congress to amend the Act to allow the North Pacific Fisheries Research Plan to be established and paid for by a broad-based system of user fees. The proposed plan was to be applicable to the groundfish, halibut, and BSAI crab fisheries.

Regulation Summary: The Magnuson-Stevens Act authorized the Council and the Secretary to establish a North Pacific Fisheries Research Plan which: (1) requires that observers be stationed on fishing vessels and at fish processing facilities, and (2) establishes a system of fees to pay for the cost of implementing the Research Plan. The Research Plan, as adopted under this amendment, contained four objectives and elements that included observer employment and contracts, observer duties, data collection and transmission, annual determination on coverage level, inseason changes to coverage levels, establishment of an observer oversight committee, coordination between the NMFS groundfish and ADF&G shellfish observer programs, a fee assessment (up to 2% of ex-vessel value of harvested fish), and details on fee collection and contingency plans in case of funding shortfalls.

Analysis: A 26-page EA/RIR (final draft dated March 22, 1994), together with a lengthy (100+ pp.) appendix section, was prepared for this amendment. Three alternatives including the status quo were considered. Under the status quo alternative, the authority to establish a research plan would not be used, existing observer coverage requirements and contracting arrangements would be used, and no observer program would be implemented for the halibut fishery. The alternative adopted provided for a research plan to address problems identified with the existing observer program.

Results: Though the amendment was approved, it was never fully implemented. Instead, implementation was delayed one year, then replaced with a modified pay-as-you-go system adopted under Amendments 47/47. Start up fees were collected by NMFS in the first year of implementation (1995), but the Council repealed the Research Plan due to various concerns, including the possibility that the fee would not cover all necessary coverage levels. Fees were refunded following the repeal of the Plan. An Observer Committee has been convened to examine fee plan alternatives and is currently evaluating possible options.

GOA Amendment 31 Establish Separate Target Category for Atka Mackerel

Dates: GOA Groundfish FMP Amendment 28 was adopted by the Council in June 1993. NMFS published a (corrected) notice of availability on July 26, 1993 (58 FR 42758) and a notice of approval on October 22, 1993 (58 FR 54553). Effective date of implementation was October 18, 1993.

Purpose and Need: Atka mackerel was an important target species of the foreign fishery in the Gulf of Alaska. The directed fishery for this species waned and through lack of interest by the domestic fishery, was combined with "other species" in 1988. The "other species" category was intended to allow for bycatch of species of minor commercial importance such as sculpins, skates, squid, smelts, etc. The "other species" category has been generally available as a Gulf-wide TAC equal to five percent of the sum of TACs for all target fisheries.

In 1990, a directed fishery resumed when a closure of the Atka mackerel fishery in the BSAI resulted in vessels moving into the Western GOA to continue targeting this species. The fishery expanded significantly in 1992 (13,835 mt), and accounted for almost the entire TAC of "other species" in the GOA. As a result, "other species" became non-retainable early in the year (May) in the entire GOA. This closure preempted fishing for "other species" and caused discarding of minor species such as octopus. In 1993, Atka mackerel were again targeted in the GOA, accounting for almost the entire TAC of other species in the Western GOA. As a result, "other species" was closed to directed fishing early in the year (April 2) in the Western GOA.

The GOA FMP defined other species as groundfish species and/or species groups, which currently are only of slight economic importance or contain economically valuable species but insufficient data exist to allow separate management. Atka mackerel no longer met this definition. The purpose for the proposed amendment was to improve management of the Atka mackerel resource in the Gulf of Alaska. By establishing Atka mackerel as a target species, harvest levels would be based on biological stock assessments. The proposed amendment would not only reduce the potential for overfishing Atka mackerel, but also allow for increased harvesting of the "other species" complex, and reduce user conflicts within the Western GOA.

Regulation Summary: Amendment 31 created a separate target category for Atka mackerel in the GOA groundfish FMP. This meant that harvest levels of Atka mackerel would be based on biological stock assessments. Although the catch would primarily occur in the Western Gulf, TAC's for Atka mackerel would be set Gulfwide to avoid waste and discarding of the small amount caught in the other subareas. The species composition of the other species category would remain the same, with the exception of Atka mackerel. TACs for other species in the GOA would increase to include 5% of the TAC for Atka mackerel.

Analysis: A 45 page EA (final draft dated July 3, 1993) was prepared for this amendment. Two alternatives including the status quo were considered. The alternative chosen was more conservative in establishing a biologically based acceptable biological catch level for this species in the GOA, rather than allowing for relatively unrestricted catch.

Results: In the late 1980s, an Atka mackerel population existed in the GOA primarily in the Shumagin Islands area. By the late1990s, the TAC was set at bycatch levels (600 mt) because there is no reliable estimate of current biomass and the species has exhibited vulnerability to fishing pressure in a foreign trawl fishery in the 1970s and early 1980s.

Catch specifications (mt) for Atka mackerel in the GOA.

Year	ABC	TAC	Catch
1994	4,800	3,500	3,538
1995	3,240	3,240	701
1996	3,240	3,240	1,580
1997	1,000	1,000	331
1998	600	600	316
1999	600	600	262
2000	600	600	170
2001	600	600	76
2002	600	600	84
2003	600	600	na

GOA Amendment 32 Pacific Ocean Perch Rebuilding Plan

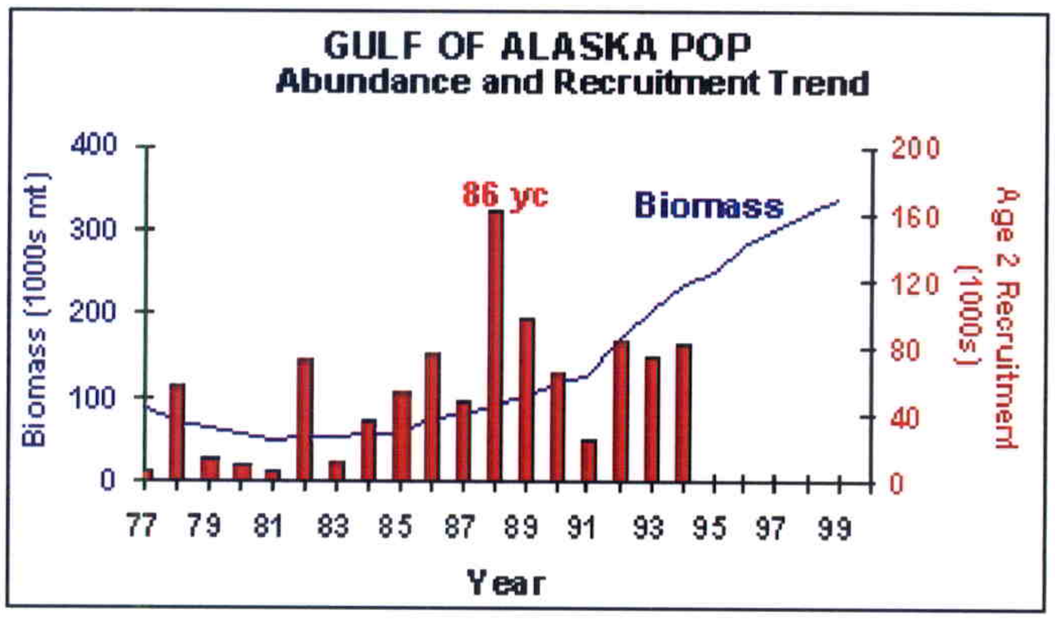
Dates: GOA Groundfish FMP Amendment 32 was adopted by the Council in September 1993. NMFS published final rule on April 15, 1994 (59 FR 18103). Effective date of implementation was March 31, 1994.

Purpose and Need: The purpose of this amendment was to establish a plan to rebuild stocks of the rockfish Pacific ocean perch (POP) (Sebastes alutus) in the Gulf of Alaska (GOA). POP is a highly valued groundfish. It was heavily exploited by a foreign trawl fleet from the early 1960's until the mid-1970's. Thereafter, a domestic at-sea processing fleet harvested POP at a substantially lower rate. Catches of POP peaked in 1965 when an estimated 350,000 metric tons (mt) were harvested by the foreign fleet; catches declined sharply in the late 1960's. From 1961-1977, annual POP landings averaged over 40,000 mt; after 1977, landings averaged 6,000 mt. In the domestic fishery, POP was managed as part of a larger slope rockfish assemblage of about 20 species until 1991, when POP was established as a separate target species category to prevent possible overfishing. As a result of increased concern about the status of POP stocks, biomass assessment methodology has been improved and domestic harvest levels have been reduced. The 1993 total allowable catch (TAC) of 2,560 mt was available only as incidental bycatch in other groundfish fisheries. In recent years POP has been managed as a single species, harvest levels have been reduced, and directed fisheries have been restricted or eliminated. In spite of this conservative management in recent years, POP biomass has increased only slightly and remains depressed from historic levels. The intent of this amendment was to minimize POP mortality necessary to maximize the probability of rebuilding success in a realistic time period.

Regulation Summary: The alternative chosen was projected in modeling simulations to rebuild POP biomass to a target level (B_{MSY}) in about 14 years by harvesting POP at a fishing mortality rate lower than the optimum rate. The target biomass B_{MSY} is the total biomass of mature females that would produce the maximum sustainable yield, on average; this number is currently estimated at 150,000 mt. The optimal fishing mortality rate is the rate that maximizes expected biological and economic yields over a range of plausible stock-recruitment relationships.

Amendment 32 establishes the procedure for deriving the annual GOA TACs for POP. POP stocks are considered to be rebuilt when the total biomass of mature females is equal to, or greater than, B_{MSY}. Annual TACs will be established as follows:

1) determine the current biomass, B_{MSY}, and the optimal fishing mortality rate;
2) determine the fishing mortality rate halfway between the optimal fishing mortality rate and the fishing mortality rate estimated to be sufficient to supply unavoidable bycatch of POP based on 1992 bycatch rates;
3) when the current biomass of mature females is less than B_{MSY}, adjust the resultant fishing mortality rate in (b) by the ratio of current biomass to B_{MSY}. When B_{MSY} is attained, the fishing mortality rate will be the optimal fishing mortality rate;
4) the GOA TAC of POP is the amount of fish resulting from the adjusted fishing mortality rate in (c); and
5) the TAC is apportioned among regulatory areas in proportion to POP biomass distribution.



Analysis: An 86-page EA/RIR/IRFA (final draft dated November 8, 1993) was prepared for this amendment. Four alternatives including the status quo were considered. The other alternatives would have established a slower rebuilding schedule (11 years) via an optimal fishing mortality rate or a faster schedule (18 years) by prohibiting a directed fishery for Pacific Ocean Perch. The alternative chosen was a fishing mortality rate that was intermediate between the optimal rate and a bycatch only rate.

Results: Since the amendment was approved, the stock has been rebuilding to target levels. In 1996, Amendment 38 was implemented to allow the POP TAC to be set at or below the amount dictated by the rebuilding plan's algorithm. The current female spawning biomass (B_{2000} = 92,920 mt) is quickly nearing target levels ($B_{40\%}$ = 110,120 mt). The current spawning biomass is much larger than it was in 1992 due to good recruitment and low fishing mortality.

GOA Amendment 33 Kodiak Pelagic Trawl Closures (withdrawn)

Dates: An EA/RIR/IRFA was developed for proposed Amendment 33 to the GOA FMP to close the crab protection zones around Kodiak Island to all trawling. Amendment 33 was withdrawn by the Council in April 1993.

Purpose and Need: Under Amendment 26, time/area closures and crab protection zones around Kodiak became permanent. These restrictions afforded protection to king crab in some areas during their molting or soft-shell period while in other areas it protected crabs from trawls year-round. The closures applied to bottom trawling operations only. In January 1993, the NOAA Office of Enforcement expressed concern about the effectiveness of the amendment as adopted by the Council. Most trawl vessels that operate around Kodiak do not have full-time observer coverage, and the only way NOAA can enforce closures is by aerial surveillance. Air surveillance can rarely distinguish between a pelagic and bottom trawl operation. The Council asked staff to analyze a closure to all trawling in light of the enforcement difficulties. The purpose of this amendment was to fully meet the Council's intent to protect crab habitat under Amendment 26.

Analysis: A 25-page EA/RIR/IRFA (final draft dated April 1993) was prepared for this amendment. Two alternatives were considered: 1) the status quo, and 2) closing the time/area crab protection zones around Kodiak Island as specified under Amendment 26 to all trawling, including pelagic trawling. The analysis indicated that the proposed alternative would make enforcement of crab closures by aerial surveillance more effective and less costly, as all vessels observed fishing with trawls in the closed areas would be in violation. The analysis also noted that bycatch rates of pelagic trawls in the Gulf of Alaska are very low.

Results: The Council noted that the analysis indicated that closing these areas to pelagic trawling could reduce some important nearshore pollock fishing grounds, and that the existing closures have been closely monitored by the Kodiak fishing industry for several years. On the basis of effective self-enforcement, the Council moved not to send the analysis out for public review and the amendment was effectively withdrawn from further consideration.

GOA Amendment 34 Remove Fishery Management Plan Reference to Community Development Quota Program

Dates: Amendment 34 to the FMP for the Groundfish of the Gulf of Alaska was adopted by the Council in April 1994 along with Amendment 30 to the FMP for the Groundfish of the Bering Sea/Aleutian Islands. Final rule was published August 24, 1994, and the effective date of implementation was September 23, 1994 (59 FR 43502). NMFS published the proposed rule on May 31, 1994 (59 FR 28048).

Purpose and Need: Amendment 34 to the GOA FMP corrected the inadvertent inclusion of the Community Development Quota (CDQ) program in the FMP by removing and reserving section 4.4.1.1.8 on "Community Development Quotas". Because the program exists for Western Alaska communities, the Community Development Quota Program should have been included only in the FMP for the Groundfish of the Bering Sea/Aleutian Islands, but not the Gulf of Alaska.

Regulation Summary: The alternative adopted removed the inadvertent inclusion of the CDQ program in the FMP for the GOA.

Analysis: No analysis was necessary for the preparation of Amendment 34. The amendment simply removed an inadvertent reference to the Community Development Quota Program from the FMP for the Gulf of Alaska.

Results: The result of the amendment was to correct the FMP for the Groundfish of the Gulf of Alaska so that it does not include a section on the CDQ program.

GOA Amendment 35 Sablefish Individual Fishing Quota Share Blocks

Dates: GOA Amendment 35 was adopted by the Council in 1994 along with BSAI Amendment 31 and a regulatory amendment affecting the Pacific halibut fishery in and off the State of Alaska. NMFS published the proposed rule to implement the Modified Block Proposal and clarify the transfer process for the Individual Fishing Quota (IFQ) program on June 28, 1994 (59 FR 33272).Effective date of implementation was November 7, 1994 (59 FR 51135; October 7, 1994.)

Purpose and Need: The IFQ program, implemented in 1995, assigned the privilege of harvesting a percentage of the sablefish and halibut quota to specific individuals with a history of harvest in the fisheries. Quota shares can be bought and sold, allowing people who did not receive an initial allocation the option to buy or lease quota. Concern over the potential for excessive consolidation of quota shares, the projected reduction of the longline fleet, and the social and economic effects on coastal communities, shore-based processors, and fishermen was the impetus for Amendment 31. Amendment 31, implementation of the Modified Block Proposal, was intended to reduce the maximum potential consolidation relative to the existing IFQ program by significantly increasing the theoretical minimum number of quota share holders and thereby easing the transition from open access to IFQs.

The purpose of this amendment is to provide for improved long-term productivity of the sablefish and halibut fisheries, by further promoting the conservation and management objectives of the Magnuson-Stevens Act and the Halibut Act. In addition to sustaining the health of the fisheries, the Council needed to address the issue of protecting small producers, part-time participants, and entry-level participants who may tend to disappear because of potential excessive consolidation under the IFQ program. The purpose of the amendment is to protect the viability of these small entities without interfering with the opportunities currently available under the IFQ program for larger operations.

Regulation Summary: The alternative adopted and approved provided that initial allocations of quota share that represent less than 20,000 lb of IFQ in the implementation year will be issued as a block, 2) quota share that represents 20,000 lb or more of IFQ in the implementation year will be "unblocked" quota share, and 3) quota share in a block cannot be separated and will have to be transferred as a block. Fishermen could own two blocks of halibut and two blocks of sablefish quota share in each area, but persons holding any amount of unblocked quota share are limited to one block of quota share per area. A sweep up provision allowed fishermen to combine small amounts into fishable amounts: halibut blocks can be combined to a sum of less than 1,000 lbs and sablefish blocks can be combined until the sum reaches 3,000 lbs. The amendment also clarified that blocked and unblocked quota share would be transferable subject to the approval of the NMFS Regional Director and the regulations. The Modified Block Proposal created the potential that some quota share would become non-transferable because the size would exceed the quota share use limits established in 50 CFR 676.22 (e) and (f); the alternative adopted solved the issue of nontransferability by allowing the transfer of a quota share block exceeding the use limits by dividing the block into two blocks.

Analysis: A 283-page EA/RIR/IRFA (final draft dated May 25, 1994) was prepared for this amendment and adjoining Amendment 31 to the FMP for the groundfish of the Bering Sea/Aleutian Islands. Without a block amendment, the IFQ program could have potentially reduced the number of halibut and sablefish quota share fishermen to 200 and 100, respectively. Three separate block proposals were considered to ameliorate this problem. The two alternatives that were not chosen would have created unique, variable size blocks or partial blocks that could be transferred across catcher vessel classes, resulting in increased search and transaction costs of persons who want to sell or buy additional quota share. The alternative chosen allowed persons to purchase relatively small amounts of quota share that is unblocked, but lowers transaction costs associated with blocked quota share.

Results: Amendment 35 created both blocked and unblocked quota shares based on the 1994 quota. As anticipated, there has been some consolidation of quota share to fewer persons than received quota share by initial issuance, but significantly less so than if the block proposal not been added. The total number of initial issuees (unique number of people) in the halibut fishery was 4,830, which was reduced to 3,485 by the end of 2001. The total number of issuees in the sablefish fishery was 1,052, reduced to 872 by the end of 2001. The number of unique vessels landing halibut and sablefish before the IFQ program was 3,450 and 1,191 in 1994, and by 2001 the number of vessels was reduced to 1,451 and 433, respectively.

GOA Amendment 36 Transfer of Sablefish Community Development Quota Compensation Shares

Dates: GOA amendment 36 was adopted by the Council in 1995 along with BSAI amendment 32 to relieve transfer restrictions on Community Development Quota (CDQ) compensation quota shares (QS). NMFS published a proposed rule that would implement GOA Amendment 36 and BSAI Amendment 32 on October 13, 1995 (60 FR 53331). Effective date of implementation was February 23, 1996. (61 FR 1844; January 24, 1996.)

Purpose and Need: The Community Development Quota (CDQ) program was proposed in conjunction with the IFQ program for sablefish and halibut management. The CDQ program apportioned designated percentages of the annual fixed gear total allowable catch (TAC) of sablefish and halibut to eligible Western Alaska communities, intending to provide near-shore communities with long-term, stable employment and access to the fishery resource. Apportioning part of the fixed gear TAC to communities reduced the amount of that TAC available for harvest by persons receiving annual allocations of IFQ. As a result, CDQ compensation quota shares were issued as partial compensation to persons who received (reduced) quota shares in CDQ areas.

Two problems were identified that inhibited the current transfer of CDQ compensation quota shares. Firstly, most CDQ compensation QS would be issued in allocations of less than 20,000 lbs and therefore would be blocked under the block provision, meaning it is nonseverable (see BSAI Amendment 31/GOA Amendment 35). The block provision was added to the IFQ program to prevent excessive consolidation of fishing privileges. Blocked quota share, especially small blocks such as the CDQ compensation QS, is difficult to market because of the two-block limit; thus creating a significant barrier to transfer. The second problem is that the IFQ program allowed transfer of quota shares only within the same vessel category. This provision was included to prevent significant consolidation into large vessel operations. However, residents of CDQ areas traditionally employed smaller vessels than the non-residents who received initially issued quota shares in the CDQ areas, making it difficult for residents of CDQ areas to increase their holdings as they must purchase larger vessels as well as initially issued quota share in the larger vessel categories.

Amendments 32 and 36 were proposed to relieve the unintended consequences of the IFQ transfer restrictions, which are contrary to the original purpose of providing CDQ compensation quota shares. By relieving the existing transfer restrictions on initial recipients of CDQ compensation quota shares, it effectively increases the remunerative value of those shares and facilitates the full utilization of the allocated resources managed under the IFQ program.

Regulation Summary: The amendment exempted some CDQ compensation QS from the block provision and allowed for a one year period of relief (one-time transfer) from the restriction against transferring CDQ compensation QS across vessel length categories. Regulations state that if a person is issued CDQ compensation QS for an area where the person already has regular QS, then their CDQ compensation QS is combined with their existing QS and is either "blocked" or "unblocked" depending on the sum total of their QS (this makes much of the CDQ compensation QS unidentifiable after issuance). If a person is issued CDQ compensation QS for an area in which the person doesn't have other QS, the QS is left unblocked. The exemption does not include Category "A" vessels–vessels of any length authorized to process IFQ species.

Analysis: A 21-page Regulatory Impact Review (final draft dated January 1995) was prepared for this amendment. Including the status quo, two alternatives addressing the block provision and three alternatives addressing the transfer across vessel length classes were considered. The option that was not chosen would have allowed "pooling" of quota shares with other compensation share holders, as opposed to exempting CDQ compensation QS from the block provision in perpetuity. With regard to transfer across vessel length classes, the other alternative not chosen would have allowed a one-time trade across vessel classes as defined by a transaction involving initially issued large vessel QS in CDQ areas and small vessel CDQ compensation QS in non-CDQ areas. The alternative chosen is more flexible by not defining the type of transaction allowed.

Continued

Results: Since the amendment was approved, coastal communities that rely on the small vessel fleet have benefitted by having IFQ in more accessible areas. The action did not significantly change the overall character of the fleet because CDQ compensation quota share accounted for only 3.5% of the total amount of quota share issued in the non-CDQ areas of the Gulf of Alaska; therefore, the net gain or loss in any one vessel length category has been insignificant. A report examining the distribution of all QS by block status shows that 69.2% of the QS in the BSAI was blocked at the end of 1998. In the Gulf of Alaska, percentage of blocked QS ranged from 7.6% in the Central Gulf to 20.1% in the Western Gulf. In addition, the amount of swappable CDQ compensation QS–catcher vessel QS that can be fished on any size vessel until its first transfer–declined sharply by year-end 1998, even though there were very few actual swaps of this type of QS to other vessel categories. Most of the decline came from regular transfers, where CDQ compensation QS also loses its swappable status. Over the 1995-98 time period there were only 5 swaps in Southeast area, 4 in West Yakutat, and 3 each in the Central and Western Gulf.

GOA Amendment 37 Limited Processing of Non-Individual Fishing Quotas Species

Dates: Amendments 37 to the GOA and 33 to the BSAI were adopted by the Council in 1996. NMFS published a proposed rule that would implement both amendments on April 2, 1996 (61 FR 14547). Effective date of implementation was July 26, 1996. (61 FR 33382; June 27, 1996.)

Purpose and Need: The IFQ program was designed to promote the conservation and management objectives of the Magnuson-Stevens Act and Northern Pacific Halibut Act. The program was implemented in 1995 and assigned the privilege of harvesting a percentage of the sablefish and halibut quota to specific individuals with a history of harvest in the fisheries. Persons receive an annual allocation of IFQ and are authorized to harvest IFQ species.

Included in the IFQ program is a provision prohibiting the processing (freezing) of fish, other than IFQ halibut or sablefish, on board a harvesting freezer vessel if, along with that fish, IFQ sablefish were harvested by a person who has catcher vessel quota shares of sablefish. The Council's intent in allowing the use of catcher vessel quota share on freezer vessels was to increase the fishing opportunities of IFQs held by crew members. The prohibition on freezing non-IFQ species came out of a Council concern that, if the owners of large, industrial-type processing vessels could harvest IFQ species with IFQ assigned to vessel categories B, C, and D while processed fish are on board, these operators could acquire the majority of the "catcher vessel" quota share that would normally be harvested by smaller boats without processing capabilities. These smaller vessels usually use shoreside local processors in coastal communities. The Council did not want to dramatically change the character of the fisheries and deprive coastal communities of the revenue generated by small vessel deliveries of IFQ species.

The combination of allowing catcher vessel quota share to be used on freezer vessels with the prohibition on processing non-IFQ species resulted in unanticipated waste of non-IFQ species caught incidentally to sablefish. Persons are required to retain all Pacific cod and rockfish caught incidentally to IFQ sablefish. Pacific cod and rockfish have a shorter "shelf life" than sablefish, and a typical sablefish fishing trip is too long to maintain sufficient quality of incidentally caught non-IFQ fish. Without the ability to freeze the non-IFQ species, the fish was often landed in poor condition, decreasing the market value of the fish significantly.

The purpose of Amendments 37 and 33 was to address the lost revenue and waste that occurs because fish other than IFQ halibut and sablefish are discarded, or if not discarded, become a low quality product, due to the prohibition on processing fish other than IFQ halibut and sablefish.

Regulation Summary: The alternative adopted and approved authorized the processing of fish other than IFQ halibut or IFQ sablefish on board the harvesting vessel by persons authorized to harvest IFQ sablefish based on an annual allocation of IFQ assigned to vessel categories B or C. This authorization is not extended to persons authorized to harvest IFQ halibut, due to the fact that halibut is characteristically prosecuted by local vessels that do not have onboard processing capabilities. Several modifications were also made to the regulations implementing the IFQ program in order to accommodate the new provision. In addition, while non-IFQ species could be frozen onboard, the freezing of IFQ sablefish caught with catcher vessel quota share on a freezer vessel would continue to be prohibited.

Analysis: A 14-page EA/ RIR (final draft dated March 8, 1996) was prepared for these amendments. The analysis determined that the proposal would not have a significant economic impact on a substantial number of small entities, and would not adversely effect shore-based plants because most of the bycatch of non-IFQ species would be discarded as the period of marketability of unprocessed product is typically exceeded. Two alternatives including the status quo were considered. The alternative chosen allows for the freezing of non-IFQ species when catcher vessel quota share is used on freezer vessels.

Continued

Results: In 1996, only thirty-eight sablefish quota share recipients in the freezer vessel category were eligible to use catcher vessel quota share from the 188 quota share holders in the less than 60 feet vessel class and 763 quota share holders in the greater than 60 feet vessel class. Allowing non-IFQ species caught incidentally to IFQ sablefish to be frozen onboard freezer longliners has significantly enhanced product quality and has allowed for the recovery of revenue otherwise lost to discards. The following is an estimate of commercial non-IFQ species landed by weight, for each 100 mt of sablefish landed in the BSAI longline sablefish fishery in 1999: 33 mt of Greenland turbot, 14 mt of rockfish, 2 mt of Pacific cod, and 4 mt of shortraker/rougheye (1999 Blend data). This equates to approximately half the weight of the targeted IFQ sablefish harvest–fish which would have potentially been discarded or in non-marketable condition had the prohibition on processing continued.

GOA Amendment 38 Revised Pacific Ocean Perch Rebuilding Plan

Dates: Amendment 38 was adopted by the Council in December 1995. NMFS published a proposed rule to amend the Fishery Management Plan for groundfish of the GOA on July 5, 1996 (61 FR 35174). and published approval of the amendment on October 2, 1996 (61 FR 51374). Effective date of implementation was September 25, 1996.

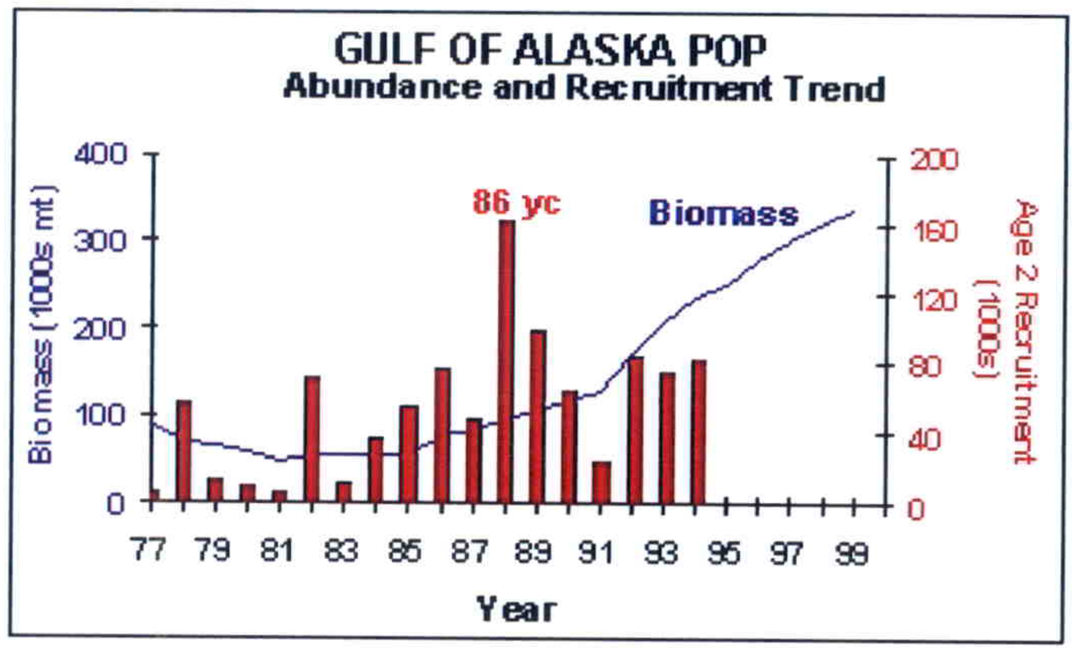
Purpose and Need: The continued decline of the Pacific ocean perch (POP) stock prompted the Council to recommend a rebuilding plan for POP, established in Amendment 32 to the Fishery Management Plan for the groundfish of the GOA (59 FR 18103; April 15, 1994). The POP Rebuilding Plan provides a specific strategy for POP stocks, based on available biological and economic information. The plan established an algorithm, or formula, to determine the annual POP total allowable catch (TAC), which is then apportioned among the regulatory areas in the Gulf of Alaska. However, the rebuilding plan neglected to allow for any flexibility to reduce the TAC below the amount specified by the formula.

Given this standard formula, it was possible for the TAC to be greater than the acceptable biological catch (ABC) determined by biological and survey data and published in the annual Stock Assessment and Fishery Evaluation (SAFE) reports. The TAC is determined using the formula in the Rebuilding Plan and is then apportioned to each regulatory area according to the percentage biomass distribution used for the ABC apportionment. Approving a TAC greater than the acceptable biological catch is a practice inconsistent with the current management practices for other groundfish stocks and the conservation and management objectives of the Magnuson-Stevens Act. The Council also expressed concern with the inability to lower the TAC to accommodate other potential resource conservation issues.

The purpose of this amendment is to improve conservation and management of POP and to further the goals and objectives of the fishery management plan by providing the flexibility to lower the calculated TAC for Pacific ocean perch based on biological or resource conservation concerns.

Regulation Summary: The alternative adopted and approved allowed the Council to recommend a POP total allowable catch at or below the amount dictated by the formula in the Rebuilding Plan. The regulations specify that any downward adjustments would be based on biological or resource conservation concerns about the POP stock or associated with the POP fishery that are not accounted for in the Rebuilding Plan or the annual stock assessment reports. The amendment only gives the Council the alternative of recommending a lower POP TAC based on resource conservation concerns, and not socioeconomic concerns. Under Amendment 38, the formula in the Rebuilding Plan would be considered the upper bound limit for the POP TAC.

Analysis: An 18-page EA (final draft dated June 1996) was prepared and an Interim Report on the Status of the Pacific Ocean Perch Rebuilding Plan in the Gulf of Alaska (Heifetz et al 1995) was submitted for this amendment. Three alternatives including the status quo were considered. The other alternative would have re-evaluated the entire POP Rebuilding Plan to reconsider the Council's intended harvest strategy. The alternative chosen would not change the general direction established by the earlier Rebuilding Plan except to allow the Council more flexibility in recommending the annual TAC if the Council identified specific biological or conservation issues that were not adequately addressed by the formula TAC level.



Results: Since the amendment was approved, the Council has continued to approve conservative TACs for the POP stock in the Gulf of Alaska as it rebuilds. The 1996 Stock Assessment and Fishery Evaluation report stated that the 1996 triennial trawl surveys indicated substantially increased biomass estimates since the 1993 survey. However, in order to ensure the stock was fully recovered, the 1997 TAC was set at 80% of the Western and Central Gulf ABC and the TAC from 1996 was rolled over for the Eastern Gulf. Since then the stock status has continued to improve, yet the annual TACs have been set below the ABCs so as to remain precautionary. The TACs for 1997, 1998 and 1999 increased to 9,190 mt, 10,776 mt and 12,590 mt, respectively; while the TAC from 2000 to the present has been set equal to the ABC (for 2003 TAC was 13,660 mt.)

GOA Amendment 39 Establish Forage Fish Category

Dates: GOA Groundfish FMP Amendment 39 (BSAI Amendment 36) was adopted by the Council in April 1997. NMFS published the final rule on March 17, 1998 (63 FR 13009). Effective date of implementation was April 16, 1998.

Purpose and Need: Forage fish are abundant fishes that are preyed upon by marine mammals, seabirds and commercially important groundfish species. Forage fish perform a critical role in the complex ecosystem functions of the BSAI and the GOA by providing the transfer of energy from the primary or secondary producers to higher trophic levels. Significant declines in marine mammals and seabirds in the BSAI and GOA have raised concerns that decreases in the forage fish biomass may contribute to the further decline of marine mammal, seabird and commercially important fish populations. Forage fish are the principal diet of more than two thirds of Alaskan seabirds. In addition, many seabirds can subsist on a variety of invertebrates and fish during nonbreeding months but can only raise their nestlings on forage fish. Small forage fish such as capelin, herring, sandlance and eulachon also have been recognized as important prey items for a variety of marine mammal species including: Northern fur seal, Steller sea lion, harbor seal, spotted seal, bearded seal, humpback whale and fin whale.

Regulation Summary: This amendment defined a forage fish species category and authorized that the management of this species category be specified in regulations in a manner that prevents the development of a commercial directed fishery for forage fish which are a critical food source for many marine mammal, seabird and fish species. Forage fish species are not included in a target species category. Management measures for the forage fish category will be specified in regulations and may include prohibitions on directed fishing, limitations on allowable bycatch retention amounts, or limitations on the sale, barter, trade or any other commercial exchange, as well as the processing of forage fish in a commercial processing facility.

The forage fish species category would include all species of the following families:

Osmeridae (eulachon, capelin and other smelts),
Myctophidae (lanternfishes),
Bathylagidae (deep-sea smelts),
Ammodytidae (Pacific sand lance),
Trichodontidae (Pacific sand fish),
Pholidae (gunnels),
Stichaeidae (pricklebacks, warbonnets, eelblennys, cockscombs and shannys),
Gonostomatidae (bristlemouths, lightfishes, and anglemouths),
and the Order Euphausiacea (krill).

Analysis: A 59 page EA/RIR (final draft dated January 1998) was prepared for this amendment. Two alternatives including the status quo were considered, along with 4 options for the non-status quo alternative. The options not chosen would have put forage fish in the other species category or the prohibited species category. The alternative chosen protected forage fish by prohibiting a directed fishery and the sale and barter of forage fish. The amendment also reduced waste by allowing retention (up to a maximum retainable bycatch amount as set in regulations) and processing (into fishmeal) those forage fish caught incidentally in groundfish fisheries.

Results: No commercial fishery has been allowed to develop on forage fish in the Exclusive Economic Zone (EEZ) off Alaska.

GOA Amendment 40 Extend Inshore/Offshore Pollock and Pacific Cod Allocations

Dates: The Council adopted Amendment 40 (BSAI Amendment 38) in June 1995. NMFS published a proposed rule to amend the Fishery Management Plan (FMP) for the groundfish of the Bering Sea/Aleutian Islands and the FMP for the groundfish of the Gulf of Alaska on September 18, 1995 (60 FR 48087). The final rule was published on December 12, 1995. Effective date of implementation was January 1, 1996 (60 FR 63654).

Purpose and Need: Amendments 38 and 40 extended the provisions of Amendment 18 to the BSAI FMP and Amendment 23 to the GOA FMP, which expired on December 31, 1995. Amendments 18 and 23 (FR Notice 57(107)23321-23346; June 3, 1992) set inshore and offshore processor allocations of pollock in the BSAI and pollock and Pacific cod in the GOA, respectively, as a response to an early closure in 1989 when several catcher/processors harvested substantial amounts of pollock in the BSAI and GOA and forced an early closure of the GOA pollock fishery. Amendment 18 allocated 35% of the 1992 non-roe pollock season TAC to the inshore sector, and the remainder to the offshore sector. Shortly after, a 35-65% inshore/offshore split was set in a revised amendment for the years 1993-1995. Amendment 23 provided for an allocation of 90% of the Pacific cod TAC and 100% of the pollock TAC to the GOA inshore sector. In addition, the Catcher Vessel Operational Area (CVOA) and the Community Development Quota (CDQ) program in the BSAI were established. The CVOA limited access to pollock within the area to catcher vessels delivering to either inshore or offshore processors. The CDQ program allocated 7.5% of the BSAI pollock TAC to CDQ fisheries.

Amendments 38 and 40 were necessary to extend the inshore/offshore allocations set in Amendments 18 and 23 through December 31, 1998. The purpose of the amendments was to keep the fishery from turning back into the "free-for-all" it represented previously. Since the original inshore/offshore allocation, the Council had been working toward developing a long-term, comprehensive plan for rationalizing all the groundfish and crab fisheries in and off of Alaska. By the end of 1995, when it was evident that the plan would not be ready for implementation before the inshore/offshore allocations expired, the Council determined it was necessary to extend the provisions of Amendments 18 and 23 for an additional three years in order to maintain stability in the industry, facilitate further development of the comprehensive management regime, and allow for the realization of the goals and objectives of the pollock CDQ program.

Regulation Summary: The provisions of BSAI Amendment 18 became the basis of Amendment 38, and the provisions of GOA Amendment 23 became the basis for Amendment 40. Thus, in the BSAI the apportionments of pollock in each subarea and season would be allocated 35% for processing by the inshore sector and 65% by the offshore sector. In the GOA, the apportionment of pollock would be allocated entirely for processing by the inshore sector, and the apportionment of Pacific cod would be allocated 90% for the inshore sector, 10% for the offshore sector.

Analysis: A 268-page EA/RIR/IRFA (final draft dated August 1, 1995) and several appendices were prepared for this amendment. Two alternatives were considered: 1) No action, and 2) continuation of the current program for a period of three additional years (1996-1998), including the pollock CDQ program as an unseverable element of the overall package. The analysis reiterated the Council's intent not to consider alternative inshore/offshore allocation percentages, as that would likely require significant new and complex economic analyses, create unnecessary delays in implementing an allocation scheme, and be inconsistent with the overall intent to develop a more long-term solution through the Comprehensive Management Plan process.

Results: This amendment simply retained the existing inshore/offshore pollock processing allocations for an additional three-year period, through 1998. Stability within and among industry sectors, and associated communities and participants, was maintained by this amendment.

GOA Amendment 41 Establish License Limitation Program

Dates: The Council took final action to recommend Amendment 41 in June 1995. The amendment was adopted with Amendment 39 to the FMP for groundfish of the BSAI and Amendment 5 to the FMP for the Commercial King and Tanner Crab Fisheries in the BSAI. NMFS published a proposed rule on Amendment 41 on August 15, 1997 (62FR43866). NMFS published the final rule on October 1, 1998, with an effective date of January 1, 1999. Following application and appeals, actual implementation occurred January 1, 2000.

Purpose and Need: In 1992, the Council committed to rationalize the groundfish and crab fisheries and begin development of a Comprehensive Rationalization Plan (CRP). The CRP was prompted by concerns that expansion of the domestic harvesting fleet, in excess of that needed to efficiently harvest the optimum yield, was burdening compliance with the Magnuson-Stevens Act and severely deteriorating the economic benefits derived from the crab and groundfish fisheries. The Council examined several management alternatives including license limitation programs, individual fishing quotas (IFQs), and more traditional measures, and determined that a limited entry program had the most potential to address the immediate overcapitalization problems of the industry. As a result, the Council approved the License Limitation Program (LLP) in 1995, recognizing the need for further rationalization in the future development of an IFQ system.

The overall purpose of the LLP is to help resolve the competing and oftentimes conflicting needs of the domestic fisheries that developed under open access and to close the gap between fishing capacity and the available fishery resource. The LLP limits the number, size, and specific operation of vessels fishing crab and groundfish in the BSAI and GOA based on historical participation. During the design and refinement of the LLP, the Vessel Moratorium Program (VMP) was implemented to provide industry stability and curtail interim increases in fishing capacity. The intent was for the LLP to replace the VMP upon implementation

Amendment 39 also expanded the Community Development Quota (CDQ) Program by including in CDQ allocations a percentage of the total allowable catch (TAC) of groundfish and crab species in the BSAI that was not previously included in the existing CDQ programs for pollock, halibut, and sablefish.

Regulation Summary: The final rule limited access to the commercial groundfish fisheries in the BSAI and GOA and commercial crab fisheries in the BSAI, except for demersal shelf rockfish east of 140° W. longitude and sablefish managed under the IFQ program. The rule provided for the following: issuance of a single type of groundfish license; LLP is not applicable to waters of the State of Alaska; licenses would be issued to current owners (as of 6/17/95) of qualified vessels; licenses would be designated as catcher vessel or catcher/processor and with one of three vessel length classes; the crab and groundfish base qualifying period is 1/1/88-6/27/92 and the groundfish area endorsement qualifying period is 1/1/92-6/17/95; endorsement areas are defined as Aleutian Islands, Bering Sea, Western Gulf Central Gulf, and Southeast Outside, or state waters shoreward of those endorsement areas; landing requirements for general license and area endorsement qualifications by vessel class; and additional provisions addressing crossover vessels, transfers, and vessel linkages. The rule also included in CDQ allocations 7.5% of the TAC of groundfish and crab in the BSAI that was not originally included in the CDQ programs for pollock, halibut, and sablefish.

Analysis: A final EA/RIR (dated September 1997) and several supplemental analyses considered the status quo and a general license limitation alternative. Out of a comprehensive list of elements and options the Council considered during the debates on LLP, the analysis identified one option for each component of a license limitation program to create the preferred alternative described above in the final rule. A supporting document also analyzed the differences between the vessel moratorium program and the license limitation program passed by the Council. The vessel moratorium was more liberal in terms of qualification criteria and the areas a vessel could fish. Under the moratorium a vessel was only required to make one landing of a qualifying species between 1/1/88 and 2/9/92, and having met that criteria the moratorium permit holders could fish groundfish in any federal waters off Alaska. Therefore, because the LLP had dual qualification criteria, many fewer vessels were expected to qualify than did for the moratorium.

Continued

Results: The LLP was effective January 1, 2000, thus an evaluation of the program and the final number of license holders is not yet available. The LLP continues to be refined through subsequent amendments. The Council recently approved BSAI Amendment 60, GOA Amendment 58, and BSAI Crab Amendment 10 which amended the LLP to include: a crab recency requirement of one landing during 1/1/96-2/7/98 in addition to the general license and area endorsement qualifications; a requirement that the vessel name is included on the license; license designations for the type of gear authorized to harvest LLP groundfish as either "trawl" or "non-trawl" gear (or both); and a requirement that the vessel itself would be a specific characteristic of the license and could not be severed (i.e., the license could not be used on any other vessel). In addition, Amendment 67 to the BSAI FMP was approved by the Council in April 2000. This amendment requires a Pacific cod species and gear endorsement to fish in the BSAI fixed gear Pacific cod fishery, including recent participation criteria for the period 1995-1999, in addition to the general license and area endorsement qualifications.

GOA Amendment 42 Individual Fishing Quota Vessel Buy Down

Dates: Amendments 42 to the GOA and BSAI FMPs were initiated by the Council in 1995.The proposed rule was published on June 25, 1996 (61 FR 32767) and the final rule, on August 22, 1996 (61 FR 43312). Effective date of implementation was August 16, 1996.

Purpose and Need: During the first year of fishing under the Individual Fishing Quota (IFQ) Program in 1995, IFQ fishermen reported that the prohibition against using or transferring QS across vessel categories limited their ability to improve the profitability of their operations. Many fishermen reported that they had received QS that represented far fewer pounds than their recent catch history prior to the IFQ program. Small boat fishermen reported the scarcity of medium- and large-size QS blocks (≥5,000 lb (2.3 mt)) available to smaller vessels and requested that the Council enable them to purchase shares from QS holders in larger vessel size categories. Also, category B vessel operators reported difficulties in using or marketing small category B blocks and requested the opportunity either to downsize operations or to sell smaller QS blocks to owners of smaller vessels.

Amendment 42 was intended to relieve certain restrictions in the IFQ Program by increasing the flexibility of QS use and transfer while maintaining the management goals of the IFQ Program and to provide small boat fishermen with more opportunities to improve the profitability of their operations.

Regulation Summary: Amendment 42 and a regulatory amendment to the IFQ Program for fixed gear Pacific halibut and sablefish fisheries in and off Alaska allowed QS initially assigned to a larger vessel category to be used on smaller vessels, while continuing to prohibit the use of QS or its associated IFQ assigned to smaller vessel categories on larger vessels. QS will continue to be assigned to vessel categories by existing criteria and will retain original vessel category assignments. However, halibut and sablefish QS and their associated IFQ assigned to vessel Category B can be used on vessels of any size and halibut QS assigned to vessel Category C likewise can be used on vessels of categories C and D. The regulations continue to prohibit the use of QS and IFQ on vessels larger than the maximum length on average (LOA) of the category to which the QS was originally assigned. It does not apply to halibut in IFQ regulatory areas 2C or to sablefish east of 140 °. W. long. Halibut QS assigned to vessel Category B in IFQ regulatory areas 2C and sablefish QS east of 140°W. long. are prohibited from use on vessels less than or equal to 60 ft (18.3 m) LOA except in QS blocks equivalent to less than 5,000 lb (2.3 mt) based on the 1996 Total Allowable Catch (TAC).

Analysis: A 31-page analysis (Secretarial review draft dated August 5, 1996) examined two alternatives to the status quo. The Council ultimately recommended an alternative that included an exemption for Southeast Alaska. Allowing the "buydown" to occur only for category B blocks < 5,000 lb in Southeast still benefits crewmen and small vessel owners who would be able to use small category B blocks on smaller vessels without affecting the market price of category B medium and large blocks and unblocked QS.

Results: Amendment 42 is assumed to have attained its job of increasing the availability of QS to owners of smaller vessels, however, no systematic evaluation has been performed.

GOA Amendment 43 Increase Individual Fishing Quota Sweep Up Levels

Dates: Amendments 43 to the GOA and BSAI FMPs were initiated by the Council in 1995.The proposed rule was published on September 27, 1996 (61 FR 50797) and the final rule, on December 26, 1996 (61 FR 67962). Effective date of implementation was December 20, 1996.

Purpose and Need: This amendment along with a regulatory amendment to effect the same regulatory change for halibut is necessary to increase the consolidation ("sweep-up") levels for small quota share (QS) blocks for Pacific halibut and sablefish managed under the IFQ program. The IFQ longline industry reported that current sweep-up levels do not equal the harvest of a viable fishing trip and proposed a moderate increase in these levels to allow greater amounts of QS to be swept-up into economically "fishable" amounts, without overly increasing consolidation or allowing the creation of large-sized blocks. This action is intended to maintain consistency with the objectives of the IFQ program (i.e., prevent excessive consolidation of QS, maintain diversity of the fishing fleet, and allow new entrants into the fishery), while increasing the program's flexibility by allowing a moderately greater amount of QS to be "swept-up" into larger amounts that can be fished more economically.

Regulation Summary: Amendment 43 would increase the sweep-up levels for small QS blocks for Pacific halibut and sablefish from the current 1,000 lb (0.45 mt) maximum for Pacific halibut and 3,000 lb (1.4 mt) maximum for sablefish to a 3,000 lb (1.4 mt) maximum and a 5,000 lb (2.3 mt) maximum, respectively. Two other changes were recommended to accompany these increases:

a) The base year TAC for determining the pounds would be the 1996, rather than 1994, TAC which was used for the first sweep-up levels;
b) Once QS levels are established for the appropriate regulatory areas based on the 1996 TAC, those QS levels would be fixed and codified. This would eliminate any confusion as to the appropriate sweep-up level in pounds, which would fluctuate with changes in the annual TAC.

Sablefish	Halibut
(i) Southeast Outside district: 33,270 QS	(i) Area 2C: 19,992 QS.
(ii) West Yakutat district: 43,390 QS	(ii) Area 3A: 27,912 QS.
(iii) Central Gulf area: 46,055 QS	(iii) Area 3B: 44,193 QS.
(iv) Western Gulf area: 48,410 QS	(iv) Subarea 4A: 22,947 QS.
(v) Aleutian Islands subarea: 99,210 QS	(v) Subarea 4B: 15,087 QS.
(vi) Bering Sea subarea: 91,275 QS	(vi) Subarea 4C: 30,930 QS.
	(vii) Subarea 4D: 26,082 QS.
	(viii) Subarea 4E: 0 QS

The maximum number of QS units that may be consolidated into a single QS block in each IFQ regulatory area.

Analysis: A 32-page analysis (final review draft dated November 27, 1996) included a range of alternatives of setting the sweep-up level at 1,000, 3,000, and 5,000 lb for halibut and 3,000, 5,000, and 7,000 lb for sablefish. The Council rejected the status quo levels (the lowest) and the highest levels. The analysis concluded that a moderate increase in the sweep-up levels would likely increase the transfer of very small, blocked QS to crew and small boat fishermen who seek to increase their holdings. While some price increases in small block shares might have occurred, a price differential was projected to remain between smaller and larger QS blocks. If the ability to transfer and consolidate small blocks would increase, then the number of unfished blocks would decrease.

At much larger sweep-up levels than currently allowed, the price differential between blocked and unblocked shares was projected to be lost. The effectiveness of the Block Program may be eliminated at large sizes since large blocks and unblocked shares have been reported to sell at roughly the same price and would eliminate entry level QS. Price structure goals of the Block Program would be lost, as well. The differential pricing of larger blocked and unblocked QS would be further exacerbated by the paucity of financing for the IFQ industry at the time, particularly for crew and new entrants without capital or assets.

Results: Relatively few sweep-up transactions occurred in 1995 and 1996 but the number of sweep-up transactions in 1997 increased over previous years and may have been related to the higher sweep-up limits that went into effect in late 1996. In 1998, the number decreased to levels closer to those similar to 1995 and 1996. In total, the number of sweepable blocks declined by 693 for halibut and 151 for sablefish from 1995 through 1998.

GOA Amendment 44 Overfishing Definitions

Dates: GOA Amendment 44 (BSAI Amendment 44) was adopted by the Council in June 1996. The notice of approval for this amendment was published on January 17, 1997 (62 FR 2656). Effective date of implementation was January 9, 1997.

Purpose and Need: In response to the national standards established in the Magnuson Act and advisory guidelines, the Council developed an objective and measurable definition of overfishing and, in 1991, implemented that definition under Amendments 16 (BSAI) and 21 (GOA) to the FMPs. In the years since implementation of that definition, fishery scientists had the opportunity to evaluate the efficacy of these definitions of ABC and overfishing. In light of that experience and with the increased understanding of the reference fishing mortality rates used to define ABCs and overfishing, fishery scientists have raised several concerns about the definitions and the extent to which they reflect and account for levels of uncertainty about fish populations. Consequently, NMFS's Overfishing Definitions Review Panel and the Council's Scientific and Statistical Committee recommended redefining ABC and overfishing to facilitate more conservative, risk-averse management measures when stock size and mortality rates are not fully known. The purpose of this Amendment was to revise the ABC and overfishing definitions to be consistent with these recommendations.

Regulation Summary: Amendment 44 provided for more conservative definitions of ABC and OFL. The fishing mortality rate used to calculate ABC was capped by the overfishing rate. The maximum allowable fishing rates were prescribed through a set of 6 tiers which are listed in descending order of preference, corresponding to descending information availability. These tiers are shown in the adjacent table. Harvest rates used to establish ABCs are reduced at low stock size levels, thereby allowing rebuilding of depleted stocks. If the biomass of any stock falls below Bmsy or $B_{40\%}$ (the long-term average biomass that would be expected under average recruitment and $F=F_{40\%}$), the fishing mortality is reduced relative to stock status. This serves as an implicit rebuilding plan should a stock fall below a reasonable abundance level.

Analysis: A 60-page EA (final draft dated January 6, 1997) was prepared for this amendment. Two alternatives including the status quo were considered. The alternative chosen was more conservative for several reasons. First, the overfishing rate varies with biomass. Second, the ABC fishing rate is reduced when biomass is below levels that produce maximum sustainable yields. Lastly, more caution is incorporated into establishing fishing rates when less information is available; this is particularly true of tier 1.

Results: The amendment resulted in lower (more conservative) ABCs; consequently, total allowable catch levels were reduced for many species. The definitions adopted under Amendment 44 were further revised under Amendment 56.

Tiers used to determine ABC and OFL for BSAI groundfish stocks under Amendment 44.

(1) Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.

1a) Stock status: $B/B_{MSY} > 1$

$F_{OFL} = m_A$, the arithmetic mean of the pdf

$F_{ABC} \le m_H$, the harmonic mean of the pdf

1b) Stock status: $a < B/B_{MSY} \le 1$

$F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$

$F_{ABC} \le m_H \times (B/B_{MSY} - a)/(1 - a)$

1c) Stock status: $B/B_{MSY} \le a$

$F_{OFL} = 0$

$F_{ABC} = 0$

(2) Information available: Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{30\%}$, and $F_{40\%}$.

2a) Stock status: $B/B_{MSY} > 1$

$F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%})$

$F_{ABC} \le F_{MSY}$

2b) Stock status: $a < B/B_{MSY} \le 1$

$F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%}) \times (B/B_{MSY} - a)/(1 - a)$

$F_{ABC} \le F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$

2c) Stock status: $B/B_{MSY} \le a$

$F_{OFL} = 0$

$F_{ABC} = 0$

(3) Information available: Reliable point estimates of B, $B_{40\%}$, $F_{30\%}$, and $F_{40\%}$.

3a) Stock status: $B/B_{40\%} > 1$

$F_{OFL} = F_{30\%}$

$F_{ABC} \le F_{40\%}$

3b) Stock status: $a < B/B_{40\%} \le 1$

$F_{OFL} = F_{30\%} \times (B/B_{40\%} - a)/(1 - a)$

$F_{ABC} \le F_{40\%} \times (B/B_{40\%} - a)/(1 - a)$

3c) Stock status: $B/B_{40\%} \le a$

$F_{OFL} = 0$

$F_{ABC} = 0$

(4) Information available: Reliable point estimates of B, $F_{30\%}$, and $F_{40\%}$.

$F_{OFL} = F_{30\%}$

$F_{ABC} \le F_{40\%}$

(5) Information available: Reliable point estimates of B and natural mortality rate M.

$F_{OFL} = M$

$F_{ABC} \le 0.75 \times M$

(6) Information available: Reliable catch history from 1978 through 1995.

OFL= the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information

$ABC \le 0.75 \times OFL$

GOA Amendment 45 Pollock Trimester Allowances

Dates: Amendment 45 was initiated by the Council in 1995.The notice of approval for this amendment was published on May 31, 1996 (61 FR 27308). Effective date of implementation was May 30, 1996.

Purpose and Need: Since 1990, the TACs specified for pollock in the Western and Central Regulatory Areas have been divided into four equal quarterly allowances, which became available on the 1st of January, June, July, and October. The quarterly allowance system was implemented as part of Amendment 19 to limit excessive harvests of roe-bearing pollock and provide a more stable year-round pollock fishery for GOA-based vessels and processors. In November 1990, NMFS listed the Steller sea lion as threatened under the Endangered Species Act and subsequently approved Amendment 25, which further subdivided the annual TAC specified for pollock in the W/C Regulatory Area into three management districts (Statistical Areas 610, 620, and 630). This action was implemented to avoid a concentration of fishing effort in time and/or space that could cause localized depletions of Steller sea lion prey and exacerbate the decline of Steller sea lions. Its effect was to divide the pollock TACs in the W/C Regulatory Areas into 12 individual allowances (four quarterly openings in each of the three management districts).

In August 1995, GOA pollock industry members submitted a proposal to combine the third and fourth quarterly allowances of pollock TAC into a single seasonal allowance of 50% of the TAC released on September 1, rather than the current quarterly releases of 25% on July 1 and October 1. Representatives of the inshore sector of the Bering Sea pollock fishery requested that the opening date for the combined third and fourth quarter allowance be delayed until October 1 so that Bering Sea-based vessels would have time to finish the Bering Sea non-roe pollock fishery before the start of the final pollock season in the W/C Regulatory Areas.

Several problems were identified with the current quarterly allowance system for pollock in the W/C Regulatory Area:

1) Since 1991, chum salmon bycatch had been approximately 500% higher during the third quarter pollock opening than any other quarter;
2) The third quarter pollock fishery conflicted with summer salmon processing activities;
3) Declining pollock stocks and escalating fishing effort had made the GOA pollock fishery increasingly difficult to manage, especially during the fourth quarter; and
4) Some GOA pollock fishery participants had requested the Council maintain concurrent GOA and Bering Sea pollock seasons to discourage the Bering Sea-based fleet from participating in GOA pollock openings.

Regulation Summary: Amendment 45 authorized seasonal allowances of pollock total allowable catch (TAC) to be specified for the combined Western/Central (W/C) Regulatory Areas of the Gulf of Alaska. The third and fourth quarterly allowances of pollock TAC were combined in the W/C areas into a single seasonal allowance that would be available on September 1. Therefore, the pollock TACs were divided into three seasonal allowances: 25% of TAC available on January 1, 25% of TAC available on June 1, and 50% of TAC available on September 1. This action complemented a regulatory amendment to delay the start of the Bering Sea pollock "B" season from August 15 to September 1 starting in 1996.

Analysis: A 31-page analysis (Secretarial review draft dated January 1998) considered three opening date options for a combined third and fourth quarter allowance; September 1, September 15, and October 1. A coalition of Bering Sea and central Gulf-based processors and vessels submitted a compromise proposal to the Council in January 1996 to establish an October 1 opening date for the Western Gulf Regulatory Area and a September 1 opening date for the Central Gulf Regulatory Area. Western Gulf-based processors and fishermen expressed dissatisfaction with the compromise proposal because an October 1 opening date in the Western Regulatory Area would facilitate entry by Bering Sea-based vessels. However, the Council subsequently recommended that NMFS implement this compromise proposal as the preferred option. The Council believed that an October 1 opening date for the Western Regulatory Area and a September 1 opening date for the Central Regulatory Area would achieve the objectives outlined above while causing the least amount of dislocation for current participants in the fishery. NMFS ultimately implemented a single opening of September 1 for both areas based on additional public comments on the proposed rule. The simultaneous opening was believed to disperse effort, resulting in more manageable fisheries and a more equitable distribution of fishing opportunity.

Results: Amendment 45 was in effect for the1996-98 seasons, after which it was superceded by a regulatory amendment that implemented reasonable and prudent alternatives (RPAs) for Steller sea lions authorized under Amendment 25. The RPAs returned the management regime to quarterly pollock allowances.

GOA Amendment 46 Remove Black and Blue Rockfish from Fishery Management Plan

Dates: The Council adopted Amendment 46 in June 1997. NMFS published the proposed rule (62 FR 63691) on December 2, 1997, and the final rule (63 FR 11167) on March 6, 1998. Effective date of implementation was April 6, 1998.

Purpose and Need: Amendment 46 removed black and blue rockfish from the FMP. The State of Alaska (State) now regulates fishing for these species by vessels registered under Alaska law to provide for more responsive management and prevent localized overfishing of black and blue rockfish stocks. Expansion of a fishery for these species in the central GOA in the mid-1990's was believed to possibly result in unsustainable black and blue rockfish catches.

Two problems with Federal management of black and blue rockfish were identified:

1) The total allowable catch (TAC) for all pelagic shelf rockfish (PSR) species was based on a triennial trawl survey. Survey catches are dominated (93 - 99 percent) by the underexploited dusky rockfish. This led to acceptable harvest levels for the PSR assemblage as a whole, but may be inappropriate for lower black and blue rockfish stocks;
2) The trawl survey only samples fish on or near a smooth bottom. However, most black and blue rockfish occur in rocky nearshore reef habitats that are not sampled by this survey.

Amendment 46 was to implement more responsive, regionally-based, management of these species than is currently possible under the FMP. The intended effect of this action was to:

1) prevent localized overfishing of black and blue rockfish stocks;
2) provide for more responsive State management;
3) repeal duplicative Federal regulations.

Regulation Summary: Amendment 46 removed black and blue rockfishes from the FMP. No additional regulations were promulgated.

Analysis: A 31-page analysis (Secretarial review draft dated January 6, 1998) identified 1,416 catcher vessels that participated in the GOA groundfish fishery in 1996. Of those, 302 vessels, or 21 percent, were presumably affected by the proposed action. Those vessels landed 973,443 lb of black rockfish, most in the directed jig-gear fishery, at an estimated value of $344,000. Removing black and blue rockfish from the PSR TAC was predicted to encourage the development of a small vessel fishery targeting under-exploited black and blue rockfish stocks in the Western and Eastern GOA. At the same time, the State was predicted to more effectively manage potentially overexploited stocks in the Central GOA and increase their long-term yield.

Another alternative to the status quo examined would have kept black and blue rockfishes in the FMP and assigned management authority for them to the State of Alaska. Similar management authority was granted to the State to address similar management problems for demersal shelf rockfish (DSR) in Southeast Alaska under Amendment 14, and clarified under GOA Amendment 21. This alternative was rejected because under delegated authority, the state would need to meet federal requirements that were deemed unwieldy. Further, the state believed it could not meet the costly assessment needs required under a federal plan for the nearshore complex in the near future; though conservation was assured through precautionary management.

Results: Black and blue rockfishes are no longer federally managed.

GOA Amendment 47 Third Party Observer Program (withdrawn)

At the December 1997 meeting the Council was scheduled to take action approving an alternative observer program structure - a Joint Partnership Agreement (JPA) between NMFS and the Pacific States Marine Fisheries Commission (PSMFC), which would have established PSMFC as a third party procurement point for observers. This was being considered as a replacement for the repealed Research Plan (Amendment 30), in an effort to address conflict of interest and other issues in the existing pay-as-you-go program structure. Due to legal concerns of PSMFC this amendment was not approved by the Council and was never forwarded for Secretarial review. Instead, the existing pay-as-you-go program was extended for an additional time period, through year 2000. Currently, NMFS and Council staff are working on revised program structure alternatives, including a fee-based plan, and the current program has been extended.

GOA Amendment 48 Total Allowable Catch Streamlining

Dates: Amendment 48 was approved by the Council in October 2003, but has not been formally submitted for Secretarial review.

Purpose and Need: The Council and NMFS acknowledged the need to revise the existing TAC specification process to meet the following objectives:

1) manage fisheries based on the best available information;
2) make adjustments to TAC amounts to respond to new information or conservation concerns;
3) comply with NEPA, ESA, and RFA provisions while minimizing unnecessary disruption to fisheries;
4) provide adequate opportunity for public review and comment on new information leading to annual TAC recommendations; and
5) promote administrative efficiency while minimizing public confusion regarding proposed and interim specifications.

Regulation Summary: The preferred alternative adopted by the Council is to establish harvest specifications for 18 months (Year 1 and first half of Year 2) for BSAI and GOA groundfish. For setting pot and hook-and-line sablefish specificaitons, the Council recommended a modified rulemaking process. If a second proposed rulemaking is required for the final specifications, the pot and hook-and-line sablefish specifications would be issued by final rulemaking. A second proposed rule may be needed for the final specifications if they are not a logical outgrowth from the proposed rule. Biennial harvest specifications will be set for certain long-lived GOA target species/complexes that are surveyed biennially. Also, the amendment deleted references to foreign fisheries in the FMPs, and updated descriptions of the fisheries.

Analysis: A 188-page analysis (public review draft dated September 2003) was prepared for this amendment. 5 alternative were considered: 1) no action, 2) eliminate publication of interim specifications, and issue proposed and final specifications prior to the start of the fishing year, 3) issue proposed and final harvest specifications based on an alternate fishing year schedule, 4) use stock assessment projections for biennial harvest specifications, for the BSAI and GOA set the annual harvest specifications based on the most recent stock assessment and set harvest specifications for the following year based on projected OFL and ABC values, 5) 18 month harvest specifications with December rulemaking decision. Three stand-alone options were also considered, A) abolish TAC reserves; B) update portions of the FMP, and C) set biennial harvest specifications for long-lived GOA target species/complexes. The Council chose alternative 5 as its preferred alternative, and adopted options B and C.

Results: The BSAI and GOA Plan Teams first proposed streamlining the groundfish specifications process in 1996. The Council initiated Amendments 48 to the BSAI and GOA FMPs in December 1996 to address administrative and public notice issues. The Council's preferred action to rollover harvest specifications from one year to the next was approved in June 1998. ABCs, TACs, and PSC amounts would remain unchanged from year to year until revised in a final rule. In July 1999, the NMFS Regional Administrator notified the Council that the Council's preferred alternative was not in compliance with the National Environmental Policy Act, the Administrative Procedures Act, and the Regulatory Flexibility Act. The revised amendment has not yet been implemented.

GOA Amendment 49 Improved Retention / Improved Utilization Program

Dates: GOA Amendment 49 was adopted by the Council in June 1997, mirroring its September 1996 action under BSAI Amendment 49. The notice of approval for this amendment was published on December 3, 1997 (62 FR 65379). Effective date of implementation was January 12, 1998.

Purpose and Need: To reduce discards, the Council adopted an improved retention and utilization program (IR/IU) for all groundfish target fisheries. The Council's objective for Gulf of Alaska groundfish fisheries centers on the same basic concern that motivated an IR/IU program in the BSAI groundfish fisheries; that is, economic discards of groundfish catch are at unacceptably high levels. An IR/IU program for the GOA would be expected to provide incentives for fishermen to avoid unwanted catch, increase utilization of fish that are taken, and reduce overall discards of whole fish, consistent with current Magnuson-Stevens Act provisions. In addition, the Council recognizes the potential risk of preemption of certain existing GOA groundfish fisheries which could occur in response to economic incentives displacing capacity and effort from BSAI IR/IU fisheries. This risk can be minimized if substantially equivalent IR/IU regulations are simultaneously implemented for the GOA.

The IR/IU program was intended to improve utilization and effective control/reduction of bycatch and discards in the fisheries off Alaska to address the following problems:

1) bycatch and discard loss of groundfish, crab, herring, salmon, and other non-target species;
2) economic loss and waste associated with the discard mortality of target species harvested but not retained for economic reasons;
3) inability to provide for a long-term, stable fisheries-based economy due to loss of fishery resources through wasteful fishing practices;
4) the need to promote improved retention and utilization of fish resources by reducing waste of target groundfish species to achieve long-term sustainable economic benefits to the nation.

Regulation Summary: Amendment 49 requires all vessels fishing for groundfish in the Gulf of Alaska to retain all pollock and Pacific cod beginning January 1, 1998, and all shallow water flatfish beginning January 1, 2003. It established a 15-percent minimum utilization standard for all at-sea processors.

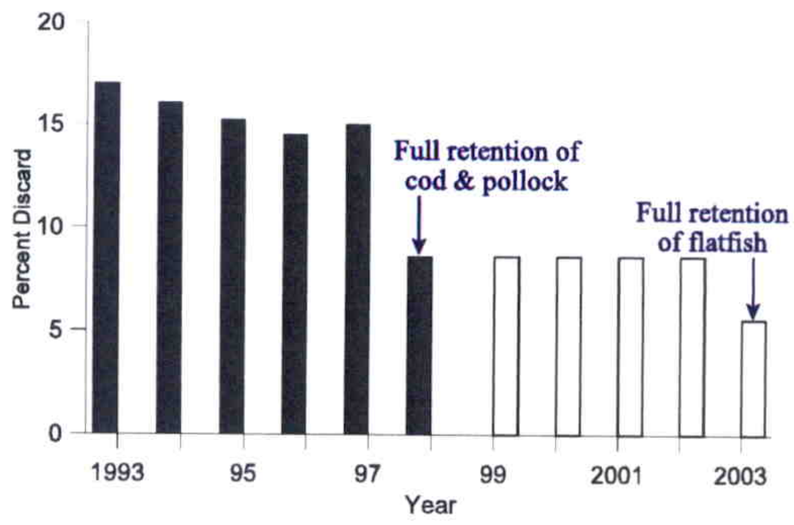
Analysis: A 130-page analysis (Secretarial review draft dated October 1997) reviewed a variety of bycatch reduction plans that had been discussed by the Council since 1993. While other alternatives were discussed, primary focus was given to these three alternative programs:

1) individual fishing quotas for groundfish species;
2) a "Harvest Priority" program that would provide for quota set-asides for vessels exhibiting low bycatch rates of non-target species;
3) retention and utilization mandates, with built-in incentives for fishing operations to avoid catch of unwanted species.

The analysis determined that pollock, Pacific cod, and shallow water flatfish represent approximately 33 percent of the total discards of allocated groundfish in the GOA groundfish fisheries. The Council concluded that by requiring 100 percent retention of these four species, initially pollock and Pacific cod, and subsequently yellowfin and rock sole, the Council's objective of "substantially reducing discards of unprocessed groundfish" in these fisheries could be achieved.

Results: Beginning in 1998, 100% retention of pollock and Pacific cod was required, regardless of how or where it was caught. Only fish not fit for human consumption can be legally discarded. This measure has dramatically reduced overall discard of groundfish.

Gulf of Alaska shallow water flatfish retention will be required beginning in 2003; the delay will allow for development of new markets and gear technological responses by the vessels engaged in these fisheries. These retention requirements are expected to reduce overall discard rates (all species) to about 5%.



Total discard rates of Alaska groundfish, all areas and species combined, 1993-1998, projections through 2003.

GOA Amendment 50 Halibut Donation Program

Dates: The Council first considered a halibut donation program to allow limited retention of halibut for donation to needy individuals in January 1993. Administrative difficulties were addressed in designing such a program, and Amendments 50 to the GOA and BSAI FMPs were adopted in April 1997. It expanded the existing Salmon Donation Program (SDP) to create a Prohibited Species Donation (PSD) program that would include halibut as well as salmon. The effective date of implementation was July 13, 1998 (63 FR 32144; June 12, 1998). This rule was effective only for a 3-year period ending December 31, 2000, to allow the Council to assess its success. In June 2000 the Council extended the program for 3 years with a review, but no sunset.

Purpose and Need: Approximately 6,500 metric tons of halibut were taken incidentally to the Alaska groundfish fisheries during 1999. Vessels participating in these fisheries typically use trawl, hook-and-line, or pot gear, with trawl gear accounting for most of the groundfish catch and halibut bycatch.

The Council discourages the discard of incidental catches of fish as wasteful. Managing halibut incidentally caught in the groundfish fisheries as a prohibited species is an appropriate short term bycatch measure. Except as provided under the prohibited species donation program, retention of prohibited species captured while harvesting groundfish is prohibited to prevent covert targeting on these species. The prohibition removes the incentive that groundfish fishermen might otherwise have to target on the relatively high valued prohibited species, and thereby, results in a lower incidental catch. It also eliminates the market competition that might otherwise exist between domestic halibut fishermen and groundfish fishermen who might land halibut in the absence of the prohibition.

The Council's intent was to:

1. reduce regulatory discards and protein waste in the groundfish trawl fisheries;
2. provide additional opportunity to collect biological samples or scientific data;
3. support an industry initiative to reduce regulatory discards and provide a healthy alternative to the diets of people who often only have access to meager and inadequate food.

The action endorsed a policy of reducing unnecessary discard of dead, but wholesome, fish and in doing so provide public benefit by allowing fish that would otherwise be discarded to be retained for processing and delivery to food bank organizations. Any costs associated with this recommended action would be borne by the voluntarily participating shoreside processors and the NMFS authorized distributor.

Regulation Summary: This action authorized the voluntary donation of Pacific halibut taken as bycatch in specified groundfish trawl fisheries off Alaska to economically disadvantaged individuals. Under the prohibited species donation program, NMFS expanded the existing salmon donation program to also authorize distribution by tax-exempt organizations through a NMFS-authorized distributor. The program is limited to dead halibut by trawl catcher vessels and delivered to shoreside processors.

Analysis: A 20-page analysis (Secretarial review draft dated September 12, 1997) determined that no changes in fishing activities in a manner that would affect the amount of groundfish harvested nor the amount of halibut taken as bycatch in the Alaska trawl fisheries was expected by the preferred alternative. In general, no information exists to indicate that the current level of halibut bycatch landed at shoreside processing sites in the Alaska trawl fisheries presents critical conservation issues. The total burden to processors resulting from the preferred alternative could not be estimated because participation would be voluntary; however, based on information acquired through the SDP, costs were estimated at approximately 20 cents per pound for donated halibut.

Results: Waste of salmon and halibut has been reduced by allowing bycatch to be donated to food banks. The food banks in turn distribute the fish to needy people in the northwestern United States. Many fishing companies voluntarily participate in the donation program. Through 1998, over 3 million pounds of donated salmon have produced an estimated 12 million meals for needy persons. To date, two plants in Dutch Harbor have donated halibut. Although limited to no more than 50,000 lb, the actual donated amount was 21,196 lb in 1998 and 4,476 lb in 1999. Inconsistency in reporting and enforcement may have led to the decline in participation in 1999.

GOA Amendment 51 Extend Inshore/Offshore Pollock and Pacific Cod Allocations

Dates: The Council approved Amendment 51 in June 1998, and NMFS published a proposed rule for Amendments 51/51 to the GOA and BSAI FMPs on October 29, 1998 (63 FR 57996). The final rule was published on January 25, 1999. Effective date of implementation was January 20, 1999 (64 FR 3653).

Purpose and Need: The TACs for pollock in the BSAI and for pollock and Pacific cod in the GOA have been allocated between the inshore and offshore components of the groundfish fisheries since 1992. Amendments 51/51 were proposed to extend the provisions of Amendment 38 to the BSAI FMP and Amendment 40 to the GOA FMP, which expired on December 31, 1998. Amendments 38 and 40 previously extended BSAI Amendment 18 and GOA Amendment 23, respectively. The original amendments set processor allocations of the pollock TAC in the BSAI and pollock and Pacific cod processor allocations in the GOA, as a response to an early closure in 1989 when several catcher/processors harvested substantial amounts of pollock in the BSAI and GOA and forced an early closure of the GOA pollock fishery. The amendments allocated 35% to the inshore and 65% to the offshore processing sector of the BSAI pollock fishery, and allocated 90% of the cod and 100% of the pollock to the inshore processing sector in the GOA. The Catcher Vessel Operational Area (CVOA) and the Community Development Quota (CDQ) program were also established. The CVOA limited access to pollock within the area to catcher vessels delivering to either inshore or offshore processors. The CDQ program allocated 7.5% of the BSAI pollock TAC to CDQ fisheries.

At its meeting in June 1998, the Council took final action to adopt Amendments 51/51 to the FMPs. By proposing these FMP amendments, the Council intended to change the inshore/offshore allocations in the BSAI but continue the existing allocations in the GOA. However, on October 21, 1998, the President signed the American Fisheries Act (AFA) into law (Pub. L. 105-277). The AFA, among other things, allocated the BSAI pollock TACs differently than the Council had recommended. The Council held a special meeting November 10-13, 1998, in part to discuss the effects of AFA on its inshore/offshore proposal and other management programs. In light of the AFA, the Council recommended specific changes to its Amendment 51/51 proposal, and on December 15, 1998, NMFS partially approved BSAI Amendment 51 and fully approved GOA Amendment 51. The decision not to approve parts of BSAI Amendment 51 is consistent with the Council's intent for achieving consistency with the AFA as expressed at its meeting in November 1998.

Regulation Summary: As adopted by the Council in June 1998, this amendment reestablishes, without change, the current inshore/offshore allocation regime in the GOA through December 31, 2001. The amendment maintains the current allocation: 100% of the pollock TAC to the inshore component, and 90% of the Pacific cod TAC to the inshore component and 10% to the offshore component.

Analysis: A 299-page EA/RIR/IRFA (final draft dated December 9, 1998) was prepared for Amendment 51/51. Five alternatives were considered, including: the no action alternative; a rollover of the existing inshore/offshore program; several options to revise the BSAI pollock processing inshore/offshore percentages; a set-aside for catcher vessels less than 125' length overall; and a set-aside for catcher vessels less than 155' length overall. The Council's preferred alterative was to allocate 39% of the BSAI pollock TAC inshore and 61% offshore (after CDQs are deducted from the BSAI TAC), and to maintain the current GOA allocations of 90% Pacific cod and 100% pollock to the inshore sector. With the passage of the AFA, however, the portions of the amendment stipulating BSAI pollock allocations became immaterial, thus only the GOA portions of the amendment and the provisions relevant to the CVOA were approved.

Results: This amendment continued the pollock and cod allocations in the Gulf as they were established in 1992. Industry sector and community stability have been maintained through the approval of this amendment. See Amendment 61/62 which further extends the GOA allocation through 2004, to be consistent with the duration of the BSAI allocations under the AFA.

GOA Amendment 52 Vessel Registration Program (tabled)

Dates: The Council initiated an analysis of two complementary management actions in GOA Amendment 52 in December 1997 and approved it in February 1998. GOA and BSAI Plan amendments 52 authorized NMFS to establish a vessel registration program for "at risk" fisheries that met certain criteria. They were tabled because of changes in the fisheries as a result of the American Fisheries Act and Amendment 61. Only a regulatory amendment for a stand-down for trawl vessels transiting between the BSAI and GOA was submitted to the Secretary and approved. Effective date of implementation for the stand-down was September 8, 1998. (63 FR 48641; September 11, 1998.)

Purpose and Need: Management of the inshore pollock and Pacific cod fisheries of the Western and Central (W/C) Regulatory Area of the Gulf of Alaska (GOA) has become increasingly difficult. The risk of harvest overruns has grown due to TAC amounts that are small relative to the potential fishing effort. The problem has been most acute in the Western Regulatory Area due to the constant potential pressure that numerous large catcher vessels based in the Bering Sea (BS) could cross into the GOA to participate in pollock and Pacific cod openings that have relatively small TACs. NMFS currently lacks a pre-season vessel registration program that could gauge potential effort in these fisheries prior to openings, and inseason catch information in these fisheries is neither timely nor accurate enough to allow adequate management.

The objective of Amendment 52 is to create a vessel registration program to require vessels to announce their participation in either the BSAI or GOA pollock and Pacific cod fisheries before the fishery commenced. This action is necessary to prevent unexpected shifts of fishing effort between BSAI and GOA fisheries that can lead to overharvesting the total allowable catch (TAC) in the Western and Central Regulatory Areas of the GOA.

Regulation Summary: Under a vessel registration program, NMFS would establish criteria to determine which fisheries would require registration. Based on these criteria, NMFS would create a roster of "registration fisheries" that would be announced at the beginning of each year and supplemented as necessary on an inseason basis throughout the year. Criteria for establishing a registration requirement for a fishery could include:

(1) the size of the TAC amount or PSC limit specified for the fishery relative to the degree of interest in that fishery,
(2) a fishery for which the TAC or PSC limit was exceeded by a significant amount in the previous year and the current year's quota and expected effort are similar,
(3) a fishery for which the above two criteria may not apply but an expanded interest has developed inseason, and
(4) a "mop-up" fishery.

Vessel operators would be required to register with NMFS a certain number of days before beginning directed fishing in a registration fishery and penalties would be established for non-compliance.

Analysis: A 25-page EA/RIR/IRFA (public review draft dated January 1998) was prepared for this amendment. Two complementary management actions were considered by the Council, in addition to the status quo alternative. The analysis concluded that the fleet as a whole would benefit if NMFS is able to manage "at risk" fisheries so that quotas are more fully harvested and the overhead costs associated with re-crewing and transiting to the fishing grounds for short term "mop-up" openings could be avoided. A registration requirement would reduce the flexibility of vessel operators to enter and leave fisheries at will. In some cases, this could pose costs for certain operations if they realize mid-course that they would prefer to be participating in a short term fishery for which they have not registered. Nevertheless, while a registration requirement for certain "at risk" fisheries will increase the constraints on the fleet, it will serve to increase the ability of NMFS to manage such fisheries to obtain optimum yield and provide the greatest net benefit to the nation.

Results: Due to higher priorities, the vessel registration program was not developed by NMFS. As a result of the American Fisheries Act of 1998, the structure of the pollock fisheries in the BSAI has been significantly altered, obviating the need for the vessel registration program as originally envisioned by the Council. A broader vessel registration program in conjunction with electronic reporting requirements may be developed in the future.

GOA Amendment 53 Full Retention of Demersal Shelf Rockfish (not submitted)

NOT SUBMITTED - The Council prepared an analysis to require full retention of demersal shelf rockfish in the GOA. This action has been implemented by regulatory amendment.

GOA Amendment 54 Individual Fishing Quota Indirect Ownership and Use Caps

Dates: The Council approved Amendments 54/54 to the GOA and BSAI FMPs in October 1998. The final rule implementing this action was issued April 29, 2002 (67 FR 20915). Effective date of implementation was May 29, 2002.

Purpose and Need: During the 1995-97 IFQ seasons, NMFS broadly interpreted the FMP and regulatory language to allow persons holding initial allocation QS to hire skippers to fish their IFQ on vessels owned by other "persons," provided that the QS holder could show a corporate association to the owner of the vessel. This policy allows individual QS holders to hire skippers to fish their IFQ on vessels owned by corporations or partnerships in which the individual QS holders are shareholders or partners. The policy also allows corporations or partnerships holding QS to fish the collectively held QS on a vessel owned by individuals who are shareholders or partners in the corporation or partnership. At the beginning of the 1997 IFQ season, NMFS announced to the IFQ fleet that this policy of broadly interpreting the term "person" as it pertains to IFQ hired skipper provisions would continue until the Council could clarify its original intent. Two other clarifying FMP language changes were also included in this action.

Three actions proposed for this plan amendment are:

(1) Revise the FMP to allow a QS holder's association to a vessel owner, through corporate or other collective ties, to substitute for the QS holder's vessel ownership *per se* for purposes of hiring a skipper to fish the QS holder's IFQ. (This document analyzes a proposal to revise the current FMP language and pertinent regulations to authorize a QS holder's indirect vessel ownership, through corporate or other collective ties, to serve as a substitute for direct vessel ownership *per se* for purposes of the IFQ program's hired skipper provisions.)

(2) Revise the definition of "a change in the corporation or partnership" in the FMPs to include language specific to estates. Estates are included under the definition of the term "Person" in the FMPs and 50 CFR 679.2 as "corporations, partnerships, associations, or other entities." The FMPs and IFQ implementing regulations require that upon any change in a corporation, partnership, or other entity that holds QS the QS transfer to a qualified individual. A "change" in a corporation, partnership, or other entity is defined as the addition of a shareholder or partner to the corporation, partnership, or collective entity. This definition is not applicable to estates, because estates are not collective entities which may acquire additional shareholders, partners, or members. Nevertheless, because an estate's QS would not automatically transfer to an heir once the estate is probated, the FMPs and IFQ regulations need to define the point at which estates must transfer their QS to a qualified individual.

(3) Change sablefish use limits from percentages of the total number of QS units in the QS pool for each area to a specific number of QS units. In June 1996, the Council approved a regulatory amendment to increase the Bering Sea (Area 4) halibut use caps from ½ percent to the QS equivalents of 1 ½ percent based on 1996 QS pools. This amendment also revised the halibut use limits to be expressed as a fixed number of QS units rather than as a percentage, in order to provide QS holders with a more stable reference for measuring their holdings against area use caps. Sablefish IFQ use limits are set in the FMPs. Consequently, the regulatory change to the halibut use limits could not at the same time change the calculation of sablefish use limits to a fixed number of QS units for consistency. This FMP amendment would effect that revision to calculate the sablefish in QS units based on the appropriate percentage of the 1996 QS pools. This change would standardize the application of use caps for both halibut and sablefish fisheries and would provide the same level of predictability for sablefish QS holdings as currently exists for halibut QS.

Analysis: A 20-page EA/RIR/IRFA (Secretarial Review draft dated January 2001) was prepared for this amendment. Three separate management actions were considered. One status quo and one proposed alternative were considered for each action.

Results: The amendment was implemented in 2002.

GOA Amendment 55 Define Essential Fish Habitat

Dates: NMFS published EFH guidelines as interim final rule on December 19, 1997 (62 FR 66531). GOA and BSAI Amendments 55/55 were adopted by the Council in June 1998 along with EFH amendments for other FMPs (groundfish, salmon, scallops, crab). The final rule was published on April 26, 1999 (64 FR 20216). Effective date of implementation was January 20, 1999.

Purpose and Need: The Magnuson -Stevens Act was amended in 1996 by the Sustainable Fisheries Act. The new Act mandated that any FMP must include a provision to describe and identify essential fish habitat (EFH) for the fishery, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat. Essential fish habitat has been broadly defined by the Act to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". All eight regional Councils are required to amend their fishery management plans by October 1998 to:

- identify and describe EFH for species managed under a fishery management plan;
- describe adverse impacts to that habitat from fishing activities and non-fishing activities;
- recommend conservation and enhancement measures necessary to help minimize impacts, protect, and restore that habitat; and
- include conservation and enhancement measures necessary to minimize to the extent practicable, adverse impacts from fishing on EFH.

The purpose of this amendment is to provide for improved long-term productivity of the fisheries, to allow NMFS and the Council to be more proactive in protecting habitat areas, and by alerting other federal and state agencies about areas of concern. Federal agencies engaging in activities that may adversely affect EFH must consult with NMFS regarding those activities. NMFS must, and the Council may, make suggestions on how to mitigate any potential habitat damage. The Council will be required to comment on any project that may adversely affect salmon habitat or habitat of any other anadromous fish (smelt, steelhead, etc.).

Regulation Summary: The alternative adopted and approved defined EFH as all habitat within a general distribution for a species life stage, for all information levels and under all stock conditions. A general distribution area is a subset of a species range. For any species listed under the Endangered Species Act, EFH includes all areas identified as "critical habitat". EFH was described in text, tables, and maps. Habitat areas of particular concern were identified as living substrates in shallow and deep waters, and freshwater habitats used by anadromous fish.

Analysis: A 364-page EA (final draft dated January 1999) and a background assessment report were prepared for this amendment. Three alternatives including the status quo were considered. The other alternative that was not chosen would have defined EFH only as areas of high concentration for each life stage. The alternative chosen was more conservative in that defining a larger area may offer more protection.

Results: Since the amendment was approved, NMFS has been sued by a coalition of plaintiffs (Earthjustice Legal Defense Fund, Center for Marine Conservation, National Audubon Society, and others) who allege that the EFH amendment failed to meet statutory requirements (did not analyze the effects of fishing on habitat, and did not impose practicable measures to minimize impacts of fishing gear) and violated NEPA. The Council and the Agency are currently preparing an Essential Fish Habitat EIS to address these concerns.

In February 2000, the Council reviewed the first draft analysis for management measures that would identify additional Habitat Areas of Particular Concern (HAPC) types and areas, and take additional measures to protect HAPC from potential effects caused by fishing activities. Alternative management actions that were considered included making HAPC biota (e.g., mussels, kelp, sponges) a prohibited species, and prohibiting bottom fishing in areas shown to have concentrations of Gorgonian coral, which have been shown to be long lived (500 yrs), vulnerable to fishing gear, and important habitat for rockfish. Based on public testimony, and input from its advisory committees, the Council voted to split the amendment and associated analysis into two parts. Part one on which for final action in April 2000, would prohibit commercial harvest and sale of HAPC biota, specifically sponges and coral. Part two of the HAPC amendments, which will require a longer time line, will be to develop a more comprehensive and iterative process for HAPC identification and habitat protection involving researchers, stakeholders, and management agencies.

GOA Amendment 56 Revised Overfishing Definitions

Dates: GOA Amendment 56 (BSAI Amendment 56) was adopted by the Council in June 1998. The notice of approval for this amendment was published on March 8, 1999 (64 FR 10952). Effective date of implementation was January 27, 1999.

Purpose and Need: The 1996 amendments to the Magnuson-Stevens Act defined the terms "overfishing" and "overfished" to mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield (MSY) on a continuing basis. Additionally, it requires that all FMPs specify objective and measurable criteria for identifying when the fishery is overfished and, in the case of a fishery which is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing and rebuild the fishery. The Magnuson-Stevens Act further required regional fishery management councils to submit amendments, by October 11, 1998, that would bring fishery management plans into compliance.

The Magnuson-Stevens Act and the revised guidelines indicate that MSY, treated as a target strategy under the current FMP definition of overfishing, should represent a limit rather than a target. This means that "limit" harvest strategies (such as the rules used to specify overfishing levels [OFL]) should result in a long-term average catch that approximates MSY, and that "target" harvest strategies (such as the rules used to specify ABC) should result in catches that are substantially more conservative than the limit. Because tiers 2-4 of the current FMP definition could be interpreted as treating MSY as a target rather than as a limit, Amendment 56 revised tiers 2-4 by changing the default fishing mortality rate value from $F_{30\%}$ to the more conservative estimate of $F_{35\%}$.

Regulation Summary: Amendment 56 revised the ABC and overfishing definitions set under Amendment 44 to be more precautionary. Like Amendment 44, the maximum allowable rates are prescribed through a set of six tiers which are listed below in descending order of preference, corresponding to descending order of information availability. For most tiers, ABC is based on $F_{40\%}$, which is the fishing mortality rate associated with an equilibrium level of spawning per recruit (SPR) equal to *40%* of the equilibrium level of spawning per recruit in the absence of any fishing. To further minimize the possibility of catches jeopardizing a stock's long term productivity, there is a buffer established between ABC and OFL. Amendment 56 modified the OFL definition from $F_{30\%}$ to $F_{35\%}$ for stocks having tiers 2-4 information.

Analysis: A 24-page EA (final draft dated June 23, 1998) was prepared for this amendment. Two alternatives including the status quo were considered. The alternative chosen was more conservative in that it consistently treats MSY as a limit rather than a target.

Tiers used to determine ABC and OFL for BSAI groundfish stocks under Amendment 56.

(1) Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.

1a) *Stock status:* $B/B_{MSY} > 1$
$F_{OFL} = m_A$, the arithmetic mean of the pdf
$F_{ABC} \le m_H$, the harmonic mean of the pdf

1b) *Stock status:* $a < B/B_{MSY} \le 1$
$F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le m_H \times (B/B_{MSY} - a)/(1 - a)$

1c) *Stock status:* $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(2) *Information available: Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{30\%}$, and $F_{40\%}$.*

2a) *Stock status:* $B/B_{MSY} > 1$
$F_{OFL} = F_{MSY}$
$F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%})$

2b) *Stock status:* $a < B/B_{MSY} \le 1$
$F_{OFL} = F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$
$F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - a)/(1 - a)$

2c) *Stock status:* $B/B_{MSY} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(3) *Information available: Reliable point estimates of B, $B_{40\%}$, $F_{30\%}$, and $F_{40\%}$.*

3a) *Stock status:* $B/B_{40\%} > 1$
$F_{OFL} = F_{35\%}$
$F_{ABC} \le F_{40\%}$

3b) *Stock status:* $a < B/B_{40\%} \le 1$
$F_{OFL} = F_{35\%} \times (B/B_{40\%} - a)/(1 - a)$
$F_{ABC} \le F_{40\%} \times (B/B_{40\%} - a)/(1 - a)$

3c) *Stock status:* $B/B_{40\%} \le a$
$F_{OFL} = 0$
$F_{ABC} = 0$

(4) *Information available: Reliable point estimates of B, $F_{30\%}$, and $F_{40\%}$.*
$F_{OFL} = F_{35\%}$
$F_{ABC} \le F_{40\%}$

(5) *Information available: Reliable point estimates of B and natural mortality rate M.*
$F_{OFL} = M$
$F_{ABC} \le 0.75 \times M$

(6) *Information available: Reliable catch history from 1978 through 1995.*
OFL= the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information
ABC ≤ 0.75 × OFL

Results: These definitions are currently being used in the annual quota specifications process.

GOA Amendment 57 Moratorium Extensions

Dates: Amendments 57 to the GOA FMP,, 59 to the BSAI FMP, and and Amendment 9 to the Crab FMP were approved jointly by the Council in June 1998. On November 13, 1998, NMFS published the proposed rule for GOA Amendment 57, BSAI Amendment 59, and Crab Amendment 9 (63 FR 63442). The final rule was published on January 25, 1999 (64 FR 3651). Effective date of implementation was January 19, 1999.

Purpose and Need: In 1987, concerned with excess harvesting capacity in the groundfish, crab, and halibut fisheries of the BSAI and GOA, the Council established a committee to examine the problem of overcapitalization. Upon conclusion that allocation conflicts and overcapitalization would worsen under the current open access system, the committee recommended a limited access management approach for these three fisheries. Concerned with the potential for speculative entry into the fisheries during discussions of management alternatives, the Council adopted Amendment 23 to the BSAI FMP and Amendment 28 to the GOA FMP, which required a moratorium permit for vessels within specific vessel categories that harvest groundfish and BSAI crab resources off Alaska. Generally, a vessel qualified for a moratorium permit if it made a legal landing of any moratorium species during the qualifying period of January 1, 1988, through February 9, 1992.

The purpose of Amendments 23 and 28 was to provide for an interim measure to slow significant increases in the harvesting capacity of the groundfish and crab fishing fleets until additional measures, such as the License Limitation Program (LLP) could be implemented. The LLP is part of a developing Comprehensive Rationalization Plan intended to resolve the overall issue of overcapitalization on a long-term basis, and transition the fisheries from an open access management system to a more market-based, limited access system. Without a moratorium, the Council feared that potentially unlimited new entry into the fishery would exacerbate overcapitalization and hinder the ultimate development of a successful Comprehensive Rationalization Plan.

The original amendments instituting the moratorium (Vessel Moratorium Program) were scheduled to expire on December 31, 1998. The License Limitation Program, intended to replace the Vessel Moratorium Program , would not be in effect until January 1, 2000. Therefore, regulatory action was necessary to extend the moratorium in order to eliminate the one year lag time between the expiration of the moratorium and the beginning of the LLP.

Regulation Summary: The final rule simply extended the Vessel Moratorium Program and the existing moratorium permits through December 31, 1999. The regulation also provided that no person could apply for a new moratorium permit after the original moratorium program expiration date of December 31, 1998, unless the application was based on a moratorium qualification that was used as a basis for obtaining a moratorium permit issued on or before that date.

Analysis: A 10-page RIR (final draft dated August 1998) was prepared for Amendments 59, 57, and 9. Two alternatives were considered: 1) allowing the Vessel Moratorium Program to expire (no action alternative), and 2) extending the program for one year. The analysis determined that although all of the impacts of a one-year lapse between the moratorium program and the LLP were not known, one potentially significant impact could be speculative entry into the affected fisheries by persons who would not qualify to fish under the moratorium program or the LLP. Because allowing new entry would exacerbate overcapitalization and the race for fish, the analysis determined that the no action alternative was inconsistent with the overall intent of comprehensive rationalization. The preferred alternative extended the moratorium for one year, allowing time for NMFS to complete the design and implementation of the LLP.

Results: As anticipated, the LLP to limit entry into the groundfish and crab fisheries off of Alaska went into effect January 1, 2000, effectively replacing the Vessel Moratorium Program (The authorization for the LLP is contained in BSAI Amendment 60/GOA Amendment 58/BSAI Crab Amendment 10). For general licenses, the base qualifying period established was January 1, 1988, through June 27, 1992, approximately four months longer than the moratorium qualification period, in order to be consistent with the Council's published cutoff date for qualification under the Comprehensive Rationalization Plan. The LLP also required an area endorsement for the BS, AI or the GOA, to provide for present participation in the fisheries (the qualifying period being January 1, 1992 through June 17, 1995). The moratorium established by Amendments 23 and 28 and extended by Amendments 59, 57, and 9 limited speculative entry into the fisheries while the LLP was being developed and approved, and kept the overcapitalization situation from worsening.

GOA Amendment 58 Adjustments to License Limitation Program

Dates: This amendment was approved by the Council in October 1998. The final rule implementing the amendment was published in 2001.

Purpose and Need: Following the approval of the original LLP program, industry members requested that the Council revise several of the provisions and qualification criteria, including adding a recent participation criteria for crab. BSAI Amendment 60, GOA Amendment 58, and BSAI Crab Amendment 10 encompass a package of changes focusing primarily on further capacity reductions and transferability restrictions, to tighten up the License Limitation Program before implementation.

Regulation Summary: Five changes were adopted and approved under these amendments: 1) a requirement that the vessel itself would be a specific characteristic of the license and could not be severed (i.e., the license could not be used on any other vessel); 2) license designations for the type of gear authorized to harvest LLP groundfish as either "trawl" or "non-trawl" gear (or both); 3) recision of the Community Development Quota (CDQ) exemption and thus the requirement that CDQ vessels hold a crab or groundfish license; 4) the addition of a crab recency requirement which requires one landing during 1/1/96-2/7/98 in addition to the general license and area endorsement qualifications; and 5) allowance of limited processing (1 mt) for vessels <60' LOA with catcher vessel designations. The most significant addition under these amendments was the recent participation requirement of at least one landing in the king and Tanner crab fisheries between January 1, 1996 and February 7, 1998, which applied only to the base qualifying period under the crab LLP.

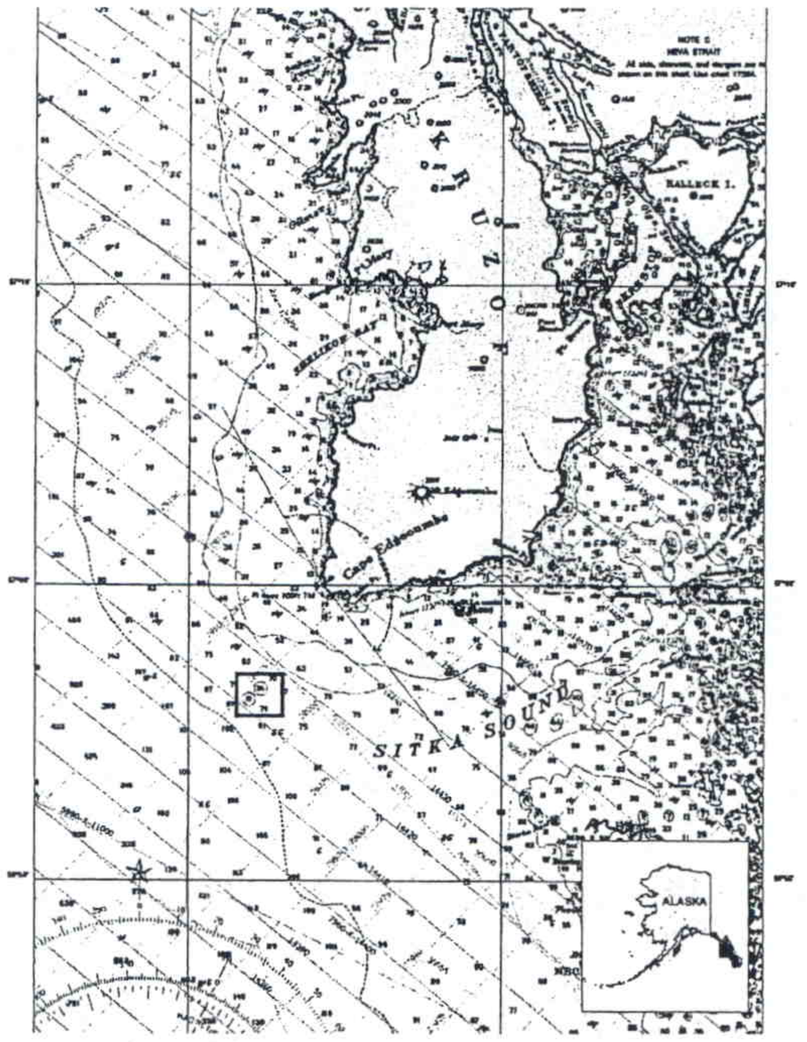
Analysis: A 203-page EA/RIR/IRFA (final draft dated July 1999) was prepared for these amendments. Six proposed actions were analyzed along with the status quo for each alternative, and the five changes outlined above were adopted. The change that was not approved would have clarified the Council's intent that catch history transfers be recognized, except those occurring after June 17, 1995, and where the owner of the vessel at that time was unable to document a vessel under Chapter 121, Title 46, U.S.C. NOAA General Counsel advised the Council that this action may violate foreign reciprocity agreements listed in the Magnuson-Stevens Act; therefore, the Council decided not to proceed with this proposed action.

Results: Amendment 58 is expected to reduce the number of vessels eligible to participate in the overcapitalized crab fisheries, and provide further capacity restrictions in the groundfish fisheries.

GOA Amendment 59 Sitka Pinnacles Marine Reserve

Dates: GOA Groundfish FMP Amendment 59 was adopted by the Council in June 1998, and was approved August 9, 2000. The final rule implementing the amendment was published November 9, 2000 (65 FR 67305) with an effective date of implementation of December 11, 2000.

Purpose and Need: The new Magnuson-Stevens Act mandate to identify, conserve, and enhance essential fish habitat is regarded as an important tool for sustainable fisheries and healthy ecosystems. This mandate includes the role of ecosystem management and identifies EFH as the waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. The pinnacle area provides habitat for all of these purposes for a variety of species and is extremely productive, in part due to its physical oceanography. Closure of this area will allow a vital ecosystem to be maintained at natural levels in an area surrounded by heavy fishing pressure. The closure would also protect the fragile nature of this rare habitat, and prevent the harvest or bycatch of these species during critical portions or their life history.



Location of the Sitka Pinnacles Marine Reserve.

The boulder field at the base of the pinnacles provides important refuge for adult fishes including large numbers of yelloweye rockfish (*Sebastes ruberrimus*), tiger rockfish (*S. nigrocinctus*), prowfish (*Zaprora silenus*) and lingcod (*Ophiodon elongatus*) as well as octopus. Aggregations of small deep-water rockfishes occur here as well, including sharpchin (*S. zacentrus*), pygmy rockfish (*S. wilsoni*), and redstripe rockfish *(S. proriger*). Besides harboring adult fishes, the boulder field is also used as spawning habitat by lingcod. The sides and top of the pinnacle are comprised of columnar basalt and *Primnoa* gorgonians provide ecologically important biogenic habitat for fishes on the steep walls of the pinnacles. Juvenile rockfishes occur in great abundance at the top of the pinnacle, as do Puget Sound rockfish (*S. emphaeus*) a small rockfish that is important prey for other rockfish and lingcod. Dense assemblages of sessile invertebrates, including *Metridium* and other anenomes, tunicates and hydrocorals provide cover for these small fishes. Adult lingcod utilize the top of the pinnacle as a seasonal feeding platform after spawning, occurring in extremely dense aggregations during the late spring and early summer. The small size of the area and high density and feeding behavior of the lingcod make them extremely susceptible to fishing pressure. In addition to fish living directly on the habitat or using the pinnacle and associated fauna for cover, there are large schools of pelagic fishes that congregate in the water column above the pinnacle. These include black (*S. melanops*), yellowtail (*S. flavidus*), dusky *(S. ciliatus*) and widow (*S. entomelas*) rockfishes that feed on the plankton in the water column.

The State of Alaska had already implemented a prohibition on fishing for lingcod and rockfish within the prescribed area. The purpose of the proposed amendment would be to mirror this regulation for federally managed fisheries, and make the closure more comprehensive.

Regulation Summary: Amendment 59 would prohibit fishing in an area containing important fish habitat, totaling 3.1 square nautical miles, off Cape Edgecumbe near Sitka, Alaska. This closure would apply to commercial, sport, charter, bycatch and subsistence fisheries for all species of bottomfish and halibut, and boat anchoring to prevent habitat degradation, and to create a groundfish refuge. The area is defined by a square, with lines connecting the following points in a clockwise manner: 56°55.5' N L following, 135°54' W L clockwise 56°57' N Latitude.,135°54' W Longitude; 56°57' N Latitude,135°57' W Longitude; 56°55.5' N Latitude, 135°57' W Longitude.

Analysis: A 20-page EA/RIR/IRFA (final draft dated November 1999) was prepared for this amendment. Two alternatives including the status quo were considered.

Results: The amendment was approved August 9, 2000.

GOA Amendment 60 Cook Inlet Bottom Trawl Ban

Dates: The Council approved the amendment in September 2000. The proposed rule was published on May 6, 2002 (67 FR 34424) and the final rule on October 22, 2002. The amendment was approved on August 13, 2002.

Purpose and Need: King and Tanner crab stocks in Cook Inlet were in need of protection. The king crab population has not recovered from its dramatic decline in the 1980s; the last commercial fishery closed in 1984. The Tanner crab population has also declined and commercial crab fishing has not opened since 1991 in the western portion and 1994 in the eastern portion of the proposed closure area. ADF&G trawl surveys assess crabs in this area.

Regulation Summary: The amendment prohibited the use of non-pelagic trawl gear in Federal waters of Cook Inlet and implemented consistent gear restrictions with the Board in State waters of Cook Inlet to optimize protection and rebuilding of crab resources. The proposed gear ban in Federal waters would provide long-term protection to depressed king and Tanner crab resources in Cook Inlet and would provide concurrent management approaches with ADF&G. Because practically no fishing using non-pelagic trawl gear has occurred in this area, there are no existing fisheries to affect.

Analysis: A 60-page analysis was prepared for this amendment. Several alternatives were considered:

Alternative 1: No action.
Alternative 2: Prohibit the use of non-pelagic trawl in Federal waters of Cook Inlet. **(Preferred)**
Alternative 3: Defer management of groundfish in Federal waters of Cook Inlet to the State of Alaska.
Alternative 4: Remove waters of Cook Inlet from the Gulf of Alaska FMP.
Alternative 5: Require observer coverage for vessels fishing for groundfish in Federal waters of Cook Inlet.
Alternative 6: Implement time and area closures.
Alternative 7: Require an ADF&G Commissioner's Permit

Results: The closure area has been in place since 2002.

GOA Amendment 61 Extend Inshore/Offshore Allocations for Pollock and Pacific Cod, Institute American Fisheries Act Fisheries Sideboards for Gulf of Alaska Groundfish Fisheries

Dates: Amendment 61, to conform with and implement provisions of the American Fisheries Act (AFA), was approved by the Council in June 1999, and implemented by NMFS via two emergency rules: (1) AFA permit requirements published on January 5, 2000, with an effective date of December 30, 1999, and (2) all other provisions of the AFA published on January 28, 2000 with an effective date of January 21, 2000. Amendment 61implements the AFA for 2001 and beyond, and was approved by the Secretary of Commerce on February 29, 2003.

Purpose and Need: For the GOA, an additional issue is to change the duration of the inshore/offshore allocations for the GOA (Amendment 51) to be consistent with the duration of the BSAI pollock allocations under the AFA; i.e., extend through the year 2004.

In addition, the AFA included provisions for the Council to enact as necessary measures to further protect non-AFA fisheries from adverse impacts resulting from the AFA and pollock fishery cooperatives. In addition to implementing the prescribed portions of the AFA, Amendment 61 contains various specific protective measures developed by the Council which limit the pollock industry's participation in other fisheries - these are referred to as 'sideboards'.

Regulation Summary: The regulations extend the GOA inshore/offshore allocations under Amendment 51 through 2004. Additionally, regulations define the sideboard amounts of crab and non-pollock groundfish (based on historical share) that can be harvested and processed by the AFA operators, in both the BSAI and the GOA.

Analysis: The original analysis for Amendment 61, upon which the emergency rules are based, is 320 pages in length with several appendices. That analysis focuses on alternatives for establishing sideboard limits for the AFA harvesters and processors, and also examines alternatives for the structure of inshore sector co-ops (the relationship between harvest vessels and the shore plants to which they deliver pollock). Primarily, the alternatives analyzed cover a wide range of options for determining the amount of the sideboard limits for each sector, whether such sideboards are applied at the sector level vs individual vessel/plant level, and whether and to what extent there may be exemptions from the sideboards. The analysis also examines the ownership structure of the pollock industry to determine the entities and companies to which sideboards will be applied. Implementation and monitoring aspects of the various alternatives are also considered. A pending EIS will further examine these issues as well as the prescribed measures of the AFA, including the specific sector allocations and limited entry aspects of the Act.

Results: The AFA was fully implemented in 2000 via the emergency rules, with permanent implementing regulations (through at least 2004) in 2002. Several issues continue to consume a significant amount of NMFS and Council resources, with various changes and regulatory amendments in the pipeline. Included are further consideration of the issues of inshore co-op structure, processing sideboards for crab and groundfish, recalculation of sideboard amounts, and consideration of further exemptions from sideboards. A significant, indirect impact of the AFA is that other industry sectors are now pushing for co-op style management in their fisheries, through either Congressional mandate or through the Council process.

GOA Amendment 62 Inshore/Offshore Language Revision (proposed)

Dates: The Council approved the amendment for inshore/offshore language revisions for the BSAI and GOA Groundfish FMPs in October 2002. The amendment has not yet been submitted for secretarial review.

Purpose and Need: In October of 1998, the American Fisheries Act was signed into law. With the passage of AFA, inshore/offshore language in the Groundfish FMP was superseded. Amendment 62 would remove this obsolete and inconsistent language in the Groundfish FMP.

Regulation Summary: The Council selected the preferred alternatives for inshore/offshore in June 2002. The preferred alternatives would remove reference to BSAI inshore/offshore from the GOA Groundfish FMP and remove the December 31, 2004 sunset date for GOA inshore/offshore allocation. At the same time the Council selected the preferred alternatives for inshore/offshore language revisions for BSAI.

Analysis: 61-page EA (draft dated February 14, 2003) was prepared for this amendment. The analysis included options for inshore/offshore revisions for both GOA and BSAI and also included options for revisions for the single geographic location restriction in the BSAI. Five options, including status quo, were considered for the inshore/offshore revisions. Of these, two were specific to the GOA Groundfish FMP. The first was to remove any reference to BSAI inshore/offshore from the GOA Groundfish FMP while other alternative was to remove the December 31, 2004 sunset date from the GOA inshore/offshore allocations.

Results: The Council took final action for inshore/offshore language changes in June 2002 and single geographic location in October 2002.

GOA Amendment 63 Move Skates to Target Species Category

Dates: The Council approved the amendment in October 2003. The proposed rule was published on November 17, 2003 (68 FR 67390) and the amendment was approved on March 3, 2004. The final rule has not yet been published.

Purpose and Need: In 2003, a directed fishery developed for two skate species in the Central GOA regulatory area. The amendment was prompted by the need to have this fishery develop in a sustainable manner. Currently, skates are managed under the "other species" category TAC. The GOA FMP does not authorize a separate ABC or TAC for the skate complex, nor for any of the individual species which make up that complex. Instead a TAC is calculated for the five taxonomic groups as a percent (5%) fo the total TAC for all of the combined GOA species.

Regulation Summary: The preferred alternative for this amendment would separate skates from the 'other species' category and add them to the 'target species' categories, thus allowing for separate ABCs and TACs to be established for skates and skate complexes. The Council recommended a Gulf-wide ABC, OFL and TAC for all skate species except in the Central GOA, where big skates and longnose skates would have a separate OFL, ABC, and TAC.

Analysis: The analysis for this amendment was part of the 140-page Harvest Specifications EA for 2004 (public review draft dated November 2003). Five alternatives were considered: 1) GOA-wide OFL and ABC for all skates, 2) GOA-wide OFL and ABC each for Big skates, Longnose skates, and 'other skates', 3) OFL and ABC by regulatory area for Big skates, Longnose skates and 'other' skates, 4) OFL and ABC by regulatory area for Big skates and Longnose Skates, and GOA-wide OFL and ABC for 'other' skates, and 5) GOA-wide OFL for all skates, an ABC by regulatory area for Big skates and Longnose skates, and a GOA-wide ABC for 'other' skates.

Results: The amendment should be in place during the 2004 fishing season.

GOA Amendment 64 Individual Fishing Quota Vessel Clearance and Recordkeeping and Reporting Changes

Dates: The Council approved the amendment in April 2002. The proposed rule was published on October 14, 2002 (67 FR 65941) and the final rule on June 6, 2003. The amendment was implemented effective August 28, 2003.

Purpose and Need: The Council initiated an analysis of proposed changes to implementation and enforcement aspects of the sablefish IFQ program.

Regulation Summary: The Council eliminated the vessel clearance requirement, but still required a verbal 'departure report' for IFQ sablefish vessels. The action also eliminated the processor shipment report, instead requiring that IFQ species be reported on teh Product Transfer Report.

Analysis: A 37-page analysis was prepared to support these IFQ changes, with no alternatives to these actions other than the status quo.

Results: The amendment changed recordkeeping and reporting requirements for the IFQ sablefish fishery.

GOA Amendment 65 Habitat Areas of Particular Concern: Harvest Control Measures (tabled)

Dates: The Council adopted Amendment 65 (BSAI Amendment 65) in April 2000.

Purpose and Need: The Magnuson -Stevens Act was amended in 1996 by the Sustainable Fisheries Act. The new Act mandates that any FMP must include a provision to describe and identify essential fish habitat (EFH) for the fishery, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat. Essential fish habitat has been broadly defined by the Act to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". Habitat areas of particular concern (HAPC) are those areas of special importance that may require additional protection from adverse effects. HAPC is defined on the basis of its ecological importance, sensitivity, exposure, and rarity of the habitat.

The purpose of amendment 65 is to provide for improved long-term productivity of the fisheries by controlling harvest on invertebrates (e.g. corals, sponges, mussels, rockweed and kelp), which provide important habitat for fish, but have the potential to be developed into large-scale commercial fisheries.

Regulation Summary: At the April 2000 meeting, the Council took final action on Harvest Control measures of HAPC Part 1. The Council adopted alternative 2 of the analysis which will add corals and sponges to the prohibited species category. This action will essentially split prohibited species into two types: the first type will continue to allow no retention for halibut, salmon, and crab species, and the second type would include only corals and sponges as prohibited species whose management would be specified in the regulations. The HAPC prohibited species will allow retention, but will prohibit the sale, barter, trade or processing of corals and sponges. Kelp (including rockweed), and mussels would not be subject to any management actions at this time. This action will apply to both the Bering Sea and Gulf of Alaska groundfish fisheries in the EEZ; other fisheries may be considered for HAPC biota protection in the future. The Council will relay concerns to the Alaska Board of Fisheries regarding protection of HAPC biota in state waters.

Analysis: A 67-page EA (draft dated March 6, 2000) was prepared for this amendment. Three alternatives including the status quo were considered. The alternatives include establishing HAPC biota as a prohibited species, or establishing a new HAPC category to allow for a controlled fishery to develop. Various options would allow some HAPC species (e.g., coral and sponges) to be prohibited from harvest, while allowing controlled fisheries to occur on the remaining species (e.g., kelp and mussels).

Results: Due to the court case on Essential Fish Habitat (see Amendment 55), the HAPC amendment was put on hold. Council and Agency staff are currently preparing an analysis of HAPC.

GOA Amendment 66 Community Quota Share Purchase

Dates: The Council approved a preferred alternative for Amendment 66 on April 10, 2002. NMFS published a proposed rule on August 22, 2003 (68 FR 52173). The amendment was approved on December 3, 2003, but a final rule has not yet been published.

Purpose and Need: In 1991, the Council proposed an IFQ Program as the best alternative to address problems associated with excess harvesting capacity in the commercial Pacific halibut and sablefish longline fisheries off Alaska. Typical problems stemming from overcapitalization and short "derby" openings include gear conflicts, deadloss from lost gear, increased bycatch and discard mortality, decrease in product quality, safety concerns, low ex-vessel prices, and a host of other issues. The IFQ Program was approved for the Pacific halibut and sablefish fixed gear fisheries in the Federal waters of the BSAI and GOA in 1991 and implemented since 1995. The IFQ Program essentially assigns the privilege of harvesting a percentage of the sablefish and halibut quota to specific individuals with a history of harvest in the fisheries. During the development of the program, the Council built in several provisions to address concerns regarding transferability and the goal of preserving an owner-operated fleet. Among other things, the Council was concerned about consolidation of ownership and divestiture of coastal Alaskans from the fisheries. Ultimately, the Council included a requirement for catcher vessel quota share (QS) to only be purchased by individual fishermen, with proven sea time, who would also be required to be on the vessel and fish the resulting IFQs. The primary intent of this provision was to maintain a diverse, owner-operated fleet and prevent a 'corporate', absentee ownership of the fisheries.

Consideration of including communities in the commercial IFQ Program was motivated by several provisions in the MSA and current National Research Council reports, as well as a specific community proposal. The proposal cited a disproportionate amount of QS transfers out of smaller, rural communities as a symptom of the continuing erosion of their participation in the commercial IFQ fisheries. The Council decided to analyze a proposal to allow a defined set of small, rural, coastal, Gulf of Alaska communities to purchase catcher vessel QS in IPHC management areas 2C, 3A, and 3B. Several factors contributed to the initiation of this analysis: 1) the rate of decline of the amount of QS in the smaller communities is higher than that of larger communities; 2) the bulk of the QS consolidation has taken place in the smaller QS holdings, and 3) very few initial large quota share recipients reside in smaller, coastal communities. The concern was that because small, remote, Gulf coastal communities are dependent on fisheries for a large portion of their employment and income and have few alternative economic opportunities, a decline in the number of QS holders in these communities has a severe effect on unemployment and related social and economic impacts.

The Council defined criteria which would allow 42 eligible Gulf of Alaska coastal communities to purchase halibut and sablefish QS. The criteria for eligibility is as follows: less than 1,500 people, no road access to larger communities, direct access to saltwater, and a documented historic participation in the halibut and/or sablefish fisheries. Communities not listed in the final regulations must apply to the Council to be approved for participation in the program and will be evaluated using the same criteria. The eight major elements of the program that were analyzed and included are:

Element 1.	Eligible communities	Element 5.	Purchase, use, and sale restrictions
Element 2.	Ownership entity	Element 6.	Performance standards
Element 3.	Use caps for individual communities	Element 7.	Administrative oversight
Element 4.	Cumulative use caps for all communities	Element 8.	Program Review

Analysis: A 144-page EA/RIR/IRFA (public review draft dated April 10, 2002) was prepared for this amendment. The analysis outlined several alternatives, options, and suboptions for each of the eight elements listed above. The analysis of alternatives was guided by the problem statement, which stated that a number of small coastal Gulf communities are struggling to remain economically viable and the current IFQ Program, as with other limited entry programs, increases the cost of entry into or expansion in the commercial halibut/sablefish fisheries. The problem statement also noted that allowing qualifying communities to purchase QS for lease to and use by community residents will help minimize adverse economic impacts on these small, remote, coastal communities in Southeast and Southcentral Alaska, and help provide for the sustained participation of these communities in the IFQ fisheries, without undermining the goals of the original IFQ Program.

Results: The Council's preferred alternative on Amendment 66 included provisions for each of the eight elements listed above. The preferred alternative requires that a new non-profit entity be established to purchase the QS on behalf of one or more eligible communities, and that the resulting IFQs can only be leased to residents of the ownership community. The final rule implementing the amendment has not yet been published.

GOA Amendment 70 Steller Sea Lion Protection Measures (withdrawn)

Dates: The amendment was approved by the Council in October 2001, along with GOA Amendment 70. NMFS published regulations as an emergency rule for 2002 fisheries on January 8, 2002 (67 FR 956) and extended them through December 31 (67 FR 34860). A proposed rule for the permanent regulations has not yet been published. NMFS decided to implement the Steller sea lion protection measures by regulations rather than plan amendment.

Purpose and Need: The western population of Steller sea lions declined by over 70% since the 1960s, and was listed as endangered in 1997 (62 FR 24345). One hypotheses to explain the continued decline of the western stock of Steller sea lions was nutritional stress due to competition with fisheries for prey. The 11/30/00 Biological Opinion concluded that fisheries for walleye pollock, Pacific cod and Atka mackerel being managed under the fisheries regulations in effect in the year 2000, jeopardized the survival and recovery of Steller sea lions and adversely modified their critical habitat. The 2000 Biological Opinion included a reasonable and prudent alternative (RPA) that included, among other things, areas closed to trawling, which if implemented in its entirety, would have had substantial adverse impacts to the fishing industry and fishing communities. Federal legislation (Public Law 106-554) allowed for a phase-in of the RPA for the 2001 fisheries while the Council developed an alternative approach which would allow fisheries to operate in such a manner that would not jeopardize the continued existence of Steller sea lion and would prevent adverse modification of their critical habitat.

Regulation Summary: The preferred alternative implements the restricted and closed area approach. This alternative is the RPA detailed in the November 30, 2000, Biological Opinion. Essential elements of this approach are: 1) to establish large areas of critical habitat where fishing for pollock, Pacific cod, and Atka mackerel is prohibited, 2) to restrict catch levels in remaining critical habitat areas, 3) seasonally apportion catches, 4) to establish a modified harvest control rule that prohibits directed fishing should pollock, cod, or mackerel stocks fall below 20% of the unfished level, and 5) a vessel monitoring system requirement for all vessels (except jig gear) participating in these fisheries.

Analysis: A 2,206 page EIS/RIR/IRFA (final draft dated November 2001) was prepared for this amendment. Five alternatives were considered including no action, a low and slow approach (from draft programmatic SEIS), a restricted and closed area approach (from the 11/2000 RPA), an area and fishery specific approach (from RPA Committee) and a critical habitat catch limit approach (based on measures in place in 2000). A map packet, containing poster sized maps that show the closure areas proposed for each alternative, was also provided. The analysis the preferred alternative would avoid jeopardy and adverse modification while at the same time, have the least negative social and economic impacts to fishermen, processors, and communities.

Results: Amendment 70 was implemented as a regulatory amendment, and not a plan amendment. The Biological Opinion on the preferred alternative, dated October 19, 2001, was challenged in US District Court. A list of trailing amendments was proposed when the Council took final action in October 2001. Two of these amendments (prohibition of AI pollock fishery, and pot gear exemptions for Cape Barnabus and Caton Island haulouts) have been analyzed.

GOA Amendment 72 Improved Retention, Improved Utilization Program Flatfish Exemptions

Dates: The amendment was approved by the Council in April 2003. The amendment has not yet been submitted for secretarial review.

Purpose and Need: The Council and NMFS recognized that there are some sectors in the GOA with minimal flatfish bycatch, and that these sectors could be exempted from the provisions of IRIU for flatfish. This provision was originally part of Amendment 49, to be implemented by regulatory amendment, but it became apparent that an FMP amendment would be required to implement the exemption.

Regulation Summary: The preferred alternative would provide exemptions to the IR/IU flatfish requirements for those sectors with less than 5% bycatch rates of shallow-water flatfish species.

Analysis: A 149-page analysis was prepared for this amendment. The alternatives include 1) status quo (no action), 2) exempt fisheries from IR/IU flatfish regulations in the BSAI and GOA if flatfish discards are less than 5 percent of total groundfish catch. Alternative 2 also has two options dealing with the review requirements for NMFS to determine whether fisheries should still be exempted.

Results: The amendment has not yet been implemented.

GOA Amendment 74 Revised Management Policy

Dates: The amendment was approved by the Council in April 2004. The amendment has not yet been submitted for secretarial review.

Purpose and Need: In the 25 years since its implementation, over sixty amendments have been made to the FMP, and fishery and environmental conditions have changed significantly. The Council and NMFS conducted a programmatic review of the FMPs, and considered alternative management policies to determine the impacts of the groundfish fisheries on the human environment and to set the future direction of groundfish fishery management.

Regulation Summary: The preferred alternative adopted by the Council revises the management policy of the GOA FMP. The revised management policy includes 45 objectives for fishery management, categorized under the headings *Prevent Overfishing, Promote Sustainable Fisheries and Communities, Preserve the Food Web, Manage Incidental Catch and Reduce Bycatch and* Waste, *Avoid Impacts to Seabirds and Marine Mammals, Reduce Impacts to Habitat, Promote Equitable and Efficient Use of Resources, Increase Alaska Native Consultation,* and *Improve Data Quality, Monitoring, and Enforcement.*

Analysis: A 7,000 page analysis of the impacts of the BSAI and GOA groundfish fisheries, the *Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement* was prepared in support of this amendment. The analysis contains four alternatives, in addition to the preferred alternative: 1) no action (status quo), 2) a more aggressive harvest strategy, 3) a more precautionary harvest strategy, 4) a highly precautionary harvest strategy.

Results: The amendment has not yet been implemented.

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APPENDIX E

Regulatory Amendment Summaries

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2003 Final Rules

American Fisheries Act

68 FR 51146, August 25, 2003. Final rule approving AFA collection-of-information requirements in Amendments 61/61/13/8, and Amendment 69. Effective September 24, 2003.

68 FR 49374, August 18, 2003. Correction to 67 FR 79692 (December 30, 2002).

68 FR 17314, April 9, 2003. Correction to a cross reference error in 67 FR 79692 (December 30, 2002).

68 FR 6833, February 11, 2003. BSAI Amendment 69 to allow an inshore cooperative to contract with a non-member vessel to harvest a portion of the cooperative's pollock allocation

Community Development Quota (CDQ)

68 FR 69974, December 16, 2003. Final rule to modify the management of the ''other species'' CDQ reserve by eliminating specific allocations of ''other species'' CDQ to individual CDQ groups and, instead, allowing NMFS to manage the ''other species.''

68 FR 59889, October 20,2003. Technical amendment to 68 FR 44473 (July 29, 2003).

68 FR 44473, July 29, 2003. Final rule to revise recordkeeping and reporting requirements for the IFQ and CDQ programs - Amendment 72 to the FMP for the Groundfish Fishery of the BSAI and Amendment 64 to the FMP for Groundfish of the GOA.

68 FR 9902, March 3, 2003. Final rule to increase the Area 4E trip limit and modify the Area 4 Catch Sharing Plan to allow CDQ Program participants to harvest allocations of Area 4D halibut CDQ in Area 4E.

Groundfish Harvest Specifications and Management

68 FR 68265, December 8, 2003. Interim final rule for Total Allowable Catch (TAC) amounts for each category of groundfish in the BSAI for 2004. Effective: January 1, 2004.

68 FR 67964, December 5, 2003. Interim final rule for Total Allowable Catch (TAC) amounts for each category of groundfish in the GOA for 2004. Effective: January 1, 2004.

68 FR 67086, December 1, 2003. Final rule to implement Amendment 77, allocation of Pacific cod among fixed gear sectors. Effective: January 1, 2004.

68 FR 59889, October 20, 2003. Technical amendment to 68 FR 44473 (July 29, 2003).

68 FR 58038, October 8, 2003. Final rule to refine requirements for the facilitation of observer data transmission and improve support for observers. Effective January 1, 2004.

68 FR 52142, September 2, 2003. Final rule to implement the partial approval of Amendment 75 to the FMP for the Groundfish Fishery of the BSAI - removal of full retention and utilization requirements (IR/IU) for rock and yellowfin sole. Effective October 2, 2003.

68 FR 44666, July 30, 2003. Amendment to the eligibility criteria for the Pacific cod endorsements for BSAI groundfish licenses issued under the License Limitation Program. Effective August 29, 2003.

68 FR 44473, July 29, 2003. Final rule to revise recordkeeping and reporting requirements for the IFQ and CDQ programs - Amendment 72 to the FMP for the Groundfish Fishery of the BSAI and Amendment 64 to the FMP for Groundfish of the GOA.

68 FR 41725, July 15, 2003. List of Fisheries for 2003.

68 FR 40812, July 9, 2003. Increased roe retention limit for pollock harvested in the BSAI.

68 FR 37095, June 23, 2003. Correction to 68 FR 715 (January 7, 2003).

68 FR 37095, June 23, 2003. Chiniak Gully Research Area opening for the groundfish trawl fisheries of the GOA.

68 FR 31629, May 28, 2003. Final rule to allow use of pot gear in waters around Cape Barnabas and Caton Island in the GOA for directed fishing for Pacific cod.

68 FR 24468, May 9 ,2003. Chiniak Gully Research Area opening for the groundfish trawl fisheries of the Gulf of Alaska. Comment period through June 6, 2003.

68 FR 24615, May 8, 2003. Correction to Steller Sea Lion Protection Measures, 68 FR 204 (January 2, 2003).

68 FR 15969, April 2, 2003. Correction to 68 FR 715 (January 7, 2003)

68 FR 14902, March 27, 2003. Correction to a docket number of 68 FR 9907 (March 3, 2003).

68 FR 11004, March 7, 2003. Seasonal closure of a portion of the waters located near Cape Sarichef in the Bering Sea subarea to directed fishing for groundfish by vessels using trawl, pot, or hook-and-line gear to support NMFS research on the effect of fishing on the localized abundance of Pacific cod.

68 FR 9907, March 3, 2003. Final BSAI 2003 Groundfish Harvest Specifications.

68 FR 9924, March 3, 2003. Final GOA 2003 Groundfish Harvest Specifications.

68 FR 1392, January 10, 2003. Correction to 67 FR 72595.

68 FR 715, January 7, 2003. Revisions to observer coverage requirements for vessels and shoreside processors in the North Pacific groundfish fisheries.

68 FR 204, January 2, 2003. Final rule to implement Steller sea lion protection measures to avoid the likelihood that the groundfish fisheries off Alaska will jeopardize the continued existence of the western distinct population segment (DPS) of Steller sea lions or adversely modify its critical habitat.

67 FR 77439, December 18, 2002. Pacific halibut and red king crab bycatch rate standards for the first half of 2003. Comment period through January 2, 2003.

Individual Fishing Quota (IFQ)

68 FR 59889, October 20,2003. Technical amendment to 68 FR 44473 (July 29, 2003).

68 FR 51711, August 28, 2003. Correction to table errors in 68 FR 44473, (July 29, 2003).

68 FR 44473, July 29, 2003. Final rule to revise recordkeeping and reporting requirements for the IFQ and CDQ programs - Amendment 72 to the FMP for the Groundfish Fishery of the BSAI and Amendment 64 to the FMP for Groundfish of the GOA.

68 FR 7719, February 18, 2003. Directed fishing for sablefish with fixed gear managed under the IFQ program opens March 1, 2003, and closes November 15, 2003.

Improved Retention/Improved Utilization (IR/IU)

68 FR 52142, September 2, 2003. Final rule to implement the partial approval of Amendment 75 to the FMP for the Groundfish Fishery of the BSAI - removal of full retention and utilization requirements (IR/IU) for rock and yellowfin sole. Effective October 2, 2003.

License Limitation Program

68 FR 46117, August 5, 2003. Final rule to amend eligibility for BSAI crab species License Limitation Program licenses. Effective September 4, 2003.

68 FR 44666, July 30, 2003. Amendment to the eligibility criteria for the Pacific cod endorsements for BSAI groundfish licenses issued under the License Limitation Program. Effective August 29, 2003.

Marine Mammal Observer Program

68 FR 41725, July 15, 2003. List of Fisheries for 2003.

Observer Program

68 FR 58038, October 8, 2003. Final rule to refine requirements for the facilitation of observer data transmission and improve support for observers. Effective January 1, 2004.

68 FR 49374, August 18, 2003. Correction to 67 FR 79692 (December 30, 2002).

68 FR 37095, June 23, 2003. Correction to 68 FR 715 (January 7, 2003).

68 FR 17314, April 9, 2003. Correction to a cross reference error in 67 FR 79692 (December 30, 2002).

68 FR 15969, April 2, 2003. Correction to 68 FR 715 (January 7, 2003).

68 FR 1392, January 10, 2003. Correction to 67 FR 72595.

68 FR 715, January 7, 2003. Revisions to observer coverage requirements for vessels and shoreside processors in the North Pacific groundfish fisheries.

Recordkeeping and Reporting

68 FR 62501, November 4, 2003. NOAA information collection requirements; update and corrections.

68 FR 61339, October 28, 2003. Technical ammendment for an update and correction to NOAA information collection requirements for the Paperwork Reduction Act.

68 FR 59889, October 20,2003. Technical amendment to 68 FR 44473 (July 29, 2003).

68 FR 58038, October 8, 2003. Final rule to refine requirements for the facilitation of observer data transmission and improve support for observers. Effective January 1, 2004.

68 FR 44473, July 29, 2003. Final rule to revise recordkeeping and reporting requirements for the IFQ and CDQ programs - Amendment 72 to the FMP for the Groundfish Fishery of the BSAI and Amendment 64 to the FMP for Groundfish of the GOA.

68 FR 23925, May 6, 2003. Correction to the definition of Length Overall in 66 FR 47416 (September 12, 2001) and 68 FR 20083 (April 24, 2003).

68 FR 20083, April 24, 2003. Revisions to definition of Length Overall of a Vessel, correction to 66 FR 47416 (September 12, 2001).

Steller Sea Lion Protection Measures

68 FR 31629, May 28, 2003. Final rule to allow use of pot gear in waters around Cape Barnabas and Caton Island in the GOA for directed fishing for Pacific cod.

68 FR 24468, May 9 ,2003. Chiniak Gully Research Area opening for the groundfish trawl fisheries of the Gulf of Alaska. Comment period through June 6, 2003.

68 FR 24615, May 8, 2003. Correction to 68 FR 204 (January 2, 2003).

68 FR 11004, March 7, 2003. Seasonal closure of a portion of the waters located near Cape Sarichef in the Bering Sea subarea to directed fishing for groundfish by vessels using trawl, pot, or hook-and-line gear to support NMFS research on the effect of fishing on the localized abundance of Pacific cod.

68 FR 204, January 2, 2003. Final rule to implement Steller sea lion protection measures to avoid the likelihood that the groundfish fisheries off Alaska will jeopardize the continued existence of the western distinct population segment (DPS) of Steller sea lions or adversely modify its critical habitat.

2003 Federal Register Notices

At-Sea Scales

68 FR 13279, March 19, 2003. Proposed information collection comment request - Alaska Region scale and catch weighing requirements. Comment period through May 19, 2003.

Bycatch

68 FR 40888, July 9, 2003. Advanced notice of proposed regulations to define the Zero Mortality Rate. Comment period through September 8, 2003.

68 FR 11501, March 11, 2003. Notice of decision on Oceana petition for rule-making on bycatch 50 CFR part 600.

Constituent Meetings

68 FR 26291, May 15, 2003. Notice of schedule for a series of eight regional constituent meetings beginning in June 2003 and running through September 2003 to gather public input on ways to improve the effectiveness of NMFS and its management of living marine resources.

Essential Fish Habitat

68 FR 19516, April 22, 2003. NPFMC Essential Fish Habitat Commitee to hold a meeting in Juneau, AK, May 5-6, 2003.

68 FR 1050, January 8, 2003. NPFMC Essential Fish Habitat Committee to meet in Seattle, WA. on January 26, 2003.

Exempted Fishing Permit

68 FR 44927, July 31, 2003. Notice of issuance of an Exempted Fishing Permit to conduct an experiment in the Bering Sea on salmon excluder devices.

Fur Seals

68 FR 36539, June 18, 2003. Notice of Intent to analyze the effects of the subsistence taking of northern fur seals on the Pribilof Islands; scoping meetings to be held. Comment period through September 16, 2003.

Groundfish Harvest Specifications and Management

68 FR 70233, December 17, 2003. Proposed Information Collection; Alaska Region Gear Identification Requirements. Comment period through February 17, 2003.

Improved Retention/Improved Utilization (IR/IU)

68 FR 61792, October 30, 2003. Notice of NPFMC Improved Retention/Improved Utilization Technical Committee meeting in Seattle, WA at the Alaska Fisheries Science Center on November 18 and November 19, 2003.

Individual Fishing Quota

68 FR 71036, December 22, 2003. Notice of standard prices and fee percentage for the North Pacific halibut and sablefish IFQ cost recovery program.

68 FR 7719, February 18, 2003. Directed fishing for sablefish with fixed gear managed under the IFQ program opens March 1, 2003, and closes November 15, 2003.

Marine Mammals

68 FR 40888, July 9, 2003. Advanced notice of proposed regulations to define the Zero Mortality Rate. Comment period through September 8, 2003.

68 FR 2751, January 21, 2003. Receipt of applications for new research permits and permit amendments.

Marine Protected Areas

68 FR 43495, July 23, 2003. Solicitation of public comments on proposed criteria for building an Inventory of Marine Managed Areas. Comment period through September 22, 2003.

North Pacific Fishery Management Council

68 FR 65889, November 24, 2003. NPFMC Fur Seal Committee meeting in Anchorage AK, on December 11, 2003.

68 FR 65890, November 24, 2003. NPFMC Joint Protocol Committee meeting in Anchorage, AK on December 8, 2003.

68 FR 65890, November 24, 2003. Meetings of the NPFMC and its advisory committees in Anchorage, AK, December 8-16, 2003.

68 FR 61792, October 30, 2003. NPFMC Improved Retention/Improved Utilization Technical Committee will meet in Seattle, WA at the Alaska Fisheries Science Center on November 18 and November 19, 2003.

68 FR 58315, October 9, 2003. NPFMC Scallop Plan Team meeting October 29 – 30, 2003 in Juneau, AK.

68 FR 53966, September 15, 2003. NPFMC public meeting - the Pacific Northwest Crab Industry Advisory Committee, Seattle, WA, September 29, 2003.

68 FR 53140, September 9, 2003. NPFMC IFQ Implementation and Cost Recovery Committee public meeting October 5, 2003 in Anchorage, AK.

68 FR 53139, September 9, 2003. NPFMC Non-Target Species Committee public meeting October 9, 2003 in Anchorage, AK.

68 FR 53138, September 9, 2003. NPFMC public meetings October 6 - 14, 2003 in Anchorage, AK.

68 FR 48885, August 15, 2003. NPFMC GOA/BSAI groundfish plan teams meeting in Seattle, WA, September 8–11, 2003.

68 FR 47912, August 12, 2003. NPFMC Steller Sea Lion (SSL) Mitigation Committee meeting in Seattle, WA, August 27 - 29, 2003.

68 FR 47912, August 12, 2003. NPFMC Crab Plan Team meeting in Kodiak, AK, September 22 - 24, 2003.

68 FR 44926, July 31, 2003. NPFMC Improved Retention/Improved Utilization Technical Committee will meet in Seattle, WA, August 25, 26 and 27, 2003.

68 FR 41564, July 14, 2003. NPFMC public meetings July 28 - 29, 2003 in Anchorage, AK.

68 FR 27785, May 21, 2003. NPFMC public meetings June 9 - 18, 2003 in Kodiak, AK.

68 FR 26291, May 15, 2003. Notice that NMFS is scheduling a series of eight regional constituent meetings beginning in June and running through September to gather public input on ways to improve the effectiveness of NMFS and its management of living marine resources.

68 FR 23703, May 5, 2003. NPFMC Pacific Northwest Crab Industry Advisory Committee to meet May 27, 2003, Seattle, WA.

68 FR 19516, April 22, 2003. NPFMC Essential Fish Habitat Committee to hold a meeting in Juneau, AK, May 5-6, 2003.

68 FR 12894, March 18, 2003. NPFMC public meetings Monday, March 31, 2003 through Tuesday, April 8, 2003.

68 FR 1050, January 8, 2003. NPFMC's Essential Fish Habitat Committee will meet in Seattle, WA. on January 26, 2003.

68 FR 1050, January 8, 2003. NPFMC's Observer Committee will meet in Seattle, WA. on January 23 and 24, 2003.

Recordkeeping and Reporting

68 FR 70233, December 17, 2003. Proposed Information Collection; Alaska Region Gear Identification Requirements. Comment period through February 17, 2003.

68 FR 64318, November 13, 2003. Submission for OMB review proposed information collection on scale and catch weighing requirements under the provisions of the Paperwork Reduction Act. Comments due within 30 days.

68 FR 57426, October 3, 2003. Continuing information collection comment period for Commercial Operator's Annual Report (COAR). Comment period through December 2, 2003.

68 FR 54716, September 18, 2003. Proposed information collection for annual harvest survey for a subsistence Pacific halibut program. Comment period through October 18, 2003.

68 FR 32012, May 29, 2003. Proposed information collection comment request - American Fisheries Act (OMB control No. 0648-0401). Comment period through June 29, 2003.

68 FR 13279, March 19, 2003. Proposed information collection comment request - Alaska Region scale and catch weighing requirements. Comment period through May 19, 2003.

68 FR 7107, February 12, 2003. Proposed Information Collection; American Fisheries Act, Vessel and Processor Permit Applications (OMB control No. 0393). Comment period through April 14, 2003.

68 FR 6417, February 7, 2003. Proposed information collection for the AFA fisheries (OMB control No. 0648-0401). Comment period through April 8, 2003.

Stock Assessments

68 FR 17920, April 14, 2003. Notice of completion and availability of final marine mammal stock assessment reports; response to comments.

2004 Final Rules

American Fisheries Act (AFA)

69 FR 7876, February 20, 2004. Final rule to make effective the collection of information contained in the following AFA-related amendments: Amendment 61 to the FMP for the Groundfish Fishery of the BSAI Area, Amendment 61 to the FMP for Groundfish of the GOA, Amendment 13 to the FMP for BSAI King and Tanner Crab, and Amendment 8 to the FMP for the Scallop Fishery off Alaska.

69 FR 6198, February 10, 2004. Final rule to remove the expiration date of regulations (67 FR 79692, December 30, 2002), implementing the AFA.

Groundfish Harvest Specifications and Management

69 FR 9261, February 27, 2004. Final 2004 Harvest Specifications for GOA Groundfish. Effective February 27, 2004.

69 FR 9242, February 27, 2004. Final 2004 Harvest Specifications for BSAI Groundfish. Effective February 27, 2004.

68 FR 68265, December 8, 2003. Interim final rule for Total Allowable Catch (TAC) amounts for each category of groundfish in the BSAI for 2004. Effective: January 1, 2004.

68 FR 67964, December 5, 2003. Interim final rule for Total Allowable Catch (TAC) amounts for each category of groundfish in the GOA for 2004. Effective: January 1, 2004.

Observer Program

69 FR 1951, January 13, 2004. Final rule to amend regulations governing the North Pacific Groundfish Observer Program to provide added flexibility in the deployment of observers in the EEZ off the coast of Alaska. Effective on February 12, 2004.

Salmon

69 FR 875, January 7, 2004. Final rule implementing Amendment 3 of the Salmon FMP. Effective February 6, 2004.

Seabird Avoidance Measures

69 FR 1930, January 13, 2004. Final rule to revise regulations requiring seabird avoidance measures in the hook-and-line fisheries off Alaska to further mitigate interactions with the Short-tailed albatross. Effective on February 12, 2004.

2004 Federal Register Notices

69 FR 7421, February 17, 2004. Notice to inform persons whom NMFS invites to bid in the fishing capacity reduction program for the crab species covered by the FMP for BSAI king and Tanner crabs.

Exempted Fishing Permit

69 FR 5509, February 5, 2004. Notice of receipt of an application for an exempted fishing permit from the Alaska Fisheries Development Foundation, Inc. to support a project that investigates and develops hook-and-line techniques specific to the harvest of various rockfish species in the GOA.

Habitat

69 FR 11837, March 12, 2004. Correction to Seattle meeting time in 69 FR 10428, (March 5, 2004).

69 FR 10428, March 5, 2004. Notice of public meetings for the Draft Environmental Impact Statement (DEIS) for Essential Fish Habitat (EFH) Identification and Conservation in Alaska.

Halibut Charter Harvest Levels

69 FR 6946, February 12, 2004. Notice of Guideline Harvest Levels for the guided recreational halibut fishery.

Individual Fishing Quota (IFQ)

69 FR 6199, February 10, 2004. Notice that NMFS is opening directed fishing for sablefish with fixed gear managed under the IFQ program. The season will open 1200 hrs, Alaska local time (A.l.t.), February 29, 2004, and will close 1200 hrs, A.l.t., November 15, 2004.

North Pacific Fishery Management Council

69 FR 8178, February 23, 2004. Notice that the NPFMC GOA and BSAI, King and Tanner, Scallop, plan teams will meet via video conference in 4 locations and by teleconference on March 8 and 9, 2004.

69 FR 2579, January 16, 2003. NPFMC advisory committee public meetings February 2 through February 10, 2004.

69 FR 51, January 2, 2004. NPFMC Steller Sea Lion Mitigation Committee meeting in Seattle WA, on January 20, 2004.

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APPENDIX F

Total Allowable Catch-Setting Process

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ACRONYMS AND ABBREVIATIONS

ABC	acceptable biological catch
AFSC	Alaska Fisheries Science Center
AP	Advisory Panel
B	Biomass
BSAI	Bering Sea and Aleutian Islands
EBS	eastern Bering Sea
EC	Ecosystem considerations
F	Fishing mortality rate
FMP	Fishery Management Plan
GOA	Gulf of Alaska
M	Natural mortality rate
maxABC	Maximum permissible level
MFMT	Maximum fishing mortality threshold
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum stock size threshold
MSY	Maximum sustainable yield
mt	metric tons
NOAA Fisheries	National Marine Fisheries Service (NMFS)
NPFMC	North Pacific Fishery Management Council
NSG	National Standard Guidelines
OFL	Overfishing level
OY	optimum yield
pdf	probability density function
SAFE	Stock Assessment and Fishery Evaluation
SEIS	Supplemental Environmental Impact Statement
SSC	Scientific and Statistical Committee
TAC	total allowable catch

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Section 1 The Total Allowable Catch-Setting Process

The Fishery Management Plans (FMPs) for the groundfish fisheries managed by the North Pacific Fishery Management Council (NPFMC) incorporate a complex suite of measures. These include harvest controls, effort controls, time and/or area closures, bycatch controls, monitoring and enforcement measures, and rules responding to other constraints (e.g., regulations to protect Steller sea lions and to avoid seabirds). This qualitative impact assessment provides a broad overview of four proposed management policies specifically as they pertain to harvest control or the Total Allowable Catch (TAC)-setting process in the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) groundfish fisheries of the North Pacific. Its goal is to provide the reader with a basic understanding of each of the four proposed policy alternatives regarding how TACs are now set and might be set in the future, and a qualitative assessment of the biological, physical, and socioeconomic consequences of each of these alternatives in relative isolation to other FMP components.

Before proceeding with the description and qualitative analysis of the four FMP alternatives under consideration, some background on the harvest strategy practiced by the NPFMC is provided. This background begins with a description of some of the key elements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the National Standard Guidelines (NSGs). It then provides an overview of the NPFMC's harvest strategy as it relates to the requirements of the MSA and NSGs.

Section 2 Background on Harvest Controls

2.1 MSA Requirements

From the perspective of the TAC-setting process, the most important part of the MSA is National Standard 1, which states, "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery for the United States fishing industry (emphasis added)." The MSA defines overfishing to mean "a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis." The MSA defines OY as the amount of fish which:

- "Will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems."

- "Is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor."

- "In the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery."

Note that the definitions of both overfishing and optimum yield refer to maximum sustainable yield (MSY). The MSA does not define MSY, but the NSGs define it as "the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions." The NSGs also introduce the concept of the "MSY control rule," defined as "a harvest strategy which, if implemented, would be expected to result in a long-term average catch approximating MSY." The MSY control rule can take a wide variety of forms. The NSGs offer the following advice regarding MSY control rules:

> *In choosing an MSY control rule, NPFMCs should be guided by the characteristics of the fishery, the FMP's objectives, and the best scientific information available. The simplest MSY control rule is to remove a constant catch in each year that the estimated stock size exceeds an appropriate lower bound, where this catch is chosen so as to maximize the resulting long-term average yield. Other examples include the following: Remove a constant fraction of the biomass in each year, where this fraction is chosen so as to maximize the resulting long-term average yield; allow a constant level of escapement in each year, where this level is chosen so as to maximize the resulting long-term average yield; vary the fishing mortality rate as a continuous function of stock size, where the parameters of this function are constant and chosen so as to maximize the resulting long-term average yield. In any MSY control rule, a given stock size is associated with a given level of fishing mortality and a given level of potential harvest, where the long-term average of these potential harvests provides an estimate of MSY.*

Under the NSGs, the MSY control rule plays a key role in making the MSA's definitions of overfishing and OY operational. In the case of overfishing, the MSY control rule serves as an upper limit on permissible specifications of the "maximum fishing mortality threshold" (MFMT). The MFMT specifies the fishing mortality rate (F) above which overfishing is defined to be occurring (i.e., if F>MFMT, overfishing is occurring). The MFMT, in turn, plays a role in defining the "minimum stock size threshold" (MSST). The

MSST specifies the biomass (B) below which the stock is defined to be overfished (i.e., if B<MSST, the stock is overfished). Specifically, the MSST is defined as whichever of the following is greater: one-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the MFMT. Taken together, the MFMT and the MSST constitute the set of "status determination criteria" which the NSGs require each FMP to specify whenever possible.

In the case of OY, the MSY control rule is key to interpreting the MSA's requirement that OY must be prescribed "on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor." According to the NSGs, this requirement means, in part, that the OY in any given year "must always be less than or equal to the harvest level that would be obtained under the MSY control rule." Therefore, if the MSY control rule were of the "constant catch" form, then a constant OY might be permissible, but if the MSY control rule were to associate different levels of catch with different stock sizes, then a constant OY would not be permissible (unless, perhaps, OY was set very conservatively).

2.2 NPFMC Harvest Strategy

Harvests in the BSAI and GOA groundfish fisheries are governed by the two FMPs, which constitute the overall "harvest strategy." The NPFMC harvest strategy is complex and multi-faceted because it must address a myriad of issues related to sustainability, legislative mandates, and quality of information. This section presents a fairly detailed overview of the various elements that comprised the NPFMC harvest strategy as reflected in the FMPs. In later sections dealing with comparisons between alternatives and example FMPs (e.g., the FMP "bookends"), attention will be focused more narrowly on those particular elements of the harvest strategy that differ between two or more alternatives.

2.3 Structure and Composition of Management Categories

The FMPs define four management categories for which catch is constrained by various regulatory mechanisms: Target Species, Prohibited Species, Other Species, and Forage Fish Species. In addition to these four management categories, the FMPs define a "Nonspecified Species" category for which catch is not constrained by any regulatory mechanism. Stocks can be moved from one management category into another only by FMP amendment. The five management categories are described below.

Target Species are those species which are commercially important and for which a sufficient database exists that allows each to be managed on its own biological merits. Within the Target Species category, stocks are managed either individually or as part of a stock complex. Stocks within the Target Species category can be added to or removed from a stock complex within the same category as part of the TAC-setting process (i.e., without an FMP amendment). Catch of each species or complex must be recorded and reported. This category includes species such as walleye pollock, Pacific cod, sablefish, flathead sole, and Pacific ocean perch.

Prohibited Species are those species and species groups that, when caught, must be returned to sea with a minimum of injury except when their retention is authorized by other applicable law. Groundfish species and species groups under the FMP for which quotas have been achieved are treated in the same manner as prohibited species. This category includes species such as Pacific halibut, herring, and Pacific salmon.

Other Species are species groups that currently are of slight economic value and not generally targeted. This category, however, contains species with economic potential or species that are important ecosystem components, but for which sufficient data are lacking to allow the species to be managed separately. Catch of this category as a whole must be recorded and reported. This category includes species groups such as sharks, skates, sculpins, and octopus.

Forage Fish Species are those species not included in the target species category and that are a critical food source for many marine mammal, seabird, and fish species. The forage fish species category is established to allow for the management of these species in a manner that prevents the development of a commercial directed fishery for forage fish. Management measures for this species category are specified in regulations and may include such measures as prohibitions on directed fishing, limitations on allowable bycatch retention amounts, or limitations on the sale, barter, trade, or any other commercial exchange, as well as the processing of forage fish in a commercial processing facility. This category includes species such as capelin, eulachon, and smelts.

Non-specified Species are those species and species groups of no current economic value taken by the groundfish fishery only as an incidental catch in the target fisheries. Virtually no data exists that would allow population assessments. No record of catch is necessary. This category includes those species that do not fall into any of the other categories.

2.4 Overfishing and Acceptable Biological Catch

The overfishing level (OFL) constitutes an absolute upper limit on the amount of fish that can be taken from a stock or stock complex in a given year, and is prescribed by an explicit set of formulae in the FMPs. The acceptable biological catch (ABC) is a preliminary description of the acceptable harvest (or range of harvests) for a given stock or stock complex. Its derivation focuses on the status and dynamics of the stock, environmental conditions, other ecological factors, and prevailing technological characteristics of the fishery. The ABC cannot exceed a maximum permissible level (maxABC), which is prescribed by an explicit set of formulae in the FMPs. In all cases, maxABC, and therefore ABC, is less than OFL. Strictly speaking, the only constraint that the FMPs impose on TACs is that their sum must fall within the OY range, meaning that, in principle, an individual TAC could be set higher than, equal to, or lower than the corresponding ABC. In practice, however, each individual TAC is always set equal to or lower than the corresponding ABC. Reasons for setting an individual TAC below the corresponding ABC may include various social, economic, or ecological considerations as well as the need to keep the sum of the TACs within the OY range. The following table describes the relationships between OFL, maxABC, ABC, TAC, the sum of the TACs ($\sum$TAC) and OY in the current system.

Quantity	Constraints imposed by FMP	Traditional, voluntary constraints
OFL	Value is prescribed by formula	None
maxABC	Value is prescribed by formula (always less than OFL)	None
ABC	$0 \leq ABC \leq maxABC$	None
TAC	$0 \leq TAC \leq$ upper OY	$TAC \leq ABC$
$\sum$TAC	lower OY $\leq \sum TAC \leq$ upper OY	None

The formal, quantitative methods for determining OFL and ABC begin with the assignment of each stock to one of six "tiers" based on the availability of information about that stock (Table 1). Tier 1 has the greatest informational requirements and Tier 6 has the least. Each tier contains a formula or set of formulae defining OFL and another formula or set of formulae defining maxABC. In Tiers 1-5, OFL and maxABC are defined in terms of their respective fishing mortality rates, F_{OFL} and *max* F_{ABC}. In Tier 6, OFL and maxABC are defined directly (i.e., in terms of catch rather than a fishing mortality rate). The OFL formulae correspond to the MFMT required by the NSGs. The current formulae were introduced as part of Amendment 56 to each of the FMPs, adopted by the NPFMC in June 1998 and implemented on March 8, 1999. The formulae make use of several biological reference points, which are defined below:

F_{MSY} The fishing mortality rate at which long-term average yield would be maximized if the MSY control rule were of the "constant F" form

B_{MSY} The long-term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units, that would be achieved under an MSY control rule of the "constant F" form

μ_A The arithmetic mean (i.e., average) of the distribution of the estimate of F_{MSY}

μ_H The harmonic mean of the distribution of the estimate of F_{MSY}

$F_{35\%}$ The fishing mortality rate at which the equilibrium level of spawning per recruit would be reduced to 35 percent of the equilibrium level of spawning per recruit in the absence of any fishing

$F_{40\%}$ The fishing mortality rate at which the equilibrium level of spawning per recruit would be reduced to 40 percent of the equilibrium level of spawning per recruit in the absence of any fishing

$B_{40\%}$ The long-term average biomass that would be expected under average recruitment when the stock is harvested at a fishing mortality rate equal to $F_{40\%}$

M The natural mortality rate

Tier 1 is used in those cases where the distribution of the estimate of F_{MSY} has been computed reliably. The theoretical background underlying the above reference points is described by Goodman *et al.* (2002). In this tier, F_{OFL} is set equal to the arithmetic mean of the distribution (the "risk neutral" point estimate) and *max* F_{ABC} is set equal to the harmonic mean of the distribution whenever biomass exceeds B_{MSY}. The harmonic mean has the mathematical property that it is less than the arithmetic mean by an amount that increases with the spread of the distribution, thus establishing a margin between F_{OFL} and *max* F_{ABC} that increases with the uncertainty surrounding the estimate of F_{MSY}. For levels of biomass below B_{MSY}, both F_{OFL} and *max* F_{ABC} decline linearly down to an intercept, below which both F_{OFL} and *max* F_{ABC} are zero (Figure 1). The default value for the intercept in Tier 1 is 5 percent of B_{MSY}, although the Scientific and Statistical Committee (SSC) can set a different intercept if warranted by the best scientific information available. Only one stock, eastern Bering Sea (EBS) pollock, is currently assigned to Tier 1.

Table 1. The North Pacific Fishery Management Council tier system developed by the Alaska Fisheries Science Center as defined by Bering Sea and Aleutian Islands and Gulf of Alaska Fishery Management Plan Amendments 56/56, June 1998.

1) Information available: Reliable point estimates of B and B_{MSY} and reliable probability density function (pdf) of F_{MSY}.

1a) Stock status: $B/B_{MSY} > 1$

$F_{OFL} = \mu A$, the arithmetic mean of the pdf

$F_{ABC} = \mu H$, the harmonic mean of the pdf

1b) Stock status: $\alpha < B/B_{MSY} = 1$

$F_{OFL} = \mu A \times (B/B_{MSY} - \alpha)/(1-\alpha)$

$F_{ABC} = \mu H \times (B/B_{MSY} - \alpha)/(1-\alpha)$

1c) Stock status: $B/B_{MSY} = \alpha$

$F_{OFL} = 0$

$F_{ABC} = 0$

2) Information available: Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{35\%}$, and $F_{40\%}$.

2a) Stock status: $B/B_{MSY} > 1$

$F_{OFL} = F_{MSY}$

$F_{ABC} = F_{MSY} \times (F_{40\%}/F_{35\%})$

2b) Stock status: $a < B/B_{MSY} = 1$

$F_{OFL} = F_{MSY} \times (B/B_{MSY} - a)/(1-\alpha)$

$F_{ABC} = F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1-\alpha)$

2c) Stock status: $B/B_{MSY} = \alpha$

$F_{OFL} = 0$

$F_{ABC} = 0$

3) Information available: Reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.

3a) Stock status: $B/B_{40\%} > 1$

$F_{OFL} = F_{35\%}$

$F_{ABC} = F_{40\%}$

3b) Stock status: $\alpha < B/B_{MSY} = 1$

$F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1-\alpha)$

$F_{ABC} = F_{40\%} \times (B/B_{40\%} - \alpha)/(1-\alpha)$

3c) Stock status: $B/B_{40\%} = \alpha$

$F_{OFL} = 0$

$F_{ABC} = 0$

4) Information available: Reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.

$F_{OFL} = F_{35\%}$

$F_{ABC} = F_{40\%}$

5) Information available: Reliable point estimates of B and natural mortality rate M.

$F_{OFL} = M$

$F_{ABC} = 0.75 \times M$

6) Information available: Reliable catch history from 1978 through 1995.

OFL = the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information.

$ABC = 0.75 \times OFL$

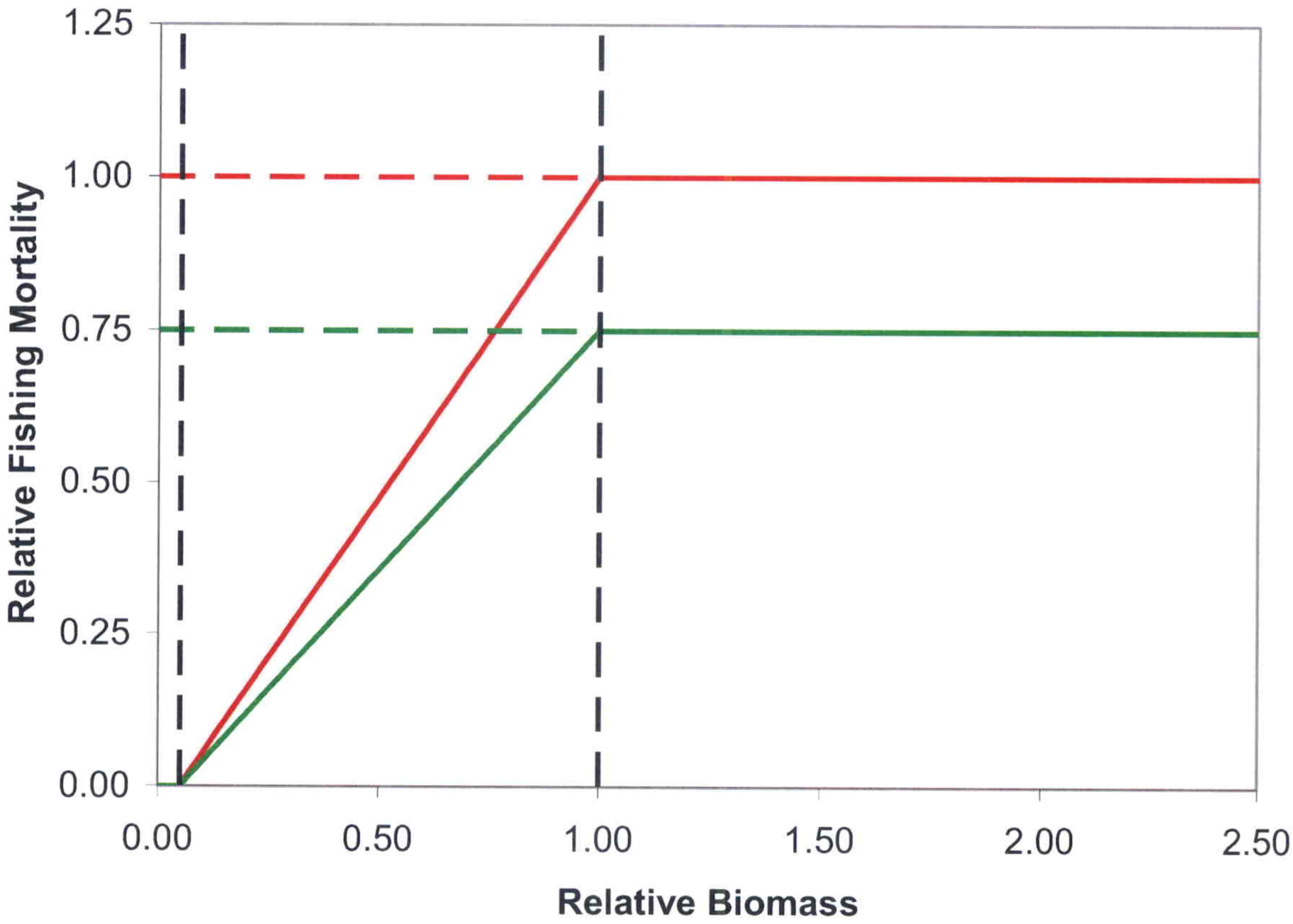


Figure 1. Harvest control rules used in Tiers 1-3.

Notes: The upper "kinked" line represents the F_{OFL} control rule. The lower "kinked" line represents the *max*F_{ABC} control rule. For any given stock, the ratio between *max*F_{ABC} and F_{OFL} is constant (a ratio of 0.75 is shown in the figure as an example). For both control rules, the following features apply: (1) Fishing mortality is constant whenever biomass exceeds a tier-specific reference level, represented in the figure by a vertical dashed line at a relative biomass level of 1.00. (2) Fishing mortality is zero whenever biomass is below 5 percent of the reference level, represented in the figure by a vertical dashed line at a relative biomass level of 0.05. (3) Fishing mortality varies linearly with biomass whenever biomass is between 5 and 100 percent of the reference level.

Tier 2 differs from Tier 1 in that only *point estimates* of the key population parameters are available; that is, the distribution of the estimate of F_{MSY} is not known. For a Tier 2 stock whose biomass is above B_{MSY}, F_{OFL} is set equal to the point estimate of F_{MSY}, much as in Tier 1, but a different formula (based on the adjustment used in Tier 3—see next paragraph) is used for adjusting the *max* F_{ABC} downward from F_{OFL}.

Tier 3 differs from Tiers 1-2 in that the available information is insufficient for any estimation of MSY. For a Tier 3 stock whose biomass is above $B_{40\%}$, F_{OFL} is set equal to the point estimate of $F_{35\%}$ and *max* F_{ABC} is set equal to the point estimate of $F_{40\%}$. According to the environmental assessment for Amendment 56, the $F_{35\%}$ reference point was intended to serve as a proxy for F_{MSY} (it was the *only* F_{MSY} proxy identified as such in the environmental assessment). Nearly all of the major target stocks in the BSAI/GOA are in Tier 3. Like the

control rules for Tiers 1-2, the control rules for Tier 3 decrease linearly with biomass when biomass is below a tier-specific reference level, which is $B_{40\%}$ in the case of Tier 3.

Tier 4 differs from Tier 3 in that information is insufficient for estimation of reference biomass levels. In this Tier, F_{OFL} is set equal to the point estimate of $F_{35\%}$ and *max* F_{ABC} is set equal to the point estimate of $F_{40\%}$, regardless of biomass (i.e., the form of the control rules shown in Figure 1 does not apply to Tier 4).

Tier 5 differs from Tier 4 in that information is insufficient for estimating $F_{40\%}$ or $F_{35\%}$. In this Tier, F_{OFL} is set equal to the point estimate of the natural mortality rate (M), and *max* F_{ABC} is set equal to three-fourths of that value, regardless of biomass (as in Tier 4).

Tier 6 differs from Tier 5 in that information is insufficient for estimating any of the stock parameters, and all that is known is the catch history. In this Tier, OFL is either the average historic catch from 1978 through 1995 or an alternative value established by the SSC on the basis of the best available scientific information, and maxABC is three-fourths of OFL, regardless of biomass (as in Tiers 4-5).

2.5 Optimum Yield and Total Allowable Catch

Another element of the NPFMC's harvest strategy is the specification of OY and TAC. The FMPs specify OY as a constant range of total (i.e., across-species) harvest levels. The range for the BSAI is 1.4 to 2.0 million metric tons (mt); and the range for the GOA is 116 to 800 thousand mt. Within the Target Species category, a separate TAC is specified annually for each individually managed stock and each stock complex. A single TAC is specified annually for the entire Other Species category. No TAC is specified for the Prohibited Species, Forage Fish Species, or Nonspecified Species categories. Although the FMPs require the sum of the individual TACs to fall within the OY range, they do not otherwise constrain individual TACs. In practice, however, individual TACs are never set higher than the corresponding ABCs. The FMP gives the Regional Administrator authority to close an area to directed fishing for a stock or stock complex whose remaining TAC is needed as bycatch in other directed fisheries. If a TAC is reached, the FMP requires the Regional Administrator to publish a notice declaring that stock or stock complex to be prohibited, in which case any further catches of that stock or stock complex must be discarded. In practice, National Marine Fisheries Service (NOAA Fisheries) attempts to manage each fishery so that total catch (including all discards) is less than, but very close to, TAC. When a directed fishery is closed, bycatch of that stock is limited by a maximum retainable bycatch, which is determined as a percentage of retained catch. If it appears that a TAC may be exceeded due to unanticipated circumstances and ABC is being approached, the managers typically prohibit retention of that species in all fisheries, in order to eliminate "topping off." If ABC is exceeded and OFL is being approached, the managers can prohibit or close any fisheries that might possibly take that species as bycatch.

Originally, OYs were specified for each stock and stock complex in the Target Species category and for the Other Species category. The OYs were derived from MSYs provided by NOAA Fisheries scientists from the Alaska Fisheries Science Center (AFSC) and reviewed by the SSC. Essentially, the approach was a constant catch strategy, which was intended to be updated whenever new information indicated that a change was needed. Because data and sophisticated analytical tools were relatively scarce by today's standards, the stock assessments were fairly simple, often estimating MSY as the product of the most recent survey biomass estimate and half the natural mortality rate. Furthermore, the early assessments were based on data taken during a period of time that is now believed to have been a point of low productivity in the two regions.

The NPFMC soon learned that the FMP amendment process as established by the MSA was not prepared to deal with annual changes in OYs that were specified as fixed numerical values in the FMPs. Each change in OY required a plan amendment, which took several months to put into place. Yet the assessed status of the population could change dramatically due to new survey and catch data, recruitment variability, and other changes in population parameters. The FMPs were amended several times to make such changes, but a better solution was needed.

The solution the NPFMC chose was to specify OY as a constant (i.e., biomass-independent) range for each of the two groundfish complexes. The summed TACs of all species in the Target Species and Other Species categories would have to be within the range, but the individual TACs could be adjusted annually through a specifications process (i.e., a plan amendment would not be required). Amendment 1 to the BSAI FMP, which was implemented on January 1, 1984, set the OY range for the BSAI at 1.4-2.0 million mt (Amendments 1a, 2, 3, 4, and 7 were actually implemented earlier than Amendment 1). The OY range was set equal to 85 percent of the range of the summed species-specific MSYs in the BSAI. This range was chosen, in part, to ensure that future harvests would be sustainable. Also, the final environmental impact statement for the BSAI FMP (dated August, 1981), which also covered Amendment 1, stated that use of the 85 percent multiplier was "intended both to assure the continued health of the target species themselves and to mitigate the impact of commercial groundfish operations on other elements of the natural environment." Thus, at the time it was specified, the BSAI OY range was believed to be conservative from both single-species and ecosystem perspectives.

Amendment 15 to the GOA FMP, which was implemented on April 8, 1987, set the OY range for the GOA at 116,000 to 800,000 mt. The upper end of the OY range was below the range of the summed species-specific MSYs in the GOA (805,000-1,000,000 mt). The lower end of the OY range was near the lowest historical catch over the period 1965-1985 (116,053 mt, taken in 1971). At the time of the lowest historical catch, pollock, cod, and Atka mackerel abundances were at low levels of abundance and, consequently, it was thought unlikely that catches lower than this value would be necessary during future instances of low abundance. The upper limit was selected in consideration of the volatility in pollock and flounder ABCs, the potential for harvesting at MSY, and the desire to allow for some moderate expansion in future flounder fisheries.

2.6 Minimum Stock Size Threshold

As noted above, the NSGs provide a standard definition of MSST, the criterion used to determine whether a stock or stock complex is overfished in the sense of the MSA. The NSGs require FMPs to specify MSST whenever possible. However, the BSAI and GOA Groundfish FMPs do not specify MSST. This has been a continuing source of confusion and controversy ever since the development of Amendment 56 (see Goodman *et al.* (2002) for a history). Although the FMPs do not specify MSST, the status of each stock in Tiers 1-3 is examined annually in the Stock Assessment and Fishery Evaluation (SAFE) reports with respect to the MSST definition contained in the NSGs. Based on this examination, no BSAI or GOA groundfish stock or stock complex managed under Tiers 1-3 is currently overfished. However, in the event that a stock or stock complex becomes overfished in the future, Tiers 1-3 contain provisions for "accelerated" rebuilding, meaning that reductions in both F_{OFL} and *max* F_{ABC} are triggered whenever the estimate of stock biomass is below a tier-specific reference level (Figure 1). In Tiers 1-2, the reference level is B_{MSY}, and in Tier 3, the reference level is $B_{40\%}$. For the purpose of determining whether a stock is "overfished," the NSGs set the rebuilding target equal to B_{MSY}. An estimate of B_{MSY} is available for Tiers 1-2 by definition. For Tier 3, the FMPs do not specify a B_{MSY} proxy, but the AFSC has traditionally used $B_{35\%}$ as the B_{MSY} proxy for Tier 3

stocks. The accelerated rebuilding schedule built into Tiers 1-3 may render specification of an MSST superfluous from a practical standpoint, because the management actions required for a stock which falls below its MSST may be identical to those that would take place automatically under the tier system.

Because it is not possible to estimate either B_{MSY} or any reliable proxy for B_{MSY} in Tiers 4-5, it is not possible to tell whether a stock or stock complex managed under either of these two tiers is currently overfished. Although Tiers 4-5 do not contain provisions for accelerated rebuilding, they *do* contain provisions for rebuilding under a constant fishing mortality rate. Thus, in the long run, stocks in Tiers 4-5 should tend toward the equilibrium biomass associated with the rate at which they are fished, but it is not possible to tell whether they have arrived at that equilibrium biomass or when they will get there. However, because biomass estimates are available for stocks in Tiers 4-5, it is at least possible to tell whether stocks managed under these tiers are increasing or decreasing over time.

As with Tiers 4-5, it is not possible to tell whether a stock or stock complex managed under Tier 6 is currently overfished. Unlike Tiers 4-5, Tier 6 does not contain provisions for rebuilding under a constant fishing mortality rate, but it does contain provisions for rebuilding under a constant catch level. Thus, in the long run, stocks in Tier 6 should tend toward the equilibrium biomass associated with the average catch so long as that catch is sustainable, but it is not possible to tell whether they have arrived at that equilibrium biomass or when they will get there. Furthermore, because biomass estimates are unavailable for stocks in Tier 6, it may not be possible to tell whether stocks managed under this tier are increasing or decreasing over time, unless measures such as commercial catch per unit effort are deemed to be reliable indicators of relative biomass.

2.7 Ecosystem Considerations in the TAC-Setting Process

Most of the above elements of the existing harvest strategy have implications for the ecosystem, at least indirectly. A few, such as the BSAI OY range, were adopted with ecosystem considerations (EC) explicitly in mind. Some other elements of the existing harvest strategy address EC directly. For example, since 1998, the existing policy has included provisions for protecting forage species. Forage species are generally small, abundant fishes (also krill) that are preyed upon by marine mammals, seabirds, and commercially important groundfish species. They are believed to perform a critical role in the BSAI and GOA ecosystems by providing transfer of energy from primary or secondary producers to higher trophic levels. Forage species have been estimated to comprise the principal diet for more than two-thirds of Alaska seabirds and are critical to many seabirds for raising their nestlings. Forage species have also been recognized as important prey items for a variety of marine mammals including the Steller sea lion, northern fur seal, spotted seal, bearded seal, humpback whale, and fin whale. They are presently relegated to bycatch-only status in the groundfish fishery. Maximum retainable bycatch limits are set at 2 percent for the entire group of forage species, regardless of the composition of the forage species taken. This percentage defines the maximum catch of forage species that may be retained aboard a vessel relative to amounts of other retained species open to directed fisheries. Forage fish taken within the 2 percent limit may be used for commercial purposes and are typically processed into fish meal. During the period 1997-1999, an average of 39 mt of forage species was taken annually in the BSAI region and an average of 61 mt was taken in the GOA.

Another example is the NPFMC's encouragement of ecosystem research and development of ecosystem-based management policies. An Ecosystem Committee was established by the NPFMC in 1995 and has developed a draft policy for ecosystem-based management of North Pacific fisheries (Witherell *et al.* 2000). The EC section of the SAFE reports continues to become more substantial. Multi-species modeling efforts

have been undertaken, mainly by AFSC personnel, and are being used as a primary analytical tool in this Programmatic Supplemental Environmental Impact Statement (SEIS). These models have allowed consideration of ecosystem impacts in ways that single-species models cannot (Goodman *et al.* 2002). Currently, these models are not viewed as a replacement for the single-species approach, but rather as a means of gaining better insight regarding potential ecosystem effects. The present FMP policy includes the goal of developing ecosystem indicators for future use in TAC setting, and the existing policy allows TAC to be set below ABC for a wide variety of reasons including EC.

A third example focuses on the groundfish species that figure most prominently in the diet of Steller sea lions: walleye pollock, Pacific cod, and Atka mackerel. In 2000, a Biological Opinion prepared under Section 7 of the Endangered Species Act on all aspects of the FMPs concluded that fisheries for these species jeopardized the continued existence of Steller sea lions and adversely modified their critical habitat due to competition for prey and modification of their prey field. To mitigate these effects, regulations now require, among other things, that the directed fishery for any stock of these species be closed if the biomass of that stock is projected to be less than or equal to $B_{20\%}$ (the long-term average biomass that would be expected under average recruitment when the stock is harvested at a fishing mortality rate equal to $F_{20\%}$) during the fishing year.

Many other aspects of the FMPs (e.g., Prohibited Species caps) also deal with EC, but they are not as directly related to the TAC-setting policy as the above items and so are dealt with in other sections of this appendix.

2.8 Annual Cycle

The TAC-setting process follows a regular annual cycle. Each year, scientists from the AFSC and the Alaska Department of Fish and Game collect data and compile and update databases on catch, age and size composition, and survey biomass. Stock assessment scientists from these agencies analyze the data and calculate estimates of population parameters, biomass, and age structure. Stock assessment models are used to integrate the scientific information, except when information is not sufficient to construct such a model. The processes of stock assessment and harvest strategy development are interrelated. Stock assessment models are used in development of the harvest strategy, and the current NPFMC biomass-based harvest strategy utilizes the most recent biomass estimates in determining ABC, OFL, and TAC.

The BSAI and GOA Plan Teams meet in September to discuss general methodological issues and any preliminary stock assessments that have been prepared. The SSC, the Advisory Panel (AP), and the NPFMC meet in October. The SSC focuses on assessment methodology, while the AP recommends and the NPFMC sets preliminary TACs based on extrapolations from the previous year. By November, the individual chapters of the SAFE reports have been prepared by the assessment scientists and another group of scientists has completed the EC section. The Plan Teams meet again in November to review the SAFE reports and make ABC and OFL recommendations. In December, the SSC reviews the SAFE reports and Plan Team recommendations, then formulates its own ABC and OFL recommendations. The AP recommends TAC values, traditionally lower than the ABC values recommended by the SSC. The NPFMC then sets final values of ABC, OFL, and TAC, subject to confirmation by NOAA Fisheries.

Section 3 FMP Policy Alternatives

Four FMP policy alternatives are under consideration by the NPFMC. Alternative 1 is the present policy. Each policy alternative contains two bookends to a range of management measures that illustrate how the framework could be implemented. These bookends provide a level of detail that allows analysis and provides contrastable policies. They also provide a means to commit the NPFMC action in implementing an alternative, while allowing the NPFMC, under the MSA, the flexibility to adaptively manage the fishery through FMP amendments.

Alternative 1 Continue Management Under Existing (Updated) Policy: Under this alternative, the NPFMC would continue to manage the groundfish fisheries based upon the present conservative and risk-averse policy. This policy assumes that fishing results in some adverse impacts to the environment and that, as these impacts become known, mitigation measures will be developed and appropriate FMP amendments will be implemented. The objectives of this policy are to adopt conservative harvest levels for single species fisheries and specify OY; continue to use existing OY cap for BSAI and GOA groundfish fisheries; and provide for adaptive management by continuing to specify OY as a range.

Alternative 2 Less Precautionary Management Policy: A less precautionary management policy (i.e., more aggressive harvest policy) would be implemented based upon the concept that the present policy is overly conservative and that higher harvests could be taken without threat of overfishing the target groundfish stocks. This policy assumes that fishing at the recommended levels would have no adverse impact on the environment, except in specific cases that are generally known. The objectives of this policy are to prevent overfishing by setting an OY cap at the sum of OFLs or the sum of the ABCs for each species and provide for adaptive management by continuing to specify OY as a range.

Alternative 3 More Precautionary Management Policy: This policy would seek to accelerate the existing precautionary management measures through community-based or rights-based management, ecosystem-based management principles and, where appropriate and practicable, increase habitat protection and impose additional bycatch constraints. Under this approach, additional conservation management measures would be taken as necessary to respond to social, economic, or conservation needs. Additional measures would be taken if scientific evidence indicated that the fishery was negatively impacting the "environment," not just a population of a given species. The objectives of this policy are to adopt conservative harvest levels for multi-species and single-species fisheries; provide for adaptive management by continuing to specify OY as a range or a formula; initiate a scientific review of the adequacy of F_{40}, and implement improvements accordingly; and to continue to collect scientific information and improve upon MSSTs including obtaining biological information necessary to move Tier 4 species into Tiers 1-3 in order to obtain MSSTs.

Alternative 4 Highly Precautionary Management Policy: This policy would require that the user of the resource demonstrate that the intended use would not have a detrimental effect on the environment before significant fishing could be allowed. The policy, as illustrated by its FMP framework, would be to impose very restrictive conservation and management measures that would only be modified or relaxed when additional, reliable scientific information became available. It would involve a strict interpretation of the precautionary principle. Management discussions would involve and be responsive to the public, but decreased emphasis would be placed on industry and community concerns, and more emphasis would be placed on ecosystem concerns and principles, including the identification and incorporation of non-consumptive use values. The overall premise is that fishing produces adverse impacts on the environment, but due to a lack of information and uncertainty, little is known about these impacts. The objectives of this policy are to prevent overfishing by transitioning from single-species to ecosystem-oriented management of fishing activities and to close an additional 20 to 50 percent of known spawning areas of target species across the range of the stock to protect productivity and genetic diversity.

3.1 Alternative 1 – Continue Management Under the Current Risk-Averse Management Policy

In the context of the TAC-setting process, this alternative is based on the premise that the best scientific information available is typically sufficient to manage fisheries so that they achieve long-term average yields close to MSY without excessive risk to the fishery or ecosystem.

3.1.1 Description of Features Pertaining to the TAC-Setting Process

The background section presented a fairly detailed overview of the various elements that comprise the NPFMC harvest strategy as reflected in the FMPs. Here, attention will be focused more narrowly on those particular elements of the harvest strategy, which differ in at least one of the other alternatives.

Structure and Composition of Management Categories

The FMPs define four management categories for which catch is constrained by various regulatory mechanisms: Target Species, Prohibited Species, Other Species, and Forage Fish Species. In addition to these four management categories, the FMPs define a "Nonspecified Species" category for which catch is not constrained by any regulatory mechanism (this category is composed of stocks which are of no current economic value and which are taken by the groundfish fishery only as bycatch). Stocks can be moved from one management category into another only by FMP amendment. Within the Target Species category, stocks are managed either individually or as part of a stock complex. Stocks within the Target Species category can be added to or removed from a stock complex within the same category as part of the TAC-setting process (i.e., without an FMP amendment).

OFL and ABC

The FMPs specify OFL and maxABC by means of a tier system wherein the amount of information available for a given stock or stock complex determines the formula that is used to define F_{OFL} and *max* F_{ABC} (Tiers 1-5) or OFL and maxABC directly (Tier 6). The tier system is configured such that maxABC is always less than OFL except at very low stock sizes (where both maxABC and OFL are zero). The FMPs require that ABC

be set between zero and maxABC. One of the central features of Tiers 1-3 is that F_{OFL} and *max* F_{ABC} decrease linearly with biomass whenever biomass falls below a tier-specific reference level. Most individual stocks are currently managed under Tier 3, where *max* F_{ABC} equals $F_{40\%}$ if biomass is above $B_{40\%}$. In Tier 1 (but not in any other tier), greater statistical uncertainty automatically results in a lower maxABC. This adjustment implies a fixed level of risk aversion and is computed using the statistical uncertainty surrounding both the estimate of projected stock size and the estimate of F_{MSY}.

OY and TAC

The FMPs specify OY as a range, which is aggregated across all stocks and does not vary with biomass. Within the Target Species category, a separate TAC is set for each individually managed stock and each stock complex. A single TAC is set for the entire Other Species category. No TAC is set for the Prohibited Species, Forage Fish Species, or Nonspecified Species categories. Although the FMPs require the sum of the individual TACs to fall within the OY range, they do not otherwise constrain individual TACs. In practice, however, individual TACs are never set higher than the corresponding ABCs. The FMP gives the Regional Administrator authority to close an area to directed fishing for a stock or stock complex whose remaining TAC is needed as bycatch in other directed fisheries. If a TAC is reached, the FMP requires the Regional Administrator to publish a notice declaring that stock or stock complex to be prohibited, in which case any further catches of that stock or stock complex must be discarded.

MSST

In practice, the status of each stock in Tiers 1-3 is examined annually in the SAFE reports with respect to the MSST definition contained in the NSGs, but no MSSTs are specified in the FMPs for stocks in Tiers 1-3 and no MSSTs are specified anywhere for stocks in Tiers 4-6.

Ecosystem Considerations

The FMPs prohibit directed fishing for forage species. Regulations require the directed fishery for any stock of pollock, Pacific cod, or Atka mackerel (key Steller sea lion prey species) to close if the biomass of that stock is projected to be less than or equal to $B_{20\%}$ during the fishing year. Traditionally, the NPFMC has encouraged research regarding indicators of ecosystem health, but the conditions under which such indicators might actually be used in the TAC-setting process are unclear.

3.1.2 Evaluation of Policy from a Single-Species Perspective

Structure and Composition of Management Categories

In the context of the TAC-setting process, the central features of the existing management categories are that some stocks are afforded the protection of a stock-specific catch limit, other stocks are afforded the protection of a complex-specific catch limit, while the stocks in the Nonspecified Species category are not protected by any catch limit (based on the understanding that stocks in that category are taken in such small amounts that no catch limit is necessary). Recently, attention has been focused on the possibility of removing certain individual stocks or groups of stocks from their respective stock complexes, affording them the additional protection of a stock-specific or group-specific catch limit. In fact, the NPFMC has taken this step several times in recent years, for example, by sequentially removing rock sole, flathead sole, and Alaska plaice from the "other flatfish" complex in the BSAI. However, concern has been expressed regarding the absence of an identifiable policy governing such decisions. In addition, comparatively little attention has been focused on

the composition of the Nonspecified Species category. Presently, a committee composed of representatives from the SSC and Plan Teams is working to develop a draft policy that could be used to structure the management categories in a more consistent and scientifically justifiable manner.

OFL and ABC

Table 2 (reproduced from Goodman *et al.* 2002) lists the stocks and stock complexes comprising the Target Species and Other Species categories in each region, together with the tier assignment, OFL, *max*ABC, ABC, and other quantities for each in 2001. The relationships between these quantities can be summarized as follows:

- The maxABCs were always set below the OFLs, resulting in values, which averaged about 80 percent (range: 60-90 percent) of the OFLs; and

- The ABCs were often set below the maxABCs, resulting in values, which averaged about 75 percent (range: 10-85 percent) of the OFLs.

In the GOA, none of the 16 stocks or stock complexes were assigned to Tiers 1 or 2; seven were placed in Tier 3; five were in Tier 4 or Tiers 4-5 (some stocks in a complex were managed under Tier 4 while the other members of the complex were managed under Tier 5); and four were assigned to Tiers 5, 5-6, or 6. Thus, a suite of GOA stocks and complexes was managed under Tier 3. A similar situation existed in the BSAI region. In the BSAI, one stock (Bering Sea pollock) had sufficient information to be assigned to Tier 1. Of the remaining 20 stocks or stock complexes, 12 were in Tier 3; seven were placed in Tiers 5 or 5-6; and squid were placed in Tier 6. Thus, a majority of BSAI stocks and complexes was managed under Tier 3. As discussed earlier, $F_{40\%}$ plays a key role in the Tier 3 maxABC control rule.

Table 2. Comparison of Fishery Management Plan frameworks regarding the total allowable catch-setting process.

Alternative 1	Alternative 2		Alternative 3		Alternative 4	
FMP 1	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
• Set acceptable biological catch (ABC) < overfishing level (OFL). • Sum of total allowable catch (TAC) has to be within optimum yield (OY) range.	• Set ABC = OFL. • Sum of TAC has to be within OY range.	• Set ABC < OFL. • Same as FMP 2.1.	• Set ABC < OFL. • Set TAC =<ABC for all targets and "other spp." category.	• Same as FMP 3.1. • Same as FMP 3.1.	• No changes from FMP 1. • No changes from FMP 1.	• No changes from FMP 1. • TAC = 0 for all species unless fisheries are proven to have no adverse effect on the environment.
OY specified as range for Bering Sea and Aleutian Islands (BSAI): 1.4 - 2.0 million (mill) metric tons (mt) and OY specified as range for Gulf of Alaska (GOA): 116,000 - 800,000 mt; BSAI OY cap: If the sum of TAC > 2 mill mt then TAC will be adjusted down.	OY specified as range; OY cap = sum of OFL.	OY specified as range; OY cap = sum of ABCs.	OY specified as range for BSAI: 1.4 - 2.0 mill mt and OY specified as range for GOA: 116,000 -800,000 mt; BSAI OY cap: If the sum of TAC > 2 mill mt then TAC will be adjusted down (No changes from FMP 1).	• No OY range in plan; OY = TAC which is =<ABC. • TAC is fishery specific.	• No OY range in plan; OY = TAC which is =<ABC. • TAC is fishery specific.	OY = 0; No fishery.
B_{20} rule for prey species (pollock, P. cod, Atka mackerel).	No changes from FMP 1.	No changes from FMP 1.	B_{20} rule for prey species (pollock, P. cod, Atka mackerel) (No changes from FMP 1).	Revise harvest control rule by incorporating a constant buffer.	Set F_{75} for prey species (pollock, P. cod, Atka mackerel).	TAC = 0 for all species.
ABC tier system (Amendment 56).	OFL management (Amendments 56 OFL definitions with inflection points removed in Tiers 1-3).	No changes from FMP 1.	Review F_{40} and adapt ABC tier system where F_{40} is maximum permissible for stocks without estimate of maximum sustainable yield (MSY).	When possible, biological reference points based on species-specific production patterns and ecosystem considerations.	Set F_{60-80} for vulnerable (e.g., long-life, slow-growing) species (will use F_{60} as proxy).	TAC = 0 for all species.
No directed fishery for forage fish (forage fish ban; Amendment 36/39).	No forage fish ban.	No changes from FMP 1.	No directed fishery for forage fish (forage fish ban, Amendments 36/39; No changes from FMP 1).	Same as FMP 3.1.	No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from FMP 1).	Same as FMP 4.1.

Table 2 (cont.). Comparison of Fishery Management Plan frameworks regarding the total allowable catch-setting process.

Alternative 1	Alternative 2		Alternative 3		Alternative 4	
FMP 1	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Specify MSSTs for Tier 1-3 stocks.	No changes from FMP 1.	No changes from FMP 1.	Identify minimum required elements, resources, cost and a realistic time frame necessary to establish MSSTs for additional stocks and prioritize a list of candidate stocks.	Initiate analysis of MSSTs for priority stocks based on the time frame determined by additional availability of required resources.	Adopt MSSTs appropriate to the harvest policy for each stock, with B_{40} as the limit (rather than the target).	No changes from FMP 1.
Set group TAC for "other species" category.	No changes from FMP 1.	No changes from FMP 1.	Break sharks and skates out of "other species" group for TAC setting (Amendments 63/63).	Break sharks and skates and additional groups out of "other species" group for TAC setting.	Least Abundant Species Aggregate TAC: e.g., TAC of species complex is based on the TAC of the least abundant member of the group.	TAC = 0 for all species.
			Develop criteria for breaking out a species from a species complex.	Develop criteria to bring a non-specified species into a managed category.	Where possible, break species out of the complex.	
Precautionary adjustments exist, but vary with uncertainty only in Tier 1.	OFL management only.	No changes from FMP 1.	Conduct F_{40} review and adopt appropriate measures.	Develop, implement and update as necessary, procedures to account for uncertainty in estimating ABC.	Incorporate survey variance and uncertainty in ABC by a survey coefficient of variation for each stock.	In the face of uncertainty, set TAC = 0 for all species unless fisheries are proven to have no adverse effect on the environment.
Develop ecosystem indicators for future use in TAC setting.	No ecosystem indicators.	No changes from FMP 1.	Develop criteria for using key ecosystem indicators in TAC setting.	Adopt, update as necessary, and use ecosystem indicators in TAC setting.	Evaluate a range of ABCs using the lower bound of a confidence limit to address uncertainties in stock assessment advice.	
Target species closures when harvest limit reached.	No changes from FMP 1.	No changes from FMP 1.	No changes from FMP 1.	No changes from FMP 1.	No changes from FMP 1.	Harvest limit = 0.

There is a fairly widespread consensus in the scientific literature that, for a range of typical groundfish life histories, $F_{40\%}$ is a safe harvest rate. However, Goodman *et al.* (2002) raised concerns regarding the use of $F_{40\%}$ in managing the BSAI and GOA rockfish species. This concern was based mainly on results obtained by MacCall (2002) and Clark (2002) working with West Coast rockfish. However, only a few rockfish stocks in Alaska are being managed under a tier in which $F_{40\%}$ plays a role, and those which are managed in one of those tiers (Pacific ocean perch and GOA thornyhead) appear to be doing well. Dorn (2002) studied Alaska rockfish stocks in addition to West Coast stocks and found that, although $F_{40\%}$ was not always a safe harvest rate for the West Coast stocks, it appeared to be safe for the Alaska stocks included in the study. Thus, the concern raised by Goodman *et al.* (2002) appears to be more germane to rockfish stocks which are currently managed in Tier 5 but which might be managed under a different tier in the future, in which case the key question is whether the Tier 5 rockfish stocks behave more like other Alaska rockfish stocks or more like West Coast rockfish stocks. Goodman *et al.* (2002) also note that the Tier 3 maxABC control rule is not directly comparable to the control rules used in the studies by MacCall (2002) and Clark (2002). Under the Tier 3 control rule, fishing mortality decreases linearly with stock size if the biomass falls below $B_{40\%}$, whereas it was assumed in the West Coast rockfish studies that harvest rates would be kept constant regardless of stock size. All else being equal, the Tier 3 control rules are more conservative than the $F_{40\%}$ strategies in the referenced studies of West Coast rockfish.

Over time, the evolution of the tier system has tended towards increasing conservatism. By the standards of the world's other large commercial fisheries, the current tier system is conservative.

OY and TAC

In addition to OFL, maxABC, and ABC, Table 2 also lists TAC and the 1997-2000 average ratio of catch to TAC for each stock and stock complex in the Target Species and Other Species categories. The relationships between these quantities can be summarized as follows:

- The TACs were often set below the ABCs, resulting in values, which averaged about 65 percent (range: 0-85 percent) of the OFLs; and

- On average, catches exceeded TACs only rarely. The median ratio of catch to TAC (averaged over the period 1997-2000) was about 60 percent for both the BSAI and GOA. The range of the ratios across areas and species was 21-112 percent, with the highest ratio coming from the GOA sablefish fishery, where catches exceeded TACs in three of the four years examined.

As noted earlier, the MSA states that OY is to be prescribed "on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor." According to the NSGs, this requirement means, in part, that the OY in any given year "must always be less than or equal to the harvest level that would be obtained under the MSY control rule." Thus, in order to determine whether the OY specification complies with the MSA, it is necessary to know the form of the MSY control rule. This is problematic in the case of the BSAI and GOA Groundfish FMPs, because the NPFMC declined to specify an MSY control rule in Amendment 56. Based on the methods used to specify the current OY range and the fact that it does not vary with biomass, it could be inferred that the NPFMC's implicit MSY control rule is of the "constant catch" form. However, this interpretation would mean that the OFL control rules in at least some of the tiers violate the NSGs' requirement that the MSST not exceed the MSY control rule (in Tiers 1-2, for example, OFL exceeds MSY whenever biomass exceeds B_{MSY}). On the other hand, if it is assumed that the OFL control rules correspond to the NPFMC's implicit MSY control rule, then the adequacy of the current OY

specification is called into question, because the entire OY range will exceed the harvest associated with the MSY control rule if biomass is low enough.

Previous reviews have identified similar concerns regarding the current OY specifications. For example, Goodman *et al.* (2002) compared the 1999 OFLs with the current OY specifications and found that, although the aggregate BSAI OFL of 3.7 million mt was higher than the BSAI OY range (1.4 to 2.0 million mt), the aggregate GOA OFL of 779,000 mt was within the GOA OY range (116,000 to 800,000 mt), leading the authors to recommend that the NPFMC might consider a review of the existing OY definitions so that they could be made consistent with the MSA in a more explicit way. In a draft review of the current OY specifications, Thompson (1998) concluded, "The GOA OY specification generally fails to address protection of marine ecosystems and may fail to insure that OY does not exceed MSY. The BSAI OY specification clearly attempts to address protection of marine ecosystems (though whether the attempt is sufficient is probably debatable) and most likely insures that OY does not exceed MSY. However, the fact that neither of the OY specifications has been formally reviewed for at least 10 years may mean that they need to be reanalyzed anyway."

MSST

As noted above, the NSGs require FMPs to specify MSST whenever possible, but the BSAI and GOA Groundfish FMPs do not specify MSST, although the status of each stock in Tiers 1-3 is examined annually in the SAFE reports with respect to the MSST definition contained in the NSGs, using $B_{35\%}$ as a proxy for Tier 3 stocks even though no such proxy is identified in the tier system, all of which has caused considerable confusion and controversy. Confusion and controversy aside, however, the lack of an FMP-specified MSST for Tiers 1-3 has had no practical impact on the management or health of the stocks. As shown by the annual examination in the SAFE reports, no stock in Tiers 1-3 has ever fallen below the MSST since the examination began in 1999. Furthermore, in the event that a stock ever did fall below the MSST, the existing maxABC control rules might very well provide an acceptable rate of rebuilding under the MSA, meaning that no change in harvest strategy would be required.

Tiers 4-6 provide a different set of problems. These three tiers apply by definition to those stocks and stock complexes for which the available information is insufficient to estimate a reference biomass level such as B_{MSY} or $B_{35\%}$, making it difficult to determine directly whether such a stock or stock complex is above its MSST. An early draft of Amendment 56 included an alternative, which identified various proxies for B_{MSY} with fewer information requirements than a direct estimate of B_{MSY} or $B_{35\%}$, but the NPFMC asked that this alternative be omitted from the final draft. Instances of a stock or stock complex moving from Tiers 4-6 to Tiers 1-3 have been few since implementation of Amendment 56.

3.1.3 Evaluation of Policy from an Ecosystem Perspective

As discussed earlier, many elements of the existing harvest strategy have implications for the ecosystem, at least indirectly, and several were adopted with EC explicitly in mind, including the BSAI OY range, the prohibition of directed fishing for forage species, and the required closure of the directed fishery for any stock of pollock, Pacific cod, or Atka mackerel that falls below $B_{20\%}$. However, the actual impacts of these measures on the ecosystem are largely unknown.

Although the present FMP policy includes the goal of developing ecosystem indicators for future use in TAC setting, the conditions under which such indicators might actually be used in the TAC-setting process are unclear. The existing policy allows TAC to be set below ABC for a wide variety of reasons including EC. In practice, however, decisions to set TAC below ABC are seldom accompanied by explicit rationale of any kind, let alone an indication of the extent to which they are due to EC.

Goodman *et al.* (2002) concluded that, while the existing system had the potential to be highly considerate of ecosystem needs, the available data could be used for a more ambitious and formalized decision system, which might be more explicitly considerate of ecosystem needs. However, the authors of the study qualified this by observing that the available data have not proven sufficient to demonstrate conclusively whether more protection is actually needed.

3.1.4 Conclusions

The existing policy is conservative overall. It has resulted in catches that have been, on average, below those that would have been obtained from a strict F_{MSY} policy, for example. However, some concern has been raised regarding certain features of the existing policy, including the following: 1) The legal adequacy of the existing OY specifications is not clear; 2) The FMPs do not specify an MSST; 3) Some of the fishing mortality rates resulting from the existing policy have been found to be too high for certain stocks in other parts of the country; 4) The impacts of the existing policy on other components of the ecosystem are evaluated on an annual basis in our TAC EAs. These TAC EAs and analysis of the status quo policy in this Programmatic SEIS have shown that target stocks are not overfished and have shown insignificant impacts of TAC on some categories of non-target species (forage, prohibited, and protected species). The EAs also acknowledge that effects are unknown for other categories of non-target species that either are not well sampled in trawl surveys or for which there is no species-level information. The ecosystem analysis presented in Section 4 discusses these components.

3.2 Alternative 2 – Adopt a More Aggressive Management Policy

In the context of the TAC-setting process, this alternative is based on the premise that the best scientific information available is typically sufficient to manage fisheries so that they achieve long-term average yields very close or equal to MSY without excessive risk to the fishery or ecosystem.

3.2.1 Description of Features Pertaining to the TAC-Setting Process

The ways in which FMPs 2.1 and 2.2 differ with respect to FMP 1 are listed below.

Structure and Composition of Management Categories

Differences under FMP 2.1: None. Differences under FMP 2.2: None.

OFL and ABC

Differences under FMP 2.1: F_{OFL} would no longer vary with biomass over any portion of the range in Tiers 1-3 and ABC would be adjusted upward so as to equal OFL in all tiers. Differences under FMP 2.2: None.

OY and TAC

Differences under FMP 2.1: OY would be specified annually as a range aggregated across all stocks and would extend from the lower end of the current range to either the sum of the OFLs or the upper end of the current range, whichever is greater. Differences under FMP 2.2: OY would be specified annually as a range aggregated across all stocks and would extend from the lower end of the current range to either the sum of the ABCs or the upper end of the current range, whichever is greater.

MSST

Differences under FMP 2.1: None. Differences under FMP 2.2: None.

Ecosystem Considerations

Differences under FMP 2.1: Directed fishing of forage species would be permitted and use of ecosystem indicators in the TAC-setting process would be prohibited. Differences under FMP 2.2: None.

3.2.2 Evaluation of Policy from a Single-Species Perspective

By making F_{OFL} independent of biomass over the entire range in Tiers 1-3 and adjusting ABC upward so as to equal OFL in all tiers, FMP 2.1 would result in higher OFLs for all stocks in Tiers 1-3 that are below their tier-specific reference levels (B_{MSY} in Tiers 1-2, $B_{40\%}$ in Tier 3) and higher ABCs for all stocks, relative to values that would be obtained under FMP 1. This change would also make it more likely for stocks to be classified as "overfished," which would in turn require the implementation of rebuilding plans that would constrain harvest to some level lower than ABC.

By specifying OY annually as a range that can extend as high as the sum of the OFLs (under FMP 2.1) or the sum of the ABCs (FMP 2.2), Alternative 2 would allow for the possibility of higher TACs than would be permissible under FMP 1. Whether Alternative 2 would actually result in higher overall catches than FMP 1 would depend in part on a variety of factors such as the biomass of the stocks, the relationship between TAC and ABC, and the extent to which management measures other than the OY cap (PSC limits, etc.) would constrain future harvests under Alternative 2.

Also, the revisions to the OY specification proposed under Alternative 2 could give the impression that the implied MSY control rule is of the "constant F" form, an impression which would be reinforced under FMP 2.1 by the fact that the OFL control rule under this FMP is also of the "constant F" form with F set equal to F_{MSY} or an F_{MSY} proxy wherever possible. Scenarios could be imagined wherein the biomass of the groundfish complex is much lower than at present and wherein the entire OY range exceeds the sum of the catches associated with an F_{MSY} control rule, thus calling into question whether this provision of Alternative 2 would comply with the NSGs' interpretation of the statutory relationship between OY and MSY.

3.2.3 Evaluation from an Ecosystem Perspective

By permitting directed fishing of forage species, FMP 2.1 could result in higher harvests of forage species and, indirectly, result in decreased abundance of predator species including some target groundfish species, marine mammals, and seabirds.

By prohibiting use of ecosystem indicators in the TAC-setting process, FMP 2.1 would fail to mitigate any adverse impacts on the ecosystem that might arise if such impacts could not be detected using conventional stock assessments or other single-species approaches.

In addition to the above, many of the management measures proposed under Alternative 2 and discussed previously from a single-species perspective could also have impacts from an ecosystem perspective. Under certain circumstances, these measures have the potential to result in higher catches of individual species than would occur under FMP 1. Basically, any of the management measures that would result in higher harvests would also alter the community structure of the affected ecosystem to some extent. This would occur by several mechanisms. First, higher catches would result directly in a smaller remaining biomass of the targeted stocks as well as those stocks taken as bycatch. Second, higher catches would probably be associated with higher fishing effort, which would result in greater impacts on the habitat. Third, impacts resulting from either of the first two mechanisms would tend to propagate indirectly through the ecosystem, resulting in changes in the biomass of various species, including non-target species such as marine mammals and birds. However, as discussed above, it is difficult to predict from qualitative considerations alone whether Alternative 2 would necessarily result in higher catches than FMP 1.

3.2.4 Conclusions

Alternative 2 is intended to provide a less precautionary management policy than currently exists under FMP 1. It spans a spectrum of possible approaches. One possible approach, represented by FMP 2.2, is identical to FMP 1 except for a provision that would allow the upper end of the OY range to be as high as the sum of the ABCs. FMP 2.1 represents another possible approach, one which provides greater contrast with FMP 1. Under FMP 2.1, the upper end of the OY range could be as high as the sum of the OFLs, various non-precautionary adjustments would be made to the OFL control rule and the relationship between OFL and ABC, directed fishing of forage species would be permitted, and use of ecosystem indicators in the TAC-setting process would be prohibited. While each of these features of FMPs 2.1 and 2.2 carries the potential for increased harvests relative to what might be achieved under FMP 1, it is not possible to determine whether such increases would actually be realized on the basis of qualitative considerations alone.

3.3 Alternative 3 – Adopt a More Precautionary Management Policy

In the context of the TAC-setting process, this alternative is based on the premise that the best scientific information available is typically sufficient to determine how far below MSY fisheries should be managed in order to prevent excessive risk to the fishery or ecosystem.

3.3.1 Description of Features Pertaining to the TAC-Setting Process

The ways in which FMPs 3.1 and 3.2 differ with respect to FMP 1 are listed below.

Structure and Composition of Management Categories

Differences under FMP 3.1: Sharks and skates would be removed from the Other Species category and given their own TACs, and criteria for removing other stocks from a stock complex within the Target Species category would be developed. Differences under FMP 3.2: Sharks, skates, and additional groups would be removed from the Other Species category and given their own TACs, and criteria for moving stocks from the Nonspecified Species category into another management category would be developed.

OFL and ABC

Differences under FMP 3.1: The tier system would be re-examined in light of the findings presented by Goodman *et al.* (2002), but any future changes to the tier system would continue to allow *max* F_{ABC} in Tier 3 to be as high as $F_{40\%}$ for any stock whose biomass is sufficiently large. Differences under FMP 3.2: Biological reference points used in the tier system would be made taxon-specific where appropriate (for example, *max* F_{ABC} for Tier 3 rockfish stocks could be capped at $F_{60\%}$ rather than $F_{40\%}$), and scientifically justifiable methods for adjusting maxABC to account for statistical uncertainty in various tiers would be developed, implemented, and updated as appropriate.

OY and TAC

Differences under FMP 3.1: The FMP would require that the TAC for each stock or stock complex be set no higher than the corresponding ABC. Differences under FMP 3.2: The FMP would require that the TAC for each stock or stock complex be set no higher than the corresponding ABC; OY would be specified separately for each stock or stock complex and set equal to the respective TAC.

MSST

Differences under FMP 3.1: MSSTs for stocks in Tiers 1-3 would be specified in the FMPs, the resources and time frame necessary to specify MSSTs for stocks in Tiers 4-6 would be identified, and a list of Tier 4-6 stocks prioritized for future MSST specification would be developed. Differences under FMP 3.2: MSSTs for stocks in Tiers 1-3 would be specified in the FMPs, the resources and time frame necessary to specify MSSTs for stocks in Tiers 4-6 would be identified, a list of Tier 4-6 stocks prioritized for future MSST specification would be developed, and MSSTs would be specified in the FMPs for priority stocks in Tiers 4-6 as the necessary resources become available.

Ecosystem Considerations

Differences under FMP 3.1: Criteria for future use of ecosystem indicators in the TAC-setting process would be developed. Differences under FMP 3.2: A set of ecosystem indicators would be formally adopted and used in the TAC-setting process.

3.3.2 Evaluation from a Single-Species Perspective

By developing criteria for removing stocks from a stock complex within the Target Species category, FMP 3.1 would confer added consistency on decisions regarding which stocks to manage individually. Similarly, by developing criteria for moving stocks from the Nonspecified Species category into another category, FMP 3.2 would focus attention on the possibility of conferring increased protection on individual non-target stocks for which catch is currently unconstrained by any regulatory mechanism.

By re-examining the tier system in light of the findings presented by Goodman *et al.* (2002), FMP 3.1 would provide an opportunity to make further precautionary improvements to an already-precautionary system. FMP 3.2 would go further by committing to the use of taxon-specific reference points where appropriate and by reformulating the harvest control rules in various tiers (not just Tier 1) so that greater statistical uncertainty automatically translates into an appropriately reduced maxABC. Whether adoption of any of the changes to the tier system proposed under Alternative 3 would result in lower overall catches relative to FMP 1 depends on a variety of factors such as the biomass of the stocks, the relationship between TAC and maxABC, and

the extent to which management measures other than the harvest control rules (OY cap, PSC limits, etc.) would constrain future harvests under FMP 1.

By making the relationship TAC≤ABC into an FMP requirement rather than just a tradition, FMPs 3.1 and 3.2 would give added assurance that this relationship will continue to hold in the future. Also, compared to FMP 1, FMP 3.2 would specify OY in a way that more clearly satisfies the single-species requirements of the MSA: If the OFL control rule is interpreted as the MSY control rule, then the relationships OY=TAC≤ABC<OFL specified under FMP 3.2 would assure that OY is always less than the catch corresponding to the MSY control rule.

By specifying MSSTs for stocks in Tiers 1-3 in the FMP, FMPs 3.1 and 3.2 would bring the FMP more clearly into compliance with the single-species requirements of the NSGs. However, because the status of each stock in these tiers is already evaluated in the SAFE reports with respect to the MSST definition contained in the NSGs, this probably would not result in any new constraints on harvests in the foreseeable future.

3.3.3 Evaluation from an Ecosystem Perspective

By removing sharks and skates from the Other Species category and giving them their own TACs, FMPs 3.1 and 3.2 would confer greater protection on these two species groups (FMP 3.2 would also remove additional groups from the Other Species category).

By developing criteria for future use of ecosystem indicators in the TAC-setting process, FMP 3.1 would clarify what additional research needs to be undertaken in order to integrate EC into the setting of TACs. FMP 3.2 would go further by moving directly to the adoption of a set of ecosystem indicators and using them in the TAC-setting process.

In addition to the above, many of the management measures proposed under Alternative 3 and discussed previously from a single-species perspective could also have impacts from an ecosystem perspective. Under the right circumstances, these measures have the potential to result in either higher or lower catches of individual species than would occur under FMP 1. Basically, any of the management measures that would result in different harvest levels would also alter the community structure of the affected ecosystem to some extent. This would occur by several mechanisms. First, different catch levels would result directly in different remaining biomasses of the targeted stocks as well as those stocks taken as bycatch. Second, different catch levels would probably be associated with different levels of fishing effort, which would result in different impacts on the habitat. Third, impacts resulting from either of the first two mechanisms would tend to propagate indirectly through the ecosystem, resulting in changes in the biomass of various species, including non-target species such as marine mammals and birds. However, as discussed above, it is difficult to predict from qualitative considerations alone whether aggregate catches obtained under Alternative 3 would be higher or lower than aggregate catches obtained under FMP 1.

3.3.4 Conclusions

Alternative 3 is intended to provide a more precautionary management policy than currently exists under FMP 1. Like Alternative 2, Alternative 3 spans a spectrum of possible approaches. Unlike the two examples considered under Alternative 2, however, both FMP 3.1 and FMP 3.2 differ from FMP 1 in a variety of ways. The "more precautionary" designation here refers to the application of a higher degree of precaution where it is needed. It should be emphasized that this is not the same thing as reducing harvest rates across the board.

For example, under Alternative 3, it might be determined that $F_{35\%}$ is a satisfactory F_{MSY} proxy for all stocks except certain rockfish, in which case a special set of control rules might be established for those rockfish while leaving the existing control rules in place for the other stocks. Thus, as the various features of Alternative 3 work together, it is possible that aggregate catches could be either higher or lower than under FMP 1, but a greater degree of protection would be afforded to the stocks that need it most, while the remaining stocks would continue to be harvested conservatively. Alternative 3 would also be more proactive than FMP 1 in terms of incorporating EC into the TAC-setting process.

3.4 Alternative 4 – Adopt a Highly Precautionary Management Policy

In the context of the TAC-setting process, this alternative is based on the premise that the best scientific information available is typically insufficient to manage fisheries so that they achieve long-term average yields anywhere close to MSY without excessive risk to the fishery or ecosystem.

3.4.1 Description of Features Pertaining to the TAC-Setting Process

The ways in which FMPs 4.1 and 4.2 differ with respect to FMP 1 are listed below.

Structure and Composition of Management Categories

Differences under FMP 4.1: Individual stocks would be removed from stock complexes within the Target Species category whenever possible. Differences under FMP 4.2: None.

OFL and ABC

Differences under FMP 4.1: The *max* F_{ABC} would be capped at $F_{75\%}$ for all stocks of pollock, Pacific cod, Atka mackerel, and rockfish managed under Tiers 1-3, and the *max* F_{ABC} for each stock or stock complex in Tiers 1-5 would be adjusted downward based on the lower bound of a confidence interval surrounding the survey biomass estimate for that stock or stock complex. Differences under FMP 4.2: None.

OY and TAC

Differences under FMP 4.1: The FMP would require that the TAC for each stock be set no higher than the corresponding ABC and would require that the TAC for a stock complex be determined by applying the appropriate maxABC control rule to each of the component stocks and then setting the TAC equal to the minimum of the resulting values; OY would be specified separately for each stock or stock complex and set equal to the respective TAC. Differences under FMP 4.2: The FMP would require that each individual TAC be set at zero unless it is proven that a higher TAC would have no adverse effect on the environment; OY would be specified separately for each stock or stock complex and set equal to the respective TAC.

MSST

Differences under FMP 4.1: An MSST would be specified in the FMP for all tiers, and would be set equal to $B_{40\%}$ for Tier 3. Differences under FMP 4.2: None.

Ecosystem Considerations

Differences under FMP 4.1: None. Differences under FMP 4.2: None.

3.4.2 Evaluation from a Single-Species Perspective

By removing individual stocks from stock complexes within the Target Species category whenever possible, FMP 4.1 would confer added protection on those stocks relative to FMP 1, because harvests of each removed stock would be limited by a stock-specific TAC rather than a complex-wide TAC.

By capping *max* F_{ABC} at $F_{75\%}$ for all stocks of pollock, Pacific cod, Atka mackerel, and rockfish managed under Tiers 1-3, FMP 4.1 would result in lower *max* F_{ABC} values for all stocks of these species managed under Tier 3, compared to FMP 1. For stocks in Tiers 1-2, the resulting *max* F_{ABC} values could, in principle, be either higher or lower than they would be under FMP 1; however, based on the very limited experience to date (only one stock has ever been managed under Tiers 1-2), it appears likely that they would be lower. By adjusting *max* F_{ABC} for each stock or stock complex in Tiers 1-5 downward based on the lower bound of a confidence interval surrounding the respective survey biomass estimate, FMP 4.1 would incorporate some amount of risk aversion into the computation of *max* F_{ABC} for those stocks. The resulting *max* F_{ABC} values for stocks in Tiers 1-5 would be uniformly lower than they would be under FMP 1. However, it is not clear what scientific justification the specific adjustment would have, and it is likely that the implied level of risk aversion would vary between stocks, even if their respective survey biomass estimates were equally precise (or imprecise). Whether adoption of either of the changes to *max* F_{ABC} proposed under FMP 4.1 would result in lower overall catches relative to FMP 1 depends on a variety of factors such as the biomass of the stocks, the relationship between TAC and maxABC, and the extent to which management measures other than the harvest control rules (OY cap, PSC limits, etc.) would constrain future harvests under FMP 1.

By making the relationship TAC≤ABC into an FMP requirement rather than just a tradition, FMP 4.1 would give added assurance that this relationship will continue to hold in the future. By requiring that the TAC for a stock complex be determined by applying the appropriate maxABC control rule to each of the component stocks and then setting the TAC equal to the minimum of the resulting values, FMP 4.1 would confer additional protection on these stocks, because it would preclude the possibility of harvesting any individual stock within a complex at a rate greater than would be allowed if it were removed from the complex and given its own TAC. By setting OY equal to TAC, FMPs 4.1 and 4.2 would specify OY in a way that more clearly satisfies the single-species requirements of the MSA than does the OY specification contained in FMP 1: If the OFL control rule is interpreted as the MSY control rule, then the relationships OY=TAC≤ABC<OFL specified under FMP 4.1 would assure that OY is always less than the catch corresponding to the MSY control rule. By requiring that each individual TAC be set at zero unless it is proven that a higher TAC would have no adverse effect on the environment, FMP 4.2 would confer complete protection on all stocks in the Target Species and Other Species categories.

By specifying MSSTs for stocks in all tiers in the FMP, FMP 4.1 would bring the FMP more clearly into compliance with the single-species requirements of the NSGs. How this would be accomplished, however, is currently unclear. By setting the MSST equal to $B_{40\%}$ for all stocks in Tier 3, FMP 4.1 would make it much more likely that individual stocks would be declared "overfished," even if the stocks were being harvested conservatively.

3.4.3 Evaluation from an Ecosystem Perspective

Many of the management measures proposed under Alternative 4 and discussed above from a single-species perspective could also have impacts from an ecosystem perspective. Under certain circumstances, some of these measures have the potential to result in much lower catches of individual species than might occur under FMP 1. Basically, any of the management measures that would result in lower harvests would also alter the community structure of the affected ecosystem to some extent. This would occur by several mechanisms. First, lower catches would result directly in a larger remaining biomass of the targeted stocks as well as those stocks taken as bycatch. Second, lower catches would probably be associated with lower fishing effort, which would result in fewer impacts on the habitat. Third, impacts resulting from either of the first two mechanisms would tend to propagate indirectly through the ecosystem, resulting in changes in the biomass of various species, including non-target species such as marine mammals and birds. However, as discussed above, it is difficult to predict from qualitative considerations alone whether Alternative 4 would necessarily result in lower catches than FMP 1. In the case of FMP 4.1, the impact on overall catches relative to FMP 1 would depend in part on a variety of factors such as the biomass of the stocks, the relationship between TAC and *max*ABC, and the extent to which management measures other than the harvest control rules (OY cap, PSC limits, etc.) would constrain future harvests under FMP 1. In the case of FMP 4.2, it seems safe to assume that overall catches would initially be much lower than under FMP 1, but long-term catch levels under FMP 4.2 would depend on factors such as the rate of growth in scientific understanding and the standards of proof used to determine safe harvest levels.

3.4.4 Conclusions

Alternative 4 is intended to provide a highly precautionary management policy. Like Alternatives 2 and 3, Alternative 4 spans a spectrum of possible approaches. One possible approach, represented by FMP 4.1, suggests that harvesting should proceed very cautiously in the presence of uncertainty. Another possible approach, represented by FMP 4.2, suggests that harvesting should not proceed at all in the presence of uncertainty. In the context of the TAC-setting process, FMP 4.1 proposes changes in many of the present management tools such as MSST, maxABC, ABC, TAC, and OY, whereas FMP 4.2 focuses entirely on TAC and OY. Like Alternative 3, the precautionary adjustments proposed under Alternative 4 are aimed primarily at the individual stocks while aggregate management measures such as the current OY cap are relaxed, meaning that Alternative 4 would not necessarily guarantee lower aggregate harvests than FMP 1 (although FMP 4.2 seems likely to result in lower aggregate harvests, at least in the short run). Ecosystem effects of Alternative 4 would be mediated entirely through management of individual stocks and stock complexes. No provision is made for use of ecosystem indicators in the TAC-setting process.

Section 4 Comparisons of Alternative Policies

As has been noted previously, predicting how actual catches would compare between alternatives on the basis of qualitative considerations alone is a complicated undertaking. This is partly due to the fact that each of the alternatives except FMP 1 embodies a spectrum of possible management approaches and partly due to the fact that each alternative permits a considerable degree of management flexibility. For example, although each of the alternatives sets or implies some sort of upper limit on individual TACs, none of the alternatives sets a lower limit on individual TACs, meaning that, under any of the alternatives, future individual TACs could be set anywhere between zero and some alternative-specific upper limit. Further complicating matters is the fact that, under FMPs 1, 2.1, and 2.2, it would not be possible to set the individual TACs independently of one another because their sum would be constrained by the alternative-specific aggregate OY range. Thus, while it is possible to describe how management measures differ between alternatives, predicting how these management measures will translate into catches is difficult in the absence of some sort of quantitative analysis (see Chapter 4 of the Programmatic SEIS).

Although it is difficult to predict how actual catches would compare between alternatives on the basis of qualitative considerations alone, it is possible to describe how the various constraints on harvests compare between alternatives. Evaluated qualitatively in terms of their respective constraints on harvests, the alternatives may be ranked as follows, beginning with the least precautionary and progressing to the most precautionary:

FMP 1: All of the existing constraints would be retained.

FMP 2.1: Some of the existing constraints would be relaxed.

FMP 2.2: All of the existing constraints would be retained, except that the upper end of the OY range would be allowed to increase.

FMP 3.1: Some of the existing constraints would be tightened and criteria would be developed for using ecosystem indicators as part of the TAC-setting process. MSSTs for Tier 3 stocks would be specified in the FMPs, but this probably would not result in any new constraints on harvests in the foreseeable future.

FMP 3.2: Some of the existing constraints would be tightened, some others would be modified in ways that are more precautionary when stocks are relatively vulnerable but potentially less precautionary under other circumstances (e.g., if a stock is shown to be highly resilient to fishing or if biomass is high), and a set of ecosystem indicators would be formally adopted and used in the TAC-setting process. MSSTs for stocks in Tiers 1-3 and some other stocks would be specified in the FMPs, but this would probably not result in any new constraints on harvests for Tier 3 stocks in the foreseeable future.

FMP 4.1: Some of the existing constraints would be tightened and some others would be modified in ways that are more precautionary when stocks are relatively vulnerable but potentially less precautionary under other circumstances (e.g., if biomass is high). MSSTs for all stocks would be specified in the FMPs and set equal to $B_{40\%}$ for all Tier 3 stocks, meaning that several Tier 3 stocks would be declared overfished, thus necessitating the development and implementation of rebuilding plans which could impose additional constraints.

FMP 4.2: All of the existing constraints would be retained, except that the constraints on OY and TAC would be tightened to an extreme degree (OY and TAC would be set equal to zero unless it is proven that a higher catch would have no adverse effect on the environment).

Finally, while there are important differences between all of the alternatives, it should be remembered that a considerable degree of commonality exists in some cases as well. For example, with respect to the five subject areas addressed in the context of the TAC-setting process (structure and composition of management categories, OFL/ABC, OY/TAC, MSST, and EC), FMPs 2.2 and 4.2 are identical to FMP 1 with respect to four (SCMC, OFL/ABC, MSST, and EC), FMP 2.1 is identical to FMP 1 with respect to two (SCMC and MSST), and FMP 4.1 is identical to FMP 1 with respect to one EC. Only FMPs 3.1 and 3.2 differ from FMP 1 with respect to all five subject areas. Looked at another way, FMP 1 is identical to at least one other alternative with respect to each of the five subject areas except OY/TAC. All of the alternatives differ from one another to some extent with respect to OY/TAC. Such commonality is expected, since each example FMP must be consistent with the MSA and NSGs.

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APPENDIX F

Spatial and Temporal Management of Total Allowable Catch

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ACRONYMS AND ABBREVIATIONS

ABC	acceptable biological catch
ADF&G	Alaska Department of Fish and Game
AFSC	Alaska Fisheries Science Center
BSAI	Bering Sea and Aleutian Islands
BSPRA	Bering Sea Pollock Restriction Area
CDQ	community development quota
CFR	code of federal regulations
CSEO	central southeast inside
CVOA	catcher vessel operational area
DAP	domestic annual processor
DSR	demersal shelf rockfish
EBS	eastern Bering Sea
EYAK	east Yakutat
FMP	Fishery Management Plan
FR	Federal Register
GOA	Gulf of Alaska
GSO	General Service Office
IFQ	individual fishing quotas
IPHC	International Pacific Halibut Commission
ITAC	interim total allowable catch
JV	Joint Venture
LLP	License Limitation Program
MRB	maximum retainable bycatch
mt	metric tons
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
NRC	National Research Council
NSEO	north southeast outside
OFL	overfishing level
OY	optimum yield
PSC	prohibited species catch
SAFE	Stock Assessment and Fishery Evaluation
SCA	Steller sea lion Conservation Area
SEI	southeast inside
SEO	southeast outside district
SSC	Scientific and Statistical Committee
SSEO	south southeast outside
TAC	total allowable catch
WYAK	west Yakutat

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Section 1 Spatial and Temporal Management of Total Allowable Catch

The spatial and temporal nature of the target fisheries in the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) is determined by a complex management structure which accounts for biological, socioeconomic, and conservation concerns. The term "spatial" refers to how fisheries are managed over a geographic area. The term "temporal" refers to the timing of fisheries over the course of a year. Total Allowable Catch (TAC) is managed by target species, and allocation of TAC ranges from year-round and area-wide to relatively small spatial and temporal scales. The vulnerability of the stocks to fishing pressure, the bycatch of non-target species, socioeconomic concerns, as well as the degree of available scientific information about an individual stock all play a role in determining the scale (e.g., broadly or minutely) at which the TAC for individual stocks are managed.

The fisheries and groundfish resources of the BSAI and GOA[1] form distinct management units. These two regions differ in their history of fishery development, bathymetry, oceanography, target species, and the composition of the commercial catch. While many species occur over a broader range than the GOA or BSAI regions, stocks of common species in the GOA and BSAI are believed to be different than in adjacent regions (NPFMC 2002b).

The measures authorized for management of groundfish in the BSAI and GOA under the approved Fishery Management Plans (FMP) fall into two categories: framework measures and conventional measures. Framework measures are ones which often require adjustment on an annual basis, such as the setting of the annual yield to fall with an optimum yield range. These types of measures are administratively designed to allow the North Pacific Fishery Management Council (NPFMC) to respond rapidly to biological or socioeconomic changes within a fishery without having to amend the plan. Conventional measures, on the other hand, are specifically in their application and can only be altered by a formal amendment to the plan. These measures include permits, reporting requirements, gear restrictions, and allocations. Most of the current measures which implement the spatial and temporal management of the BSAI and GOA groundfish fisheries are conventional measures implemented through amendments to the FMPs.

Spatial and temporal management of TAC has evolved over time through these FMP amendments as different issues have been resolved by the NPFMC that required modification of various fisheries. These issues range in breadth and scope but generally fall into two categories of rationale: economic concerns and biological/conservation concerns. Some economic grounds for managing TAC in space and time include reducing competition between fisheries, dispersing the fishery in time, and increasing the access to the fishery resources for specific communities. Many early actions by NPFMC specifically dealt with allocation issues between certain fleets; for example, to allocate between foreign and domestic fleets, and later between inshore and offshore fleets. Other actions were specifically to disperse the fishery in space and time both to control the symptoms of the race for fish as well as to decrease bycatch in certain areas, as exceeding bycatch limits results in the closure of a fishery prior to reaching the target fishery TAC.

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[1]Excluding halibut which is managed by the International Pacific Halibut Commission (IPHC).

Biological and conservation concerns drive other spatial and temporal management decisions. Often when information on the impact on a stock is unknown, a precautionary response is to manage on smaller spatial and temporal scales in order to avoid the potential for localized depletion. This is particularly true during spawning seasons. Pollock is one of the key prey species in the BSAI and GOA, and specific spatial and temporal measures in both regions are intended to disperse the pollock fishery in space and time in order to avoid the potential for impacts on the endangered Steller sea lion. Prohibited species catch (PSC) are also allocated in space and time in order to protect small, localized populations of prohibited species (e.g., salmon, herring, crab), and target fisheries are closed when these caps are exceeded (Table 1).

Table 1. Restrictions on the Bering Sea and Aleutian Islands other flatfish fishery from 1994 to 2002.

Year	Dates	Bycatch Closure
1994	2/28 – 12/31 5/7 – 12/31 7/5 – 12/31	Red King crab cap (Zone 1 closed) Bairdi Tannner crab (Zone 2 closed) Annual halibut allowance
1995	2/21 – 3/30 4/17 – 7/1 8/1 – 12/31	First seasonal halibut cap Second seasonal halibut cap Annual halibut allowance
1996	2/26 – 4/1 4/13 – 7/1 7/31 – 12/31	First seasonal halibut cap Second seasonal halibut cap Annual halibut allowance
1997	2/20 – 4/1 4/12 – 7/1 7/25 12/31	First seasonal halibut cap Second seasonal halibut cap Annual halibut allowance
1998	3/5 – 3/20 4/21 – 7/1 8/16 – 12/31	First seasonal halibut cap Second seasonal halibut cap Annual halibut allowance
1999	2/26 – 3/30 4/27 – 7/04 8/31 – 12/31	First seasonal halibut cap Second seasonal halibut cap Annual halibut allowance
2000	3/4 – 3/31 4/30 – 7/03 8/25 – 12/31	First seasonal halibut cap Second seasonal halibut cap Annual halibut allowance
2001	3/20 – 3/31 4/27 – 7/01 8/24 – 12/31	First seasonal halibut cap Second seasonal halibut cap Annual halibut allowance
2002	2/22 – 12/31 3/1 – 3/31 4/20 – 6/29 7/29 – 12/31	Red King crab cap (Zone 1 closed) First seasonal halibut cap Second seasonal halibut cap Annual halibut allowance

Note that in 1994, the other flatfish category included flathead sole. Unless otherwise indicated, the closures were applied to the entire BSAI management area. Zone 1 consists of areas 508, 509, 512, and 516, whereas zone 2 consists of areas 513, 517, and 521.
Source: Spencer *et al.* 2002

Managing TAC in space and time requires an in-depth knowledge of each stock biology and migratory patterns, and the relative impact that fishing will have on the stock biology. Often the knowledge of biomass distribution and migratory patterns is inadequate and the relative impact of fishing on these stocks is often unknown. Unlike many of the other issues under discussion in this Programmatic SEIS, there is no specific policy objective that relates spatial and temporal to our current management of TAC. The current management of TAC has evolved over time in response to changes in the fishery, both biologically and socioeconomically. Each action or amendment was intended to respond to a specific need, thus there was a specific individual objective to achieve for each subsequent change to the FMP. Thus, spatial and temporal effects are management outcomes, rather than being a policy goal or objective, per se. This will be discussed further in the sections regarding the FMP amendments; however, current management practices do not follow an overarching spatial and temporal management objective.

Our current management of TAC in space and time is a reflection of these combined amendments to the FMPs. In each amendment, spatial and temporal management of TAC is a tool by which specific objectives are intended to be achieved. Spatial and temporal management measures are implemented on a stock-by-stock basis according to concerns as they arise, not in accordance with an actual policy direction to manage in space and time. Similarly, across alternatives, while some measures change in the bookends of each alternative, these are measures which reflect a change in overall management policy but not a change according to a specific policy for spatial and temporal management of TAC. It is a management tool that is used to achieve often competing objectives and is thus not considered as a policy objective in and of itself.

The intent of this paper is to provide a broad overview of the current rationale behind the spatial and temporal management of TAC for target groundfish stocks in the BSAI and GOA FMPs. There will also be an examination of alternative measures for formalizing and expanding upon spatial temporal management of target stocks and the research and data needs which would be necessary in order to do so.

1.1 Regulatory Areas

Fishing areas correspond to the defined regulatory areas within the fishery management units. The BSAI is divided into 16 reporting areas (Figure 1), some of which are combined for TAC specification purposes. The Bering Sea subarea comprises all of the regulatory areas except the three Aleutian Island areas (543, 542, 541). The Bogoslof District is area 518. The eastern Bering Sea (EBS) as a regulatory region includes all of the regulatory areas in the Bering Sea region except for the Bogoslof District (area 518). The EBS is managed as a regulatory region separate from the Bering Sea region for EBS pollock. All other stocks, regardless of whether the stock is described as being in the EBS, are managed Bering Sea area-wide, indicating that the regulatory area incorporates all of the regions including area 518. The Aleutian Islands subarea is comprised of regulatory Area 541 (eastern Aleutian Islands), 542 (central Aleutian Islands), and 543 (western Aleutian Islands).

The GOA is divided into seven reporting areas (Figure 2): the western GOA is Area 610, the central GOA includes Areas 620 and 630, and the eastern GOA includes Areas 640 and 650. Area 640 is the West Yakutat District (WYAK) while area 650 is known as the East Yakutat/southeast Outside District (EYAK/SEO). For demersal shelf rockfish (DSR) management only, area 650 is further subdivided into subareas: East Yakutat (EYAK), north southeast Outside (NSEO), central southeast Outside (CSEO) and south southeast Outside (SSEO). Area 649 are state waters in Prince William Sound, while Area 659 encompass state waters within southeast Alaska. The Shelikof Strait District is a specific sub-management district for GOA pollock only (Figure 3).

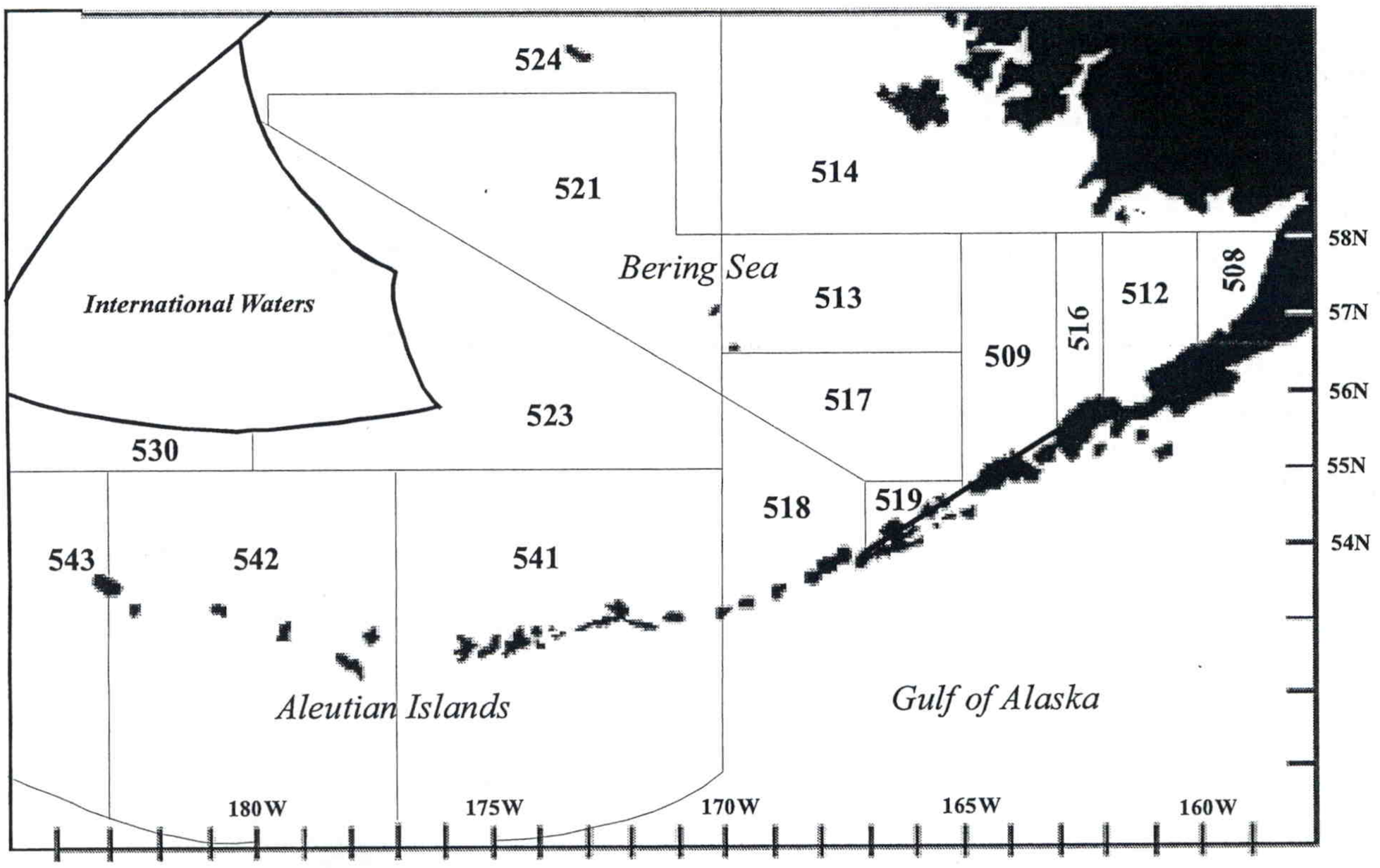


Figure 1.6-2 Bering Sea and Aleutian Islands statistical and reporting areas.

Figure 1. Bering Sea and Aleutian Islands statistical and reporting areas.

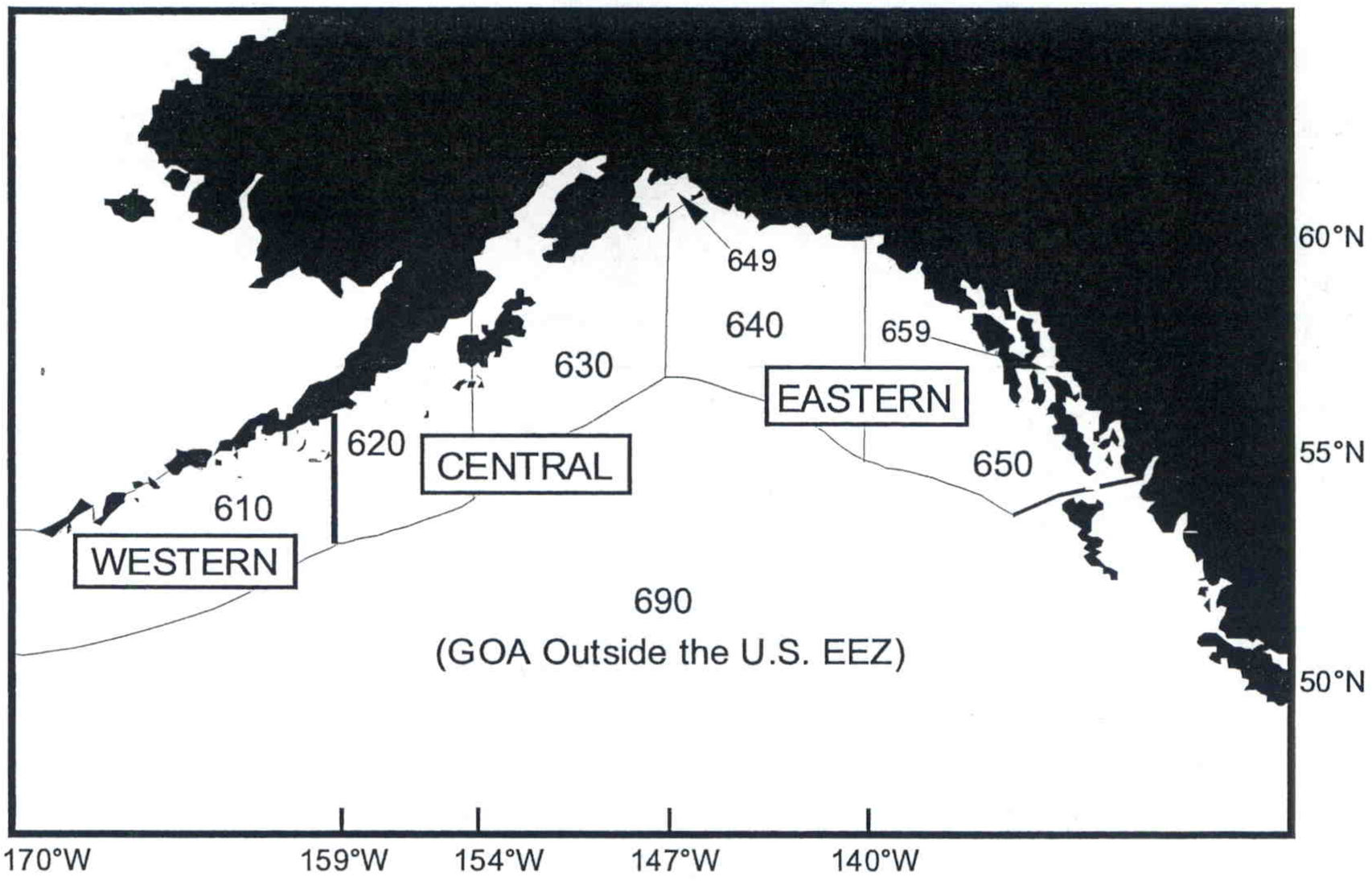
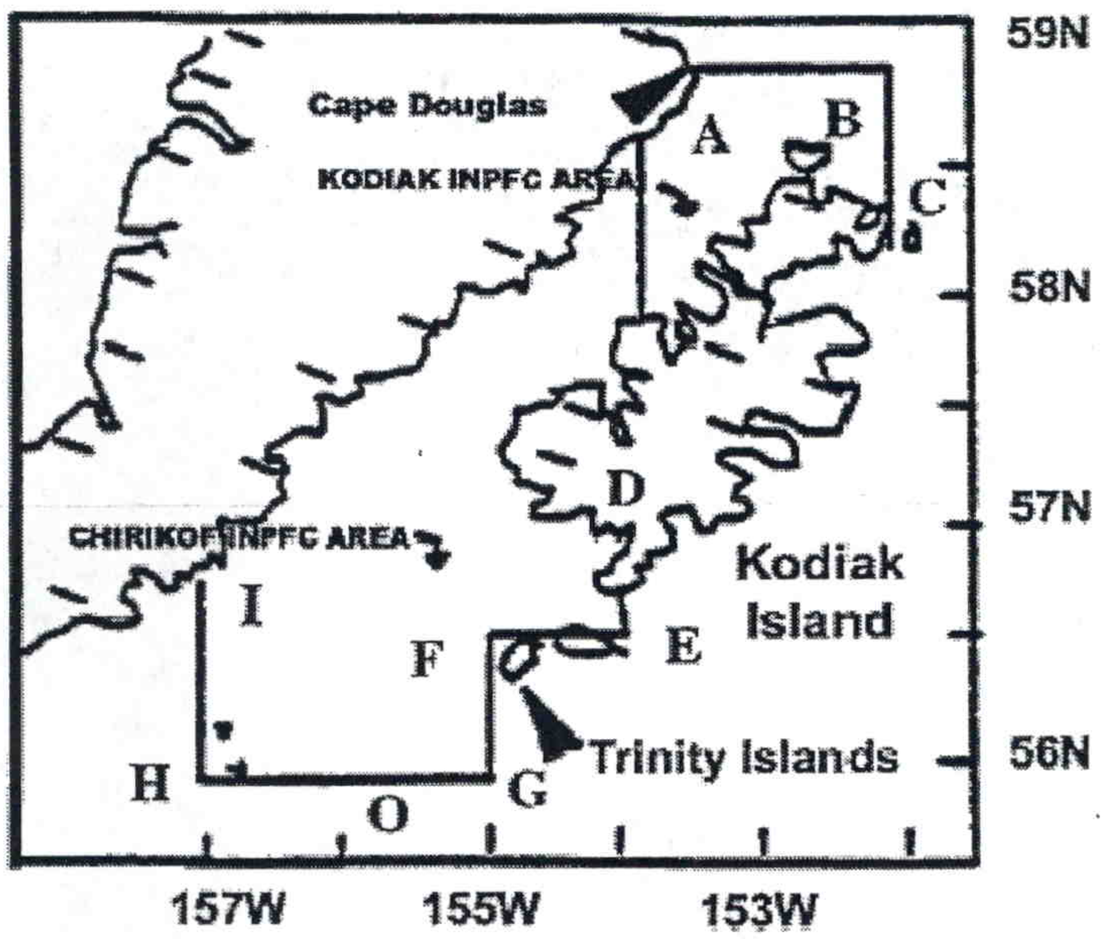


Figure 1.6-3 Gulf of Alaska statistical and reporting areas.

Figure 2. Gulf of Alaska statistical and reporting areas.



Boundaries of the Shelikof Strait District in the Gulf of Alaska.

The Shelikof Strait District means all waters of the EEZ enclosed by a line connecting the following points in the order listed:

Reference point	N. Lat.	W. Long.	Description
A	58°51' N.	153°15' W.	Cape Douglas then
B	58°51' N.	152°00' W.	south to the intersection
C			of 152°00'W. with Afognak Island, then counter clockwise around the western shorelines of Afognak, Kodiak, and Raspberry Islands to
D	57°00' N.	154°00' W.	Alitak Bay then south to
E	56°30' N.	154°00' W.	then west through Trinity Islands to
F	56°30' N.	155°00' W.	then south to
G	56°00' N.	155°00' W.	then west to
H	56°00' N.	157°00' W.	then north to
I			Intersection of 157°00'W. with the Alaska Peninsula.

Figure 3. Shelikof Strait regulatory areas. Source: Gulf of Alaska Fishery Management Plan.

1.2 Suballocation

Suballocations of TAC and PSC limits are made for biological and socioeconomic reasons according to percentage formulas established through FMP amendments. For particular target fisheries, TAC specifications are further allocated within regulatory areas (eastern, central, western Aleutian Islands; Bering Sea; western, central, and eastern GOA) among management programs (open access or community development quotas [CDQ] program), processing components (inshore or offshore), specific gear types (trawl, non-trawl, hook-and-line, pot, jig), and seasons according to regulations 50 Code of Federal Regulations (CFR) 679.20, 50 CFR 679.23, and 50 CFR 679.31.

Suballocations of TAC to the various gear groups, management areas, and seasons are made according to regulation-driven formulas or, for discretionary allocations, according to Secretary of Commerce-approved specifications. The National Marine Fisheries Service (NMFS or National Oceanic and Atmospheric Administration [NOAA] Fisheries) uses in-season management authority to open and close the fisheries (50 CFR 679.25). The entire TAC amount is available to the domestic fishery (50 CFR 679.20). The gear authorized in the federally managed groundfish fisheries off Alaska includes trawl gear, fixed-gear, longline gear, pot gear, and non-trawl gear (50 CFR 679.2 Authorized Fishing Gear). TAC is allocated amongst these gear types, and specific allocation by gear types varies by target fishery and region.

1.3 Apportionment to Total Allowable Catch Reserves and Community Development Quota

TAC Reserves

A groundfish reserve is established at the beginning of each fishing year. This reserve amount of TAC is equal to the sum of 15 percent of each target species and the other species TAC in the BSAI Pacific cod, flounders and other species in the GOA. This TAC reserve is set aside by the NPFMC prior to the beginning of the fishing year. This reserve is used for: (NPFMC 2002a):

1. Unexpected expansion of the domestic fishery.

2. Correction of operational problems of the domestic and foreign fishing fleets, promoting full and efficient use of the groundfish resources.

3. Adjustments of species TACs according to the condition of stocks during the fishing year.

4. Apportionments.

This TAC reserve is not designated by species or species groups and will be apportioned to the fishery during the fishing year by the Regional Administrator of NOAA Fisheries (NPFMC 2002b). The Regional Administrator will determine the appropriate amounts and species for allocation, consistent with the most recent stock assessments of the individual resource conditions unless socioeconomic concerns and/or specific fishery operational problems are determined to dictate otherwise (NPFMC 2002b). The Regional Administrator may also withhold reserves for conservation reasons.

CDQ Allocation

Of the total TAC, the CDQ Program in the BSAI is allocated 10 percent of the allowable catch for pollock; 7.5 percent of all other groundfish, except 20 percent of fixed gear allocation for sablefish; and 7.5 percent for prohibited species (50 CFR 679.31). The rest of the TAC is then apportioned to directed fishery or bycatch reserve according to spatial and temporal management measures that apply.

1.4 Harvest Specifications and Initial Total Allowable Catch Allocation

The fishing year coincides with the calendar year, January 1 to December 31 (50 CFR 679.2 and 679.23). Depending on the target species' spatial allocation (detailed below in the fisheries descriptions), additional specifications are made to particular seasons (quarters of the year or combinations of quarters) within the year. Fisheries are opened and closed by regulatory announcement. Closures are made when in-season information indicates the apportioned TAC or available PSC has been or will soon be reached, or at the end of the specified season if the particular TAC has not been taken (50 CFR 679.25).

Rules to establish harvest specifications are required for harvest in these federal groundfish fisheries to resume from one fishing year to the next. Specifying TAC and PSC limits follows the fishery regulation rule-making process. To conform with rule-making requirements, three separate rules are published per management area, per year. The published rules are, sequentially, 1) proposed specifications, 2) interim specifications, and 3) final specifications. This three-part process has been in place, with various refinements, since implementation of the FMPs. The process is explained in more detail below and in Appendix F-1, TAC-Setting Process qualitative assessment.

Proposed Specifications

Proposed acceptable biological catch (ABC), TAC, and PSC[2] specifications are typically recommended by the NPFMC at its October meeting and published in the *Federal Register* (FR) for public review and comment. The recommendations are based on the preliminary Stock Assessment and Fishery Evaluation (SAFE) reports prepared by the NPFMC's GOA and BSAI Groundfish Plan Teams during and subsequent to their September meetings. Any new data on stock levels obtained from the previous summer's surveys are generally not yet in a useable form; therefore, the proposed specifications are based on previous year's data. At their 2002 September meeting, the plan teams recommended using a new approach for proposed specifications. This new approach used the 2001 SAFE Report model projections for 2003 preliminary and interim specifications for groundfish stocks at Tier 3 or above and incorporated updated 2002 catch estimates rather than assuming that the catch is equal to the ABC as in previous years. This procedure is more in line with the intention to recommend preliminary and final specifications most likely to approximate the final specifications that will be recommended in November.

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[2]BSAI crab and herring and GOA halibut only; BSAI PSC limits for halibut and salmon are established in regulations (50 CFR 679.21.)

Occasionally, given evidence of imminent population changes, recent data may be used to recommend proposed specifications (which may be different from the previous year's data). For example, in 2002, exploratory model results for GOA pollock using recent Shelikof survey data indicated a continuing decline of adult pollock. However, the model fit to the survey data at this time was poor and the model was unable to match the steep decline indicated by the survey results. While this was only a preliminary indication of stock decline, the stock assessment author was concerned regarding the stock status. At the October NPFMC meeting, the Scientific and Statistical Committee (SSC) concurred with the stock assessment author's recommendation and established the preliminary ABC as a rollover of the previous year's ABC for pollock. This represented a more conservative preliminary ABC than would have been recommended based upon the newly approved procedure in establishing preliminary ABCs. Preliminary SAFE reports are incorporated into the environmental analysis accompanying the proposed specifications rule.

Interim Specifications

Interim TAC specifications are mathematical determinations using the proposed specifications according to implementing regulations 50 CFR 679.20(c)(2). These regulations authorize one-fourth of each proposed interim total allowable catch (ITAC) and apportionment thereof, one-fourth of each PSC allowance, and the first seasonal allowance of GOA and BSAI pollock and BSAI Atka mackerel to be in effect on January 1 on an interim basis and to remain in effect until superceded by final specifications. NMFS publishes the interim specifications in the FR as soon as practicable after the October NPFMC meeting. There are some exceptions to setting interim specifications in this manner. For instance, retention of sablefish with fixed gear is not currently authorized under interim specifications. Further, existing regulations do not provide for an interim specification for the CDQ non-trawl sablefish reserve or for an interim specification for sablefish managed under the individual fishing quota (IFQ) program.

While interim specifications are superceded by final specifications, depending on the stock, the interim specification can be used to specify the TAC for the first seasonal allocation. Depending upon the timing of final specifications and the fishery, the entire allotted TAC can be taken before the final specifications supercede the preliminary specifications. Thus, if preliminary specifications are set too high or too low, it can severely impact the fishery in the first season.

In the case of the 2002 GOA pollock, the preliminary specifications were recommended as if the stock showed an increased decline at the time of final specifications. With the regulatory system in place, the entire resulting Season A interim TAC could have been taken before the final TAC, based on the most recent data that was in place. In some cases if the preliminary (and then interim) specification is too high compared to the final specification, this could result in the overfishing of a stock during the first seasonal allocation.

Final Specifications

Final TAC and PSC specifications are recommended by the NPFMC at its December meeting. The recommendations are based on SAFE reports prepared by the NPFMC's GOA and BSAI Groundfish Plan Teams during and subsequent to their November meetings. Final SAFE reports are incorporated into the environmental analysis accompanying the final rule (NMFS 2003a).

NOAA Fisheries packages the NPFMC recommendations into proposed or final rule specification documents and forwards them to the Secretary of Commerce for approval. Secretarial approval of final specifications usually occurs by March for the subject fishing year. Upon approval, the new TAC specifications replace the preliminary TAC specifications (50 CFR 679.20(c)(3)).

There is progress underway towards revising the TAC-setting process under Amendments 48/48. Under the current process there may be inadequate time allotted for the public to comment on the proposed specifications prior to the start of the fishery. (Under consideration are alternatives to the current process: publishing final specifications based on two-year stock projections; issuing specifications every two years; and changing the start of the fishing year from January to July.) Additional proposed alternatives may also be considered depending upon a legal assessment of their adequacy in satisfying the requirements of Administrative Procedure Act. Final action on these amendments should be taken by the NPFMC in April or June, 2003.

1.5 In-Season Management

While TACs are established by the NPFMC based upon the best biological, ecological, and socioeconomic information available, circumstances arise on occasion whereby new information or data relating to stock status may become available and established harvest quotas or limits may need to be adjusted. These adjustments are accomplished by the NOAA Fisheries Regional Administrator in consultation with the agency's in-season management staff. Using all available information, the Regional Administrator may extend, open, or close fisheries in any or part of a regulatory area, or restrict the use of any type of fishing gear in order to conserve the resource. The Regional Administrator may also change any previously specific TAC or PSC limit if such are proven to be incorrectly specific on the basis of the best available scientific information on biological stock status (NPFMC 2002b).

In-season adjustments may be necessary to prevent either the overfishing of any species or stock of fish (including those for which PSC limits are set) or the harvest or closure of any groundfish TAC or PSC limit that may have been improperly specified (NPFMC 2002b). The Regional Administrator must first consider the least restrictive adjustments to the fishery in his or her choice of management responses to potential overfishing. The order in which the Regional Administrator must consider in-season adjustments to prevent over-fishing are specified as 1) any gear modification that would protect the species in need of conservation protection but which would still allow fisheries to continue for other species; 2) a time/area closure which would allow fisheries for other species to continue in non-critical areas and time periods; and 3) total closure of the management area and season (NPFMC 2002b).

1.6 Historical Summary of Major Fishery Management Plan Amendments Establishing Current Spatial/Temporal Management Measures

There is a long history of enacting measures for spatial and temporal management of TAC and gear and fishery allocations in the BSAI and GOA fisheries. The FMPs were instituted in 1978 and 1981, respectively, and both the original FMPs as well as many subsequent amendments have dealt sequentially with time and area restrictions as needs have arose. The following provides a brief list of many of these amendments, which were instituted to respond to a specific problem, and have subsequently evolved over time. This is not a comprehensive list of every amendment that had an allocative result, but synthesizes many (together with some additional regulations) that set the stage for the spatial and temporal management as it is currently

pursued. The amendments are listed with their initial rationale as stated in their respective environmental impact analyses. An attempt is made to discuss first the BSAI amendments and then the GOA amendments. Although they are often discussed together in the FMPs, in some instances they are discussed as combined amendments in the text. The actual cumulative impacts of the amendments are not given here, only the intent of each individual amendment. More information on the cumulative impacts of these amendments may be found in Section 4.5.10 under Alternative 1. Most FMP amendments were multi-purpose in their intent, thus not all aspects of the amendments are discussed here. The emphasis is on the spatially and temporally relevant aspects of each amendment.

BSAI Amendment 11, implemented in 1987, enacted a split-season apportionment of Joint Venture (JV) pollock vessels. This amendment had both socioeconomic as well as conservation rationale behind it. It was an early amendment to the FMP to reduce the competitive disadvantage placed on domestic annual processors (DAP). This amendment also changed policy by prohibiting roe-stripping and reduced the concentration of the pollock harvest during the winter spawning season. While there was limited data at the time on the spawner-recruit relationship for pollock, there was a general consensus that prudent management by the NPFMC would require some limit on the harvests on spawning aggregations to alleviate the risk of reducing the stock's reproductive capacity. From an economic standpoint, it was more beneficial to the domestic industry to have exclusive access to the grounds during one month of spawning season. This amendment was limited to two years, in order for proper evaluation of the stock status and regime.

BSAI Amendment 12a, implemented in 1989, replaced Amendment 10 and revised the PSC limits for crab and halibut. Under this amendment, PSC limits were allocated among flatfish and other fisheries. Amendment 16 modified Amendment 12a by allowing for seasonal apportionments of the PSC caps, as well as by adding the DAP rock sole, DAP sablefish and turbot fisheries to those fisheries already managed under the PSC caps. This allowed for greater flexibility in managing bycatch more equitably and efficiently.

BSAI Amendment 13, implemented in 1990, allocated sablefish by gear type, dividing the TAC into fixed- and trawl-gear allocations for the Bering Sea (50/50) and Aleutian Islands (75/25). This amendment also established a procedure to set annual fishing seasons by regulatory amendment. The administrative aspect of this amendment was instituted to allow the NPFMC to respond more efficiently to an increasingly complex suite of management options that effect the timing of the various fisheries. In the GOA, this administrative procedure was established by Amendment 18. Amendment 13 also clarified the Secretary's authority to split or combine species groups within the target species management category by a framework procedure.

BSAI Amendment 14, FMP implemented in 1991, set forth a seasonal allowance schedule for pollock. While the impact of concentrated fishing on the stocks during spawning season was still unknown, it was deemed precautionary to mitigate against possible impacts by spreading out the pollock catch over a number of seasons. Pollock seasons were divided into roe-bearing and non roe-bearing seasons, with the percentage of the TAC allocated to each, determined during the annual TAC-specifications process.

BSAI Amendments 16a and 17, implemented in 1991 and 1992, respectively, again dealt with the BSAI pollock fishery. Amendment 16a specified the allocation of pollock TAC to bottom trawl in order to control crab and halibut bycatch. Amendment 17 established the Bogoslof Subarea District (area 518) in order to allow for specific management of the pollock fishery in this region during the roe season. The Bogoslof area, the new reporting area 518, was established as the section of area 515 west of 167 West longitude in order to allow for a separate TAC for pollock in this smaller region. The remainder of area 515 was designated as the new area 519. This area does not have a separate TAC for pollock and is instead combined with the other

reporting areas to make up the Bering Sea area for TAC allocation. The seasonal closures around the Walrus Islands were also permanently established under this amendment and occur from April 1-September 30.

BSAI Amendment 19, which supplemented Amendment 16, was implemented in 1992. This amendment, among other things, delayed the start of all trawl fisheries until January 20 with the exception of flatfish, which would begin May 1. This was done to address the high amounts of salmon bycatch and to address problems with bycatch in the pollock roe fishery as well as to reduce average bycatch rates for halibut. Also under this Amendment 19, allocations of PSC limits were respecified by more specific trawl fisheries and groups. This allowed for increased equity and accountability as the "other trawl" fisheries would also close down when their limit was reached. Prior to that, only bottom trawl pollock and Pacific cod closed when the PSC limits were reached. Similarly, under BSAI Amendment 21, the Regional Administrator is authorized to apportion non-trawl PSC limits by specific fishery categories; to apportion them seasonally; and, to exempt some non-trawl fisheries from PSC limits when appropriate.

BSAI Amendment 24, implemented in 1994, established seasonal allocations for Pacific cod by trimester for longline and pot gear only. These seasons were January to May, June to August, and September to December. This helped to decrease the halibut bycatch mortality. Amendment 46 further decreased bycatch mortality by allocating Pacific cod across gear types.

BSAI Amendment 28, implemented in 1993, divided the Aleutian Island management area into three districts for spatially allocating TAC (Figure 1). These districts are east (area 541), central (area 542), and west (area 543). This spatial division of the Aleutian Islands into three districts allowed for harvesting of potential TAC for species exhibiting limited movement (i.e., Atka mackerel) while mitigating against the potential for localized depletion.

BSAI Amendment 53, implemented in 1998, allocated shortraker/rougheye rockfish between the trawl and non-trawl gear sectors in the Aleutian Islands. Prior to this amendment, excessive bycatch of shortraker and rougheye in the Pacific ocean perch and Atka mackerel trawl fisheries would close those fisheries.

In the GOA, the initial FMP established five statistical areas over which the optimum yield was apportioned (Figure 4 Original 5 Areas). Under GOA Amendment 4, this was decreased to three in order to alleviate operational problems with maintaining these areas. These areas were named the western, central and eastern regulatory areas (Figure 2). Creation of the present day SEO/EYAK District area and WYAK District area was accomplished through a combination of four subsequent amendments: Amendments 8, 11, 14, and 22. Under Amendment 8, the eastern GOA was subdivided into three different districts: Yakutat, SEO (outside 3 miles), SEI (inside 3 miles). This was done to prevent localized depletion of sablefish. This amendment also redistributed the other species category GOA-wide (from distribution over management areas due to insufficient data available for management at smaller spatial scales), and established a non-specified species category.

GOA Amendment 11 further subdivided the Yakutat District into EYAK and WYAK Districts. This was done in order to better manage sablefish stocks by encouraging fishermen to extend their efforts over a wider area. Catch reporting in each district would enable more conservative management of local stocks. Under this amendment the area between 137° to 140°W was called the EYAK District (area 68) and 140° to 147°W is WYAK District.

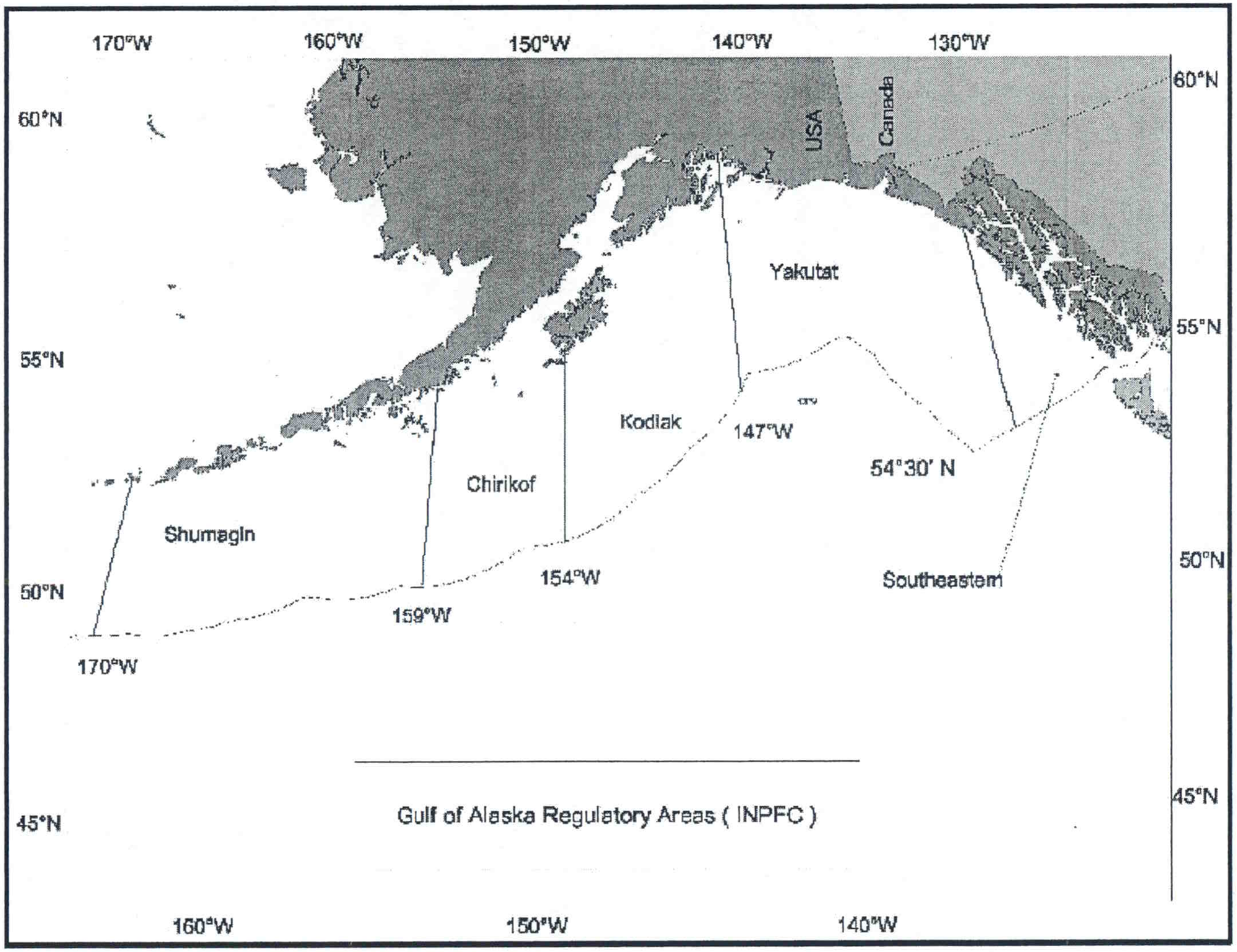


Figure 4. The original five Gulf of Alaska management areas.

GOA Amendment 14 defined a new regulatory district for better managing DSR (Figure 5). This new regulatory district was called CSEO District, located between 56°W and 57° 30'W. Amendments 17/22 collectively established a separate statistical area around the area of Bogoslof Island in BSAI, established closures around the Walrus Islands in northern Bristol Bay in BSAI and rescinded GOA statistical area 68, EYAK District. Area 68 was not deemed necessary for fishery conservation and management and was therefore imposing unnecessary record keeping and recording costs. Practically NOAA Fisheries had been managing the two districts, EYAK and SEO as a single, combined district since 1984. In 1987, a single harvest quota was established for these combined districts (52 FR 785, January 9, 1987).

GOA Amendment 22 simply formalized this by rescinding area 68 and making East Yakutat and southeast Outside a single, combined district for record keeping and recording purposes (Figure 5).

GOA Amendment 58 in 1998 prohibited trawling in the eastern GOA, in waters east of 140°W longitude. This trawl closure in the eastern GOA was instituted to preserve the small vessel fixed-gear fishery in this SEO region while the License Limitation Program (LLP) was being instituted in the GOA and BSAI. The closure also protects vulnerable rockfish stocks, which were seen to concentrate in this area. Due to this trawl closure, the ABC for northern rockfish in the eastern Gulf is combined with that of other slope rockfish in the West Yakutat District.

Amendments 16/21 (BSAI 16/GOA 21) provide a range of changes to the FMPs including modified crab and halibut bycatch management measures in the BSAI as well as the establishment of interim groundfish specifications. Crab and halibut bycatch management measures established in Amendment 12a were modified by apportioning PSC caps to additional fisheries; DAP rock sole and DAP deepwater sablefish and turbot, apportioning PSC caps seasonally, and providing for the imposition of sanctions on vessels with excessively high bycatch rates. The seasonal apportionment of PSC caps exerts the most significant spatial and temporal measure here; as once seasonal allocations of PSC caps are reached, these fisheries can be closed. This is discussed further under Section 3.5.1 of the Programmatic SEIS. These amendments extend 25 percent of the proposed TAC specifications, made at the September meeting, into the new fishing year until superseded by publication of the final specifications. This process of interim specification has been described in Appendix F-1, TAC-Setting Process qualitative assessment.

Steller sea lion protection measures have been implemented in a variety of forms since 1992. Current measures were implemented by emergency rule in 2002, and by final rule in 2003, in order to avoid the likelihood that the groundfish fisheries off Alaska will jeopardize the continued existence of the western distinct population segment of Steller sea lions or adversely modify its critical habitat (FR January 2, 2003). These measures were implemented through regulations and thus are not amendments to the FMPs. There are several measures which pertain to the spatial and temporal management of groundfish fisheries in the BSAI and GOA, specifically with respect to the management of the prey species pollock, Pacific cod, and Atka mackerel. The measures with spatial and temporal TAC management aspects are discussed below; however, the full listing of all the protection measures, including all relevant closures, are discussed elsewhere in this document.

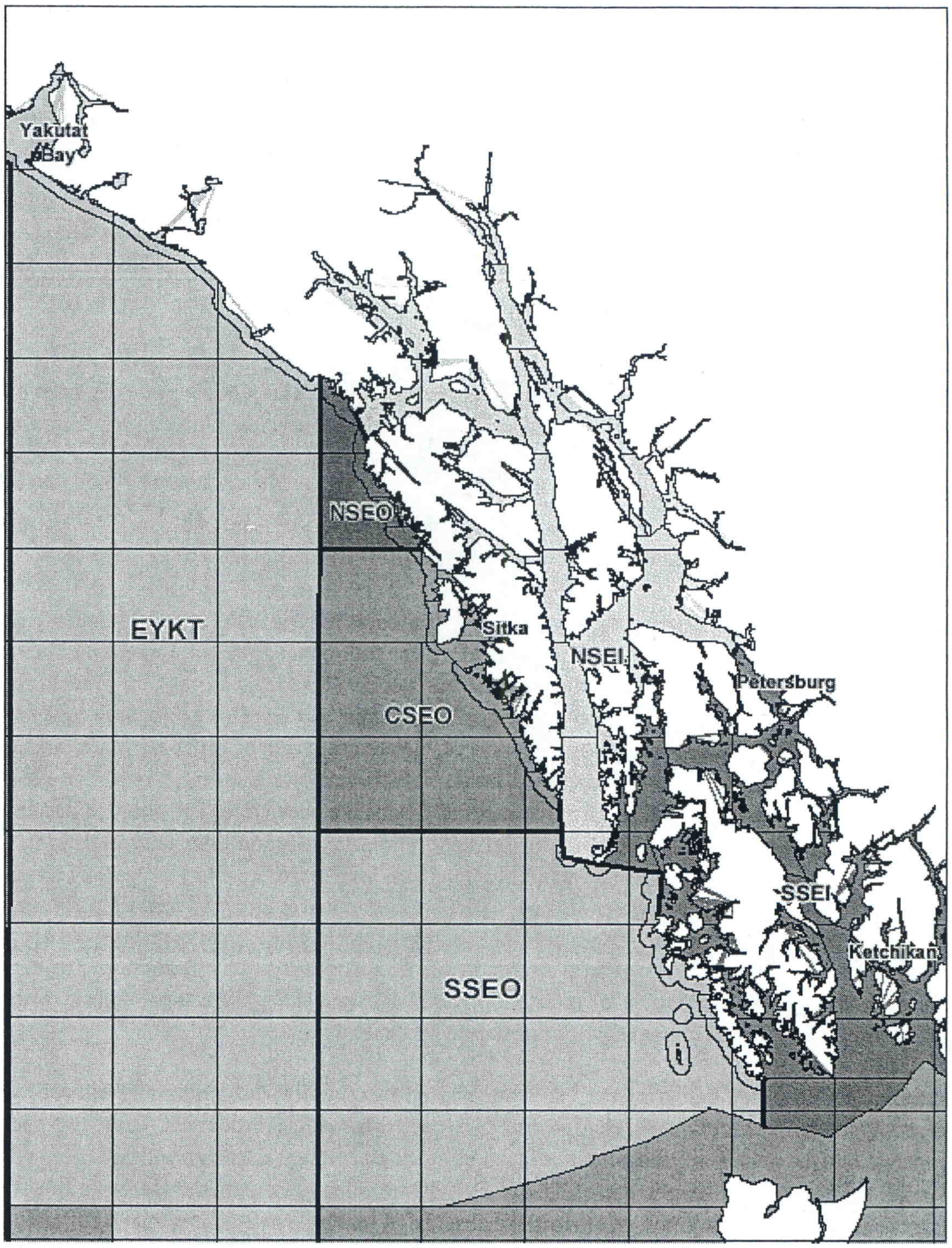


Figure 5. **The Alaska Department of Fish and Game and NOAA Fisheries jointly manage the East Yakutat (EYK), north-southeast Outside (NSEO), central-southeast Outside (CSEO), and south-southeast Outside sections (SSEO), which comprise the southeast Outside Subdistrict (SEO). The north-southeast inside (NSEI) and south-southeast Inside (SSEI) areas are managed entirely by Alaska Department of Fish and Game. Source: O'Connell *et al.* 2002.**

Spatial and temporal TAC management measures for Steller sea lion protection are implemented in the BSAI subareas and the GOA. In the Aleutian Island subarea, these measures include the apportionment of pollock to two seasons (40:60 percent to each), TAC apportionment by season and gear for Pacific cod, gear-specific area restrictions which alternate with the Atka mackerel fishery in critical habitat in waters west of 178°W. longitude, and a critical habitat harvest limit for Atka mackerel in waters west of 178°W longitude. In the Bering Sea, the measures include two seasons for pollock apportionment (40:60 percent in each), with an added restriction that no more than 28 percent of the TAC be taken from the Steller sea lion conservation area (SCA) before April 1, and Pacific cod TAC apportionments by season and gear. In the GOA, the measures include the apportionment of pollock evenly among four seasons and the apportionment of Pacific cod among two seasons (60:40 percent in each), as well as gear- and area-specific restrictions.

The combination of all of these and other amendments and regulatory changes sets the stage for the current spatial/temporal management of TAC. Many amendments build upon and modify previous ones. It is a complex system which also varies by region and by individual target species. Allocations and in-season management decisions are based on the best available science; however, they are also limited in the amount and depth of data available.

1.7 Challenges in Seasonal Distribution and Apportionment of Target Species

Each year during the stock assessment process when the plan teams for the BSAI and GOA meet to discuss the status of individual stocks and make recommendations for future management, there are issues raised regarding the spatial and temporal distribution of different stocks. The decision-making process for how stocks are managed spatially and temporally is based both upon the level of biological concerns and information available as well as socioeconomic concerns. There are levels of decisions made within each stock assessment regarding the technique used to allocate stock biomass (e.g., average over five surveys or 5 years of surveys). These individual stock assessment decisions are based upon the range of assumptions made about stock viability, seasonal movement, spatial distribution annually and seasonally, and the statistical means used by each stock assessment author in addressing these issues. For a variety of reasons based upon availability of information, different species characteristics and individual author preference, stock assessment authors use different methods for estimating spatial distribution of stocks across management areas. Decisions are made based on the number of years of survey data available and recent catch information. The degree of averaging can also vary by the amount of information available to a stock assessment author, with more sophisticated means used as additional stock information becomes available.

Two examples are provided below of the challenges faced in spatially and temporally allocating TAC amongst management areas for two different stocks: GOA pollock and BSAI rockfish. These two examples provide insight into the management challenges faced by stock assessment scientists and fisheries managers in the spatial and temporal management of TAC. For GOA pollock, the concern lies with how to best approximate seasonal migration amongst areas in the absence of seasonally explicit spatial information. For the BSAI rockfish example, the concerns are whether or not to spatially allocate amongst smaller areas, and the inherent management and accounting problems inherent in doing so. Additionally, in the discussion of the current management of individual stocks (Section 4.5.1 under Alternative 1) information is listed for the spatial/temporal allocation scheme for each stock assessment, with critical differences discussed as necessary.

GOA Pollock

GOA pollock is spatially apportioned amongst the regulatory areas: western, central, and eastern. The relative spatial allocation amongst areas is intended to approximate the relative proportion of the surveyed biomass in these regions. Since 1992, pollock TAC has also been seasonally apportioned in these areas in order to reduce impacts on Steller sea lion (Dorn *et al.* 2002). The TAC is apportioned spatially and temporally amongst these three management areas. Since 2001, four seasons were established to implement the Steller sea lion Protection Measures in the central and western GOA. These seasons begin on January 20, March 10, August 25, and October 1, with 25 percent of the total TAC allocated to each season. Both single species and ecosystem considerations provide the rationale for TAC apportioning, such that apportioning the TAC will spatially distribute the effects of fishing on other pollock consumers (i.e., Steller sea lions) and reduce the intensity of any adverse effects. Also, from a single-species perspective, TAC apportionment assures that no small component of the stock experiences higher mortality than any other (Dorn *et al.* 2002). While no sub-stock units have been identified yet in the GOA, it would be more precautionary to manage for their existence. Thus, if sub-units are identified, they are not subject to specifically high mortality. This potential protection of sub-stock units is particularly important during the spawning season when they are spatially separated (Dorn *et al.* 2002).

The Steller sea lion Protection Measures are intended to apportion the pollock TAC based upon the seasonal distribution of biomass, and thus reduce the potential impact of fishing on these endangered sea lions. However, it is important to recognize that apportioning TAC based upon inaccurate or inappropriate estimates of biomass distribution could have adverse impacts both on the pollock population as well as on the species that prey upon pollock (Dorn *et al.* 2002). For this reason, consideration is paid to the apportionment scheme for all stocks and especially for spatial and temporal allocation of pollock.

Because pollock undergo an annual migration between summer foraging habitats and winter spawning grounds, the biomass distribution in each area will change seasonally. The apportionment scheme needs to reflect this. However, since surveying effort has been concentrated during the summer months and prior to spawning in late winter, the timing of this migration is not well understood (Dorn *et al.* 2002). There is extensive summer survey information, but limited winter survey information, with surveys concentrated primarily in the Shelikof Strait spawning grounds. Dorn *et al.* (2002) recommended an apportionment scheme that attempts to synthesize and best use the available limited information on the summer and winter pollock distributions and the timing of the migration to and from spawning areas.

Apportionment Scheme

This apportionment scheme uses a ternary plot to show the seasonal distribution of walleye pollock biomass, and the distribution between areas for summer and winter (Figure 6). The ternary plot is then used to estimate the seasonal movement between areas. Relative biomass apportionment between areas 620 and 630 has been a particular problem, especially during the pollock season (Section 3.5 of the Programmatic SEIS). Previous recommendations were based on the assumption that the pollock stock on January 20 had the same spatial distribution as the mean distribution on the spawning grounds in mid-March. However, the experience of the fishing fleet since 2000 in these areas suggests that this is not accurate (Dorn *et al.* 2002).

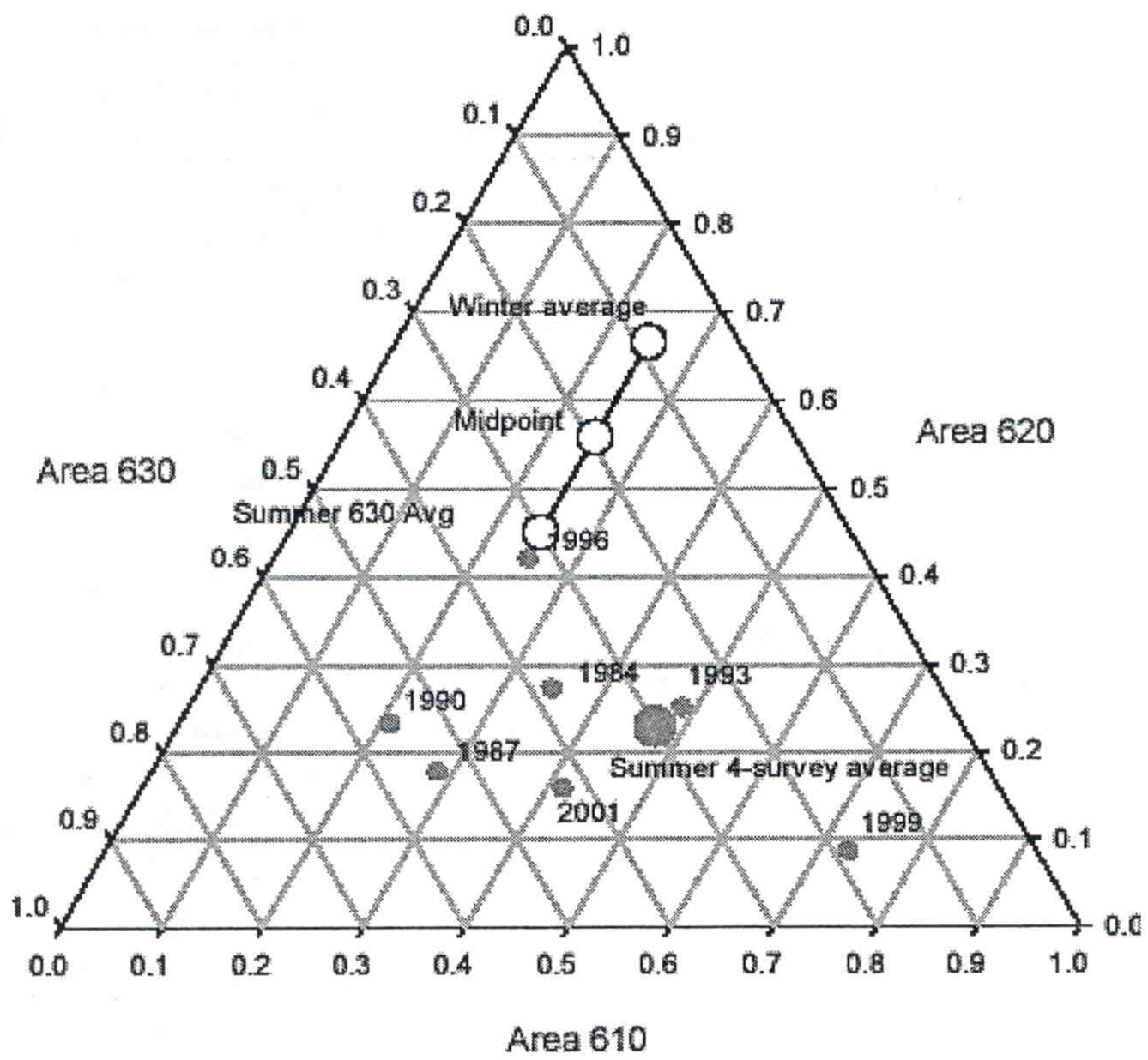


Figure 6. **Ternary plot of the seasonal biomass distribution of walleye pollock in the Gulf of Alaska.**
Source: Dorn et al. 2002.

Three alternative apportionment strategies were considered by Dorn et al. (2002), using relative percentages of biomass in each area from the summer distribution (Option A), the winter survey distribution (Option B), or the midpoint between summer and winter distribution (Option C). For all of these options, the distribution of biomass in area 610 remains the same (24.73 percent). This reflects the assumption that pollock targeted by the 610 fishery in the pollock season are fish that will spawn in 610 (Dorn *et al.* 2002).

Under Option A, the relative distribution of biomass in areas 620 and 630 was 45.23 percent and 30.05 percent, respectively. This represents the distribution of biomass obtained in area 630 in the summer with 620 biomass obtained by subtraction. This distribution assumes that the migration between areas has not begun by the start of the pollock season.

Option B results in relative apportionments between 630 and 620 of 66.46 percent and 8.81 percent, respectively, and assumes that the seasonal migration between areas has already been accomplished. This option is based on the relative winter distribution.

Finally, Option C takes the midpoint of these two assumptions, giving a relative distribution of 55.84 percent in Area 620 and 19.43 percent in area 630. This midpoint graphically represents the assumption that the fish are moving from one area to another during pollock season, thus the relative distribution of biomass should reflect neither the exact summer nor winter distribution.

At their November 2002 meeting, the plan team recommended Option C for an apportionment strategy and the use of a 4-year unweighted average to compute the survey biomass. The plan team also concurred with the assessment author's recommendation that any overage or underage of pollock harvest at the end of the pollock season be proportionately subtracted from or added to the western/central management areas based on the estimated distribution of pollock in the C/D seasons. The plan team further recommended that data collection efforts be increased in order to utilize the data more effectively for the actual seasonal apportionments.

This example of the strategy utilized in the GOA pollock apportionment, and the importance of recognizing the limited data available to choose apportionment schemes, highlights the inherent problems and trade-offs in spatially and temporally apportioning individual fisheries. For many fisheries data is lacking or insufficient to make decisions on seasonally spatial apportionment. As described above for GOA pollock, while some seasonal survey data is available, and thus innovative means are being used to extrapolate missing data, better data at specific seasonal migration times are necessary to validate the management schemes being utilized. Otherwise, apportionment schemes may not reflect the actual seasonal biomass distribution, and seasonal TACs may be over- or under-harvested accordingly.

BSAI Rockfish Management

Rockfish are a slow-growing, long-lived species that are particularly vulnerable to over-exploitation and slow to recover once driven below the level of sustainable yield (Leaman and Beamish 1984; Francis 1985). Thus, rockfish management has been a continual concern for the NPFMC. Specific concerns regarding the management of the other red rockfish complex has been under review by the NPFMC since October 2002. Concerns raised by the NPFMC regarding BSAI other red rockfish management include: (shortraker/rougheye rockfish and northern rockfish) reliable species identification within the shortraker/rougheye rockfish species group, the apportionment of this species group TAC among the Bering Sea subarea and the three Aleutian Islands subarea districts, and concerns regarding the overfishing level (OFL) and ABCs for northern rockfish by management area.

Pacific ocean perch rockfish species complex has been continually changing as different species groups are moved into separate species categories and more information becomes available. Specifically, the other red rockfish complex currently contains shortraker/rougheye rockfish and northern rockfish after the movement of sharpchin rockfish to the other rockfish complex in 2002. Currently, separate TACs are established for the BSAI management areas; however, the OFL pertains to the region as a whole.

The BSAI Groundfish Plan Team recommended in both 2000 and 2001 that a single BSAI-wide ABC be applied for each species of the other red rockfish complex, partitioned by management area according to recent survey biomass estimates (Reuter and Spencer 2002). While the NPFMC adopted this recommendation, it was hindered by the inability of observers to identify shortraker and rougheye rockfish to species level. The observer program implemented a number of changes aimed at increasing the ability of observers to identify shortraker and rougheye rockfish to the species level. Currently, shortraker/rougheye

are still treated as a complex. Improvements in observer identification should allow single-species ABC determinations in the future.

Additional Shortraker/Rougheye Management Concerns

The OFL and ABC for shortraker/rougheye is established for the BSAI and TACs are applied to the two subareas. There have been concerns raised that the Aleutian subarea should be apportioned by individual regulatory area to prevent the possibility of localized depletion. In 1997, the ABC for shortraker/rougheye in the Aleutian Islands was reached. Thus, to prevent overfishing of the complex, special reporting requirements were implemented, some fisheries were closed and other groundfish catch foregone. The estimated catch in 1997 was only 207 metric tons (mt) less than the OFL of 1,250 mt. In 1998, the NPFMC recommended and NOAA Fisheries implemented a revision of the maximum retainable bycatch (MRB) of this complex. Shortraker/rougheye was separated as a species category for MRBs (previously it was managed under "other red rockfish") and retention was limited to 7 percent of deep water species and 2 percent of shallow water species.

Since October 2002, the NPFMC has been considering apportioning the shortraker/rougheye TAC in the Aleutian Islands subarea by individual districts, following public interest in this apportionment. The catch in 2002 by subarea did not show a disproportionate catch by subarea (NMFS 2002). This may be because the primary targets for trawl gear (Atka mackerel and Pacific ocean perch) are already apportioned by subarea in the Aleutians.

There are ramifications for management of apportioning the TACs by subareas in the Aleutian Islands for shortraker/rougheye. These problems include the potential change in the distribution of target species in the subareas and, thus, the chance for premature closures of these fisheries, and the increased complexity of inseason management measures on this smaller management scale (NMFS 2002). If the distribution of target fisheries or shortraker/rougheye abundance change significantly, the relative catch may also change in and among the subareas. This could result in the subarea-specific TAC being exceeded for shortraker/rougheye, requiring that this be given as prohibited species status and that any future catch be discarded. Given the difficulties of managing species complexes that are caught incidentally on such a small scale, it may require that management prohibit retention of shortraker/rougheye on a preemptive basis rather than waiting on current inseason data.

Northern Rockfish Management

Northern rockfish have also been a concern for fisheries managers particularly regarding the reliability of stock biomass information for northern rockfish stocks in the EBS and Aleutian Islands. Unreliable biomass estimates can lead to under- or over-fishing of stocks by management area and trigger inseason management measures to close fisheries. Under Tier 5 management, the biomass estimates for the northern rockfish complex relies solely on survey biomass estimates. In December 2002, the SSC set the northern rockfish stock in the EBS in Tier 6 as a precautionary measure due to unreliable stock biomass estimates. This resulted in a higher ABC but a lower OFL by regulatory area than was recommended by the stock assessment authors. A lower OFL puts many Bering Sea fisheries at risk of premature closures should the OFL be exceeded. The NPFMC, following information presented by the Alaska Fisheries Science Center (AFSC) scientists, as well as a report from the SSC, revised its 2003 northern rockfish TAC specifications by combining the BSAI ABCs and OFLs. More reliable information on northern rockfish biomass is necessary before this complex can be managed more effectively.

BSAI Rockfish Management Summary

The difficulties with BSAI rockfish management are related to the uncertainty in biomass information for each stock. Some specific concerns with acquiring reliable biomass estimates include the problems encountered with trawl survey gear and the general design of these studies. There are two primary problems: one relates to the inadequate sampling of rockfish habitat, and the second to the disproportionate sampling of biomass. Rockfish habitat is particularly difficult for trawl gear to sample as it is rocky and often the bathymetry is too rugged for most gear. Thus, difficult areas are not sampled, and rockfish biomass in these regions may be underestimated. Rockfish can also be patchily distributed in particular habitat types, thus if a survey catches large concentrations of rockfish in habitats that constitute a small fraction of overall strata, then the area-swept estimate would overestimate biomass. Conversely if the trawl survey misses patches of rockfish then it will underestimate biomass. Disproportionate over-sampling and under-sampling of rockfish patches would be exacerbated by inadequate sample size leading to large interannual variability in estimated biomass levels. More information on these problems and some on-going work to improve surveying of rockfish can be found in the Discussion Paper on Rockfish Research and Management, by the Rockfish Working Group (NMFS 2003b).

Spatial and temporal management of TAC is dependant upon the amount of available information on stock biomass and distribution. As mentioned in the sections above, the available data impacts management in a variety of ways, from the necessity of making assumptions regarding seasonal migration between areas for GOA pollock, to the ability to apportion rockfish on smaller spatial scales. Accurate management on small spatial and temporal scales requires specific data on each individual stock. However, in the interest of precautionary management, apportionment decisions are made on the best available science and vary across each stock. As current management practices show, stocks are managed on different spatial and temporal scales depending upon their perceived vulnerability to overfishing, socioeconomic concerns within the fishery, and the availability of scientific information on the stock.

Section 2 Analysis of Alternatives

The following four policy alternatives are under consideration by the NPFMC:

Alternative 1 Continue Management Under Existing (Updated) Policy: Under this alternative, the NPFMC would continue to manage the groundfish fisheries based upon the present conservative and risk-averse policy. This policy assumes that fishing results in some adverse impacts to the environment and that, as these impacts become known, mitigation measures will be developed and appropriate FMP amendments will be implemented. The approach would be to continue the current strategy which relies upon spatial and temporal management of stocks according to individual stock concerns as well as interactions with other species (i.e., Steller sea lions) on a stock-by-stock basis and in consideration of such additional factors as bycatch, socioeconomic concerns, scientific data availability, and an assessment of the vulnerability of individual stocks.

Alternative 2 Less Precautionary Management Policy: A less precautionary management policy (i.e., more aggressive harvest policy) would be implemented based upon the concept that the present policy is overly conservative and that higher harvests could be taken without threat of overfishing the target groundfish stocks. This policy assumes that fishing at the recommended levels would have no adverse impact on the environment, except in specific cases that are generally known. There would be no change to the current spatial and temporal management practices. However, because PSC limits would be adjusted or eliminated under this alternative, the seasonal spatial and temporal management of target species would be impacted.

Alternative 3 More Precautionary Management Policy: This policy would seek to accelerate the existing precautionary management measures through community or rights-based management, ecosystem-based management principles and, where appropriate and practicable, increased habitat protection and additional bycatch constraints. Under this approach, additional conservation management measures would be taken as necessary to respond to social, economic, or conservation needs. Additional measures would be taken if scientific evidence indicated that the fishery was negatively impacting the environment, not just a population of a given species. Under this alternative, objectives and criteria will be developed for allocating TAC in space and time. The spatial and temporal nature of some fisheries may be impacted by reducing PSC limits in the BSAI and GOA.

Alternative 4 Highly Precautionary Management Policy: This policy would require that the user of the resource demonstrate that the intended use would not have a detrimental effect on the environment before significant fishing could be allowed. The policy, as illustrated by its FMP framework, would be to impose very restrictive conservation and management measures that would only be modified or relaxed when additional, reliable scientific information became available. It would involve a strict interpretation of the precautionary principle. Management discussions would involve and be responsive to the public, but decreased emphasis would be placed on industry and community concerns. More emphasis would be placed on ecosystem concerns and principles, including the identification and incorporation of non-consumptive use values. The overall premise is that fishing produces

adverse impacts on the environment, but due to a lack of information and uncertainty, we know little about these impacts. Under this alternative, TAC would be distributed on smaller spatial scales for all possible species. EBS pollock provides an example of how finer-scale spatial (and temporal) management might be approached. The spatial and temporal nature of some fisheries may also be impacted by the reduction in PSC limits in the BSAI and GOA.

Section 3 Alternative 1: Continue Under the Current Risk-Averse Management Policy

This alternative, as illustrated by the current BSAI and GOA FMPs, would maintain the existing spatial and temporal allocations of TAC for all stocks. Currently, there are no explicit objectives for managing TAC spatially and temporally. Rather, management varies according to the individual target stocks as well as the predators dependent upon these stocks (e.g., seabirds, Steller sea lions, and other marine mammals). Some stocks are managed at a single spatial and temporal level, while others are managed at a very fine spatial scale and have multiple seasons to disperse the fishery temporally. Generally, the ability to manage stocks at a fine spatial and temporal scale is dependant upon the biological concerns regarding the stock itself as well as the degree of scientific information available for the stock. Often decisions are made to change fishing seasons when targeting a certain stock may cause an unacceptable level of bycatch in another stock; thus, timing of the fishery is changed. The following is a description of how stocks are managed under the current system and a rationale for why certain stocks are managed on smaller spatial or temporal scales than others.

For all fisheries (unless otherwise noted), the fishing season for fixed gear runs from January 1 to December 31, and for trawl gear the season runs from January 20 to December 31. Many fisheries are further suballocated according to seasons, with the rationale for this suballocation varying according to the individual stocks. The spatial and temporal allocation schemes are listed below for each stock. If no temporal allocative scheme is listed specifically for the fishery, then this fishery is managed according to the fishing year only. Spatial allocative schemes often vary by individual stocks. Important differences in allocative schemes and the rationale thereof are noted.

3.1 Gulf of Alaska Management Area

The GOA is broken up into three management areas: eastern, central, and western (Figure 1). These regions are divided into individual statistical and reporting areas. The western GOA is completely contained within Area 610. The central GOA is made up of areas 620 and 630. The eastern GOA contains two management areas, the WYAK District (Area 640) and the SEO District (Area 650). Amendment 58 prohibits trawling in the eastern GOA east of 140°W. Two new subareas were created by this amendment, WYAK (147° 140°W) and EYAK/SEO (area east of 140°W). Trawling is prohibited in the EYAK/SEO subarea.

3.2 Gulf of Alaska Stocks

The stock-by-stock description of spatial allocation schemes begins with stocks that are managed Gulf-wide and proceeds on progressively smaller spatial scales to those stocks managed with separate TACs for each regulatory area.

3.2.1 Stocks Managed Gulf-Wide

In the GOA, only Atka mackerel and the other species complex categories are managed Gulf-wide. This indicates that for these species a single OFL, ABC, and TAC are set for the entire Gulf region.

Atka mackerel was separated from the other species category in 1994 through GOA Amendment 31. Since 1997, there is no directed fishery for Atka mackerel in the GOA. Instead, Atka mackerel's status has been bycatch-only. The stock population is low and believed to be vulnerable to fishing pressure due to its patchy distribution and sporadic recruitment patterns (Lowe 2002).

In the GOA there are no reliable biomass estimates of other species and no annual stock assessment. The TAC is set at 5 percent of the total groundfish TAC and other species are managed as bycatch only.

3.2.2 Gulf of Alaska Stocks Managed in the Southeast Outside District

DSR is only managed (and fished) in the SEO District due to the amendments to the FMP as mentioned in the introductory sections and the restrictions on trawling from Amendment 58 to protect rockfish. For this stock, which the NPFMC has deferred management to the Alaska Department of Fish & Game (ADF&G), the SEO District is further subdivided for DSR TAC into four smaller subareas: EYAK, NSEO, CSEO, and SSEO to prevent localized depletion (Figure 5). These areas are all part of SEO (Area 650). SEI (Area 659) are those state waters adjacent to Area 650. This area is managed by the state and is further subdivided into the north and south.

While the ABC for DSR is given for the SEO area-wide, this calculation is done by summing the individual ABCs by subarea (O'Connell *et al.* 2002). For DSR, 67 percent of directed fishery quota is allocated between January 1 and March 15, 33 percent between November 16 and December 31. Directed fishery quotas are set by management area and are based on the remaining ABC after subtracting for the estimated DSR bycatch in other fisheries. The bycatch limit of DSR during halibut fishing is equal to 10 percent of the halibut weight. The directed fishery in 2002 was pre-empted by the halibut fishery in East Yakutat subarea. The 2003 fishery is expected to be pre-empted by the halibut fishery again.

3.2.3 Gulf of Alaska Stocks which are Managed in Western, Central and Eastern Districts

Multiple stocks are managed spatially in western, central, and eastern districts: Pacific cod, northern rockfish, shortraker/rougheye and thornyheads. Individual apportionment of ABC amongst areas varies by each individual stock.

For Pacific cod, the ABC is spatially allocated amongst areas according to a calculation of the average biomass distribution from the three most recent trawl surveys. The TAC area allocation is within 1 percent of this average biomass distribution on an area-by-area basis (Thompson *et al.* 2002a). For 2003, the area allocation is western 39 percent, central 55 percent, and eastern 6 percent. Under measures implemented by the NPFMC to prevent potential competition with Steller sea lions, the TAC for the fishery is divided between the A Season and the B Season for the western and central regulatory areas. In these areas, 60 percent of the TAC will be allocated for the A Season, and the remaining 40 percent allocated for the B Season. Any Pacific cod harvested as bycatch between the closure of the A season and the opening of the B season is deducted from the B season apportionment.

For northern rockfish, the spatial apportionment of ABC among areas is by a weighted average based on survey biomass and relative variability in survey estimates/survey error. For 2003, this resulted in apportionment of 16.1 percent of the ABC in western area, 83.8 percent of the ABC in the central area, and 0.1 percent in the eastern area. The small eastern ABC for northern rockfish is combined with other slope rockfish in the WYAK for management purposes.

For shortraker/rougheye and Pacific ocean perch, the same method of apportionment is used as for Northern rockfish. In 2003, this resulted in an ABC apportionment for shortraker/rougheye of 13.3 percent of the ABC in the western GOA, 51.9 percent of the ABC in the central GOA, and 34.8 percent of the ABC in the eastern GOA.

For thornyhead rockfish, beginning in 2003, ABC will be apportioned by management area. Prior to this time it was managed Gulf-wide; however, given the historical concentration by foreign vessels in the central region (Ianelli and Ito 1995), the stock assessment authors were concerned that this pattern of concentration may reflect current trends as well (Gaichas and Ianelli 2002). Thus, the authors recommended management of thronyheads by region rather than Gulf-wide to avoid the potential for localized depletion due to concentration of the fishery. Observer coverage is not evenly distributed in this area thus it is impossible to determine the relative magnitude of removals in this region. Based upon the relative biomass in each area from four surveys (1990, 1993, 1996, and 1999), the relative apportionment of biomass by management area is as follows, western 18 percent, central 42 percent, and eastern 40 percent.

3.2.4 Gulf of Alaska Stocks Managed Spatially in Western, Central and East, Where the Eastern District is Further Subdivided into West Yakutat and East Yakutat/Southeast Outside

Stocks which are managed spatially in western, central, and eastern districts with the eastern district further subdivided into WYAK and EYAK/SEO include deepwater flatfish, rex sole, shallow water flatfish, flathead sole, arrowtooth flounder, sablefish, other slope rockfish, Pacific ocean perch, and pelagic shelf rockfish.

Deepwater flatfish are managed separately from shallowwater flatfish for purposes of differential halibut bycatch between the two fisheries. These fisheries are often closed quarterly as the halibut bycatch limit is approached (Table 1). Deepwater flatfish and rex sole were closed in each quarter in 2002 (on May 24, August 2, and October 13, respectively) to prevent exceeding the halibut bycatch limit (Turnock *et al.* 2002). The shallow water flatfish fishery was closed May 15, August 5, and October 13 due to attainment of the halibut bycatch limit.

Rex sole was split out of the deep-water management category in 1993 due to concerns regarding the Pacific ocean perch bycatch in the rex sole target fishery (Turnock *et al.* 2002). Rex sole is now managed with a separate ABC.

The flathead sole apportionment was estimated by calculating the fraction of the 2001 survey biomass in each area and applying that fraction to the model-estimated ABC.

Arrowtooth flounder was separated from the flatfish assemblage by the NPFMC in 1990 for management purposes given its high abundance and low commercial value (Turnock *et al.* 2002). The recommended 2003 ABC apportionment by area of arrowtooth flounder is estimated by calculating the fraction of the 2001 survey biomass in each area and applying that fraction to the total ABC.

Sablefish apportionment is currently based upon 5-year exponential weighting of the survey and fishery abundance indices in weight by region. Prior to 2000 the ABC was apportioned based upon the survey data alone; however, since 2000 the NPFMC approved an allocative scheme based upon both survey and fishery data. Sablefish is allocated by gear type according to Amendment 14, whereby 80 percent of the quota is to hook-and-line gear and 20 percent to trawl gear in the western and central GOA. In the eastern GOA the

quota is allocated 95 percent to hook-and-line gear and 5 percent to trawl gear. Amendment 8 to the GOA FMP established the WYAK and EYAK management areas for sablefish. The sablefish fishery since 1995 is an IFQ fishery, and as such, is largely dispersed in space and time (Sigler *et al.* 2002).

In order to protect vulnerable stocks such as Pacific ocean perch, shortraker, rougheye and northern rockfish from possible overfishing, the NPFMC divided the slope rockfish assemblage in 1991 (and again to separate northern rockfish in 1993) into management subgroups. Each subgroup, Pacific ocean perch, shortraker/rougheye, northern rockfish and other slope rockfish are assigned an individual ABC and TAC and apportioned amongst the three Gulf management areas based on the distribution of exploitable biomass (Heifitz *et al.* 2002). Amendment 58 prohibited trawling in the eastern GOA area in waters east of 140°W longitude. Most slope rockfish are caught exclusively with trawl gear. In order to not concentrate fishing effort for rockfish between 140° and 147°W longitude, the NPFMC subdivided this area in 1999 into subareas (WYAK (between 147° and 140°W) and EYAK/SEO (east of 140°W) with separate ABCs and TACs assigned to these subareas for Pacific ocean perch and other slope rockfish subgroups (Heifitz *et al.* 2002).

The pelagic shelf rockfish assemblage is comprised of dusky, widow, and yellowtail rockfish with the ABC computed separately for each and then summed for a Gulf-wide ABC for the entire assemblage. This ABC is then apportioned spatially by weighting the biomass according to the three most recent trawl surveys to compute biomass by area, yielding a percent distribution of approximately 9 percent in the western area, 63 percent in the central area, and 27 percent in the eastern area (Clausen *et al.* 2002).

3.2.5 Gulf of Alaska Stocks Managed Spatially in Western, with Central Subdivided Further into Area 620, Area 630 and Eastern Districts with East Subdivided into West Yakutat and East Yakutat/Southeast Outside

Pollock is the only fishery in the GOA which is managed with separate TACs by individual reporting areas in the central regulatory area (i.e., 620 and 630). Since 1992, GOA pollock has been apportioned spatially and temporally to reduce impacts on Steller sea lions (Dorn *et al.* 2002). The objective of the apportionment scheme is to allocate the TAC to management areas according to the relative distribution of the surveyed biomass. Four seasons were established in 2001 to implement the Steller sea lion Protection Measures in the central and western GOA. These seasons begin on January 20, March 10, August 25, and October 1 with 25 percent of the total TAC allocated to each season. Specific allocations amongst spatial areas (610, 620, and 630) are estimated according to the seasonal biomass distributions in these regions from the groundfish surveys. Information on the problems inherent in seasonally apportioning the Gulf pollock fishery have already been discussed above. In the eastern regulatory area, pollock is not divided into seasonal allowances.

3.3 Bering Sea and Aleutian Island Stocks

The stock-by-stock description of spatial allocation schemes begins with stocks that are managed BSAI-wide and proceeds on progressively smaller spatial scales to those stocks managed with separate TACs for individual regulatory areas as specified.

3.3.1 Bering Sea and Aleutian Islands Stocks Managed Bering Sea and Aleutian Islands-Wide

The following stocks are managed BSAI-wide, indicating that the stock is managed as a single ABC, OFL and TAC between the BSAI areas: Pacific cod, yellowfin sole, arrowtooth flounder, rock sole, flathead sole, Alaska plaice, other flatfish, squid, other species.

The Pacific cod fishery has been temporally dispersed across three seasons in 2001 and 2002, in an attempt to mitigate for possible impacts on Steller sea lions. These seasons are January through May, June through August and September through December (Thompson and Dorn 2002). Gear-specific TAC apportionments are established for these seasons and across all gear types. Bycatch of crab and halibut often cause the Pacific cod fisheries to close prior to reaching the TAC.

The yellowfin sole fishery is constrained seasonally by the PSC cap for the halibut fishery as well as the red king crab bycatch allowance. In 2002, the fishery was constrained twice for closures due to attainment of the halibut PSC cap (from May 11-21 and June 15-30) and Zone 1 was closed on May 21, 2002 for the remainder of the year to prevent exceeding the 2002 bycatch allowance for red king crab in the yellowfin sole target fishery (Wilderbuer and Nichol 2002).

The rock sole fishery in the BSAI is also closed periodically due to bycatch restrictions. In 2002, Zone 1 was closed from 2/22 to 12/31 due to exceeding the red king crab cap. The BSAI was closed for the following time periods after exceeding the first two seasonal halibut caps and the annual halibut allowance, respectively: March 1 through April 4, April 20 through July 1, July 29 through December 31 (Wilderbuer and Walters 2002).

Flathead sole was contained in the other flatfish assemblage prior to 1994. After this time it was separated out of that assemblage and assigned its own ABC, in order to comply with a request by the NPFMC and to comply with the change in the directed fishing standards to allow for improved retention of flatfish (Spencer *et al.* 2002).

Prior to 2002, Alaska plaice was managed as part of the other flatfish complex. Starting in 2002, it is being managed separately under its own ABC and TAC. Like the yellowfin sole and rock sole fisheries, the Alaska plaice fishery and the other flatfish fishery have also been closed due to the bycatch of halibut and a portion of the EBS has been closed in 2002 due to exceeding the red king crab bycatch allowance (Spencer *et al.* 2002).

The other species complex in the BSAI is currently managed based on Tier 6 criteria. Since 1999, discussions with the Plan Teams, SSC, and NPFMC have focused on better management of the other species complex. Separate ABC estimates have been proposed for squid and the remaining other species complex. Currently, the ABC for other species is managed as a single ABC for the whole complex.

3.3.2 Bering Sea and Aleutian Islands Stocks Managed in the Aleutian Islands only (Aleutian Islands Split by Eastern, Central, Western)

Atka mackerel is the only stock which is managed in the Aleutian Islands only, with the Aleutian Islands management split by eastern, central, western regulatory areas. Amendment 28 to the BSAI FMP divided the Aleutian subarea into three districts at 177°W and 177°E to spatially apportion TAC (Figure 1). Since 1994, BSAI Atka mackerel has been allocated to these three regions based on the four survey-weighted average of the biomass distribution from the Aleutian Island bottom trawl surveys.

Measures are currently in place to disperse the fishery temporally and spatially to reduce the level of fishing for Atka mackerel within Steller sea lion critical habitat. Temporally, the TAC is divided into two seasons. The A season runs from January 1 to April 15, and the B season runs from September 1 to November 1.

Spatially the fishery is further dispersed by regulations regarding maximum catch percentages of each of these seasonal allowances which can be caught within sea lion critical habitat in the central and western Aleutian Islands areas. There are no critical habitat closures established for the eastern subarea, although year-round 20-nautical mile trawl exclusion zones exist around Seguam and Agligadak rookeries. The percent distribution for 2002 TAC inside and outside critical habitat was 40 percent inside critical habitat, 60 percent outside for both western and central Aleutian Island regulatory areas (543 and 542, respectively).

3.3.3 Bering Sea and Aleutian Islands Stocks Managed with Spatial Split between the Bering Sea and Aleutian Islands

Stocks managed with a spatial split between the BSAI include: Greenland turbot (TAC only, no ABC split), northern rockfish, shortraker/rougheye, sablefish, and other rockfish.

The ABC for Greenland turbot is split between Aleutian Islands and Bering Sea regions according to survey biomass estimates in both regions.

Sablefish is allocated by gear type, according to Amendment 13, with 50 percent allocated to fixed gear and 50 percent to trawl gear in the EBS, and 75 percent to fixed gear and 25 percent to trawl gear in the Aleutian Islands. Amendment 15 of the BSAI FMP (amendment 20 to the GOA FMP) established IFQ management for sablefish beginning in 1995. Under these amendments, 20 percent of the fixed gear allocation was allocated to a CDQ reserve for the BSAI. Sablefish is allocated by area based upon a weighted average using survey and fishery information.

Northern rockfish and shortraker/rougheye rockfish are assessed together as other red rockfish complex. Separate ABCs are established for northern rockfish and shortraker/rougeye by BSAI management areas in proportion to recent survey biomass estimates. However, the OFL for each of these is for the entire BSAI combined area. This has been discussed previously in the section on BSAI other red rockfish management.

The other rockfish category is made up of 29 species, of which light dusky rockfish and shortspine thornyheads are the most abundant (Reuter and Spencer 2002). Sharpchin rockfish were moved into the other rockfish category in 2002. Separate ABCs and OFLs are set for the BSAI region. Concern was expressed by the SSC in 2001 regarding disproportionate exploitation of any one of the species in the other rockfish complex (Reuter and Spencer 2002). Light dusky rockfish are the predominate catch in the Aleutian Islands, despite the fact that 85 percent of the other rockfish biomass is shortspine thornyheads. The stock assessment author recommended that light dusky rockfish be split out from the other rockfish in ABC and OFL determinations (Reuter and Spencer 2002). Data on the spatial distribution of light dusky rockfish indicate that it may be a single stock in the BSAI region (Reuter and Spencer 2002). It was therefore recommended that a combined biomass estimate be used in the BSAI for this stock, and a subsequent ABC and OFL be determined for the combined BSAI management area (Reuter and Spencer 2002). The NPFMC did not separate light dusky rockfish at this time; thus it continues to remain within the other rockfish complex and is managed spatially between the Bering Sea and Aleutian Islands regions.

3.3.4 Bering Sea and Aleutian Islands Stocks Managed between Bering Sea and Aleutian Islands (with Aleutian Islands split Eastern, Central, Western)

Pacific ocean perch is the only stock managed between the BSAI, with the Aleutian Islands split into three regulatory units, (eastern, central, western). Pacific ocean perch and four other species of rockfish (northern, shortraker, rougheye and sharpchin) were managed as a complex, the Pacific ocean perch complex, until

1991. In 1991 the NPFMC separated Pacific ocean perch from the complex in order to provide protection from possible overfishing (Spencer and Ianelli 2002). For the EBS slope region, the Pacific ocean perch complex was divided into two subgroups: Pacific ocean perch, and an other red rockfish category made up of shortraker, rougheye, sharpchin and northern rockfish. In 2001, the other red rockfish in the Bering Sea was further subdivided into two additional subgroups, rougheye/shortraker and rougheye/northern. In 2002, sharpchin was assigned to the other rockfish category. In the Aleutian Islands regions, the Pacific ocean perch complex was divided into three groups: 1) Pacific ocean perch, 2) shortraker/rougheye, and 3) sharpchin/northern (Spencer *et al.* 2001). Each of these subgroups is assigned an individual ABC and TAC.

Since 2001, the BSAI area Pacific ocean perch stocks have been assessed and managed as a single stock; however, a separate ABC is established after the stock assessment calculations for each area. While age-structured models for both Aleutian Islands and Bering Sea stocks were being done prior to 2001, there were concerns regarding the lack of data upon which to base an age-structured assessment as well as the uncertainty that the Bering Sea Pacific ocean perch represent a discrete stock (Spencer and Ianelli 2001). The ABC for BSAI Pacific ocean perch is then split between the two management areas according to the percent of the combined biomass from surveys in both the Aleutian Islands and the EBS. For 2002, 16 percent of the ABC was allocated to the EBS region, while 84 percent was allocated to the Aleutian Islands region. The Aleutian Islands region is further partitioned amongst the Aleutian Islands management areas (E,C,W) according to the relative proportion of the estimated biomass from the five most recent trawl surveys.

3.3.5 Bering Sea and Aleutian Islands Stocks Managed with Bering Sea Split Out between Eastern Bering Sea and Bogoslof Regions, and Aleutian Islands (Managed Aleutian Islands-Wide)

Pollock is the only stock where the Bogoslof Region (area 518) is given a separate TAC for management purposes. The remainder of the Bering Sea regulatory areas are then combined into an area called the EBS.

The BSAI pollock comprises three stocks for management purposes: the EBS, which consists of pollock occurring on the EBS shelf from Unimak Pass to the U.S.-Russia convention line; the Aleutian Islands regions encompassing the Aleutian Islands shelf region from 170°W to the U.S.-Russia convention line; and the central Bering Sea-Bogoslof Island pollock (Ianelli *et al.* 2002). These three regions, EBS, Aleutian Islands, and Bogoslof, are given individual ABCs and OFLs. The Bogoslof region has been closed to directed pollock fishing since 1992 to rebuild stock.

In order to reduce the potential for competitive interactions with Steller sea lion, measures have been taken by the NPFMC and NOAA Fisheries to disperse the pollock fishery in space and time according to pollock biomass distributions. These measures included the closures of additional areas around sea lion rookery or haulout sites (see Appendix F-4, Steller Sea Lion Protection Measures for more details on closures) as well as TAC-specific reductions and temporal allocations. In 2000, the entire Aleutian Islands region was closed to pollock fishing, and phased-in reductions in the proportion of seasonal TAC within the SCA were instituted. The pollock fishery is prosecuted under two seasons, the A Season beginning January 20 to April 15 and the B season beginning September 1 and running until November. The A Season is apportioned 40 percent of the TAC and the B Season is apportioned 60 percent of the TAC. Regulations further state that no more than 28 percent of the the annual directed fishery allowance be taken from the SCA before April 1 (FR notice January 2, 2003). Other allocative measures in the Bering Sea include the establishment of the Bering Sea Pollock Restriction Area (BSPRA) during the A Season, and the closure of the Catcher Vessel

Operation Area (CVOA) to non-CDQ pollock trawl catcher processor during the B Season (FR notice January 2, 2003). These last two measures are discussed in more detail in Appendix F-4.

Section 4 Alternative 2: Adopt a More Aggressive Management Policy

Under this alternative there are no proposed changes to the spatial and temporal management of TAC from the current FMP. As discussed previously, there are no specific policy objectives relating to spatial and temporal management, thus any changes from one alternative to the next would be within the tools listed in the individual bookend frameworks. All TAC allocations and spatial and temporal management would remain as described above for FMP 1. However other aspects of this alternative may have an impact upon the temporal nature of some target stocks.

Spatial and temporal management changes under the FMPs 2.1 and 2.2.

FMP 2.1: No change from FMP 1
FMP 2.1: No change from FMP 1

Measures which may have a related impact on spatial and temporal management of the fisheries are discussed below.

Specifically, under the framework for FMP 2.1, PSC limits are eliminated. Many fisheries are currently timed to avoid excessive bycatch in prohibited and non-target species, specifically many flatfish fisheries (Table 1). The fisheries close for periods of the year over different seasons when they have exceeded their PSC caps, usually for halibut bycatch (Table 1). Consequently, many of these fisheries do not catch their allotted TAC since they are closed for halibut bycatch reasons prior to reaching their TAC. Eliminating these PSC limits would mean that many of these fisheries would remain open for the whole season until their allotted TACs are achieved.

Another measure under FMP 2.1 impacting spatial and temporal management of TAC would be repeal of the sablefish IFQ and the CDQs (except for pollock and crab as mandated under the American Fisheries Act). Repealing these programs from a TAC perspective frees up an additional 7.5 percent of the TAC for the directed fishery.

Section 5 Alternative 3: Adopt a More Precautionary Management Policy

Under this alternative, there are no specific management policies that would change for spatial and temporal management. Under the FMP 3.2, however, objectives and criteria to specifically allocate TAC in space and time would be developed. This would represent a departure from the current program, where TAC is allocated spatially and temporally under FMP 1. Under FMP 3.2, goals and objectives for allocating TAC in space and time would be developed, along with a sample uniform allocative scheme. There are also related measures within this alternative that would impact the spatial and temporal management of the individual fisheries. These related measures are the impact of fishery-specific TACs; breaking sharks and skates (and additional species) from the other species complex; reduced PSC limits on herring, crab, halibut and salmon; and establishing PSC limits in the GOA. While none of these measures directly change the spatial and temporal management of TAC they could all impact it.

Specific spatial and temporal management measures under the FMPs 3.1 and 3.2:

FMP 3.1: No changes from FMP 1
FMP 3.2: Develop goals and objectives for allocating TAC in space and time.

In order to allocate TAC in space and time, specific goals and objectives for spatial and temporal management need to be developed. As previously explained, spatial and temporal allocation of TAC is a tool by which other objectives are achieved. There are currently no policies which denote the specific objective to manage on smaller spatial and temporal scale for the explicit benefit of the target fishery. Under FMP 3.2, however, it is assumed that a general overarching goal is to manage stocks on smaller spatial and temporal scales. In addition to explicitly declaring this policy objective, reasonable mechanisms must be developed to both systematically manage stocks in time and space, as well as to account for the varying degrees of uncertainty in stock biomass information across all stocks. This mechanism would need to be adaptive to the level of available information for each stock.

Proposed Season and Area Proportionate Harvesting Scheme

A proposed means of seasonal and spatial allocation is provided by G. Thompson (Appendix A *Grant's P cod allocative scheme*) This allocative scheme was initially developed for Pacific cod but is here made applicable to all stocks.

In order to allocate TAC on the basis of time and space, it is necessary to partition the fishing year and area. For example, the year could be partitioned into a number of seasons, and the area could be partitioned into a number of subareas. The seasons could be of equal or different lengths, the subareas could be of equal or different sizes, and the numbers of seasons and subareas could be equal or different.

In current stock assessments, biomass estimates are typically available only on a start-of-year and area-wide basis (for example, in the case of an EBS stock, we typically have estimates of January biomass for the entire EBS, but we typically do not have estimates of August biomass for area 517). However, as assessment methodology continues to become more sophisticated, it is likely that season- and subarea-specific biomass estimates will become available for some stocks. When such estimates are available, they could form the basis for season-and-subarea-specific TACs. Such an allocation could be developed by first specifying the

fishing mortality rate corresponding to the overall TAC. Then, this fishing mortality rate could be applied to each season-and-subarea specific biomass estimate to produce an "equal exploitation" distribution of season- and subarea specific TACs which would sum to the overall TAC. Next, a limit on the acceptable deviation from this distribution could be specified. For example, it might be determined that the catch taken from any single season- and subarea-specific cell could not exceed 150 percent of the value from the "equal exploitation" distribution (the 150 percent figure is purely hypothetical). Of course, the overall TAC could still be viewed as a constraint on the overall catch.

When season-and-subarea-specific biomass estimates are not available, something else would have to be used. One possibility would be to use the distributions of season lengths and subarea sizes to approximate an "equal exploitation" distribution of season- and subarea-specific TACs. The seasons could be expressed as proportions of the year, so they would sum to one. Likewise, the subareas could be expressed as proportions of the area, so they would sum to one as well. A subarea-by-season matrix R could then be formed in which rows represent subareas, columns represent seasons, and each element of the matrix is equal to the product of proportional subarea size and proportional season length, so the elements of R would sum to one. Then, the "equal exploitation" distribution could be approximated simply as the product of R and the overall TAC. As in the case where season-and-subarea-specific biomass estimates are available, a limit on the acceptable deviation from the "equal exploitation" distribution could be specified, and the method would proceed in the same way.

A variant on the above approach would be to form the "equal exploitation" distribution on the basis of the fishing mortality rate corresponding to ABC or OFL, rather than TAC. That is, an "equal exploitation" distribution of season-and-subarea-specific ABCs or OFLs could be formed, and acceptable deviations could be calculated relative to that distribution. Of course, the overall TAC could still be viewed as a constraint on the overall catch. In this approach, as with other allocative schemes, more specific biomass estimates on smaller, subarea scales by season would improve these season- and subarea-specific allocations.

Additional measures which may have a related impact on spatial and temporal management of the fisheries follow.

- Under the FMP 3.2, there are proposed changes to the TAC-setting process which may impact spatial/temporal management. The establishment of biological reference points based upon species-specific production patterns, using F_{60} as a proxy for vulnerable species is proposed under FMP 3.2 (refer to Appendix B). Under this alternative, TACs will be less for these vulnerable species and thus the fishery may close sooner and/or impact the timing of other fisheries which catch this as bycatch.

- Under Alternative 3 for TAC setting, both FMPs 3.1 and 3.2 examine ways to break a species out of a species complex. FMP 3.1 proposes to separate sharks and skates from the other species groups. FMP 3.2 proposes to separate sharks and skates and additional groups from the other species groups. These changes would impact how the other species TAC for each of these measures is then calculated. Currently, the other species TAC is calculated as a percentage of the total TAC for all target species in the GOA. In the BSAI, the other species ABC is calculated as a Tier 6 stock for sharks and a Tier 5 for skates with the TAC set less than the combined other species ABC. With sharks and skates broken out as their own category, the other species ABC and TAC would need to be recalculated to account for this (refer to Appendix B).

- Additional impacts on spatial and temporal management of TAC by this measure could be the closure of many target fisheries when the shark and skate (and additional species in the case of FMP 3.2) TAC has been exceeded. There is currently no temporal nature to other species management however this may change by altering the species in the complex.

- Reducing PSC limits on herring, crab, halibut and salmon in the BSAI could impact the temporal nature of many fisheries. Fisheries which currently close seasonally due to exceeding seasonal caps, particularly the flatfish fisheries, would have even shorter seasons and possibly harvest less of their TACs with reduced PSC limits. However, under other measures in this alternative there are bycatch reduction incentive programs, increased rationalization and other means to harvest fish without exceeding this PSC cap regardless of whether or not it is reduced. It is possible, therefore, that this would not radically change the temporal nature of the fishery.

- In the GOA under policy Alternative 3, PSC limits for salmon, crab and herring are established (FMP 3.1) and then reduced (FMP 3.2). PSC limits for halibut are reduced under both example FMPs. Establishing crab, herring, and salmon PSC limits in the GOA fisheries could alter the temporal nature of these fisheries. Depending upon the amount of seasonal bycatch, some fisheries may have to rearrange their seasons and/or change the nature of their fishery to accommodate these caps. Some spatial management (area closures) may also be necessary as an in-season management measure in order to comply with PSC caps. Again, some closure areas will also be developed separately under this alternative; therefore, the cumulative impact of these closures would need to be considered in order to assess the importance on the spatial and temporal management of the fisheries. More information is in Appendix F-3, Essential Fish Habitat and Marine Protected Areas paper as well as Appendix F-5, Bycatch and Incidental Catch Restrictions paper.

Section 6 Alternative 4: Adopt a Highly Precautionary Management Policy

Under this alternative, in the FMP 4.1, TAC will be distributed spatially on smaller scales for all possible species except other species. The rationale for this alternative is that in the absence of scientific certainty that fishing is not causing an adverse impact, the burden of proof should be shifted such that it is assumed that it is causing an impact until evidence shows conclusively otherwise. Under this alternative, more precautionary measures are taken to mitigate for uncertainty in stock assessments and spatial allocative schemes. While no policy objectives specifically address spatial and temporal management, many of the objectives of managing on smaller spatial scales are covered under additional objectives.

Specific spatial and temporal management measures under the FMPs 4.1 and 4.2:

- FMP 4.1: Distribute TAC on smaller scales for all possible species. For analytical purposes, EBS pollock will be used as a proxy.

- FMP 4.2: TAC = 0, therefore, there is no spatial and temporal management of TAC for as long as the fisheries are closed.

6.1 Fishery Management Plan 4.1 Management Measures

Spatial and temporal management can be used as a tool to mitigate for the current limitations in both the stock assessment surveys and the models utilized. These limitations are associated with the degree of uncertainty in the stock structure in part due to seasonal rather than year-round surveys, and the degree of uncertainty in the spatial distribution of survey biomass. The objective is to disperse the fishery in both time and space to guard against localized depletion. Given the uncertainties regarding stock structure, a general concern is that concentrated fishing on a particular stock may result in the depletion of one segment of the stock population, as for example, when the fishery targets heavily on the spawning biomass.

Under this alternative, fishing effort would be proportional to the amount and distribution of biomass, provided this is consistent with essential fish habitat and other such mandates. Some problems with this approach, as discussed previously, are that it is very difficult to estimate the spatial and temporal distribution of stock biomass. Current surveys generally only cover limited timing within seasons. The difficulties of extrapolating between seasons for stock surveys (e.g., GOA pollock) where seasonal surveys exist, have already been highlighted in previous sections. However, under this alternative more precautionary management measures with respect to the spatial and temporal management of TAC will be taken using the best available scientific data until conclusive evidence shows that this is not necessary for managing these fisheries.

EBS pollock will be used as an example of a stock which could be managed on a smaller spatial and temporal scale. The National Research Council (NRC) (1996) noted that spreading out the large pollock fishery in time and area may prove beneficial to predators. One potential mechanism for further dispersing the fishery in the absence of detailed information is to use measures proposed in the 1998 Biological Opinion. The 1998 Biological Opinion provides an example of how the EBS pollock could be dispersed on a finer spatial and temporal scale.

6.1.1 Spatial Measures

The spatial scales designated in this Biological Opinion for EBS pollock were the following three broad areas (based on available summer survey information):

1. critical habitat in the eastern Aleutian Islands (Sea Lion Conservation Area, "SCA")
2. areas outside of critical habitat to the east of 170°W longitude
3. areas outside of critical habitat to the west of 170°W longitude

6.1.2 Temporal Measures

Two key objectives were recommended for temporal dispersion of the pollock fisheries (NMFS 1998). The first objective was for temporal dispersion to avoid removal during the winter period, and the second objective was to distribute the catch more evenly over the course of the year. The following criteria were also recommended, including a quarterly approach to allocation of the EBS pollock TAC (NMFS 1998):

1. Continue prohibition of pollock fishing from November 1 to January 19 in the Bering Sea and GOA.
2. Distribute catch into at least four seasons, two from January to May, and two from June to October.
3. Limit combined TAC in winter/spring to a maximum of 45 percent.
4. Allocate single-season TACs to be no more than 30 percent of the annual TAC.
5. Prevent concentration of catch at the end of one season, beginning of the next.
6. Limit rollovers of unused TAC from one season to the next.

In addition to these measures, in order to slow the pace of the fishery on a daily basis, a cap of 5,000 mt is proposed on daily catch rates. This 5,000 mt cap dates back to the average catch rates in these areas by the foreign fisheries in the period between 1982-1985 (Table 2*)*. During this period, the fishery was slower-paced and more widely dispersed outside of the current SCA, to the east and west of the 170°W longitude line in the EBS. (NMFS 1998).

One potential problem with these proposed measures is the ability of NOAA Fisheries to adequately enforce them. The 5,000 mt cap would be particularly difficult to enforce and could add an extreme burden to the inseason management staff. Impacts of these measures on target species are unknown but presumably these measures would be beneficial to the pollock population for which they are proposed, as well as to the endangered Steller sea lion population.

Table 2. Bering Sea and Aleutian Islands pollock specifications (metric tons).

Area	1999 biomass	1999 OFL	1999 ABC	1999 TAC	1998 TAC	1998 catch
Eastern Bering Sea	7,040,000	1,720,000	992,000	992,000	1,110,000	1,020,720
Winter seasons				40%	45%	
Summer/fall				60%	55%	
Aleutian Islands	106,000	31,700	23,800	2,000	23,800	21,945
Bogoslof	403,000	21,000	15,300	1,000	1,000	8

Notes: Recommended by NPFMC for 1999.
Source: NMFS 1998; Table 2.

Section 7 Comparative Analysis of Alternatives

Spatial and temporal management of TAC is utilized as a tool in all of the alternatives, as illustrated by their associated FMPs. Under the current system, TAC is managed spatially and temporally as a tool to achieve various objectives, both biological and socioeconomic. Potential changes to the current management occur in FMPs 3.2 and 4.1. Under Alternatives 3 and 4, this current management would also include specifically conceiving of goals and objectives for managing TAC in space and time (FMP 3.2), a conceptual approach to manage all species on smaller spatial and temporal scales, regardless of the level of knowledge of the stock (FMP 3.2), and managing on a smaller spatial and temporal scale for conservation reasons utilizing a different approach (FMP 4.1). These alternatives all assume that management of TAC on smaller spatial and temporal scales would be beneficial to the target species.

The ability to effectively manage on smaller spatial and temporal scales is tied to the availability of stock biomass data. A discussion of better spatial and temporal management necessarily includes highlighting the need for additional information to effectively manage stock. These data gaps which have been previously mentioned include better spatial and temporal information on individual stock migration, better identification to the species level of shortraker/rougheye rockfish, and more fine-scale, detailed information on the spatial and temporal distribution of every target species managed under these FMPs. The ability to effectively manage TACs on progressively smaller spatial and temporal scales necessitates the need for more information.

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APPENDIX F

Essential Fish Habitat

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ACRONYMS AND ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
AFSC	Alaska Fisheries Science Center
BSAI	Bering Sea and Aleutian Islands
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeters
DOI	Department of Interior
EAs	Environmental Assessments
EBS	Eastern Bering Sea
EEZ	Exclusive Economic Zone
EISs	Environmental Impact Statements
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FMPs	Fishery Management Plans
E.O.	Executive Order
ft	feet/foot
GOA	Gulf of Alaska
HAPC	Habitat Areas of Particular Concern
IFQs	individual fishing quotas
km^2	square kilometers
LLP	License Limitation Program
m	meters
MMA	Marine Managed Areas
MPAs	Marine Protected Areas
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
nm^2	square nautical miles
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
NRC	National Research Council
PSC	prohibited species catch
SEIS	Supplemental Environmental Impact Statement
SFA	Sustainable Fisheries Act
SSL	Steller sea lion
TAC	total allowable catch
U.S.	United States (of America)
VMS	Vessel Monitoring System

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Section 1 Essential Fish Habitat and Marine Protected Areas

Protection of marine habitats including areas defined as essential fish habitat (EFH) is an integral component of the Groundfish Fishery Management Plans (FMPs) for the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA). This section considers the proposed closure areas under the four policy alternatives, and their direct/indirect effects on EFH and other aspects of the biological, physical, social, and economic environments.

Historically, the North Pacific Fishery Management Council (NPFMC) and Alaska Board of Fisheries have adopted, and the National Marine Fisheries Service (NMFS or NOAA [National Oceanic and Atmospheric Administration] Fisheries) has implemented, closures of certain areas to fishing in order to achieve a variety of objectives, all of which provide some level of habitat protection or reduced levels of disturbance. These historical closures, along with other measures such as time/area controlled harvest quotas, bycatch limits and gear restrictions, are legitimate fishery management tools that support designations of EFH and Habitat Areas of Particular Concern (HAPC) (EFH Final Rule: 50 Code of Federal Regulations [CFR] Part 600). HAPCs are habitat types or areas that may require extra protection and are defined using specific considerations (see Section 3.6 of the Programmatic Supplemental Environmental Impact Statement [SEIS]). In Alaska, HAPC has been specifically defined as living substrate in shallow and deep water, and freshwater areas used by anadromous fish.

One way that impacts to EFH and HAPC can be mitigated is through the designation of Marine Protected Areas (MPAs). In May of 2000, President Clinton signed an Executive Order (E.O.) 13158 "Regarding Marine Protected Areas in the United States." This order directs the Department of Commerce and Department of the Interior to develop a plan for enhancing existing MPAs and establishing or recommending new MPAs, as appropriate.

MPAs are geographically defined areas designated with special protections to enhance the management of marine resources (Alaska Department of Fish and Game [ADF&G] 2002, National Research Council [NRC] 2001 and E.O. 13158). Specifically, MPAs can include the following types of management areas:

- **Marine Reserve (No-Take)** – a general category that prohibits the extraction of all living resources and disturbance or destruction of habitats. This includes critical habitat areas established to protect threatened or endangered species. Included in the Marine Reserves are Ecological Reserves where removal or disturbance of living or non-living marine resources as necessary for monitoring and research to evaluate reserve effectiveness is allowed. Access and recreational activities may be restricted in Marine Reserves to prevent damage to the resources. In the Programmatic SEIS management alternatives, the term "no-take marine reserve" is used to describe this type of closure area as applied to the groundfish fishery. An example from existing management is the Sitka Pinnacles Marine Reserve where all groundfish fishing is prohibited, but commercial and recreational salmon trolling is allowed. If the no-take concept were to be applied more broadly (in this case outside of the groundfish FMPs), consultation within and outside of NOAA Fisheries and the NPFMC would be required along with possible regulatory action.

- **Marine Fishery Reserve** – a closure area where extraction of a specified fishery resource is prohibited. These long-term, but not necessarily permanent closure areas are used to rebuild stocks, provide insurance against overfishing, or enhance fishery yield. Under the current groundfish FMPs, the Bogoslof Groundfish Closure Area could be considered to have the secondary intent of improving the groundfish fishery resources in the area, even though the primary intent of this closure is protection of Steller sea lions (SSLs).

- **Marine Habitat Reserve** – a closure area where habitat disturbance, such as the use of bottom contact fishing gear of specified types, is prohibited. The Programmatic SEIS denotes these areas as "no-trawl MPAs". Examples from existing management would be the Red King Crab Savings Area and Pribilof Islands Habitat Conservation Areas (see Section 1.2 below). Most of the closures discussed under existing management fall into this category.

Many of the existing closure areas fit one or more of these definitions of an MPA, but have not been specifically defined as MPAs in the existing groundfish FMPs and Amendments.

1.1 Definition of EFH and a Regulatory Overview

In October 1996, the United States (U.S.) Congress reauthorized the Magnuson-Stevens Fishery Conservation and Management Act (MSA) through the Sustainable Fisheries Act (SFA). The Final Rule implementing the EFH provisions of the MSA (50 CFR Part 600) was promulgated in January 2002. The intended effect of the rule is to promote the protection, conservation, and enhancement of EFH.

EFH is defined by the MSA as those waters and substrate necessary to manage fish species for spawning, breeding, feeding, or growth to maturity. For Alaska groundfish, this includes the habitat for all target groundfish species, non-target species, prohibited species, other species, and their prey. When viewed in aggregate, across all species, EFH is all pelagic and benthic habitat in the Alaska Exclusive Economic Zone (EEZ). The EFH definitions for all managed species are currently being reviewed by the NPFMC and NOAA Fisheries through its EFH amendment process. A decision on the Alaska EFH definitions will be made by the end of 2004. For purposes of this PSEIS, we therefore provisionally defined EFH generally as all benthic habitat.

The Final Rule also includes provisions requiring Regional Fishery Management Councils (Council) to amend their FMPs to describe and protect EFH and to mitigate any adverse impacts potentially caused by fishing activities. Consistent with these provisions, this analysis focuses on the following question: Do the alternative management policies result in conditions that offer protection to and minimization of adverse impacts to EFH? As explained above, this analysis focuses on benthic EFH, which is generally believed to be at greater risk to the impacts of fishing than non-benthic habitat in the water column. In addition, much of the analysis focuses on the impacts of bottom trawling. It is recognized that fixed gear (longlines, pots, and jigs) or pelagic trawl gear that comes in contact with the sea floor can disturb benthic EFH. In some types of habitat, fixed-gear may cause an impact due to its ability to be more easily fished on rougher substrates (e.g., boulders with coral) than bottom trawl gear. However, most scientific studies of gear impacts have dealt with bottom trawls and dredging because this gear is the most controversial (Auster and Langton 1999, Jennings and Kaiser 1998, Hall 1999, NRC 2002).

The Final Rule requires that FMP components include mitigation measures for the adverse effects of fishing. Fishery management options may include, but are not limited to fishing equipment restrictions, time area closures, and harvest limits. At present, environmental and human variables that could affect habitat quality are now addressed in the FMPs for both the BSAI and GOA (NPFMC 1999). However, the EFH environmental assessment (EA) and FMP Amendments 55/55, along with similar actions prepared by five other Councils, were challenged by a coalition of seven environmental groups and two fishermen's associations. The plaintiffs' challenge was twofold: 1) to prove that the agency's evaluation was not in compliance with the MSA, and 2) to prove that the documentation (Eas) did not comply with NEPA. The U.S. District Court for the District of Columbia found that the agency's evaluation of fishing gear impacts on EFH in the FMP amendments was in accordance with the MSA. However, the supporting EAs failed to comply with the requirements of the National Environmental Policy Act (NEPA) and the regulations promulgated by NPFMC on Environmental Quality (CEQ) and the NOAA. The court determined that the EAs did not consider the full range of relevant alternatives, nor did they fully explain the environmental impact of the proposed action and alternatives. In addition, the EAs failed to address any mitigative efforts to reduce adverse effects from fishing activities.

The Assistant Administrator of NOAA Fisheries determined that the agency would prepare new regional environmental impact statements (EISs) to include all FMPs covered by the EAs. Following are several key areas of guidance provided in his determination:

- The selected range of alternatives should be developed by taking into account comments NOAA Fisheries receives during the scoping process; the EIS must evaluate a reasonable range of alternatives for developing the mandatory EFH provisions of the affected FMPs.

- The analysis should include alternative ways of identifying EFH.

- The analysis should discuss alternative areas or different approaches that could be used to designate HAPCs.

- The alternatives analysis should identify a range of approaches that could be taken to minimize the adverse effects of fishing on EFH. If information is lacking on the effects of specific fishing practices on EFH, the analysis should examine alternatives that could be taken in the face of uncertainty.

- To the extent feasible, NOAA Fisheries should use the NEPA process as the vehicle for reviewing and revising the information contained in the original EFH FMP amendments. Such a review should include information regarding the description and identification of EFH, threats to EFH from fishing and non-fishing activities, and measures that could be taken to minimize those threats.

The proposed action to be addressed in the EFH EIS is the development of the mandatory EFH provisions of all five FMPs of the NPFMC: the Bering Sea and Aleutian Islands Groundfish; GOA Groundfish FMP; Bering Sea/Aleutian Islands King and Tanner Crab FMP; Scallop Fishery off Alaska FMP; and the FMP for the Salmon Fisheries in the EEZ off the Coast of Alaska. At present NOAA Fisheries and the NPFMC are identifying feasible alternatives for analysis in the EIS for NPFMC's eventual selection of a preferred alternative. The Alaska Groundfish Programmatic SEIS is not intended to replace or supercede the EFH EIS, but will provide overarching policy guidance for EFH and will set the stage for future FMP actions.

1.2 Management Measures Used to Protect Habitat in Alaska

Habitat Protection

Passage of the MSA in 1976 marked the beginning of efforts to integrate habitat considerations into the fishery management process. The MSA directs the Regional Councils to recommend management plans for commercial and recreational harvests of fish in the EEZ. For the most part, the individual states have responsibility for managing fisheries within the territorial sea. Although some early efforts were made to address significant fishery habitat issues, NPFMCs and NOAA Fisheries concentrated largely on ocean harvest during the first decade after passage of the MSA.

In 1983, NOAA Fisheries adopted a National Habitat Conservation Policy, uniting its MSA authority with its advisory responsibilities and authority under the Fish and Wildlife Coordination Act and NEPA. The National Habitat Conservation Policy provides guidance to the agency regarding interactions with NPFMCs and with federal and state agencies. It also focuses NOAA Fisheries' habitat conservation efforts on specific habitat impacts potentially affecting fishery resources, marine mammals, and endangered marine species. Although the policy notifies other agencies and NPFMCs of NOAA Fisheries' intent, it does not clarify NPFMCs' role in fishery-related habitat issues.

In 1986, Congress amended the MSA, essentially codifying elements of the NOAA Fisheries Habitat Conservation Policy and giving NPFMCs new authority and responsibility to include "readily available" habitat information in all FMPs. The amendments to the MSA direct NPFMCs, with guidance from NOAA Fisheries, to evaluate fishery practices and assess any practices changing the habitat important to commercial fisheries. Furthermore, the 1986 amendments give NPFMCs the opportunity to recommend habitat management measures for ongoing and proposed federal and/or state activities that could potentially adversely affect fishery resources. Federal agencies are required to respond specifically and substantively to a Council's recommendations within 45 days. The amendments also encourage NPFMCs to monitor state activities and to comment on those activities that could adversely affect Council-managed fishery resources.

In September 1988, the NPFMC adopted a policy to guide the review of habitat issues. In light of this policy, the NPFMC and NOAA Fisheries have enacted certain measures that are consistent with protecting habitat and ecosystem components from potential negative impacts of fisheries. These measures include the use of closed areas to protect habitat. As a result, several areas of the Bering Sea were closed to groundfish trawling and scallop dredging to reduce potential adverse impacts on the habitat for crab and other resources. A chronology of management measures undertaken by the NPFMC with the primary intent or secondary effect of protecting habitat is provided in Table 1. Figure 1 depicts the groundfish closures presently enacted in Alaska's EEZ.

Table 1. Chronology of groundfish management measures and closure areas protecting habitat under the BSAI and GOA groundfish FMPs.

Year	Location	Season	Area Size	Notes
Bering Sea and Aleutian Islands (BSAI)				
1982 - BSAI groundfish Fishery Management Plan (FMP); descriptions of fish habitat, gear restrictions, and several no-trawl zones.				
1983 - National Oceanic and Atmospheric Administration (NOAA) Fisheries adopts a National Habitat Conservation Policy.				
1985 - Intentional discarding of fishing gear and debris prohibited.				
1986 - Magnuson-Stevens Act (MSA) amended to give Councils authority to protect habitat and recommend habitat protection measures.				
1986 - Habitat policy added to BSAI FMP.				
1987	Area 512	Year-round	8,000 square nautical miles (nm^2)	Trawling prohibited to protect king crab habitat.
	Area 516	3/15-6/15	4,000 nm^2	Trawling prohibited during crab molting period.
1995	Chum Salmon Savings Area	8/1-8/31	5,000 nm^2	Re-closed if 42,000 chum salmon bycaught.
	Chinook Salmon Savings Area	Trigger	9,000 nm^2	Closed if 48,000 chinook salmon bycaught.
	Herring Savings Area	Trigger	30,000 nm^2	Closed to specified trawl fisheries when trigger reached.
	Zone 1	Trigger	30,000 nm^2	Closed to specified trawl fisheries when trigger reached.
	Zone 2	Trigger	50,000 nm^2	Closed to specified trawl fisheries when trigger reached
	Pribilof Islands	Year-round	7,000 nm^2	Established to protect red king crab habitat.
	Red King Crab Savings Area	Year-round	4,000 nm^2	Bottom trawling prohibited by emergency rule, pelagic trawling allowed.
	Walrus Islands	5/1-9/30	900 nm^2	12–mile no-fishing zones around 3 haulouts.
1995	Steller sea lion (SSL) Rookeries	Year-round	5,800 nm^2	10–mile no-trawl zones around 27 rookeries .
	SSL Rookeries	Seasonal ext.	5,100 nm^2	20–mile extensions around 8 rookeries.
1996 - same closures in effect as in 1995.				
1997 - Red King Crab Savings Area permanently established as year-round closure area.				
1997 - same closures in effect as in 1995 and 1996, with two additions:				
1997	Nearshore Bristol Bay	Year-round	19,000 nm^2	Expanded area 512 closure.
	Opilio Tanner Crab Bycatch Limitation Zone	Trigger	90,000 nm^2	Closed to specified trawl fisheries when trigger reached.
1998 - same closures in effect as in 1995, 1996, and 1997				
1999 - same closures in effect as in 1995, 1996, 1997, and 1998				
2000 - Non-pelagic trawls prohibited in BSAI pollock fisheries.				
2000 - same closures in effect as in 1995, 1996, 1997, and 1998 with three additions:				
2000	Eastern Bering Sea (EBS) and Aleutian Islands (AI) Pollock Trawl exclusion zones	Year-round	11,900 nm^2 (Inc.Gulf of Alaska [GOA])	Trawling for pollock prohibited for SSL protection.
	EBS and AI Pollock Trawl exclusion zones	Jan-June	14,800 nm^2 (Inc.GOA)	Trawling for pollock prohibited for SSL protection.
	EBS and AI Trawl exclusion zones	Year-round	29,000 nm^2 (Inc. GOA)	Trawling for Atka Mackerel restricted for SSL protection.

Table 1 (cont.). Chronology of groundfish management measures and closure areas protecting habitat under the BSAI and GOA groundfish FMPs.

Year	Location	Season	Area Size	Notes
2001- same closures in effect as in 1995, 1996, 1997, 1998, 1999, and 2000.				
2002 -same closures in effect as in 1995, 1996, 1997, 1998, 1999, 2000, and 2001.				
Gulf of Alaska				
1978 - GOA groundfish FMP; descriptions of fish habitat, gear restrictions, and area closures to foreign fishing.				
1985 - NOAA Fisheries habitat policy added to GOA FMP.				
1987	Kodiak	Year-round	1,000 nm^2	Trawling prohibited; Intended to protect juvenile red king crab habitat
	Kodiak	2/15-6/15	500 nm^2	Trawling prohibited; Intended to protect juvenile red king crab habitat
1990 - Kodiak trawl closures extended				
1993 - Kodiak no-trawl zones made permanent				
1995	SSL Rookeries	Year-round	3,000 nm^2	10–mile no-trawl zones around 14 rookeries
	SSL Rookeries	Seasonal ext.	1,900 nm^2	20–mile no-trawl extensions around 3 rookeries
1996 and 1997 same closures in effect as in 1995.				
1998 same closures in effect as in 1995, 1996, and 1997, with one addition:				
1998	Southeast Trawl areas	Year-round	52,600 nm^2 (1,929 nm^2 on continental shelf)	Adopted as part of license limitation program, all trawling prohibited East of 140°
1999 Additional closures to protect SSL critical habitat and:				
1999	Sitka Pinnacles Marine Reserve	Year-round	3.1nm^2	Closure to all commercial gear
2000 same closures in effect as in 1995, 1996, 1997, 1998, and 1999 plus:				
2000	GOA Pollock Trawl exclusion zones	Year-round	11,900 nm^2 (Inc. EBS & AI)	SSL protection
	GOA Pollock Trawl exclusion zones	Jan-June	14,800 nm^2 (Inc. EBS & AI)	SSL protection
	Cook Inlet Trawl Closure	Year-round	7,000 nm^2 (inc. state waters	Control crab bycatch and protect crab habitat in an area with depressed King and Tanner crab stocks.
2001 same closures in effect as in 1995, 1996, 1997, 1998, 1999, and 2000.				
2002 same closures in effect as in 1995, 1996, 1997, 1998, 1999, 2000, and 2001.				

Source: NMFS 2001a and Coon *et al.* 1999

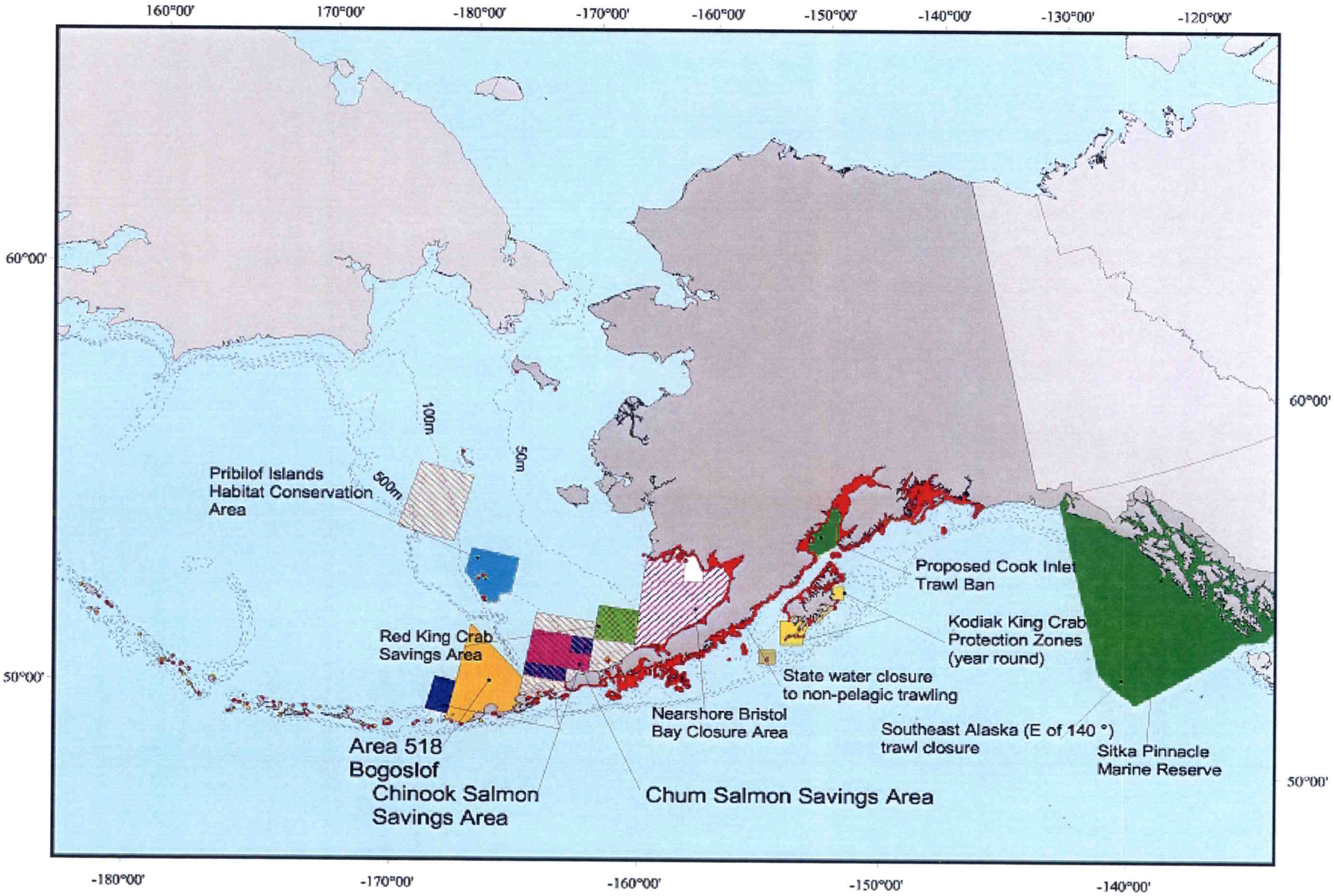


Figure 1. **Groundfish closures presently enacted in Alaska's Exclusive Economic Zone. Source: Coon *et al.* 1999.**

1.3 Designation of EFH

The 1996 re-authorization of the MSA mandated that NOAA Fisheries and NPFMCs specifically describe and identify EFH within the FMPs. The MSA also required that FMPs minimize, to the extent practicable, adverse effects on EFH caused by fishing. NOAA Fisheries and the NPFMC prepared one EA and a comprehensive set of Habitat Assessment Reports to address the new EFH requirements of the MSA (NPFMC 1999). EFH FMP amendments were submitted to the Secretary in October 1998. The amendments were reviewed and approved by the Secretary of Commerce and took effect on January 20, 1999 (64 CFR 20216). These FMP amendments identified EFH for 80 individual species including target and other fish, and for five species groups, incorporating a total of 115 individual species. In cases where information was available, EFH was identified by each particular life stage for a given species (34 of the 80 individual species fell into this category).

According to the Final Rule implementing the EFH provisions of the MSA (50 CFR Part 600), to identify EFH, basic information is needed to understand the usage of various habitats by each managed species. Pertinent information includes the geographic range and habitat requirements by life stage, the distribution and characteristics of those habitats, and current and historic stock size as it affects occurrence in available habitats. Temporal and spatial distribution of each life history stage is necessary to understand each species' relationship to, or dependence on, its various habitats. Data summarizing all environmental and habitat variables that control or limit distribution, abundance, reproduction, growth, survival, and productivity of the managed species should be provided.

Councils must obtain this information to describe and identify EFH from the best available sources, including peer-reviewed literature, unpublished scientific reports, data files of government resource agencies, fisheries landing reports, and other reliable sources. The scientific rigor of the reports and species-specific data gaps and potential deficits in data quality should be taken into consideration.

To analyze habitat information, the EFH Final Rule specifies the following levels for organizing the data necessary to describe and identify EFH:

- **Level 1:** Distribution data are available for some or all potions of the geographic range of the species. Distribution data may be derived from presence/absence sampling and/or may include opportunistically collected information on species and life stages. In the event that distribution data are available for only portions of the geographic area occupied by a particular life history stage of a species, habitat use can be inferred on the basis of distributions among habitats where the species has been found and on anecdotal information about its habitat requirements and behavior. Habitat use may also be inferred from information on a similar species or another life stage.

- **Level 2:** Habitat-related densities of the species are available. At this level, quantitative data (i.e., density or relative abundance) are available for the habitats occupied by a species or life history stage. Because the efficiency of sampling methods is often affected by habitat characteristics, strict quality assurance criteria should be used to ensure that density estimates are comparable among methods and habitats. Density data should reflect habitat utilization, and the degree that a habitat is utilized is assumed to be indicative of habitat value. When assessing habitat value on the basis of fish densities in this manner, temporal changes in habitat availability and utilization should be considered.

- **Level 3:** Growth, reproduction, or survival rates within habitats are available. At this level, data are available on habitat-related growth, reproduction, and/or survival by life history stage. The habitats contributing the most to productivity should be those that support the highest growth, reproduction, and survival of the species (or life history stage).

- **Level 4:** Production rates by habitat are available. At this level, data are available that directly relate the production rates of a species or life history stage to habitat type, quantity, quality, and location. Essential habitats are those necessary to maintain fish production, consistent with a sustainable fishery and the managed species' contribution to a healthy ecosystem.

Councils should strive to obtain data sufficient to describe habitat at the highest level of detail (i.e., Level 4). If there is no information on a given species or life stage, and habitat use cannot be inferred from other means, EFH should not be designated.

The NPFMC (1999) identified EFH information levels for groundfish, crab, scallops, and salmon in the Alaska region. Level 2 data is available for some adult life history stages of groundfish, crabs, and shellfish. Level 2 data is also available for some stocks of red and blue king crab, and tanner and snow crab stocks in some regions, at the egg, larval, late juvenile, and adult stages. The remainder of the data for all other crab stocks is either at Level 1 or unknown. Level 1 data is available for the eggs, larvae, early juvenile, and late juvenile stages of pollock, and for the late juvenile stages of most other groundfish species. Even minimal (Level 1) data are not available for forage fish at all life stages, so distribution and habitat use are considered to be unknown. Salmon EFH data are highly variable and cross Levels 1 through 4 depending on species, stock, and life stage. The majority of the data available for adults in the freshwater stage ranges from Levels 1 to 3. The information levels for all EFH are continually being refined and updated and will be presented in the EIS currently being developed for EFH.

1.4 Potential Impacts of Fishing on Marine Habitat

It is important to distinguish between the direct and indirect effects of trawling and dredging on marine habitat (NRC 2002). Direct and immediate effects of fishing gear potentially include the following:

- Mortality either as intended catch or bycatch or incidental by killing benthic and demersal species or increasing their vulnerability to predators;

- Increased food availability for scavengers due to discarded fish, fish offal, and dead benthic organisms; and

- Loss of habitat due to scraping and plowing, thereby destroying seafloor habitat.

Indirect effects are removed in space and/or time from the actual fishing activity. These effects include post-fishing mortality and reductions in total biomass of target fish. The reductions in biomass could subsequently affect predators, prey, competitors of the targeted species, and the overall benthic community structure. Indirect effects also could be realized at the ecosystem level due to potential changes in energy flow and shifts in the processes of primary production, primary consumption, and secondary production (NRC 2002). An assessment of the potential effects (encompassing both direct and indirect effects) must include the following information.

- Effects of different types of fishing gear on different types of habitat;
- Frequency and geographic distribution of fishing effort; and
- Physical and biological characteristics of the seafloor in the areas being fished.

Effects of Fishing Gear on Habitat

Types of potential effects from fishing gear on habitat are outlined below.

- Alteration of the physical structure;
- Direct mortality of benthic organisms;
- Sediment suspension;
- Chemical modifications to the water column;
- Benthic community changes; and
- Ecosystem changes.

Alteration of Physical Structure

Physical effects of fishing gear such as plowing, smoothing of sand ripples, removal of stones, and turning of boulders can act to reduce the heterogeneity of the sediment surface. Boulder piles, crevices, and sand ripples can provide fish and invertebrates hiding areas and a respite from the need to swim against currents (Rose in prep.). Removal or alteration of these features and of taxa such as worm tubes, corals, and gorgonians that provide relief, and the removal or shredding of submerged vegetation, can also occur, thereby reducing structures available to biota as habitat (see NMFS 2002, Kaiser *et al.* 1998, Lindebloom and de Groot 1998, Auster and Langton 1999).

Any type of fishing gear that is towed, dragged, or dropped on the seabed will disturb the sediment and the resident community to varying degrees. The intensity of disturbance is dependent on the type of gear, sediment type, and frequency of disturbance. See Section 3.6 for a detailed description of different types of fishing gears and their relative disturbance. Heavy gears such as the shellfish dredge and the flatfish beam trawl disturb the seabed intensely. Lighter gears, such as the otter trawl, predominately used in Alaska, also cause disturbance mostly due to the trawl doors and foot ropes which can leave tracks or trenches up to several meters wide and can remove or displace boulders (Hall 1999). There are no studies of fishing gear effects that use gear that is directly comparable to Alaskan pelagic trawls. By regulation, these trawls must not use bobbins or other protective devices, so the footropes are small in diameter, and typically consist of bare chain. Pelagic trawls are fished with the doors above the seafloor, so door effects are not realized. Because the footrope is unprotected, these trawls are not used on rough or hard substrates and therefore do not contact some of the most vulnerable habitats (Rose in prep.).

A number of papers describe trawl marks on substrate, including Gilkinson *et al.* (1998), who describe the scouring process in detail as part of a model door study. It is not known if the trenches might compensate for the sediment smoothing actions of other gears (NMFS 2002). The actions of roller gear trawls can replace natural sediment structures (hummocks, biogenic features, and sand ripples) with other, anthropogenic structures (door, footrope, and roller tracks). In habitats with an abundance of such natural structures, this can represent a decrease in habitat complexity, while in naturally smooth areas, an increase in complexity would be apparent.

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Very little information exists regarding the effects of longlining on benthic habitat (see Section 3.6 of Programmatic SEIS). Rose (in prep.) postulates that due to the very light weight of the lines used with longline gear, effects on substrate and benthic organisms would be limited to the impact of anchors and weights. These make up less than 1/500th of the total length of the gear, so effects on the soft bottoms should be very small. However, effects in hard bottom areas could be realized through snagging on smaller boulder piles and other emergent structures. In a report presented by NPFMC (1992), the authors determined that setline gear often lies slack and can meander for a considerable distance 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. Invertebrates and other lightweight objects are dislodged and pass over or under the line. If a line becomes hung or breaks during the retrieval process, the other end, which also has a float, can be used to complete the gear retrieval.

Although little research has been conducted to document the impacts to physical structure from pot gear, it is likely that benthic structures (both living and non-living) could be impacted as the pots are dropped or dragged along the bottom (see Section 3.6 of Programmatic SEIS). Eno *et al.* (2001) observed that impacted sea pens were able to recover within 72 to 144 hours of the pots being removed. The study concluded that the use of pots and traps has no lasting effects on three different habitat types. However, this study used gear much smaller and lighter than that used in Alaska waters, so the results are not directly applicable. Alaska pots have mesh bottoms that are suspended 2.5 to 5 centimeter above the weight rails that initially contact the substrate (Rose in prep.). The greater weight of the pots is concentrated in a smaller area beneath the pot. Also of concern is the incidence of bottom disturbance by the weight rails as the pot is dragged across the seafloor by bad weather, currents, or during hauling. Rose (in prep.) assumes that the average pressure applied to the seafloor along the rails would be sufficient to penetrate into most substrates during lateral movement. This effect was speculated to be most similar to the effects of pelagic trawls. However, effects could be minimized by pot longline fishermen who retrieve gear by holding the vessel in deeper waters. This allows the gear and pot to pulled up off the bottom and then be suspended pelagically until the completed set is brought aboard, thereby somewhat reducing bottom effects.

<u>Direct Mortality of Benthic Organisms</u>

In addition to effects on the physical habitat, trawling can cause direct mortality to emergent epifauna. In particular, erect, foliose fauna (fauna which build reef-like structures) can be destroyed by towed gear, longlines, or pots (Hall 1999). Within the trawl track, which could range up to several meters wide, epifauna such as sponges, corals, or gorgonians are often removed, crushed, or broken (Van Dolah *et al.* 1987). Large coral colonies may be hundreds of years old (Risk *et al.* 1998). The habitat created by these gorgonians may be occupied by communities with high biodiversity and may provide shelter for fish (Risk *et al.* 1998, Fossa *et al.* 1999). Given their size and longevity, gorgonian corals may be especially vulnerable to fishing impacts and may take over 100 years to recover (Andrews *et al.* 2002). Although scientists have a limited understanding of its importance as fish habitat, deep water coral clearly provides vertical structure for fish to use for protection and cover. This has been observed in Alaska during submersible dives (Krieger and Wing 2002).

Freese *et al.* (1999) found during experimental trawling studies in the GOA that no motile invertebrates showed reductions in density as a result of trawling. The researchers also note that apparent damage to echinoids, holothurians, molluscs, and arthropods was < 1 percent. However, the authors observed that sponges and sea whips are especially vulnerable to trawl damage, and extensive trawling over wide areas could impact spatial patterns of invertebrate diversity. More detailed information regarding impacts of trawling on marine benthic organisms is provided in Section 3.6 of Programmatic SEIS.

Sediment Suspension

Resuspension of sediment can occur as fishing gear is pulled along or immediately above the seafloor (NMFS 2002). The chronic suspension of sediments and resulting turbidity can affect aquatic habitat by reducing available light for photosynthesis, burying benthic biota, smothering spawning areas, and causing negative effects on feeding and metabolic rates. If occurring over large areas, resuspension can redistribute sediments having implications for nutrient budgets by burying fresh organic matter and exposing deeper anaerobic sediments (Messieh *et al.* 1991, Black and Parry 1994, Mayer *et al.* 1991, and Pilskaln *et al.* 1998). The effects may be more pronounced in shallower water.

Species' reaction to turbidity depends on life history characteristics of the organism. Effects are likely to be more significant in waters that are normally clear as compared with areas that typically experience high naturally induced turbidity (Kaiser 2000). Motile organisms can move out of the affected area and quickly return once the turbidity dissipates (Coen 1995). Even if species experience high mortality within the affected area, those with high levels of recruitment or high mobility can re-populate the affected area quickly. Sessile or slow-moving species would likely be buried and could experience high mortality. If effects are protracted and occur over a large area relative to undisturbed area, recovery through recruitment or immigration may be hampered. Furthermore, chronic resuspension of sediments may lead to shifts in species composition by favoring those species that are better suited to recover or those that can take advantage of the additional nutrient supply as the nutrients are released from the seafloor to the euphotic zone (Churchill 1989).

Chemical Modifications to the Water Column

Disturbance due to fishing gear can cause changes in the chemical composition of the water column overlying impacted sediments. In shallow water, the impacts may not be noticeable relative to mixing effects caused by tidal and storm surges, and wave action. However, in deeper, calmer areas with more stable waters, the changes in chemistry may be evident (Rumohr 1998). Increases in ammonia content and decreases in oxygen have been observed in the North Sea waters, along with pulses of phosphate. Although these changes have been documented, it is not clear how they affect fish populations. Increased incidence of phytoplankton blooms could occur during seasons when nutrients are typically low. The increase in primary production could have a positive effect on zooplankton communities and on organisms up the food chain. Eutrophication (the stimulation of algae blooms due to high nutrient concentrations), often considered to be a negative effect, could also occur. However, it is important to note that these releases of nutrients to the water act to recycle existing nutrients and thereby make them available to benthic organisms rather than add new nutrients to the system (ICES 1992). The recycling is thought to be less influential in the eutrophication process than the input of new nutrients from rivers and land runoff.

Changes to the Benthic Community and Ecosystem

Benthic community structure can be impacted due to direct mortality of benthic organisms, potentially causing a shift in the community from low-productive, long-lived species (k-selected species) to highly productive, short-lived, rapidly colonizing species (r-selected species). Motile species that exhibit high fecundity and rapid generation times will recover more quickly from trawl-induced disturbance than non-mobile slow-growing organisms, leading to a potential community shift in chronically trawled areas (Levin 1984, NMFS 2002).

The physical structure of the biota also determines their ability to withstand and recover from the physical impacts of fishing gear. For example, thinner shelled bivalves and sea stars often suffer higher damage than solid shelled bivalves (Rumohr and Krost 1991). Animals that can retract below the penetration depth of the fishing gear and those that are more elastic and can bend upon contact with the gear also fare much better than those that are hard and inflexible (Eno *et al.* 2001). In chronically trawled areas, a switch in dominant species based on these avoidance and survival traits could be evident.

Increased fishing pressure in a given area can also lead to changes in species distribution; changes could be evident in benthic, demersal, and even pelagic species (i.e., localized depletion). Specifically, McConnaughey *et al.* (2000) examined the effects of chronic trawling on soft-bottom benthos of the eastern Bering Sea (EBS). They found that overall species diversity and niche breadth of sedentary taxa were greater in unfished areas. The authors have also speculated that mobile fishing may lead to increased populations of opportunistic feeders in chronically trawled areas.

Frequency and Geographic Distribution of Fishing Effort

The continental shelf and slope region off the coast of Alaska comprises one of the most extensive fishing grounds in the world (NRC 2002). Bottom trawling in the Bering Sea began in 1929 with a Japanese operation and continued through the 1930s and early 1940s, recommencing in the 1950s after World War II. Soviet and other distant water trawl fishing operations intensely fished the Bering Sea and GOA through the 1960s and 1970s. Domestic bottom trawling began as joint ventures in the Bering Sea in 1978 after passage of the MSA in 1976. These U.S. trawl activities grew rapidly during the 1980s and had displaced foreign fishing by the end of the 1980s. Presently the groundfish fleet is divided into catcher vessels and catcher processors. In 1999, the catch was almost equally divided between the two sectors (NMFS 2001a).

Non-pelagic trawling (bottom trawling) in the Bering Sea during the early 1990s was most intense on the slope and shelf area north of the Aleutian Islands (NRC 2002). The Alaska peninsula in the area of Unimak Island, east of the Pribilofs west of Bristol Bay and off of Cape Constantine were also heavily fished. Virtually all areas of the Bering Sea have experienced some degree of exposure to bottom trawls (see Section 3.6 of Programmatic SEIS). However, the intensity of exposure, measured in trawls made per unit area, varies substantially. These patterns reflect the nonrandom behavior of fishing fleets, which is based on historical patterns of performance and regulatory restrictions. Relatively heavy trawling has occurred in three places: along the continental shelf edge, along the Alaska Peninsula near Unimak Island, and in Togiak Bay. The primary composition of the catch in these three areas, respectively, is 1) pollock, Pacific cod and Greenland turbot, 2) Pacific cod and pollock, and 3) yellowfin sole (Fritz *et al.* 1998).

However, large areas of the Bering Sea presently have no trawling activity because of closed management areas, less productive fishing grounds, or unobserved tows. Both the spatial extent and intensity of fishing effort decreased in the 1990s. Over large parts of the Bering Sea observations ranged from either no bottom trawls or only about four tows averaged over two years (NRC 2002). There were also significant reductions in the geographic extent and intensity of trawling the GOA also. The number of tows in the GOA region was reduced by about half due to management area closures and general reductions in fishing effort associated with fisheries management. The area experiences a relatively low intensity of trawling as compared with other regions of the United States (NRC 2002). Section 3.6 (of Programmatic SEIS) provides additional discussion on the frequency of trawling in the Bering Sea and GOA.

The relative significance of seabed disturbance by mobile and other fishing gear must be considered in light of the magnitude and frequency of seabed disturbance due to natural causes. De Alteris *et al.* (1999) found that in a shallow, sand substrate where natural processes are disturbing the seabed regularly, recovery of the substrate from gear-related disturbance was almost immediate. However, in deep, mud substrates the analyses indicated that natural processes are rarely capable of disturbing the seabed; therefore, recovery from gear-related disturbance was slow. Many studies summarized by NRC (2002) and NMFS (2002) indicate that more stable, biogenic, gravel and mud habitats experience the greatest impacts from trawling and have the slowest recovery rates. By comparison, those areas with less consolidated, coarse sediments that also typically experience high rates of natural disturbance, show fewer impacts. These habitats tend to be populated by opportunistic species that recolonize the area rapidly, thereby reducing recovery times. Section 3.6 (of Programmatic SEIS) provides additional discussion of the relative impacts of fishing on different habitats.

Physical and Biological Characteristics of the Seafloor

Most bottom fishing off the coast of Alaska takes place on the continental shelf and upper slope in water depths of less than 500 meters (m). The seafloor affected, or potentially affected, covers a wide range of habitats, from relatively featureless sand and mud to more complex rocky areas and HAPCs. As discussed previously under Alteration of Physical Structure, hard substrates and rocky areas provide the most habitat complexity for the benthic community and are likely to be more vulnerable to fishing disturbance.

Four habitat types in the Bering Sea shelf were defined by Rose (in prep.) using habitat sediment data in Smith and McConnaughey (1999). Figure 2 depicts these habitat strata. The first, situated around the shallow eastern and southern perimeter of the shelf and near the Pribilof Islands, consists of sand substrates with a small amount of gravel. The second lies across the central shelf out to the 500-m contour and is composed of mixtures of sand and mud. A third strata, west of a line between St. Matthew and St. Lawrence Islands, is composed primarily of mud (silt) substrates with some sand. The fourth strata, found north and east of St. Lawrence Island including Norton Sound, consists of a complex mixture of substrates that are not easily separated out or defined; however, these areas are subject to very little fishing effort.

A similar comprehensive substrate data set does not exist for the GOA and Aleutian Islands. Both of these areas have complicated substrates with mixtures of hard (pebbles, cobbles, boulders, and rock) and soft (silt, sand, and gravel) substrates, but data are not sufficient to describe the spatial distributions of these substrates. However, data collected from NOAA Fisheries groundfish surveys regarding "trawlability" were compiled to approximate percentages of hard substrate in the following depth strata (Rose, in prep.).

- Shallow waters (1-100 m) - 19 percent hard substrate.
- Deeper areas on the shelf (gullies; 100-300 m) - 5 percent hard substrate.
- Upper slope (200-500 m) - 10 percent hard substrate.

These areas are also depicted on Figure 2. As presented below, the percentages of hard bottom substrate as derived from "trawlability" data are limited in interpretation.

- A standard trawl may function well on hard substrate consisting of smoother pebbles and cobbles.
- Trawlable bottom may be found in areas of mostly hard substrate.
- Patches of soft bottom may exist in otherwise untrawlable areas.

As described above, there is a considerable lack of scientific information on benthic habitats found in the EEZ. Thus, NOAA Fisheries through the Alaska Fisheries Science Center (AFSC) is presently conducting research to map limited areas of the Alaska EEZ for geographic characterization. In 2000, 900 square kilometers of seafloor near Kodiak were mapped and during July 2002 an additional 500 square kilometers near Yakutat were mapped using a high-resolution multi-beam echo-sounder. Survey depths ranged from 100 m to 760 m and the seafloor consisted of irregular seabed with mixed sediments (sand, mud, gravel) and high-relief areas consisting of boulders. As it is completed, the mapping of the area will allow habitat characterization to be compared to fishing intensity for analysis of impacts. Figure 3 depicts scientific interest and research areas presently being studied by NOAA Fisheries.

1.5 Recommendations for Establishing MPAs in Alaska

In order to comply with the requirements of E.O. 13158 mandating the establishment of MPAs, NOAA, in conjunction with the Department of Interior (DOI) and other partners, has created the MPA Center, the mission of which is to facilitate the effective use of science and information in the management of MPAs (see http://www.mpa.gov). E.O. 13158 defines an MPA as "any area of the marine environment that has been reserved by federal, state, territorial, tribal or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." Moreover, it defines "marine environment" to mean "those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands there under, over which the United States exercises jurisdiction, consistent with international law."

Given the breadth of this definition and the wide array of potential sites it includes, the MPA Center has developed operational criteria to interpret the definition consistently and to decide whether to consider specific sites or entire classes of sites for inclusion in the official inventory. According to the MPA Center, to be included in the MPA List the site must meet the following criteria:

- Have defined geographical boundaries or a definable geographic location and: a) may or may not be associated with the underlying seabed and b) may be of any size, but must be a subset of the U.S. federal, state, territorial, local, or tribal waters.

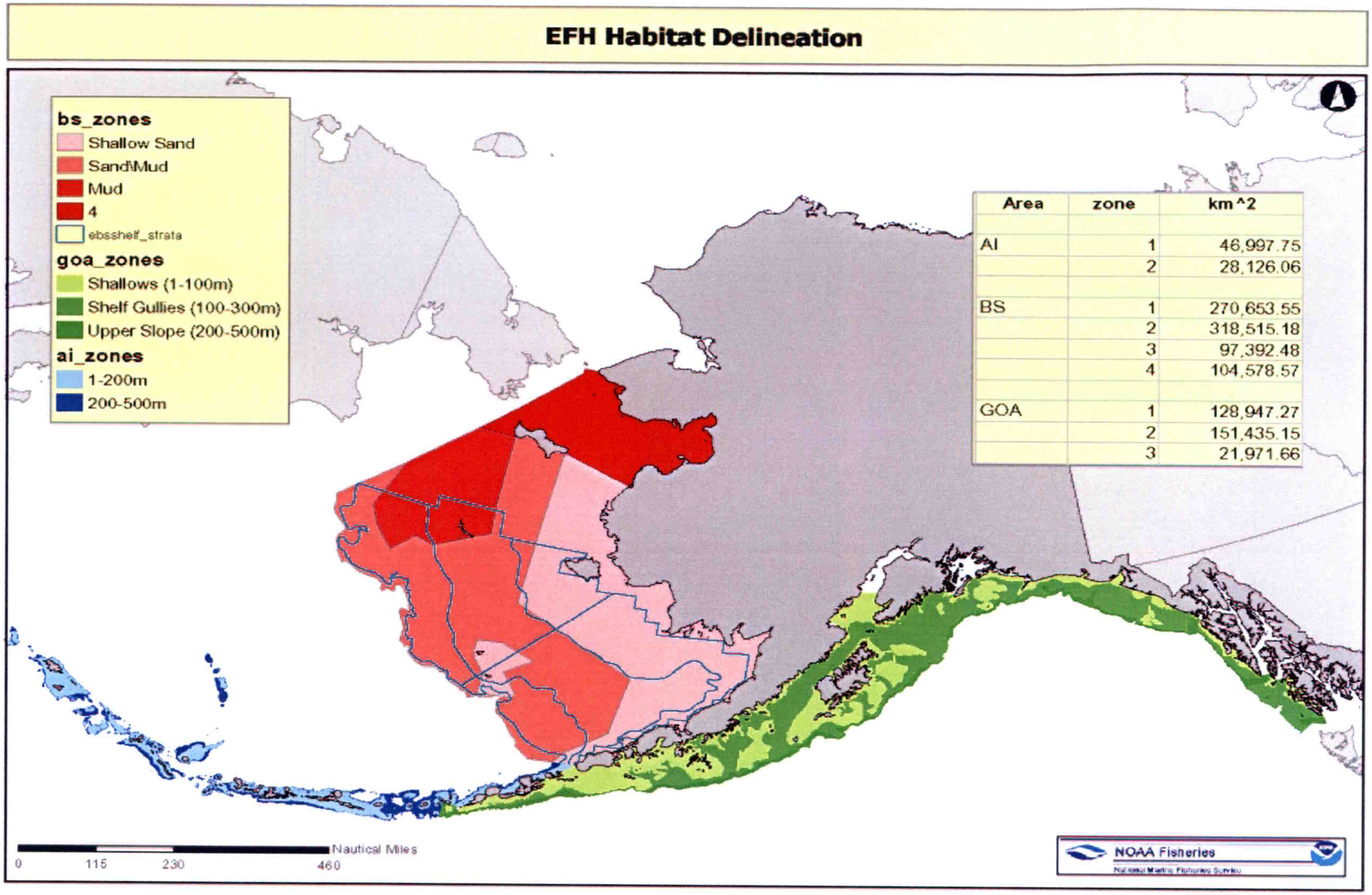


Figure 2. Essential fish habitat delineation.

NMFS Fishery Impact Scientific Interest and Study Areas*

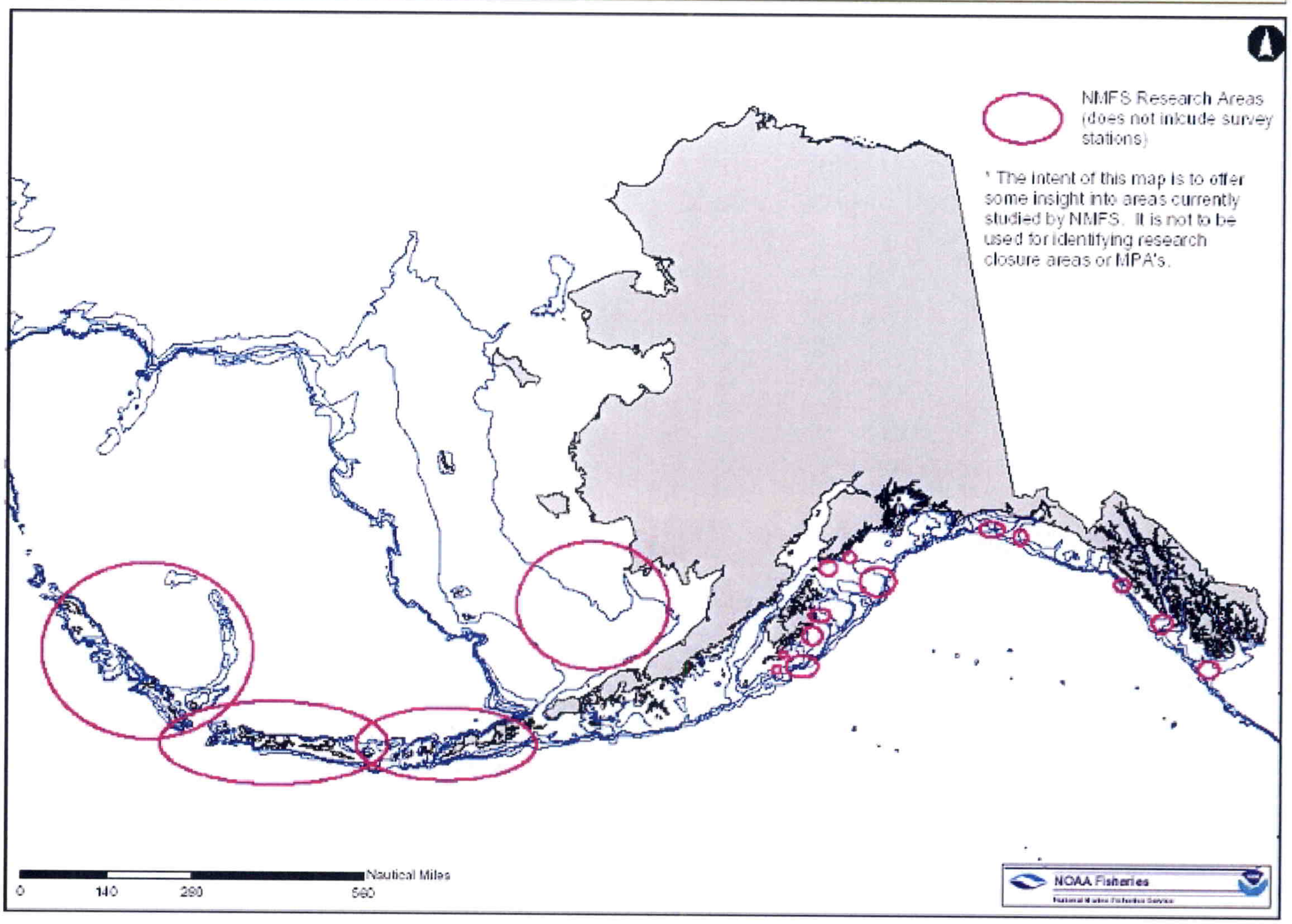


Figure 3. **National Oceanic and Atmospheric Administration Fisheries' fishery impact scientific interest and study areas.**

- Encompass: a) areas of the oceans, coastal waters, bays and/or estuaries; or b) the Great Lakes and their connecting waters.

- Have a marine component which may include an intertidal area and may have an associated land (terrestrial) component.

- Be authorized by some form of federal, state, territorial, local or tribal law, or regulations.

- Provide year-round (12 months) protection.

- Be established with an expectation of, or at least the potential for, permanence. Areas with a sunset clause must provide a minimum of four years of continuous protection and must have a specific mechanism to renew protection at the expiration of the sunset period.

- Have existing laws/regulations that apply to the MPA and that were designed to afford increased protection to part or all of the natural and cultural resources therein, beyond any general protections which apply outside the MPA.

Specifically, the MPA Center's working definition excludes sites that fit in the following categories:

- Areas of the U.S. EEZ that are covered under legal authorities but have no distinct boundaries with specific authorities for resource protection.

- Areas subject to generic resource management authorities linked to habitat type but without specific locations.

- Areas subject to species-specific conservation authorities that are not focused on a definable geographic area.

- Strictly freshwater areas outside the Great Lakes that contain marine species at certain seasons or life history stages.

- Privately created and maintained marine areas.

- Areas subject to emergency measures designated for fisheries or other purposes.

- Mitigation sites and other temporarily closed areas.

- Areas set aside to avoid fishing gear conflicts.

- Areas subject to single species management measures that do not have demonstrable benefits to a broader array of species or habitats.

- Areas subject to fisheries quota management tools.

Taken together, these criteria provide the basis for the MPA List Site Working Definition. The MPA Center will coordinate the implementation of the E.O. by developing "a framework for a national system of MPAs, and federal, state, territorial, tribal, and local governments with the information, technologies, and strategies to support the system."

The Departments of Commerce and the Interior are the implementing agencies for developing the MPA List. A five-step process is proposed to determine which sites should be added to the official MPA List. While this process is still under agency review, it is presented here to illustrate the process that has been followed to date:

1. The implementing agencies, working collaboratively with federal, territorial, state, local, and tribal partners, identify potential sites for consideration as marine managed areas and MPA List Sites.

2. Basic information about the sites is gathered by the implementing agencies (see Initial Data Fields Available from the Inventory at http://www.mpa.gov) and is compiled in the Marine Managed Areas (MMA) Inventory.

3. A review panel of the implementing agencies considers each site in the MMA Inventory to determine if it meets the criteria for an MPA List Site. Those sites that meet all criteria will be forwarded for approval by the Secretaries of Commerce and the Interior or their designates. Those that do not will remain in the inventory database.

4. Sites approved by the Secretaries or their designates will be entered on the official MPA List.

5. The implementing agencies will initiate an expanded data collection effort for sites on the MPA List.

Additionally, the EFH Final Rule (50 CFR Part 600) offers options to manage adverse effects from fishing. One of these options is time and areas closures. Actions related to time and area closures may include designating zones or use as MPAs to limit adverse effects of fishing practices on vulnerable or rare areas, species, or EFH life stages, such as those areas designated as HAPCs.

The Final Rule also requires FMPs to identify specific types or areas of habitat within EFH as HAPC based on one or more of the following considerations. In designating MPAs, these HAPC considerations should also be addressed:

- Importance of ecological function provided by the habitat.
- Extent to which the habitat is sensitive to human-induced environmental degradation.
- Whether, and to what extent, development activities are, or will be, stressing the habitat type.
- The rarity of the habitat type.

Similarly, the National Research Council recommends that the task of designating MPAs follow four sequential steps (NRC 2001):

1. Evaluate conservation needs at both local and regional levels.

2. Define the objectives and goals for establishing MPAs.

3. Describe key biological and oceanic features of the region.

4. Identify and choose sites(s) that have the highest potential for implementation.

In Alaska, ADF&G is taking the initiative to develop a public process for establishing MPAs (ADF&G 2002). The ADF&G recommendations focus on closing areas to fishing. Despite this focus on fishing, the department recognizes a larger context and need for MPAs. Multiple objectives are to be considered: protection for marine life, protection from pollution, protection from adverse impacts of mineral extraction, protection of culturally important sites, and maintenance of pristine ecosystem structure and function. The recommendations contend that these issues must also be considered when evaluating MPAs that are initially proposed for fishery management purposes. While both the National Research Council and ADF&G focus on the designation of MPAs as tools to improve fishery management, both also recognize that there are other reasons for establishing MPAs (ADF&G 2002, and NRC 2001):

- Conserve biodiversity.

- Protect ecosystem integrity and sensitive habitats from disturbance.

- Preserve cultural heritage.

- Provide educational and recreation opportunities and establish sites for scientific research.

Taking into consideration the criteria, considerations, steps, and processes described above, specific actions to achieve the objectives for MPA establishment have been recommended by ADF&G:

- Adopting a policy for establishing MPAs with due considerations to realistic time frames and staff commitments.

- Establishing a public involvement process to involve stakeholders at the earliest reasonable opportunity.

- Conducting a needs analysis for reserves and habitat protection.

- Selecting reserve sites through an objective and transparent process so that stakeholders are included and decisions are well-justified. Identified sensitive marine habitats and use of experimental control areas should be considered and possibly receive priority for designation.

- Establishing buffer zones around reserves to help meet reserve objectives. For example, a no-take zone may be established with a larger MPA having seasonal gear or individual species closures.

- Facilitating coordination among federal and state agencies.
- Developing a management plan for designated reserves.

- Monitoring and evaluating reserve effectiveness.

The following chapters present the four policy alternatives. FMP 3.1 under Alternative 3 directs that a methodology for developing MPA designation criteria be created. Therefore, a methodology incorporating aspects of these papers is provided later in this section.

1.6 Non-Consumptive Factors Associated with Establishing MPAs

The above discussion provides recommendations and a process for the designation of marine reserves and protected areas as tools in fisheries management, particularly as applied to the identification and protection of EFH and HAPCs. However, there are other, equally important values associated with MPAs including recreation, tourism, education, and scientific inquiry.

The marine environment provides people with a range of benefits, even if marine resources are not specifically exploited from a given area (NRC 2001). Direct, on-site values are typically associated with consumptive uses (commercial and sport fisheries, shell and sponge collecting, resource extraction from the sea bed, etc.); however, non-consumptive uses such as tourism, diving, bird and whale watching, and the general aesthetics of wild areas can also be considered valuable to humans. Consumptive activities are more easily quantified since they usually provide income directly to participants and indirectly to coastal economies that service the activities. Non-consumptive uses related to tourism, diving and bird watching, and education can have measurable economic benefits as industries supporting these users are developed.

Less easily quantified are the heritage or existence values associated with the public's appreciation of unique and natural systems (NRC 2001). Also difficult if not impossible to adequately quantify are any potential or perceived benefits of MPAs to components of regional and global climatological, biological, and chemical systems.

Establishment of MPAs will directly curtail consumptive use such as fishing and other resource extraction. The potential increase in non-consumptive uses such as tourism and education, which can often have positive economic outcomes, may serve to balance any resulting economic disadvantages. However, due to the remoteness of Alaska and the likelihood that MPAs may be located in offshore/deep waters, economic gain from non-consumptive uses may be limited.

Section 2 Alternative Analysis

There are four policy alternatives under consideration by NPFMC:

Alternative 1 Continue Under the Current (Updated) Risk Averse Management Policy: Under this alternative, the NPFMC would continue to manage the groundfish fisheries based upon the present conservative and risk-averse policy. This policy assumes that fishing does result in some adverse impacts to the environment and that, as these impacts become known, mitigation measures will be developed and appropriate FMP amendments will be implemented. Under this policy statement, specific goals to reduce and avoid impacts to habitat include responding to new scientific information regarding areas of critical habitat by closing those regions to all fishing; evaluating the impacts of trawl gear on habitat through the stepwise implementation of a comprehensive research plan to determine appropriate habitat protection measures; and continuing to evaluate candidate areas for MPAs as stipulated by E.O. 13158.

Alternative 2 Adopt a More Aggressive Management Strategy: A more aggressive harvest policy would be implemented based upon the concept that the present policy is overly conservative and that higher harvests could be taken without threat of overfishing the target groundfish stocks. This policy assumes that fishing at the recommended levels would have no adverse impact on the environment, except in specific cases where there is sufficient information. Under this alternative, the evaluation of trawl gear impacts on habitat would continue through the implementation of the existing research plan. The identification of EFH, determination of appropriate habitat protection measures, and evaluation of candidate areas for marine protected areas (E.O. 13158) would also continue, but certain areas presently closed to fishing in order to protect habitat could be considered open to fishing.

Alternative 3 Adopt a More Precautionary Management Policy: This policy would seek to accelerate the existing precautionary management measures through community or rights-based management and ecosystem-based management principles, and, where appropriate and practicable, to increase habitat protection and impose additional bycatch constraints. Under this approach, additional conservation management measures would be taken as necessary to respond to social, economic, or conservation needs. Additional measures would be taken if scientific evidence indicated that the fishery was negatively impacting the environment not just a population of a given species. Specifically, Alternative 3 seeks to reduce and avoid impacts to habitat by developing goals, objectives, and criteria to evaluate the efficacy of MPAs and no-take marine reserves as tools to maintain abundance, diversity, and productivity of marine organisms. This could be done by considering implementation of MPAs and, where appropriate, giving due consideration to areas already closed to various types of fishing operations. In addition, the policy would develop a research program to identify regional baseline habitat information and mapping, evaluate the impacts of all gear on habitat through the implementation of a comprehensive research plan, monitor habitat recovery, and use the information to determine habitat protection measures as necessary and appropriate.

Alternative 4 Adopt a Highly Precautionary Management Policy: This policy shifts the burden of proof to the user and would require that the agency certify that the intended fishery would not have a detrimental effect on the environment before significant fishing could be permitted. The policy, as illustrated by its FMP frameworks, would be to impose very restrictive conservation and management measures that would only be modified or relaxed when reliable scientific information shows that there would be no significant adverse effect. It would involve a strict interpretation of the precautionary principle. Management discussions would involve and be responsive to the public; however, decreased emphasis would be placed on industry and community concerns, and more emphasis would be placed on ecosystem concerns and principles, including the identification and incorporation of non-consumptive use values. The overall premise is that fishing produces adverse impacts on the environment. However, due to a lack of information and uncertainty, we know little about these impacts. Under this policy alternative, impacts to habitat would be reduced and avoided through zoning and limiting fishing gear use to the action area and establishing no-take marine reserves (both pelagic and nearshore) encompassing 20-50 percent of management areas. In fisheries that can be prosecuted with more selective gear, trawling would be prohibited and trawl closure areas would be established. Other policy objectives of Alternative 4 are to manage the fisheries in an explicitly adaptive manner to facilitate learning (including adding large no-take marine reserves that provide experimental controls); to protect marine habitats, including EFH, HAPC, Endangered Species Act-designated critical habitats and other identified habitat types; and to commit to funding a comprehensive research plan.

FMP Bookends: Each policy alternative contains two example FMPs that serve as bookends to a range of management measures that illustrate how the policy could be implemented. These bookends provide a level of detail that allows analysis and provides contrastable policies. They also provide a means to communicate the intended NPFMC actions for achieving a policy, while allowing the NPFMC, under the MSA, the flexibility to adaptively manage the fishery through FMP amendments and the public process.

The bookends are not stand-alone alternatives but rather illustrations that serve to define a range of management actions and potential environmental consequences of a policy alternative. This alternative structure recognizes that the resource being managed, as well as the marine ecosystem, is quite dynamic in nature, and only partially understood. Providing a range of management tools and analyzing their potential effects for each policy alternative attempt to take into account the dynamic nature of the fisheries as a whole and to provide enough management regime flexibility in each alternative to allow the decision-makers to base decisions on the best available science.

Section 3 Alternative 1 – Continue Under the Current Risk-Averse Management Policy

3.1 Overview of Management Measures Specific to MPAs and EFH

Adequate habitat is essential for maintaining the productivity of fishery resources, and some species or life stages require particular habitats for food, reproduction, and shelter from predators. Under this alternative, the numerous existing fishery closures and/or limitations that protect benthic habitat in the BSAI and GOA would continue (see Table 1 and Figure 1). Alternative 1 measures protecting habitat include fishing seasons and area quotas, fishing gear restrictions, time/area closures (including MPAs and HAPCs) and prohibited species restrictions. The primary focus of these past regulations has been to prevent potential damage to vulnerable crab habitat from bottom trawl gear, and therefore they do not necessarily cross a wide range of habitat types. Some of the trawl closures are in effect year-round while others are seasonal (see Table 1). In general, year-round trawl closures have been implemented to protect vulnerable benthic habitat. Seasonal closures are used to reduce bycatch by closing areas where and when bycatch rates have historically been high. Additional measures to protect the declining western stocks of the SSL began in 1991 with some simple restrictions based on rookery and haulout locations, and expanded to a more complex suite of fishery restrictions in 2000 and 2001. Most of the areas listed on Table 1 allow fishing by gear other than trawl gear and restrict only those fisheries that target SSL prey species (e.g., pollock, Pacific cod, and Atka mackerel). However, nine closure areas shown on Table 1 meet the E.O. 13158 criteria of providing lasting protection for part or all of the natural resources on a year-round basis:

- BSAI - Area 512, Pribilof Islands Conservation Area, Red King Crab Savings Area, Steller Sea Rookeries, Nearshore Bristol Bay Closure Area.

- GOA - Year-round Kodiak Trawl Closure, SSL Rookeries, Southeast Trawl Area Closure, Sitka Pinnacles Marine Reserve.

Expected to continue under the Alternative 1 FMPs are closure areas in the Bering Sea (Red King Crab Savings Area, Nearshore Bristol Bay encompassing Area 512, and Area 516), which together encompass 27,000 square nautical miles (nm^2). These areas, along with the Pribilof Islands Conservation Area (7,000 nm^2) and the Opilio/Tanner Crab Bycatch Limitation Zone, would continue to be closed to groundfish trawling and/or other specified fisheries such as scallop dredging on a seasonal or prohibited species catch (PSC)-trigger basis to reduce potential adverse impacts on crabs and crab habitat. The shallow areas in particular contain complex living and non-living substrates, which are essential for juvenile crab survival and are potentially sensitive to bottom trawling. Also continuing would be the Chum and Chinook Salmon Savings Areas, the Herring Savings Area, and the Zones 1 and 2 areas. These PSC-triggered closures reduce EFH disturbance for several species and encompass nearly 125,000 nm^2. The Walrus Islands seasonal closures and the SSL critical habitat and trawl exclusion zones would also continue. State waters (0-3 nm) are also closed to bottom trawling.

In the GOA, several discrete trawl closure areas (Kodiak No-Trawl Zones) covering about 1,500 nm^2 would continue around Kodiak Island to reduce crab bycatch, but also serve to protect crab habitat. In addition, fishing with all gear types except salmon trolling has been prohibited in an area around two nearshore

pinnacles identified as supporting rare, vulnerable, and ecologically important habitat (Sitka Pinnacles Marine Reserve). The year-round southeast trawl area closure, adopted as part of the License Limitation Program (LLP), prohibits all trawling east of 140° W longitude and closes about 53,000 nm^2, of which about 2,000 nm^2 is located on the shelf. SSL critical habitat and trawl exclusion zones are also identified in the GOA and would continue under Alternative 1. Also, Cook Inlet waters (7,000 nm^2) are closed to bottom trawling in order to protect crab habitat; this would continue under Alternative 1.

Figure 4 depicts in detail the existing closure areas specifically described under the existing Alternative 1 policy (1a) and the current FMPs; Table 2 provides the descriptive statistics regarding no-trawl MPAs and no-take marine reserves. Table 3 shows the intended and indirect effects of the closures. As seen in Table 2 and Figure 4, the current FMP offers complete or partial habitat protection for 28.8 percent of fishable area (defined as continental shelf out to the 1,000-m isobath) in the BSAI and GOA combined. Of this 28.8 percent, most (28.5 percent) is designated as "no-trawl MPAs" that may allow seasonal trawling and/or other fishing activities, while only 0.3 percent is designated as no-take marine reserves closed to fishing year-round. Some of the bottom trawl closures are triggered by PSC bycatch limits, while others are seasonal-based on the need to protect certain life stages of crabs (see Table 3). As shown in Table 2, the total closures accounted for in the GOA encompass nearly 46 percent of the fishable area (closed to bottom trawling at one time or another). However, this GOA percentage is greatly influenced by the no-trawl closure in the eastern GOA that protects nearly 82 percent of the fishable area from trawl impacts. Comparatively, 43 percent of the Aleutian Islands and 19 percent of the Bering Sea fishable area is closed at one time or another. The most area that can be defined as no-take marine reserves is found in the Aleutian Islands (1.6 percent due to the SSL critical habitat closures).

Regarding the specific Alternative 1(b) policy goal of responding to new scientific information and evaluating candidate areas for MPAs, the NPFMC currently takes proposals from NOAA Fisheries, ADF&G, the public, and other stakeholders. Areas that are of high concern or are candidates for MPAs are investigated, then acted upon. A recent example of this process occurred with the designation of the Sitka Pinnacles Marine Reserve. In this case, the State of Alaska approached the NPFMC with a request to mirror in Federal waters the protection already in place in state waters. The request went through NPFMC process and the no-take marine reserve area was designated. This process would continue under the alternative.

Another policy goal of Alternative 1(b) is to support the implementation of a comprehensive research plan to evaluate the impacts of trawl gear on habitat and monitor habitat recovery. Since the 1980s, AFSC has been conducting research on the effects of fishing gear on benthic habitat. This research has led to important findings that increase the understanding of the effect of fishing gear effects on benthic habitat. Since 1991, research has specifically focused on four areas:

- Understanding the direct effects of bottom trawling on seafloor habitat.
- Studying the associations of fish and invertebrate species with habitat features that may be affected by fishing gear.
- Evaluating technology to determine gear effects and benthic habitat features.
- Analyzing the spatial and temporal patterns of bottom trawling, retrospectively.

Table 2. Descriptive statistics for closure areas under Alternative 1 (as of Jan. 23, 2002).

Current 2002 Trawling Closures[1 2 3 4 5]			
	Fishable area (in square kilometers [km^2])	Management area (km^2)	Percentage (%) of fishable area closed
Aleutian Islands (AI)			
No trawl	105,380,000,000	43,357,506,644	41.1%
No take reserve	105,380,000,000	1,662,800,000	1.6%
Total	105,380,000,000	45,020,306,644	42.7%
Bering Sea (BS)			
No trawl and Bogoslof	798,870,000,000	153,708,738,278	19.2%
No take reserve	798,870,000,000	567,620,000	0.1%
Total	798,870,000,000	154,276,358,278	19.3%
Entire BS & AI			
No trawl	904,250,000,000	197,066,244,922	21.8%
No take reserve	904,250,000,000	2,230,420,000	0.2%
Total	904,250,000,000	199,296,664,922	22.0%
Central \ Western Gulf - west of 144°			
No trawl	265,690,000,000	87,906,000,000	33.1%
No take reserve	265,690,000,000	1,266,300,000	0.5%
Total	265,690,000,000	89,172,300,000	33.6%
Eastern Gulf - east of 144°			
No trawl	90,509,000,000	73,958,000,000	81.7%
No take reserve	90,509,000,000	8,304,042	0%[6]
Total	90,509,000,000	73,966,304,042	81.7%
Entire Gulf of Alaska			
No trawl	356,199,000,000	161,864,000,000	45.4%
No take reserve	356,199,000,000	1,274,604,042	0.5%
Total	356,199,000,000	163,138,604,042	45.8%
Totals			
Total no trawl	1,260,449,000,000	358,930,244,922	28.5%
Total no take	1,260,449,000,000	3,505,024,042	0.3%
Total FMP Area	1,260,449,000,000	362,435,268,964	28.8%

1 Closures include Steller sea lion (SSL) protection measures, Alaska Department of Fish and Game (ADF&G) restrictions, and No Transit Zones.

2 For consistency with other Programmatic Supplemental Environmental Impact Statement (SEIS) analysis, closures are cut at the 1,000 meter (m) boundary with the exception of the Bogoslof foraging area and the Aleutian Islands.

3 Pelagic and non-pelagic trawl closures are included.

4 The Steller No Transit areas account for the No take reserves. Also includes Sitka Pinnacles (no take marine reserve for groundfish but salmon trolling is allowed).

5 With the complexity for the SSL measures in the AI, for this analysis, SSL rookeries and haulouts were buffered at 12.7 nautical miles (nm) to effectively close 50 percent of critical habitat.

6 Sitka Pinnacles - Percentage is about 0.01 percent so this number appears as 0 percent.

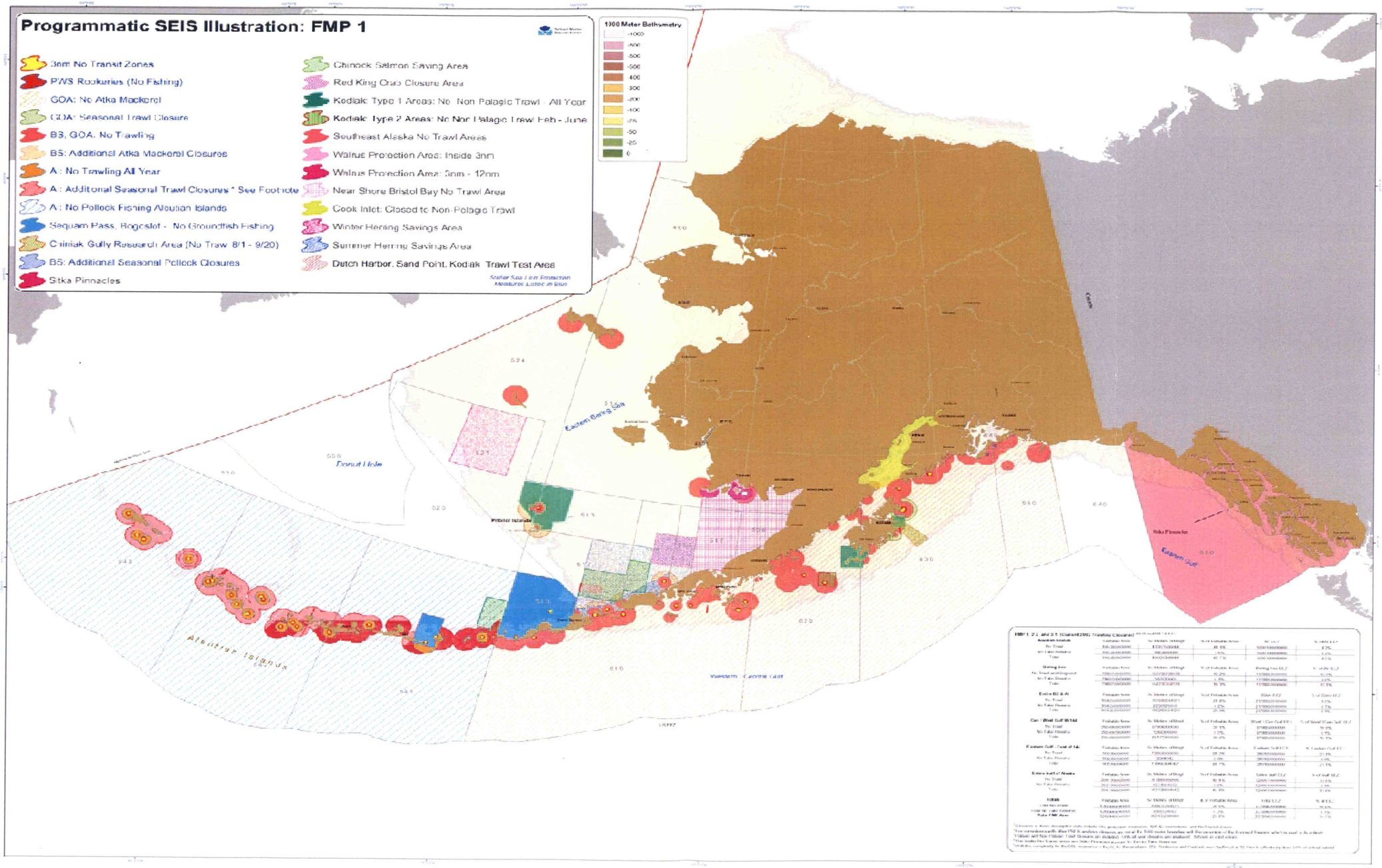


Figure 4. Programmatic SEIS Illustration: FMP 1.

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Table 3. Intended and indirect effects of closure areas under Alternative 1.

Closure area	Year	Region	Closure type	Closure purpose	Major gear restricted	Main Fishery Management Plan (FMP) species protected	Direct intent of closure	Indirect effect(s) from closure on essential fish habitat (EFH) and habitat area of particular concern (HAPC)	Habitats protected (living and non-living)
Cape Edgecumbe Pinnacles Reserve (Sitka Pinnacles)	1999	Gulf of Alaska (GOA)	year-round	Habitat	bottom trawl gear jig gear hook & line gear anchoring	Rockfish spp. juveniles and adults.	Closure to all groundfish commercial fishing and vessel anchoring to protect rare and ecologically important habitat. Troll fishing for salmon is allowed.	None.	epifauna HAPC pinnacle
Southeast Alaska No-Trawl Area	1998	GOA	year-round	Habitat	all trawl gear	Corals Sponges Groundfish	Adopted as part of the license limitation program but covers a vast area of deep water living substrates, including red tree coral.	Benthic habitat, HAPC, groundfish, and non-FMP crab previously impacted by trawl gear are no longer subject to disturbance, damage, and/or direct and indirect mortality.	epifauna infauna nearshore slope shelf
Kodiak Red King Crab Savings Area	1986	GOA	year-round; seasonal	Habitat Species	bottom trawl gear scallop dredge gear	Red king crab adults	Closure to protect adult red king crab concentrations, juvenile rearing areas, migration pattems, and recruitment.	Benthic habitat, HAPC, and groundfish previously impacted by bottom trawl and dredge gear are no longer subject to disturbance, damage, and/or direct and indirect mortality.	epifauna infauna shell hash slope shelf
Pribilof Islands Habitat Conservation Area	1995	Bering Sea (BS)	year-round	Habitat	all trawl gear scallop dredge gear	Blue king crab juveniles	Closure to protect important areas for juvenile blue king crab survival.	Benthic habitat, HAPC, and groundfish previously impacted by gear are no longer subject to disturbance, damage, and/or direct mortality.	shell hash slope shelf
Bristol Bay Nearshore Closure	1997	BS	year-round	Habitat	all trawl scallop dredge gear	Red king crab juveniles	Closure to protect juvenile red king crab and rearing habitats. Expanded Area 512 closure (see below).	Benthic habitat, HAPC, and nearshore areas supporting juvenile and adult groundfish and crab previously impacted by gear are no longer subject to disturbance, damage, and/or direct mortality.	emergent epifauna shell hash HAPC shallows sand slope
Red King Crab Saving Area 512 (Middle Bristol Bay)	1987	BS	year-round	Species Habitat	all trawl gear scallop dredge gear	Red king crab juveniles and adults	Closure to protect high densities of red king crab adults and juvenile rearing habitats.	Benthic habitat, HAPC, juvenile crab, and groundfish previously impacted by gear are no longer subject to disturbance, damage, and/or direct mortality.	epifauna infauna sand shelf

Table 3 (cont.). Intended effects of closure areas under Alternative 1.

Closure area	Year	Region	Closure type	Closure purpose	Major gear restricted	Main Fishery Management Plan (FMP) species protected	Direct intent of closure	Indirect effect(s) from closure on essential fish habitat (EFH) and habitat area of particular concern (HAPC)	Habitats protected (living and non-living)
Red King Crab Savings Area 516 (Outer Bristol Bay)	1987	BS	seasonal; March 15 to June 15	Species	bottom trawl gear scallop dredge gear	Red king crab adults	Closure to protect high densities of red king crab adults and halibut.	Benthic habitat, HAPC, juvenile crab, and groundfish previously impacted by bottom trawl and dredge gear are no longer subject to disturbance, damage, and/or direct mortality.	epifauna infauna sand/mud shelf
Opilio and Tanner Crab Bycatch Limitation Zones	1997	BS	Inseason prohibited species catch (PSC) cap	Species	trawl gear	Tanner crab adults Snow crab adults	Closed to specified groundfish fisheries when crab bycatch trigger is reached in order to reduce mortalities to crab and egg-laden mature crabs.	Benthic habitat, HAPC, and groundfish , and crab previously impacted by bottom trawl gear are no longer subject to disturbance, damage, and/or direct mortality.	emergent epifauna shelf
Chinook Salmon Savings Area	1995	BS	trigger	Species	pelagic trawl gear	Chinook salmon late juveniles - marine Chinook salmon adults - marine	Areas closed to trawling should the chinook salmon bycatch exceed 48,000 chinook (a period of high chinook bycatch). For 2003 the cap is reduced to 29,000 and this applies only to vessels fishing for pelagic pollock. The accounting towards the cap begins Jan 1st and the area will be closed for the remainder of the year should the cap be reached.	Maturing chinook salmon previously recruiting to pelagic trawl gear are afforded greater protection to potentially reach maturity and spawning areas. Seasonal timing directly corresponds with migratory patterns and concentrations of maturing salmon within fishing areas.	
Chum Salmon Savings Area	1995	BS	seasonal: closed August; limited Sept. through October 15	Species	trawl gear	Chum salmon late juveniles - marine Chum salmon adults - marine	To reduce excessive bycatch of other (mainly chum) salmon in groundfish trawl fisheries; the area is closed to trawling only during the month of August. The area is re-opened on September 1, but can be closed if the total bycatch of chum in the surrounding area should exceed 42,000 salmon.	Maturing chum (and other) salmon previously recruiting to pelagic trawl gear are afforded greater protection to potentially reach maturity and spawning areas. Seasonal timing directly corresponds with migratory patterns and concentrations of maturing salmon within fishing areas.	

Table 3 (cont.). Intended effects of closure areas under Alternative 1.

Closure area	Year	Region	Closure type	Closure purpose	Major gear restricted	Main Fishery Management Plan (FMP) species protected	Direct intent of closure	Indirect effect(s) from closure on essential fish habitat (EFH) and habitat area of particular concern (HAPC)	Habitats protected (living and non-living)
Herring Savings Areas	1995	BS	trigger	Species	trawl gear	Bycatch species	Established to limit the amount of herring taken as bycatch in the trawl fisheries. Two of the areas are closed in the summer and one in the winter.	An important prey resource of groundfish are afforded greater protection during spawning and migratory concentrations.	nearshore offshore
State of Alaska Nearshore Waters Closure	2000	GOA, Aleutian Islands (AI), BS	year-round	Habitat	all bottom trawl gear	Nearshore adult and juvenile salmon, crab, shellfish, and groundfish	Close all state waters (0-3 nautical miles [nm]) to commercial bottom trawling to protect nearshore habitats and species.	None.	nearshore nursery and adult areas HAPC slope
Cook Inlet No-Trawl Zone	2001	GOA	year-round	Habitat	bottom trawl gear	Bycatch species	Prohibit non-pelagic trawling in Cook Inlet to control crab bycatch mortality and protect crab habitat in an area with depressed king and Tanner crab stocks. Includes areas in state waters.	Benthic habitat, HAPC, groundfish , and non-FMP crab previously impacted by bottom trawl gear are no longer subject to disturbance, damage, and/or direct mortality.	shallows
Adak Scallop Closure Area	1995	AI	year-round	Habitat	scallop dredging	Scallops, groundfish, crab	Closure to prevent scallop dredging in biologically critical areas: reduce high bycatch of other species (i.e., crabs); avoid nursery for groundfish and shellfish; avoid sensitive habitats.	Benthic habitat, HAPC, and nearshore areas supporting juvenile and adult groundfish and crab previously impacted by dredging are no longer subject to disturbance, damage, and/or direct mortality.	sand mud
Dutch Harbor Scallop Closure Area	1995	BS, AI	year-round	Habitat	scallop dredging	Scallops, groundfish, crab	Closure to prevent scallop dredging in biologically critical areas: reduce high bycatch of other species (i.e., crabs); avoid nursery for groundfish and shellfish; avoid sensitive habitats.	Benthic habitat, HAPC, and nearshore areas supporting juvenile and adult groundfish and crab previously impacted by dredging are no longer subject to disturbance, damage, and/or direct mortality.	sand mud

Table 3 (cont.). Intended effects of closure areas under Alternative 1.

Closure area	Year	Region	Closure type	Closure purpose	Major gear restricted	Main Fishery Management Plan (FMP) species protected	Direct intent of closure	Indirect effect(s) from closure on essential fish habitat (EFH) and habitat area of particular concern (HAPC)	Habitats protected (living and non-living)
Kodiak Scallop Closure Area	1995	GOA	year-round	Habitat	scallop dredging	Scallops, groundfish	Closure to prevent scallop dredging in biologically critical areas: reduce high bycatch of other species (i.e., crabs); avoid nursery for groundfish and shellfish; avoid sensitive habitats.	Benthic habitat, HAPC, and nearshore areas supporting juvenile and adult groundfish and crab previously impacted by dredging are no longer subject to disturbance, damage, and/or direct mortality.	sand mud
Alaska Peninsula Scallop Closure Area	1995	GOA	year-round	Habitat	scallop dredging	Scallops, groundfish, crab	Closure to prevent scallop dredging in biologically critical areas: reduce high bycatch of other species (i.e., crabs); avoid nursery for groundfish and shellfish; avoid sensitive habitats.	Benthic habitat, HAPC, and nearshore areas supporting juvenile and adult groundfish and crab previously impacted by dredging are no longer subject to disturbance, damage, and/or direct mortality.	sand mud
Bering Sea Scallop Closure Areas	1995	BS	year-round	Habitat	scallop dredging	Scallops, groundfish, crab	Closure to prevent scallop dredging in biologically critical areas: reduce high bycatch of other species (i.e., crabs); avoid nursery for groundfish and shellfish; avoid sensitive habitats.	Benthic habitat, HAPC, and nearshore areas supporting juvenile and adult groundfish and crab previously impacted by dredging are no longer subject to disturbance, damage, and/or direct mortality.	sand mud
Bogoslof Groundfish Closure Area	1992	BS	year-round	Marine Mammal	bottom trawl gear	Walleye pollock, Pacific cod, Atka mackerel	Closure to Walleye pollock, Atka mackerel, and Pacific cod commercial bottom trawl fisheries associated with the Steller sea lion (SSL) protection measures.	Walleye pollock, Atka mackerel, and Pacific cod adults previously taken by their directed fishery are afforded greater protection to potentially reach maturity. Additionally, benthic habitats and HAPC will be subject to less bottom trawling intensity levels, but not total protection. Fisheries, other than these three, may still be prosecuted with bottom trawl gear.	nearshore nursery and adult areas HAPC nearshore slope shelf

Table 3 (cont.). Intended effects of closure areas under Alternative 1.

Closure area	Year	Region	Closure type	Closure purpose	Major gear restricted	Main Fishery Management Plan (FMP) species protected	Direct intent of closure	Indirect effect(s) from closure on essential fish habitat (EFH) and habitat area of particular concern (HAPC)	Habitats protected (living and non-living)
SSL Closure Areas	2000	GOA, BS, AI	year-round	Marine Mammal	bottom trawl gear	Walleye pollock, Atka mackerel, Pacific cod	Seller sea lion foraging areas for prey. Indirectly protecting EFH within the closed areas. 10-20 mile no-trawl zones around sea lion rookeries. Additional closures to protect critical habitat enacted in 1999.	Walleye pollock, Atka mackerel, and Pacific cod adults previously taken by their directed fishery are afforded greater protection to potentially reach maturity. Additionally, benthic habitats, HAPC, and other nearshore groundfish will be subject to less bottom trawling intensity levels, but not total protection. Fisheries, other than these three, may still be prosecuted with bottom trawl gear.	rock beaches pinnacles kelp nearshore
SSL Major Rookies	1995	GOA, BS, AI	year-round	Marine Mammal	all gear no vessel entry	Nearshore adult and juvenile salmon, crab, shellfish, and groundfish	SSL major rookeries and haulout areas used as foraging areas, reproductive areas, and social interactions.	Groundfish, shellfish, and crab are afforded protection from any disturbance, damage, or mortality.	nearshore
Walrus Islands Federal Closure	1995	BS	seasonal: April 1 through Sept. 30	Marine Mammal	all gear	Groundfish and crab	All fishing vessels prohibited between 3 and 12 miles offshore to protect walrus in the water.	Benthic habitat, HAPC, and nearshore areas supporting juvenile and adult groundfish and crab previously impacted by fishing are no longer subject to disturbance, damage, and/or direct mortality.	nearshore nursery and adult areas HAPC slope

Most of the field-oriented studies have focused on small geographic areas in specific habitat types (see Figure 3). Similarly, in the last few years, the U.S. Geological Survey Coastal and Marine Geology Program has applied high resolution mapping tools to map benthic habitats in Alaska. These mapping efforts address small specific areas and localized issues. With additional funding, expansion of NOAA Fisheries and U.S. Geological Survey research efforts over larger geographic areas and a variety of habitat types will provide fisheries managers the information needed to develop measures for minimizing impacts and determining appropriate habitat protection measures. Additional information concerning existing and planned research can be found at : http://www.afsc.noaa.gov/abl/MarFish/geareffects.htm.

3.2 Effects of EFH/MPA Management Measures of the Alternative 1 Policy

Specific impacts to habitat from different management regimes are very difficult to predict. To evaluate the effects of fishing on habitat features, detailed information on the distribution and abundance of habitat types, the life history of living substrates, and the natural disturbance regime is needed. This information is generally incomplete for Alaskan waters. Knowledge of how fishing affects different habitat types under a variety of circumstances has been summarized by NMFS (2002). Presently it is not possible to fully and quantitatively account for all factors involved in determining how an ecosystem will respond to fishing activities. Given those caveats, this evaluation of the Alternative 1 policy is illustrated by the current groundfish FMP. The subsequent evaluation of the additional alternatives and their respective FMP bookends provides a qualitative discussion of impacts, assuming that greater habitat disturbance is expected with less habitat protection. Therefore, in analyzing the effects of fishing gear on habitat, two simplifying assumptions are made:

- Closing areas to trawling, at least part of the time, or designating no-take reserves, benefits EFH by lessening the occurrence of the impact; thus the habitat becomes less vulnerable to disturbance-induced changes.

- Increasing fishing effort in an area puts additional stress on EFH in that area.

These assumptions are applied directly to the question of whether the alternative is likely to impact the physical, biological, or social and economic environments. They are used throughout this document to discuss potential impacts of each alternative policy through analysis of its associated illustrative FMP.

Effects on the Physical Environment

Non-living substrates and features such as boulders, cobbles and sand waves can be disturbed by bottom trawls (Auster and Langton 1999). For example, gear can overturn boulders and cobbles and smooth sand waves. In addition, boulder piles could be dispersed, thus reducing the number of crevices. In most cases the structural integrity, and hence the complexity of the habitat, would not be greatly reduced (NMFS 2001a,b). Therefore, any impacts of Alternative 1 on the physical environment (substrate) are expected to be neither beneficial nor adverse (e.g., no significant impact).

Effects on the Biological Environment

EFH - Benthic Biodiversity

Alternative 1 as illustrated through the current FMPs could impact biodiversity of benthic invertebrates and fish. The adverse effects of bottom trawling and other mobile fishing gears on benthic biodiversity have been documented for Alaska and other regions (Auster and Langton 1999, McConaughey *et al.* 2000, Freese *et al.* 1999, NRC 2002 and see Section 3.6). This conclusion is further supported by past recognition that the existing management regime (i.e., Alternative 1) has had impacts that justify year-round bottom trawl closure areas in order to provide some protection to EFH.

The spatial distribution of the closed areas under the current FMPs may not protect the full range of habitat types in the BSAI and GOA. This is because many fish species depend on particular habitat features during various life stages. One way to protect benthic biodiversity is to establish a properly designed network of marine reserves (NRC 2001, Murray *et al.* 1999). Given the limited information on distribution and abundance of habitat types in waters off Alaska, evaluation of the impacts of the Alternative 1 policy is based primarily on the size of bottom trawl closure areas and secondarily on the spatial distribution of these closure areas.

As shown in Figure 4 and Table 2, Alternative 1 closes nearly 29 percent of the total FMP area (BSAI and GOA combined) at various times throughout the year. Closures within various subareas range from 19 percent to nearly 82 percent. Although these percentages near, or greatly exceed, the 20 percent closure recommendation for marine reserves (Agardy 1994, Lauck *et al.* 1998, Allison *et al.* 1998), the primary focus of the current FMPs is protection of crab habitat and SSL critical habitat. These habitats are generally relatively shallow; thus, the closures do not encompass a wider range of habitat types and depths, which would protect a wide range of EFH for species that inhabit deep water. The exception is the bottom trawl closure in the eastern GOA, which encompasses a wide range of habitat types and depths. There are generally no area restrictions in the deeper waters that encompass the outer continental shelf and upper slope of the central and western GOA and BSAI. The Aleutian Islands region, in particular, is an area with high habitat complexity and high abundance and diversity of coral species (Heifetz 2002). Within the areas currently open to bottom trawl fishing, specific areas or "hotspots" are fished each year, while other areas are undisturbed or fished very lightly (Coon *et al.* 1999, Fritz *et al.* 1998). Presumably, an area is repeatedly trawled because there are high catches per unit of effort of target species, and the bottom topography is suitable (i.e., trawlable). In many cases, these areas likely correspond to the preferred habitat of adult groundfish species, and are often fished seasonally.

The closures to bottom trawling are in many cases not year-round, and do not restrict fixed-gear use. In some cases, fixed-gear may adversely impact benthic biodiversity. Some specific geographic areas with sensitive habitat (e.g., gorgonian corals) are probably the most susceptible to fixed-gear impacts. Under Alternative 1 as illustrated by the current FMPs, there is a near absence of year-round closures to all fishing, with no-take marine reserves constituting only 0.3 percent of the fishable area (see Table 2). A higher percentage of no-take marine reserves would provide a wider range of protection for EFH from disturbances caused by all gear at all times. (See the analyses of Alternatives 3 and 4, below, for a discussion of the environmental consequences of such an increase.)

EFH - HAPCs

HAPCs include living substrates that provide high micro-habitat complexity, which serves as cover for groundfish and other organisms. A detailed description of HAPC as related to EFH is provided in Section 3.6. Five groups of organisms have been identified as deepwater HAPCs in Alaska: coral, sponges, anemones, sea whips, and sea pens.

Documentation of localized depletions, changes in benthic community structure, and acute damage all indicate that HAPC biota and other living substrates are directly impacted by bottom trawl fisheries (Freese *et al.* 1999, McConaughey *et al.* 2000). Criteria to determine acceptable levels of mortality to HAPC biota have not been established. Such criteria would need to consider fishing-induced mortality relative to such characteristics as natural mortality, fecundity, abundance, and growth rates. Many of the deep water areas that HAPC biota inhabit are characterized as stable environments dominated by long-lived species. In such areas the impacts of fishing can be substantial and long-term (Auster and Langton, 1999). Species such as gorgonian red tree coral (*Primnoa*) are very long lived (can be over 100 years old), and would therefore not easily recover if damaged by bottom trawls or some other gear type (Risk *et al.*1998, Andrews *et al.* 2002, Krieger and Wing 2002).

Gorgonian coral has been harvested throughout the world for use as jewelry. In general, corals and sponges are traded worldwide. Specific protective measures for HAPC biota (Amendment 65 in BSAI and GOA FMP), were developed and approved by the NPFMC to prohibit the sale of gorgonian coral and sponges, prior to the development of such a fishery in Alaska. However, in February of 2001, NOAA Fisheries informed the NPFMC that they would not be pursuing Amendment 65 regulations and instead suggested that the most efficient option would be for the NPFMC to request the State of Alaska to prohibit commercial fishing for these HAPC species in the EEZ outside of state waters. The MSA provides authority for the state to regulate a vessel in the EEZ, even if it is not registered under the State of Alaska laws. The state could use this authority to prohibit a commercial fishery for HAPC species in the EEZ, provided that the necessary determinations are made under MSA Section 306(a)(3). It is presumed that this process could move forward under the Alternative 1 policy.

Living substrate can be inadvertently impacted through fishing activities that are not directed on the HAPC itself (i.e., damage by bottom trawls, longlines, and pot gear, and bycatch of HAPC biota in other fisheries). Therefore, with respect to groundfish fisheries that use both mobile and fixed gear, a certain amount of bycatch, unobserved damage, and mortality to HAPC biota is expected to occur under the Alternative 1 policy and existing FMPs. Existing management measures under the current groundfish FMPs that were put into place to protect prohibited species and SSLs, close about 22 percent and 46 percent of fishable area in the BSAI and GOA, respectively, to bottom trawling (see Table 2). However, these areas are not necessarily closed year-round, do not incorporate concurrent reductions in total allowable catch (TAC), and do not close the areas to fishing with fixed gear. In addition, the trawl closures are specific only to three directed bottom fisheries: pollock, Pacific cod, and Atka mackerel. Thus, bottom trawling for other groundfish such as rockfish and flatfish may still occur in some of the closed areas. As such, the closures are likely to benefit EFH (including HAPC) in some areas by reducing the level and frequency of disturbance, but could possibly increase stresses on the habitat elsewhere, and at an unknown rate, where fishing is intensified. Some marginal grounds not previously fished could possibly now be disturbed due to the closures, particularly since concurrent reductions in TAC would not accompany the closures. Not having experienced as much fishing effort in the past, these areas could be more vulnerable to trawling impacts. In

addition, damage to HAPCs by pot and fixed gear; and by trawling for rockfish and flatfish; is not mitigated by the closures since this type of fishing is not restricted in these areas. Therefore, Alternative 1 policy as illustrated by the current BSAI and GOA groundfish FMPs has the potential to increase trawl effort in areas that could have high concentrations of HAPC species.

Target and Non-Target Species

The closure areas in place in the BSAI and GOA under the Alternative 1 policy as illustrated by the current FMPs generally have been designed to protect various prohibited species, but could provide indirect benefits to target and non-target groundfish species as well (see Table 3). As shown in Table 3, many of the existing seasonal and year-round closure areas are intended to protect the prohibited species (crab, salmon, halibut, and herring). The issue of localized depletion of pollock and other target groundfish species is also addressed indirectly by the Bogoslof closure, which was primarily designated as part of the SSL Protection Measures.

Forage Fish

Most of the forage fish bycatch is taken in pelagic trawls (74 percent in the BSAI, 93 percent in the GOA) (NMFS 2001a). The vast majority of forage fish taken as bycatch consists of osmerids (capelin, eulachon, other smelts). Collectively, forage fish form only a small part of bycatch of groundfish fisheries, typically comprising less than 1 percent of any directed harvests. The low volume of incidental catch of forage fish currently observed under the existing FMPs is anticipated to continue under Alternative 1.

Prohibited Species

The Alternative 1 policy as illustrated by the existing FMPs moves fishing effort outside of SSL critical habitat areas compared to the historic catch from 1997-1999. Chinook salmon, other Tanner crab (besides bairdi), and halibut bycatch rates appear to be lower outside of critical habitat, and the shift in effort outside of these areas leads to reductions in the expected bycatch of these three prohibited species (NMFS 2001b). Existing closures have been put into place to protect these species by reducing bycatch and protecting habitat.

Marine Mammals

Also shown in Table 3 are the closures intended to protect marine mammals, namely SSLs. One or more of the target species (pollock, Atka mackerel, and Pacific cod) have been identified as prey species of SSLs, certain whales, and fur and harbor seals. Trawl limitations described above for these prey species will indirectly benefit these marine mammals also (NMFS 2001b).

For example, trawl closures around the Pribilof Islands, established mainly for the protection of crab stocks, may offer positive benefits to fur seals by limiting prey removals in waters surrounding their Pribilof Island rookeries. However, only northern fur seals foraging close to the islands would benefit, and recent tracking studies show that foraging trips of both adult female and juvenile male fur seals extend well beyond the trawl closure boundaries. Therefore, while fisheries harvest prey of northern fur seals (i.e., pollock and Pacific cod), competition due to the harvest rates of those species may vary depending on the size range consumed by the seals.

Since fishing vessels would either be eliminated (no-take marine reserves) or reduced (no-trawl MPAs), direct effects such as mortality and direct disturbance of marine mammals would also be eliminated or reduced in the closure areas, depending on the type and season of closure. Therefore, it may be anticipated that protection from direct (mortality, direct disturbance) and indirect (loss of prey) effects would be provided.

Seabirds

None of the closure areas currently in place are specifically designed to protect or enhance seabird populations. However, some of the nearshore closures may indirectly benefit seabirds by benefitting forage fish populations. However, as described above, the small amount of average incidental catch in the BSAI and GOA, as occurs under the existing FMPs, is not likely to significantly affect the abundance of forage fish available for seabirds.

The incidence of direct mortality due to seabird/vessel collisions and inadvertent take of seabirds by fishing vessels also would not occur in the year-round closed areas; however, these areas comprise only a very small percentage of the overall closure areas. The protection for seabirds would occur to a lesser extent, if at all, in the seasonally closed areas, since many of these areas remain open to longline fishing, which has the greatest potential for direct take of seabirds. Additional discussions on the impacts of Alternative 1 on seabirds are discussed in the Seabird Qualitative Impact Assessment (Appendix F-6).

Effects on the Social and Economic Environment

Under the existing FMPs, the BSAI and GOA groundfish fisheries are expected to continue to provide high and relatively stable levels of seafood products to domestic and foreign markets. However, as compared to a no-closure scenario, Alternative 1 would produce socioeconomic effects that would vary by industry sector (catcher vessel, catcher processor, and inshore processor), fishery, and region. While these effects are quantified and discussed in detail in Chapter 4 of the Programmatic SEIS, a brief qualitative discussion is provided herein.

Due to longer transit times to reach areas open to fishing, the critical habitat and other closures existing under the current FMPs likely lower catch and increase the cost of harvesting a given amount of fish. The existing closures affect the industry by increasing travel time to and from distant fishing grounds compared to prior years when such closures were not in effect. Time associated with learning how to fish new fishing grounds, reducing catch per unit of fishing effort from fishing less concentrated stocks, increasing down time and layups all contribute to increasing costs to processors. If the operating costs increase, these would be expected to have some impacts on the market. Catcher processors and inshore processors would face competition from and loss of market share to foreign fisheries and farmed fish if product price increases while product quality decreases. Operating costs for catcher vessels and product values for inshore processors would be exacerbated by adverse trends in salmon and crab fisheries, particularly in the Alaska Peninsula, Aleutian islands, and Kodiak Island Borough (NMFS 2001b).

Since the closed areas result in greater distances between ports and open fishing grounds and require fishing further offshore, vessels will incur an increased risk of accidents and injury (NMFS 2001b). Smaller catcher vessels based out of the Alaska Peninsula, Aleutian Islands, and Kodiak communities would have to travel

further to fish, requiring more time, incurring more costs, potentially reducing the quality of the catch and exposing the vessels to additional risks due to hazardous weather conditions.

On the other hand, the Alternative 1 closures as illustrated by the current FMPs could benefit non-market issues such as existence values and eco-tourism. Studies have shown that the general public is willing to pay for the preservation of species (including endangered species) as well as the preservation of wilderness areas (NMFS 2001b). While estimates of non-consumptive and non-use values for various levels of the BSAI and GOA ecosystems are not available, it can be assumed that the closures under the existing FMPs serve to enhance these values to an unknown extent.

Effects on the Ecosystem

As described previously in the section titled Benthic Biodiversity, the primary focus of the Alternative 1 closure areas is protection of vulnerable life history stages of crab, crab habitat, and SSL critical habitat. This habitat is generally relatively shallow; thus, the closures do not encompass a wide range of habitat types and depths. While predator/prey relationships could be improved in closed areas, particularly in the year-round closure areas and "no-transit" areas, effects on the ecosystem as a whole are unlikely. If the closures were to cover a wider range of habitats, then improved protection for a wide range of species could be realized, eventually benefitting overall species diversity. Therefore, due to the narrow focus of the closures, beneficial effects on top predators, energy flow, and balance are also unlikely to be realized.

Effects on Management and Enforcement

Under existing management, it is unlawful for any person to operate a vessel authorized to participate in the Atka mackerel, Pacific cod, or pollock directed fisheries in any BSAI or GOA reporting areas, unless the vessel carries an operable NOAA Fisheries-approved vessel monitoring system (VMS) transmitter. The only exemption is for vessels using jig gear. This requirement would continue under the Alternative 1 policy as illustrated by the current FMPs.

As such, VMS is an essential component of monitoring and enforcement for closure areas. In the absence of VMS, enforcement of compliance with closed areas would be limited to random sightings by enforcement vessels or aircraft. To monitor critical habitat harvest limits, managers need to know which vessels fished in the area and how much fish they caught. VMS data provide real-time information on vessel location and indicate fishing activity. These VMS data can be matched with observer data or landing data for the trip to determine if the catch is counted against the catch limit.

By allowing fishing to continue, the VMS requirement has a positive economic effect on fishery participants and fishing communities. Many important fishing grounds are found within SSL critical habitat. The SSL Protection Measures, including VMS, were developed to afford vessels an opportunity for continued access to those grounds. Allowing that access, with addition of the VMS requirement, is preferred by the fishing industry to closing the areas entirely. The VMS reporting system is discussed further in the Data and Reporting Requirements Qualitative Impact Assessment (Appendix F-11).

The observer program, which is discussed in detail in Appendix F-10 (see the Observer Program Qualitative Analysis), would also continue under this alternative and these FMPs. Under the program, vessels greater than 125 feet (ft) must carry an observer at all times; vessels between 60 ft and 125 ft are required to carry

observers for only 30 percent of the vessel's time at sea, and vessels that are less than 60 ft are exempt from observer coverage. With these levels of observer coverage, NOAA Fisheries is confident that most of the groundfish harvest is being observed and that with observers on board, fishing vessels are unlikely to venture into closed areas.

Section 4 Alternative 2 – Adopt a More Aggressive Management Policy

4.1 Overview of EFH/MPA Management Measures of FMP Bookend 2.1

This bookend to the Alternative 2 policy proposes that no MPAs be designated. This FMP is intended to illustrate a management regime where a more aggressive harvest strategy is employed with fewer restrictions on fishing. It would repeal all current closed/restricted areas intended to protect crab habitat and other prohibited species such as salmon and herring. In addition, the Sitka Pinnacles Marine Reserve, intended to protect sensitive habitat and HAPC, would be repealed. Only the SSL Protection Measures to avoid a determination of jeopardy under the ESA would remain in place.

Figure 5 depicts the existing closure areas under FMP bookend 2.1; Table 4 provides the descriptive statistics regarding no-trawl MPAs and no-take marine reserves. As seen in Table 4 and Figure 5, FMP 2.1 would provide limited protection to 14.6 percent of fishable area in the GOA and BSAI combined, with 14.3 percent designated as no-trawl areas, leaving just 0.3 percent as no-take marine reserve areas (SSL No Transit Zones). Also shown in Table 4, about 22 percent of the fishable area in the entire GOA would be closed to bottom trawling at one time or another under this FMP illustration. Comparatively, about 43 percent of the Aleutian Islands and nearly 8 percent of the Bering Sea fishable area would be closed. Most of the no-take marine reserve areas defined by FMP 2.1 are found in the Aleutian Islands (1.6 percent) due to the number of SSL critical habitat closures located there. Only a small percentage (0.5 percent) of fishable area in the GOA is afforded complete protection, again for the purposes of protecting SSLs.

4.2 Effects of EFH/MPA Management Measures of FMP Bookend 2.1

Effects on the Physical Environment

There will be additional impacts on the substrate under FMP 2.1 since areas presently closed to bottom trawling would be opened. Depending on the intensity of the trawling in a given location, the physical impacts on the substrate itself may be notable. However, as described for the Alternative 1 policy and current FMPs, the structural integrity and complexity of the overall habitat found in the BSAI and GOA would not be greatly reduced by this FMP, but there could be localized areas of significant disturbance as a result of concentrated fishing effort.

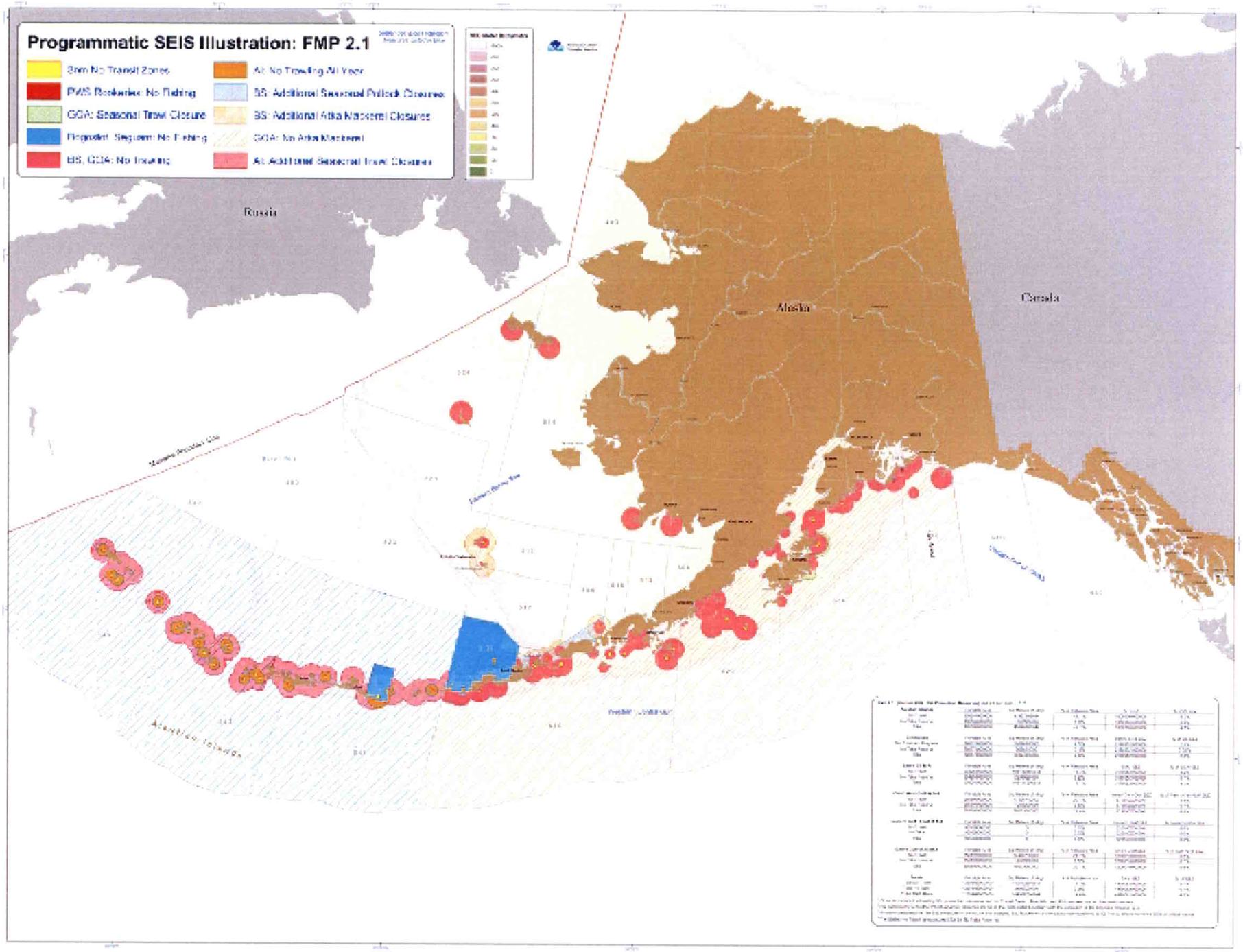


Figure 5. Existing Closure Areas in FMP Bookend 2.1.

Table 4. Descriptive statistics for closure areas under FMP Scenario 2.1.

Current 2002 Trawling Closures [1 2 3]			
	Fishable area (in square kilometers [km^2])	Management area (km^2)	Percentage (%) of Fishable area closed
Aleutian Islands (AI)			
No trawl	105,380,000,000	43,357,200,000	41.1%
No take reserve	105,380,000,000	1,662,800,000	1.6%
Total	105,380,000,000	45,020,000,000	42.7%
Bering Sea (BS)			
No trawl and Bogoslof	798,870,000,000	59,826,380,000	7.5%
No take reserve	798,870,000,000	567,620,000	0.1%
Total	798,870,000,000	60,394,000,000	7.6%
Entire BS & AI			
No trawl	904,250,000,000	103,183,580,000	11.4%
No take reserve	904,250,000,000	2,230,420,000	0.2%
Total	904,250,000,000	105,414,000,000	11.6%
Central \ Western Gulf - west of 144°			
No trawl	265,690,000,000	77,406,700,000	29.1%
No take reserve	265,690,000,000	1,266,300,000	0.5%
Total	265,690,000,000	78,673,000,000	29.6%
Eastern Gulf - east of 144°			
No trawl	90,509,000,000	0	0.0%
No take reserve	90,509,000,000	0	0.0%
Total	90,509,000,000	0	0.0%
Entire Gulf of Alaska			
No trawl	356,199,000,000	77,406,700,000	21.7%
No take reserve	356,199,000,000	1,266,300,000	0.5%
Total	356,199,000,000	78,673,000,000	22.2%
Totals			
Total no trawl	1,260,449,000,000	180,590,280,000	14.3%
Total no take	1,260,449,000,000	3,496,720,000	0.3%
Total FMP Area	1,260,449,000,000	184,087,000,000	14.6%

1 Closures include the trawling SSL protection measures and No Transit Zones. Most hook and line (H&L) and Pot closures overlap the trawl closures.

2 For consistency with other Programmatic Supplemental Environmental Impact Statement (SEIS) analysis, closures are cut at the 1,000- meter boundary with the exception of the Bogoslof and Seguam Pass foraging areas.

3 With the complexity for the SSL measures in the AI, for this analysis, SSL Rookeries and Haulouts were buffered at 12.7 nautical miles (nm) to effectively close 50 percent of critical habitat.

Effects on the Biological Environment

EFH – Benthic Biodiversity

FMP bookend 2.1 could impact biodiversity of benthic invertebrates and fish. It is recognized that the spatial distribution of the closed areas under the scenario may not protect the full range of habitat types in the BSAI and GOA. This is because many fish species depend on particular habitat features. One way to protect benthic biodiversity is a properly designed network of marine reserves (NRC 2001, Murray *et al.* 1999). This scenario recommends repealing many existing MPAs and closure areas.

As shown in Table 4, FMP 2.1 closes about 12 percent of the BSAI and about 22 percent of the GOA with about 15 percent of the total FMP area (BSAI and GOA combined) closed at various times throughout the year. Although these percentages are near the 20 percent closure recommendation for marine reserves (Agardy 1994, Lauck *et al.* 1998, Allison *et al.* 1998), they are not true marine reserves as described above. The primary focus of the closure areas is protection of SSL critical habitat. The closures to bottom trawling are in many cases not year-round, and do not restrict fixed-gear use, and close fishing for only target certain species (pollock, Pacific cod, and Atka mackerel). Bottom trawling for flatfish and rockfish is still allowed within certain areas of the designated critical habitat. Also, in some cases, fixed-gear may adversely impact benthic biodiversity. Some specific geographic areas with sensitive habitat (e.g., gorgonian corals) are probably the most susceptible to fixed-gear impacts. Under FMP 2.1, there is a near absence of year-round closures to all fishing; no-take marine reserves constitute only 0.3 percent of the fishable area (see Table 4). These marine reserves areas would provide protection to EFH from disturbances caused by any fishing gear at all times.

EFH-HAPC

With respect to groundfish fisheries that use both mobile and fixed gear, a certain amount of bycatch and unobserved damage and mortality to HAPC biota is expected to occur under FMP 2.1. Management measures that were put into place to protect SSLs close to bottom trawling about 12 percent and 22 percent of fishable area in the BSAI and GOA, respectively. However, these areas are not necessarily closed year-round, do not necessarily incorporate concurrent reductions in TAC, and do not close the areas to fishing with fixed gear. As such, the SSL closures are likely to benefit EFH (including HAPC) in some areas, but could possibly increase stresses on the habitat elsewhere, and at an unknown rate. In addition, damage to HAPCs by pot and fixed gear is not mitigated by the closures since this type of fishing is not restricted in these areas. Therefore, FMP 2.1 has the potential for moderate to substantial impact in areas with high concentrations of HAPC species. The increase in fishing effort by all gear types is not offset by large, year-round closures, or any TAC reductions throughout the management area. Opening the Pribilof Islands Habitat Conservation Area and Sitka Pinnacles Marine Reserve could have adverse effects on HAPC.

Target and Non-target Species

The environmental consequences of the Alternative 2 policy, as illustrated by FMP 2.1 on target, non-target, prohibited species, marine mammals, and seabirds is not known. The elimination of the existing closed areas (with the exception of those required to protect SSLs) may result in increased impacts to these species. However, unless documented, the Alternative 2 policy presumes there are no significant adverse effects on the environment.

Forage Fish

Under this FMP scenario, many closed areas would be opened, TACs would be raised, and PSC limits would be removed; a higher volume of forage fish could be caught as bycatch in the groundfish fisheries. Although the extent of the effect on forage fish populations is unknown, adverse effects could be realized.

Prohibited Species

Since the closures and catch limits enacted to protect these species from excessive bycatch and habitat destruction would be repealed, prohibited species are likely to experience adverse effects.

Marine Mammals

While the SSL Protection Measures would remain in place and could provide benefits to other marine mammals, repeal of the prohibited species and other closures could indirectly adversely affect marine mammals.

Seabirds

Since many closed areas would be opened, additional incidental take and vessel strikes could impact seabird mortality. Also, impacts could be realized if forage fish populations are impacted.

Effects on the Social and Economic Environment

Due to the more aggressive harvest strategy of policy Alternative 2, FMP 2.1 would produce socioeconomic effects that are relatively similar among industry sectors (catcher vessel, catcher processor, and inshore processor), fishery, and region.

FMP 2.1 is intended to increase the level of harvest in all fisheries and therefore increase the short-term benefits for fishery participants. All three industry sectors are expected to see improved conditions, at least in the short-term (4-5 years) (NMFS 2001a). Positive impacts related to vessels, catcher processors, and inshore and offshore processors would accrue to all Alaska regions involved in the groundfish fishery: Alaska Peninsula and Aleutian Islands, Kodiak, southcentral Alaska, and southeast Alaska. Average costs per unit of catch for catcher vessels can be expected to decrease somewhat due to the increase in overall levels of production resulting from higher catches. Because revenues are expected to increase while costs decrease, the percentage increase in profits can be expected to be greater than the increase in revenues; however, quantitative estimates are unavailable at this time (NMFS 2001a).

Under Alternative 2 as illustrated by FMP 2.1, the BSAI and GOA groundfish fisheries are expected to continue to provide high and relatively stable levels of seafood products to domestic and foreign markets. Increases in productivity of several different products could result in lower consumer prices and increased consumer surplus (NMFS 2001a).

Because FMP 2.1 would remove some fishing restrictions in nearshore areas, it would allow vessels to spend more time fishing nearer to shore and would reduce the potential for the risk of accidents and injury due to hazardous weather and other conditions. This could be particularly true in southeast Alaska where repeal of the LLP would open all of the area east of 144° W longitude to trawling. Other positive impacts would be realized in the Bristol Bay area as the Nearshore Bristol Bay closures in areas 506 and 512 would be open; along the Aleutian Islands where the Chinook Savings Area, Herring Savings Area, and Red King Crab Savings Area would be open; and around Kodiak with the opening of the Kodiak Type 1 and Type 2 Areas.

Conversely, the aggressive strategy illustrated by FMP 2.1 could have a large impact on some species and the environment (NMFS 2001a). It is possible that a large reduction in non-use and non-consumptive values would result.

Effects on the Ecosystem

Under FMP 2.1, the increase in fishing effort and opening of all time/area closures except the SSL Protection Measures may increase the risk of local and temporal depletions that can be disruptive to ecosystems. The main predator-prey related effects of the FMP illustration would be an increase in short-term harvests of economically desirable species such as pollock (a key prey item) and cod (an important predator). Thus the bookend could provide less protection to pelagic forage ability (NMFS 2001a). Increased catches of pollock could also impact the spatial and/or temporal concentration of prey removals, especially since the Bogoslof area and Donut Hole would be open to fishing. However, since there would be little change in the trophic level of the catch under FMP 2.1 relative to trophic level of biomass, fishing-down effects on the food web would not be realized.

FMP 2.1 could induce an unknown level of decline in species diversity through increased catch levels of target species (NMFS 2001a). These increased catch levels could reduce protection of endangered species that rely on target species for prey. Increased bycatch of potentially sensitive species such as skates, grenadiers, and sharks would occur along with increased mortality of benthic invertebrates and HAPC biota such as corals, sponges, anemones, sea pens, and sea whips. Alternative 2, as illustrated by FMP 2.1, would provide less protection to genetic diversity because it would possibly increase fishing intensity on spawning aggregations (due to opening of closed areas such as the Seguam Pass/Bogoslof area) and on larger, more heterozygous fish.

Effects on Management and Enforcement

FMP bookend 2.1 eliminates the VMS monitoring system as part of illustrating a less precautionary management policy. As described for Alternative 1, VMS data provide real-time information on vessel location and indicate fishing activity. Without the system, enforcement of SSL Protection Measures would be difficult. Elimination of the current VMS requirement may have a negative impact on the fishing industry, as it could lead to the closure of all SSL critical habitat to fishing should it be determined by NOAA Fisheries, Office of Protected Resources, that without VMS monitoring the remaining SSL Protection Measures are no longer effective.

4.3 Overview of EFH/MPA Management Measures of FMP Bookend 2.2

Figure 6 depicts the closure areas for this bookend, while Table 5 provides the descriptive statistics. The FMP 2.2 bookend proposes no change to the existing closure areas as described under the existing FMPs. Therefore, a total of approximately 29 percent of the total FMP area in the BSAI and GOA combined (closures within various subareas range from about 19 percent to 82 percent) is closed to trawling at various times throughout the year.

4.4 Effects of EFH/MPA Management Measures of FMP Bookend 2.2

Impacts of the FMP 2.2 illustration on the physical, biological, and social and economic environments would be the same as under the Alternative 1 FMPs:

- While non-living substrates and features such as boulders, cobbles, and sand waves can be disturbed by bottom trawls (Auster and Langton 1999), in most cases the structural integrity and complexity of the habitat would not be greatly reduced (NMFS 2001a). Therefore, any impacts of FMP 2.2 on the physical environment are expected to be neither beneficial nor adverse (e.g. no significant impact).

- The spatial distribution of the closed areas under the FMP 2.2 may not protect the full range of habitat types in the BSAI and GOA. The primary focus of the closures is protection of crab habitat and SSL critical habitat. These habitats are generally relatively shallow; thus, the closures do not encompass a wide range of habitat types and depths, which would protect a wide range of EFH for species that inhabit deep water. Under FMP 2.2, there is a near absence of year-round closures to all fishing, with no-take marine reserves constituting only 0.3 percent of the fishable area. A higher percentage of no-take marine reserves would provide a wider range of protection of EFH from disturbances caused by all gear at all times.

- Since the closed areas result in greater distances between ports and open fishing grounds and require fishing further offshore, vessels would incur an increased risk of accidents and injury (NMFS 2001b). Smaller catcher vessels based out of the Alaska Peninsula, Aleutian Islands, and Kodiak communities would have to travel further to fish, requiring more time, incurring more costs, potentially reducing the quality of the catch, and exposing the vessels to additional risks due to hazardous weather conditions.

Table 5. Descriptive statistics for closure areas under FMP scenario 2.2.

Current 2002 trawling[1,2,3,4,5]			
	Fishable area (in square kilometers [km^2])	Management area (km^2)	Percentage (%) of fishable area closed
Aleutian Islands (AI)			
No trawl	105,380,000,000	43,357,506,644	41.1%
No take reserve	105,380,000,000	1,662,800,000	1.6%
Total	105,380,000,000	45,020,306,644	42.7%
Bering Sea (BS)			
No trawl and Bogoslof	798,870,000,000	153,708,738,278	19.2%
No take reserve	798,870,000,000	567,620,000	0.1%
Total	798,870,000,000	154,276,358,278	19.3%
Entire BS & AI			
No trawl	904,250,000,000	197,066,244,922	21.8%
No take reserve	904,250,000,000	2,230,420,000	0.2%
Total	904,250,000,000	199,296,664,922	22.0%
Central \ Western Gulf - west of 144°			
No trawl	265,690,000,000	87,906,000,000	33.1%
No take reserve	265,690,000,000	1,266,300,000	0.5%
Total	265,690,000,000	89,172,300,000	33.6%
Eastern Gulf - east of 144°			
No trawl	90,509,000,000	73,958,000,000	81.7%
No take reserve	90,509,000,000	8,304,042	0%[6]
Total	90,509,000,000	73,966,304,042	81.7%
Entire Gulf of Alaska			
No trawl	356,199,000,000	161,864,000,000	45.4%
No take reserve	356,199,000,000	1,274,604,042	0.5%
Total	356,199,000,000	163,138,604,042	45.8%
Totals			
Total no trawl	1,260,449,000,000	358,930,244,922	28.5%
Total no take	1,260,449,000,000	3,505,024,042	0.3%
Total FMP Area	1,260,449,000,000	362,435,268,964	28.8%

1 Closures include Steller sea lion (SSL) protection measures, Alaska Department of Fish and Game (ADF&G) restrictions, and No Transit Zones.

2 For consistency with other Programmatic Supplemental Environmental Impact Statement (SEIS) analysis, closures are cut at the 1,000-meter boundary with the exception of the Bogoslof foraging area and the Aleutian Islands.

3 Pelagic and Non-Pelagic Trawl Closures are included.

4 The Steller No Transit areas and Sitka Pinnacles account for the No take reserves.

5 With the complexity for the SSL measures in the A1, for this analysis, SSL Rookeries and Haulouts were buffered at 12.7nautical miles (nm) to effectively close 50 percent of critical habitat.

6 Sitka Pinnacles - percentage is about 0.01 percent so this number appears as 0 percent

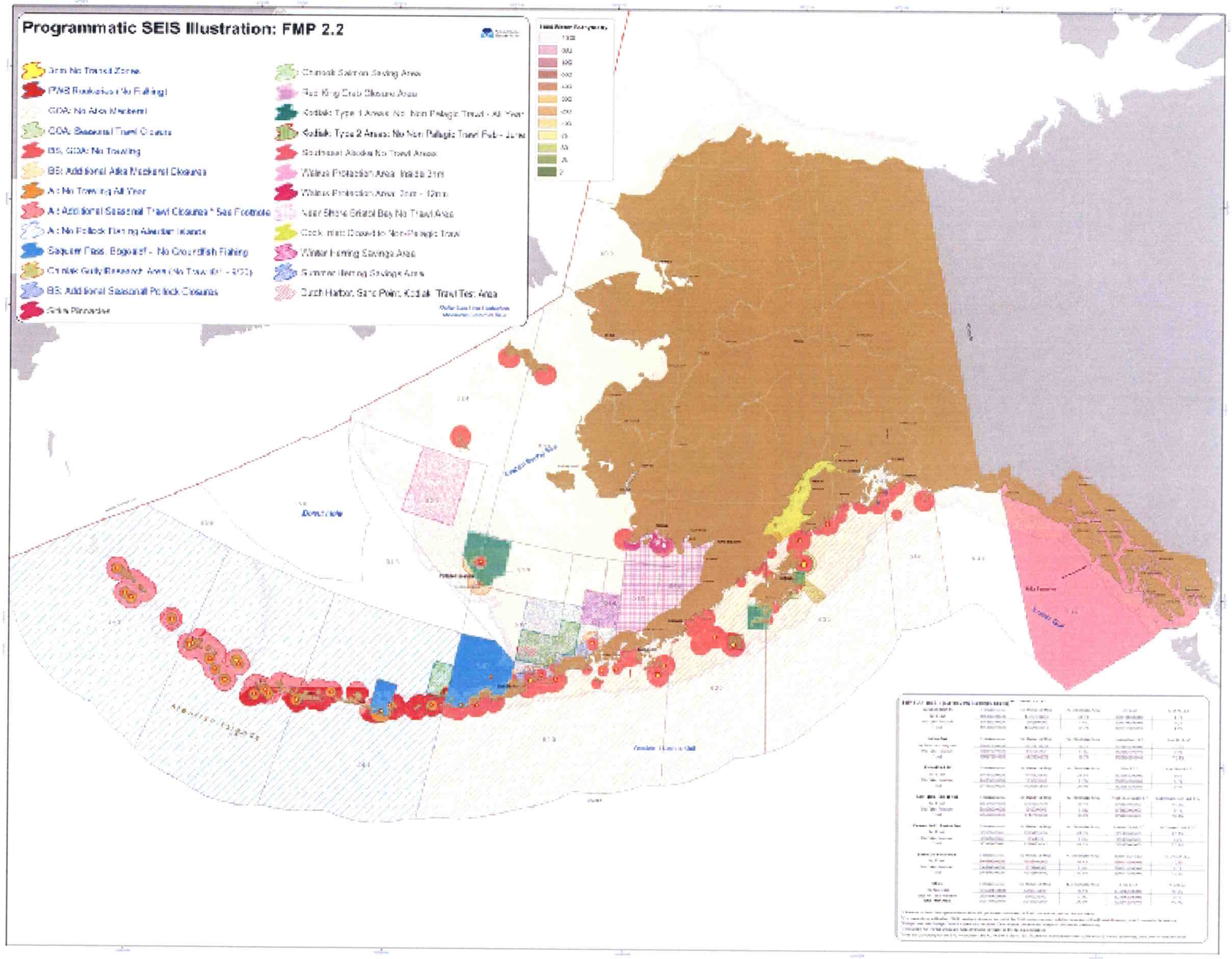


Figure 6. Closure Areas for FMP Bookend 2.2.

Section 5 Alternative 3 – Adopt a More Precautionary Management Policy

5.1 Overview of EFH/MPA Management measures of FMP Bookend 3.1

A goal of the Alternative 3 policy as illustrated by FMP 3.1 is to develop an MPA efficacy methodology including program goals, objectives, and criteria for establishing MPAs and no-take marine reserves. Specifically, the criteria should meet certain objectives:

- Consider that MPAs may include no-take areas.

- Review existing closures such as Sitka Pinnacles to determine if these areas qualify for MPAs under established criteria.

- Include restrictions of specific gear types or fisheries.

- Assume that existing closures (see Alternative 1) would remain in effect until the process is complete and MPAs are designated. Table 6 provides the descriptive statistics and Figure 7 depicts the closure areas proposed under this scenario.

Regarding the development of an MPA efficacy methodology, Figures 8 through 10 suggest a three-phase method for the MPA designation process that could be used under this framework. The methodology employs and expands upon EFH/HAPC considerations, the ADF&G (2002) recommendations, and suggestions provided by the NRC (2001). Figure 8 depicts the Phase I design and selection process for establishing an MPA. The goals of this initial phase are to select candidate sites based on the best available science, and to employ early involvement of stakeholders (ADF&G 2002). As shown in the figure, the public, recognized ecological and socioeconomic experts (organized into teams or forums), and interested federal and state agency representatives all have the opportunity to provide input into each step of the candidate selection process. The process follows ADF&G (2002) recommendations and the suggested steps include the following:

1. Adopting a statewide policy for MPA designation,

2. Developing MPA evaluation criteria, and

3. Identifying and evaluating potential sites using the developed criteria.

Phase I ends with the selection of a number of candidate MPA sites, each incorporating one or more of the objectives set at the policy stage.

Phase II, as depicted in Figure 9, advances the MPA designation process and has a goal of designating an MPA site using a process that again maximizes public input and stakeholder concurrence. As in Phase I, public stakeholders, agency representatives, and scientific and socioeconomic experts provide input in the establishment of the candidate MPA boundaries and buffer zones, and are instrumental in the development

Table 6. Descriptive statistics for closure areas under FMP scenario 3.1.

Current 2002 Trawling Closures[1 2 3 4 5]			
	Fishable area (in square kilometers [km^2])	Management area (km^2)	Percentage (%) of fishable area closed
Aleutian Islands (AI)			
No trawl	105,380,000,000	43,357,506,644	41.1%
No take reserve	105,380,000,000	1,662,800,000	1.6%
Total	105,380,000,000	45,020,306,644	42.7%
Bering Sea (BS)			
No trawl and Bogoslof	798,870,000,000	153,708,738,278	19.2%
No take reserve	798,870,000,000	567,620,000	0.1%
Total	798,870,000,000	154,276,358,278	19.3%
Entire BS & AI			
No trawl	904,250,000,000	197,066,244,922	21.8%
No take reserve	904,250,000,000	2,230,420,000	0.2%
Total	904,250,000,000	199,296,664,922	22.0%
Central \ Western Gulf- west of 144°			
No trawl	265,690,000,000	87,906,000,000	33.1%
No take reserve	265,690,000,000	1,266,300,000	0.5%
Total	265,690,000,000	89,172,300,000	33.6%
Eastern Gulf - east of 144°			
No trawl	90,509,000,000	73,958,000,000	81.7%
No take reserve	90,509,000,000	8,304,042	0%[6]
Total	90,509,000,000	73,966,304,042	81.7%
Entire Gulf of Alaska			
No trawl	356,199,000,000	161,864,000,000	45.4%
No take reserve	356,199,000,000	1,274,604,042	0.5%
Total	356,199,000,000	163,138,604,042	45.8%
Totals			
Total no trawl	1,260,449,000,000	358,930,244,922	28.5%
Total no take	1,260,449,000,000	3,505,024,042	0.3%
Total FMP Area	1,260,449,000,000	362,435,268,964	28.8%

1 Closures include Steller sea lion (SSL) protection measures, Alaska Department of Fish and Game (ADF&G) restrictions, and No Transit Zones.

2 For consistency with other Programmatic Supplemental Environmental Impact Statement (SEIS) analysis, closures are cut at the 1000-meter boundary with the exception of the Bogoslof foraging area and the Aleutian Islands.

3 Pelagic and Non-Pelagic Trawl Closures are included.

4 The Steller No Transit areas and Sitka Pinnacles account for the No take reserves.

5 With the complexity for the SSL measures in the A1, for this analysis, SSL Rookeries and Haulouts were buffered at 12.7 nautical miles (nm) to effectively close 50 percent of critical habitat.

6 Sitka Pinnacles - percentage is about 0.01 percent so this number appears as 0 percent.

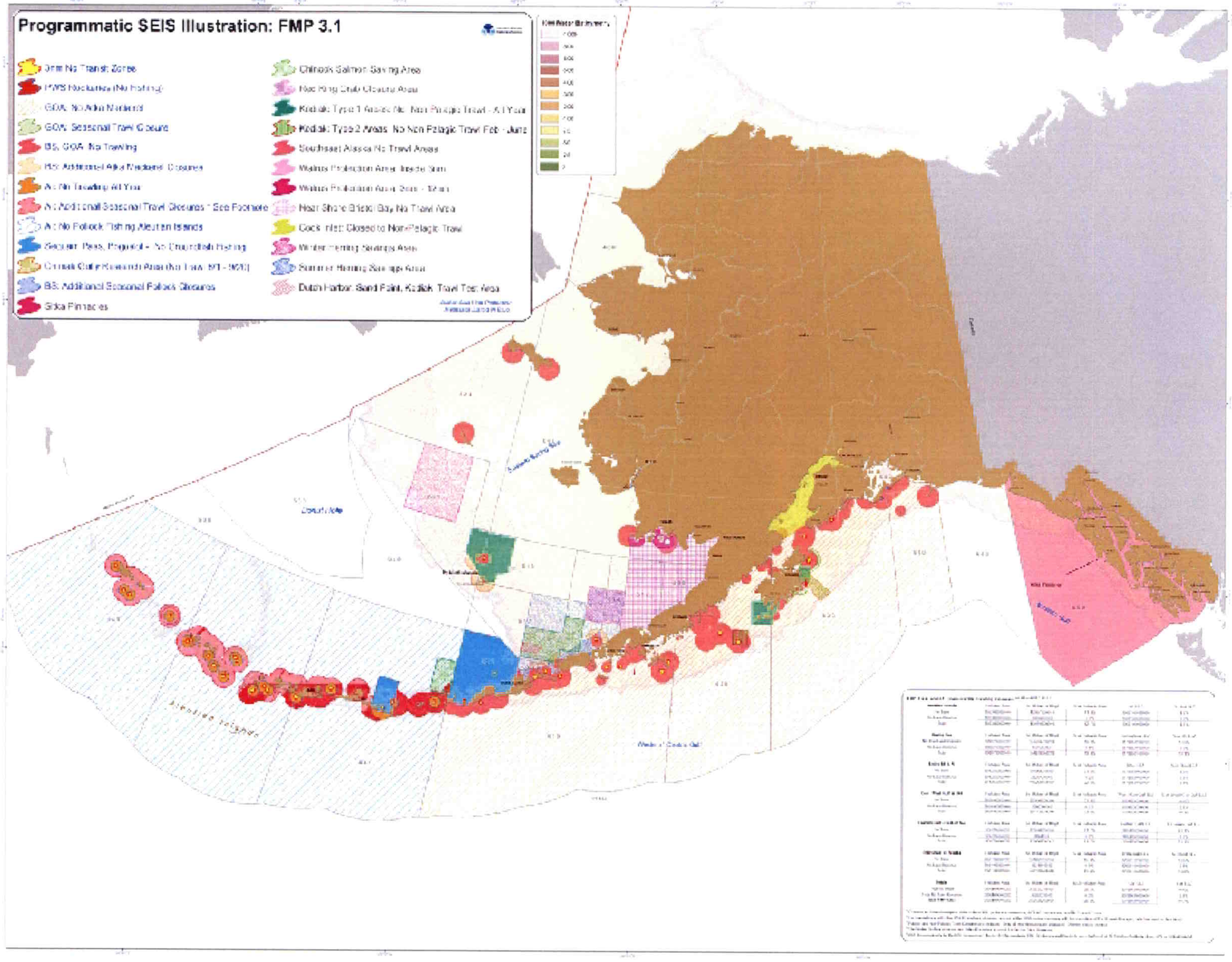


Figure 7. Closure Areas of FMP Bookend 3.1.

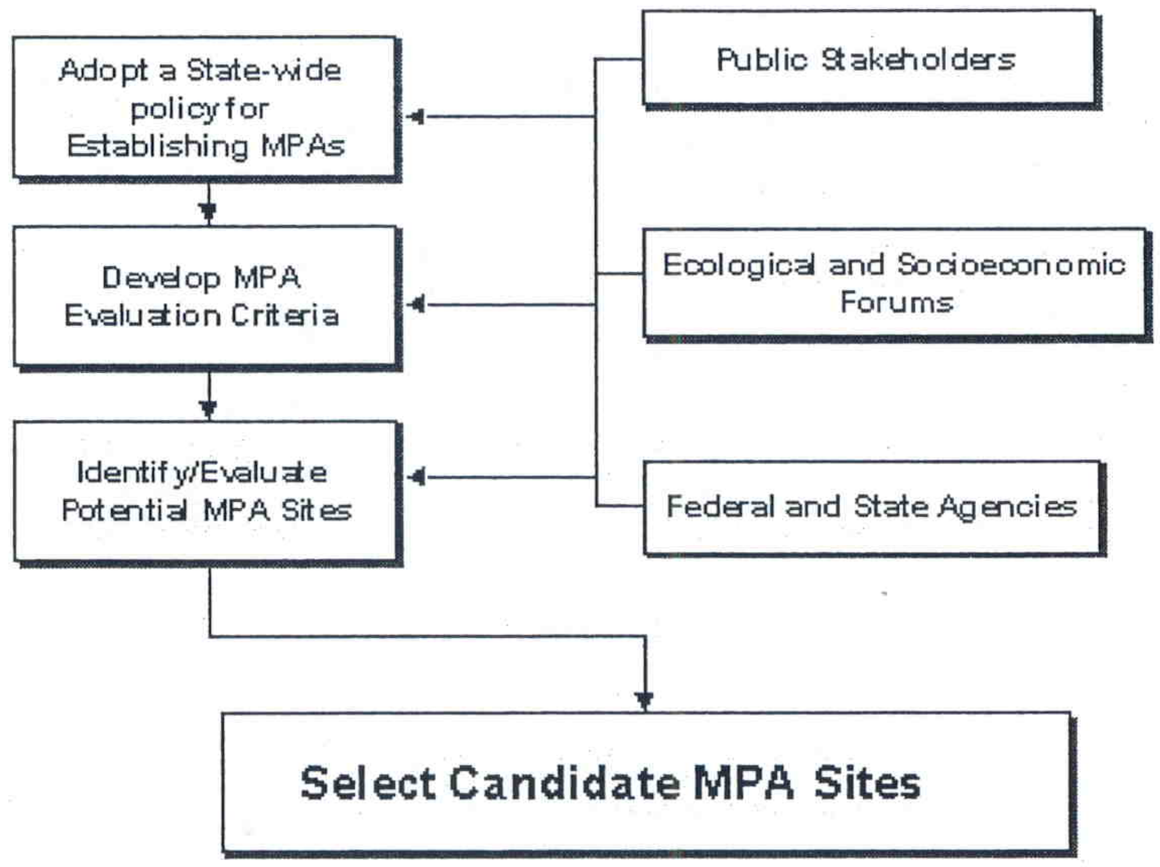


Figure 8. **Phase I - MPA design and selection process. The goal of Phase I is to select candidate sites based on best available science and employing early involvement of stakeholders. Source: ADF&G 2002 and NRC 2001.**

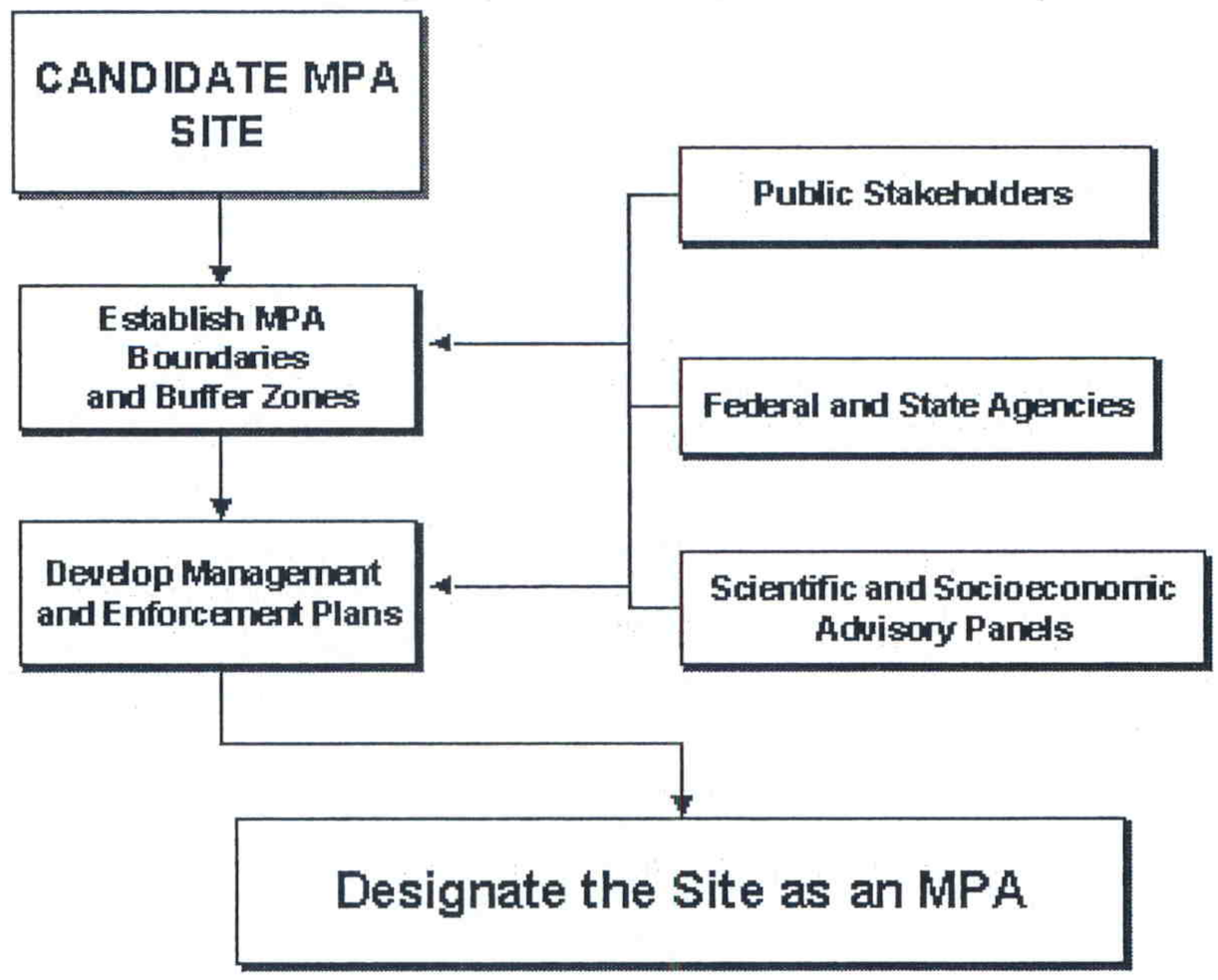


Figure 9. **Phase II - MPA design and selection process. The goal of Phase II is to designate MPA sites utilizing a process that maximizes public input and stakeholder concurrence. Source: ADF&G 2002 and NRC 2001.**

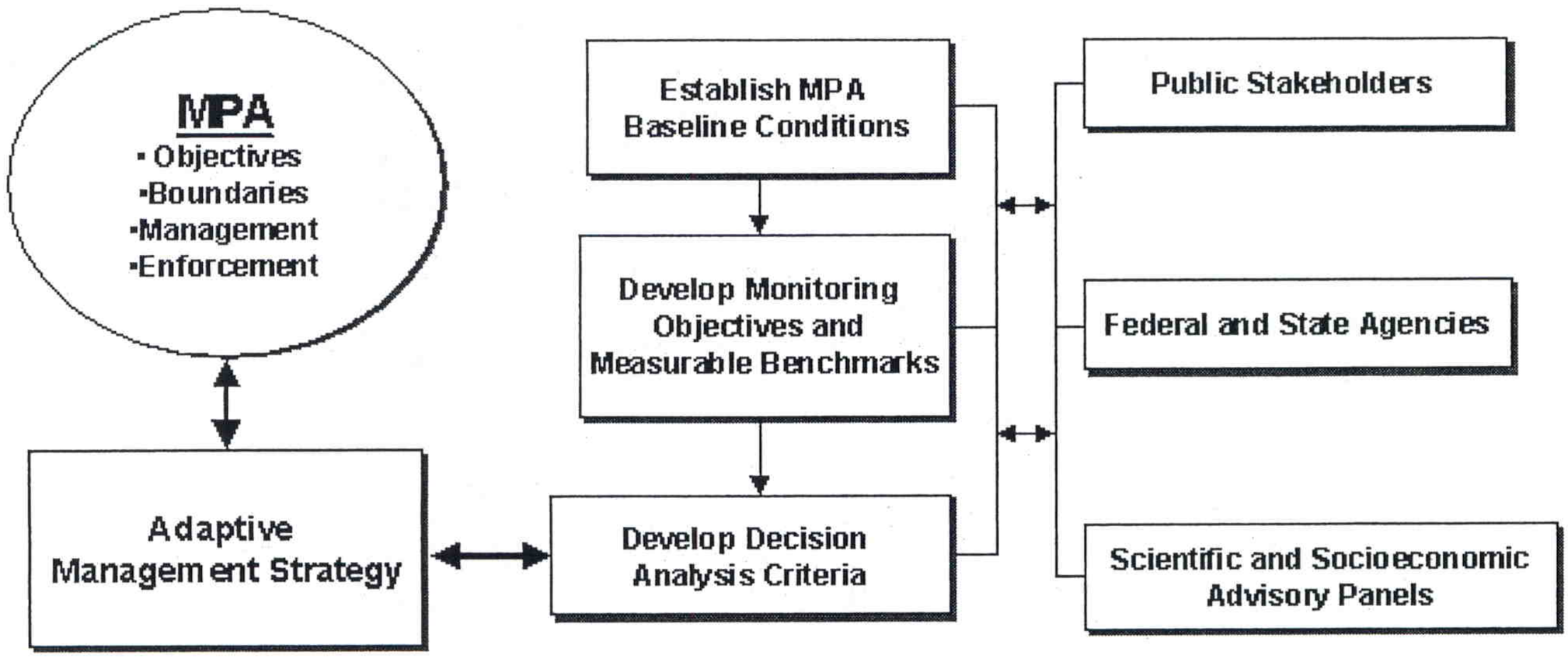


Figure 10. Phase III - MPA adaptive management process. The goal of Phase III is to evaluate MPA effectiveness and allow for changes in management to further advance site objectives. Source: ADF&G 2002 and NRC 2001.

of management and enforcement plans for the candidate MPA. The final step of the phase is to formally designate the candidate site as an MPA.

Phase III, as depicted in Figure 10 above occurs after designation and provides an adaptive process for management of the MPA. The goal is to evaluate the effectiveness of the reserve and allow for changes in management, particularly if site conditions change. Again, the public, federal and stage agencies, and experts in the subject matter have an opportunity to provide input throughout all steps in the process. The development of the adaptive management strategy should be viewed as a continuous, reciprocal process, where feedback from the existing strategy is provided to decision-makers and stakeholders through an interactive process.

Another goal of Alternative 3, as illustrated by FMP 3.1, is to evaluate the impacts of all gear on habitat through the implementation of a comprehensive research plan. A comprehensive research program would provide data on the following:

- Habitat type and structure,
- Productivity and biodiversity,
- Habitat recovery,

- Effects of fishing, and

- Effects of other human induced impacts such as pollution.

For example, a research program designed to provide regional shoreline information on habitat type would serve fishery managers and the public well by providing scientific information necessary to produce a regional marine habitat atlas. Such an atlas would allow scientists to more fully evaluate the impacts of fishing on habitat type and determine appropriate mitigation measures.

5.2 Effects of EFH/MPA Management Measures of FMP Bookend 3.1

The impacts of the FMP 3.1 closure areas on the biological, physical, and social and economic environments are the same as those for the current FMPs under Alternative 1:

- While non-living substrates and features such as boulders, cobbles, and sand waves can be disturbed by bottom trawls, in most cases the structural integrity and complexity of the habitat would not be greatly reduced (NMFS 2001a).

- The primary focus of the closures is protection of crab habitat and SSL critical habitat. These habitats are generally relatively shallow; thus, the closures do not encompass a wide range of habitat types and depths. A higher percentage of no-take marine reserves would provide a wider range of protection for EFH from disturbances caused by all gear at all times.

- Since the closed areas result in greater distances between ports and open fishing grounds and require fishing further offshore, vessels would incur an increased risk of accidents and injury (NMFS 2001b).

Should the methodology developed under this FMP illustration provide for additional closures or specific gear restrictions, additional protection for habitat, prohibited species, and marine mammals could be realized.

5.3 Overview of EFH/MPA Management Measures of FMP Bookend 3.2

FMP bookend 3.2 provides an alternative FMP that could be implemented under the Alternative 3 policy. For example, it designates 0 to 20 percent of the BSAI and GOA as no-trawl MPAs and no-take marine reserves (e.g., 5 percent = no-take, 15 percent = no-trawl MPA) across a range of habitat types. The management regime would also designate no-take marine reserves to serve as research control areas; these areas could encompass existing closures. There are many possible permutations of this type of FMP that would vary both MPAs and the establishment of no-take reserves. For analysis purposes, Figure 11 has been developed to provide one illustration of the many scenarios possible under FMP 3.2; Table 7 provides descriptive statistics for the illustration.

As shown in Table 7 and Figure 11, the FMP 3.2 would close 47.8 percent of the fishable area covered by the FMPs in the BSAI and GOA combined. This area would be closed to bottom contact trawling (non-pelagic) or other fishing for at least part of the year. Of this 47.8 percent, 8.2 percent is designated as

no-take marine reserves closed to all fishing year-round. As shown in Table 7, bottom contact trawl closures in the GOA total 72 percent of the fishable area at one time or another with almost 14 percent of the fishable area designated as no-take marine reserves. The largest percentage of GOA closures takes place in the Eastern Gulf, where 92.2 percent of the fishable area is closed at one time or another with about 5 percent designated as no-take marine reserves. In the central and western Gulf, seasonal and other restrictions close about 66 percent of the fishable area, with about 17 percent designated as no-take marine reserves. Comparatively, nearly 80 percent of the Aleutian Islands is closed to bottom trawling for at least part of the year, with about 19 percent designated as no-take marine reserves. In the Bering Sea nearly 33 percent of the fishable area is closed at one time of year or another to various fishing gears, with about 4 percent designated as no-take marine reserves.

FMP bookend 3.2 breaks out percentages for two additional restricted areas:

- SSL No-Trawl MPA, where trawling for pollock, Pacific cod, and Atka mackerel (SSL prey species) is not allowed, but fishing by other methods for these fish, and fishing by all methods for other fish such as rockfish and flatfish is allowed. In the BSAI and GOA, these areas account for about 2 percent and 10 percent of the fishable area, respectively.

- SSL No Hook-and-Line, Pot, or Trawl MPA, where no fishing by any method is allowed for the sea lion prey species, but fishing by all methods for other species is allowed. These areas comprise nearly 7 percent of the fishable area in the BSAI and nearly 22 percent in the GOA.

Percentages for these closure areas, which are considered MPAs but do not meet the definition of no-take marine reserves, are shown in Table 7.

5.4 Effects of EFH/MPA Management Measures of Bookend 3.2

Effects on the Physical Environment

As described under Alternative 1 and FMP 3.1, the existing closure areas in the BSAI and GOA approach 20 percent coverage of the fishable area. However, the FMP 3.1 (existing) closures are not necessarily year-round and may not restrict all gear and protect all habitat types. The FMP 3.2 bookend illustrates a different management regime where an MPA program is established with a minimum amount of the fishable area designated either as a no-trawl or no-bottom contact MPA or a no-take reserve. It is predicted that there would be fewer impacts on the substrate under this regime, since more area would be closed to bottom contact, and a greater percentage of fishable area would be designated as no-take marine reserves.

Effects on the Biological Environment

<u>EFH - Benthic Biodiversity</u>

This FMP scenario has the potential for increased protection for EFH since it strives to protect a broader range of habitats, substrates, and depths. At present, much of the closed areas is used to protect prohibited species such as crab and halibut, or for sea lion critical habitat. Many of these areas require only seasonal closures or closures only when certain bycatch triggers are reached.

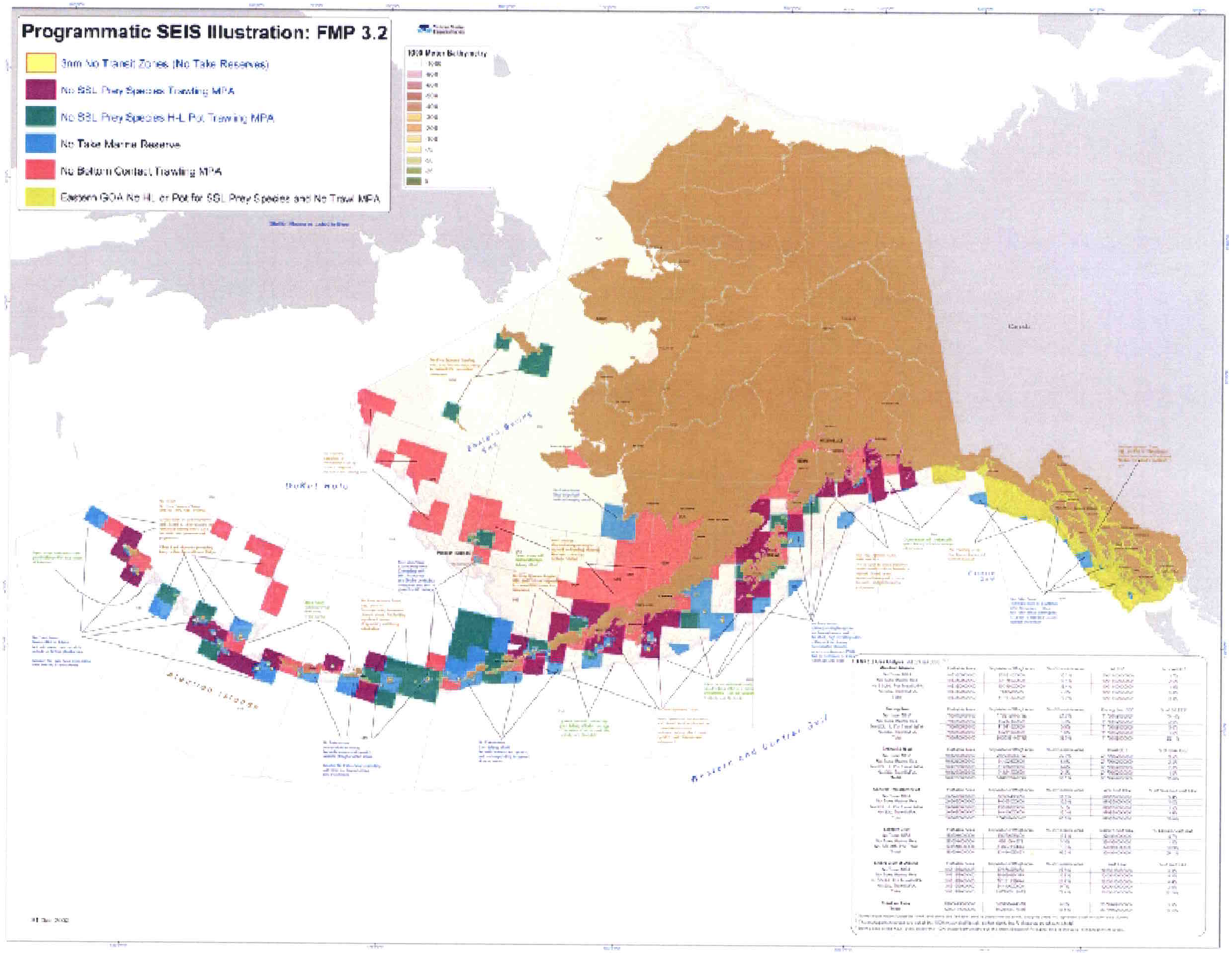


Figure 11. Closure Areas for FMP Bookend 3.2.

Table 7. Descriptive statistics for closure areas under FMP scenario 3.2.

Current 2002 Trawling Closures[1 2 3 4]			
	Fishable area (in square kilometers [km^2])	Management area (km^2)	Percentage (%) of fishable area closed
Aleutian Islands (AI)			
No trawl marine protected area (MPA)	105,380,000,000	37,021,000,000	35.1%
No take marine reserve	105,380,000,000	20,175,000,000	19.1%
No Steller sea lion (SSL) hook and line (HL) pot trawl MPA	105,380,000,000	19,345,000,000	18.4%
No SSL trawl MPA	105,380,000,000	7,650,200,000	7.3%
Total	105,380,000,000	84,166,200,000	79.9%
Bering Sea (BS)			
No trawl MPA	798,870,000,000	170,212,365,792	21.3%
No take marine reserve	798,870,000,000	34,247,800,000	4.3%
No SSL HL pot trawl MPA	798,870,000,000	41,941,000,000	5.3%
No SSL trawl MPA	798,870,000,000	14,231,000,000	1.8%
Total	798,870,000,000	260,632,165,792	32.6%
Entire BS & AI			
No trawl MPA	904,250,000,000	207,233,365,792	22.9%
No take marine reserve	904,250,000,000	54,422,800,000	6.0%
No SSL HL pot trawl MPA	904,250,000,000	61,286,000,000	6.8%
No SSL trawl MPA	904,250,000,000	21,881,200,000	2.4%
Total	904,250,000,000	344,798,365,792	38.1%
Central \ Western Gulf - west of 144°			
No trawl MPA	265,690,000,000	82,306,490,050	31.0%
No take marine reserve	265,690,000,000	44,057,000,000	16.6%
No SSL HL pot trawl MPA	265,690,000,000	13,529,000,000	5.1%
No SSL trawl MPA	265,690,000,000	34,410,000,000	13.0%
Total	265,690,000,000	174,302,490,050	65.6%
Eastern Gulf - east of 144°			
No trawl MPA	90,509,000,000	15,070,038,000	16.7%
No take marine reserve	90,509,000,000	4,811,664,379	5.3%
No SSL HL pot trawl	90,509,000,000	63,602,319,644	70.3%
Total	90,509,000,000	83,484,022,023	92.2%
Entire Gulf of Alaska			
No trawl MPA	356,199,000,000	97,376,528,050	27.3%
No take marine reserve	356,199,000,000	48,868,664,379	13.7%
No SSL HL pot trawl MPA	356,199,000,000	77,131,319,644	21.7%
No SSL trawl MPA	356,199,000,000	34,410,000,000	9.7%
Total	356,199,000,000	257,786,512,072	72.4%
Totals			
Total no take	1,260,449,000,000	103,291,464,379	8.2%
Total FMP Area	1,260,449,000,000	602,584,877,865	47.8%

1 Some areas extend past the shelf and since the fishable area is based on the shelf, analysis does not represent total fishable area closed.

2 The management areas are cut at the 1,000 meter shelf break but for clarity the AI closures are shown in total.

3 Bering Sea areas have been cut by the 1,000 meter bathymetry but the Bogoslof Foraging and small surrounding areas are included in management areas.

4 Since the Eastern Gulf does not contain SSL Protection Measures, combined GOA area calculations must be read carefully.

Under the Alternative 3 policy, no-take marine reserves could be established across a broad range of habitat types and water depths. These reserves would prohibit all commercial groundfish fishing year-round. FMP Bookend 3.2 illustrates one application where, in addition to no-take reserves, 47.8 percent of the fishable area would be closed to bottom trawling and or other gear for at least part of the year. Of this percentage, 8.2 percent is designated as no-take marine reserves (see Table 7). While the existing closures total about 29 percent of fishable area in the GOA and BSAI combined (see Table 2), which is more than the actual percentage defined by the Alternative 3 policy, these closures are generally trawl limitations enacted to protected specific prohibited species and SSLs rather than broadly protecting EFH. The existing FMP designates less than 1 percent of the fishable area as no-take reserves. Therefore, the more-focused, year-round closures recommended under FMP 3.2 are likely to benefit EFH by offering protection to a larger portion of the continental shelf compared to FMP 3.1, and by decreasing bottom contact from all gear types.

EFH - HAPC

As shown in Figure 11 and Table 7, FMP 3.2 illustrates an FMP where additional closure areas are used in the deeper waters that encompass the outer continental shelf and upper slope of the central and western GOA and BSAI. These deep water areas contain bottom features that have been found to be associated with juvenile rockfish. The Aleutian Islands region, in particular, is an area with high habitat complexity and high abundance and diversity of coral species (Heifetz 2002). This area would receive considerable protection under FMP 3.2.

Bottom trawl closures are, in many cases, not year-round and do not restrict fixed gear use under FMP 3.1 as well as under the current FMPs (Alternative 1). In some cases, scientific studies have shown that fixed-gear adversely impacts HAPC. Some specific geographic areas with sensitive habitat (e.g., gorgonian corals) are probably the most susceptible to fixed-gear impacts. Under FMP 3.2, there would be additional areas closed to all fishing year-round compared to FMP 3.1. These no-take marine reserves would provide protection of HAPC from disturbances caused by all gear at all times. While this FMP bookend still provides potential for moderate-to-substantial trawling effort in areas with high concentrations of HAPC species, the effects of disturbance to HAPC are offset in this FMP by year-round closures to all fishing across a broad range of habitats, along with reductions in TAC, so fishing effort does not merely move to and concentrate in another, possibly sensitive, area.

Target, Non-Target, Forage Fish, and Prohibited Species

Under the FMP bookend 3.2 the existing closure areas in the BSAI and GOA that generally have been designated to protect various prohibited species would remain in place and would be supplemented by additional no-trawl MPAs and no-take marine reserves. These closures may indirectly provide benefits to target and non-target species by protecting juveniles and important habitat. The use of additional, year-round no-take marine reserves could likely also provide benefits to prohibited species and forage fish.

Marine Mammals

The additional no-take marine reserves defined by FMP 3.2 would benefit marine mammals by lessening direct impacts (mortality, direct disturbance) and indirect impacts (loss of prey).

Seabirds

None of the closure areas currently in place are specifically designed to protect or enhance seabird populations. However, the additional near-shore closures proposed under FMP 3.2 may directly benefit seabirds by reducing the incidence of direct mortality due to seabird/vessel collisions and inadvertent take of seabirds by fishing vessels. Also any beneficial effects for this FMP on forage fish could indirectly benefit seabirds. Additional discussions on the impacts of this scenario on seabirds are found in the Seabird Qualitative Impact Assessment (see Appendix F-6).

Effects on the Social and Economic Environment

Under policy Alternative 3 as illustrated by FMP 3.2, average costs per unit of catch for catcher vessels can be expected to increase (NMFS 2001a). Spatial displacement of fishing effort due to the extensive closure areas could lead to increased operating costs for vessels. The spatial displacement of fishing effort would be large for some bottom trawl fisheries. Operating costs would be increased as vessels travel further to harvest fish and may be required to fish in less productive areas in some cases.

It is reasonable to assume that, subject to regulatory constraints, harvesters target catch with the gear that maximizes its value either by increasing the quality of the fish or by decreasing the harvesting costs, or both. Therefore, the replacement of several bottom trawl fisheries with pelagic trawl and fixed-gear fisheries would result in an increase in cost per unit of catch. Preemption of some fishery sectors is possible as catch is shifted toward larger vessels and the plants to which they deliver fish (NMFS 2001a).

Alternative 3 as illustrated by FMP 3.2 could produce impacts beyond reducing profits in the harvest and processing sectors. Reductions in production of several different products could result in higher prices and a loss of consumer surplus to the American public; however, individual effects could be mitigated by increased production of other seafood products.

As compared to FMP 3.1 and Alternative 1 (existing closures under the current FMPs), the closed areas under FMP 3.2 could result in possibly greater distances between ports and open fishing grounds and require fishing even further offshore. Smaller catcher vessels based out of the Alaska Peninsula, Aleutian Islands, and Kodiak communities would have to travel further to fish, requiring more time, incurring more costs, potentially reducing the quality of the catch, and exposing the vessels to additional risks due to hazardous weather conditions. Therefore, the closures would favor larger vessels over small. These effects could be mitigated somewhat if Individual Fishing Quotas (IFQs) for local fishermen were allowed in certain nearshore areas.

Positive impacts of the policy Alternative 3 closures as illustrated by FMP 3.2 include benefits to non-market issues such as existence values and eco-tourism. While estimates of non-consumptive and non-use values for various levels of the BSAI and GOA ecosystems are not available, it can be assumed that the closures under the existing FMPs serve to enhance these values to an unknown extent. Since the closures illustrated under FMP 3.2 provide additional protection to habitat, an additional benefit above that achieved from the status quo is assumed.

Effects on the Ecosystem

The FMP 3.2 illustration could change predator-prey relationships by providing additional areas that would be totally closed to fishing. The no-take marine reserves would provide areas where prey populations would not be disturbed and could therefore benefit predators (NMFS 2001a). Reducing the disturbance of benthic prey through bottom trawling would provide a less disturbed prey base for benthic feeding animals. Scavenging animals that presently benefit to some degree from trawls that expose benthic prey would experience a decline; however, the actual magnitude of the positive benefits to non-scavenging predators is not known. Changing the selectivity toward gear that removes older fish would reduce energy flow at higher trophic levels which would shorten the food chain and decrease the lifespan of organisms. However, since there would be little change in the trophic level of the catch under FMP 3.2 relative to trophic level of biomass, fishing-down effects on the food web is not predicted.

FMP 3.2 could provide an unknown level of protection for species-level diversity since many benthic invertebrates that are vulnerable to high levels of mortality through gear impacts would be protected. The policy alternative, as illustrated by FMP 3.2, would provide additional protection to benthic trophic guilds that supply prey to many groundfish species (NMFS 2001a).

Effects on Management and Enforcement

The requirement that all vessels participating in the Atka mackerel, Pacific cod, or pollock directed fisheries carry an operable, approved VMS transmitter would continue under the FMP 3.2 bookend. VMS data provide real-time information on vessel location and indicate fishing activity and would be essential for enforcement under this bookend, which incorporates a complicated patchwork of closure areas and seasonality. The VMS reporting system is discussed further in the Data and Reporting Requirements Qualitative Impact Assessment.

The Observer Program, which is also discussed in detail in a separate paper, would also continue under this bookend and would be extended to include 100 percent of vessels over 60 ft. The additional coverage would help to ensure that these larger vessels are not fishing in closed areas.

Section 6 Alternative 4 – Adopt a Highly Precautionary Management Policy

6.1 Overview of EFH/MPA Management Measures of FMP Bookend 4.1

This FMP component illustrates a plan that designates 20 to 50 percent of the management area as no-take reserves covering the full range of marine habitats. The emphasis is on closing areas where impacts of fishing are unknown due to insufficient data. Additional areas could be opened when information is available to show no or negligible impacts from fishing. There are many possible ways to apply a 20 to 50 percent rule. Each would vary the location and geographical extent of the seasonal closure areas and no-take reserves. For analysis purposes, Figures 12 and 13 depict the Alternative 4 policy as described by FMP 4.1. Figure 12 depicts the closures in a monochromatic scheme in order to emphasize the total area closed and the concept that all areas are closed (purple) until available information regarding impacts allows them to join areas which are already open to fishing (white). Figure 13 depicts the closure areas using the same color scheme that was used for the other FMPs.

Table 8 provides the descriptive statistics for the FMP 4.1 illustration. As shown, this FMP scenario would close 51.1 percent of the fishable area in the BSAI and GOA combined to trawling for at least part of the year. Under this illustration, in the combined BSAI and GOA 28.5 percent of fishable area would be designated as no-take marine reserves, closed to all fishing year-round. In the BSAI nearly 40 percent of the fishable area would be closed to trawling at some point during the year, with about 25 percent designated as no-take marine reserves. The majority of the closed areas would occur in the GOA where just over 80 percent of the fishable area would be closed to trawling at one time or another. This is due to the relatively limited continental shelf and slope in the GOA, and the higher abundance of vulnerable habitat in that region. No-take marine reserves covering about 38 percent of the fishable area would be designated in the GOA.

6.2 Effects of EFH/MPA Management Measures of FMP Bookend 4.1

Effects on the Physical Environment

As described above, the existing closure areas in the BSAI and GOA approach 30 percent coverage of the fishable area (e.g., continental shelf and slope to 1,000 m water depth) (See Table 2.) However, the existing closures are not necessarily year-round and may not include all gear and habitat types. FMP 4.1 would close additional, deeper areas to trawling and establishes a higher percentage of no-take marine reserves. Therefore, benthic substrates across a wide range of depths and habitats should be protected from impacts due to bottom contact gear.

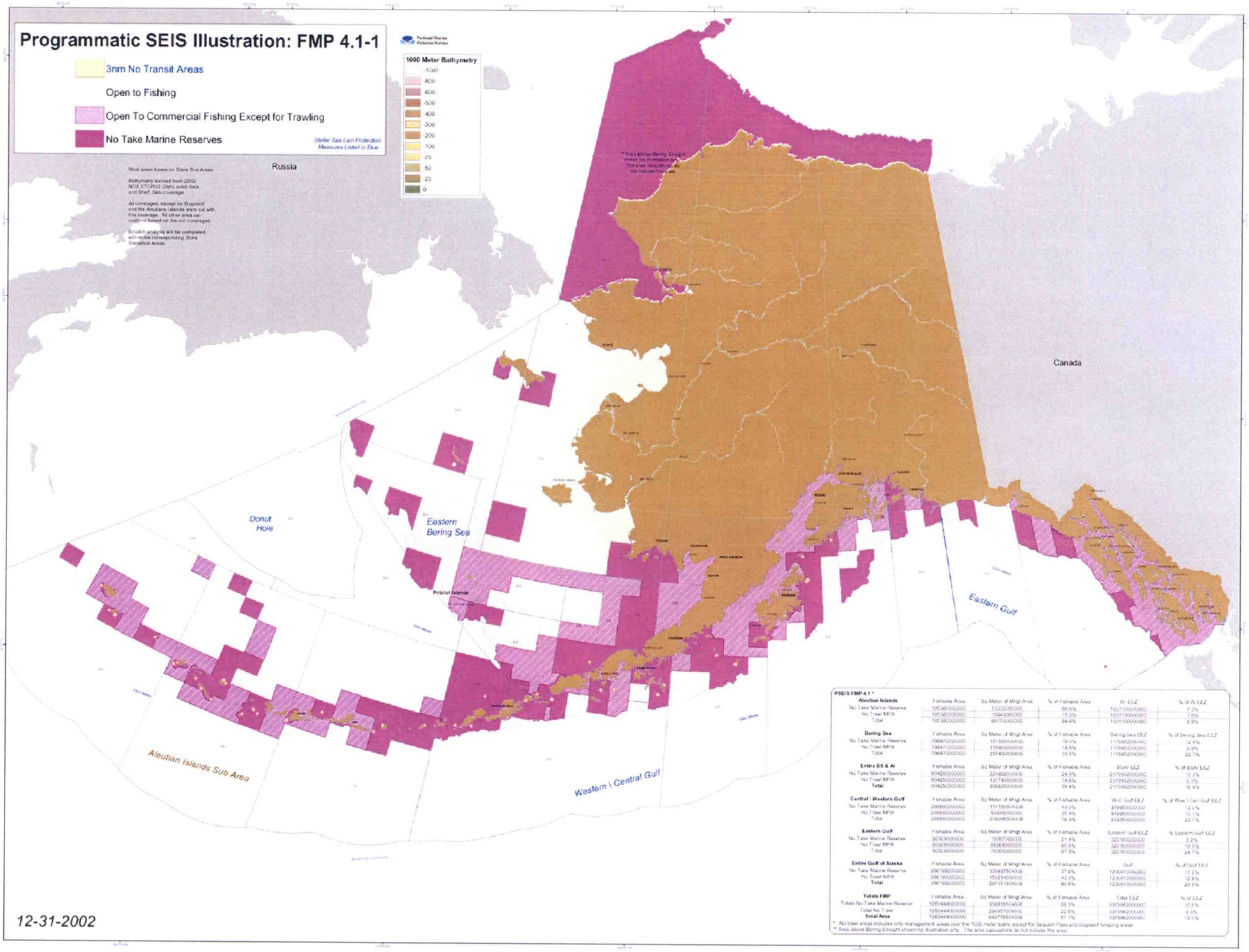


Figure 12. Closure Areas of FMP Bookend 4.1 (monochrome).

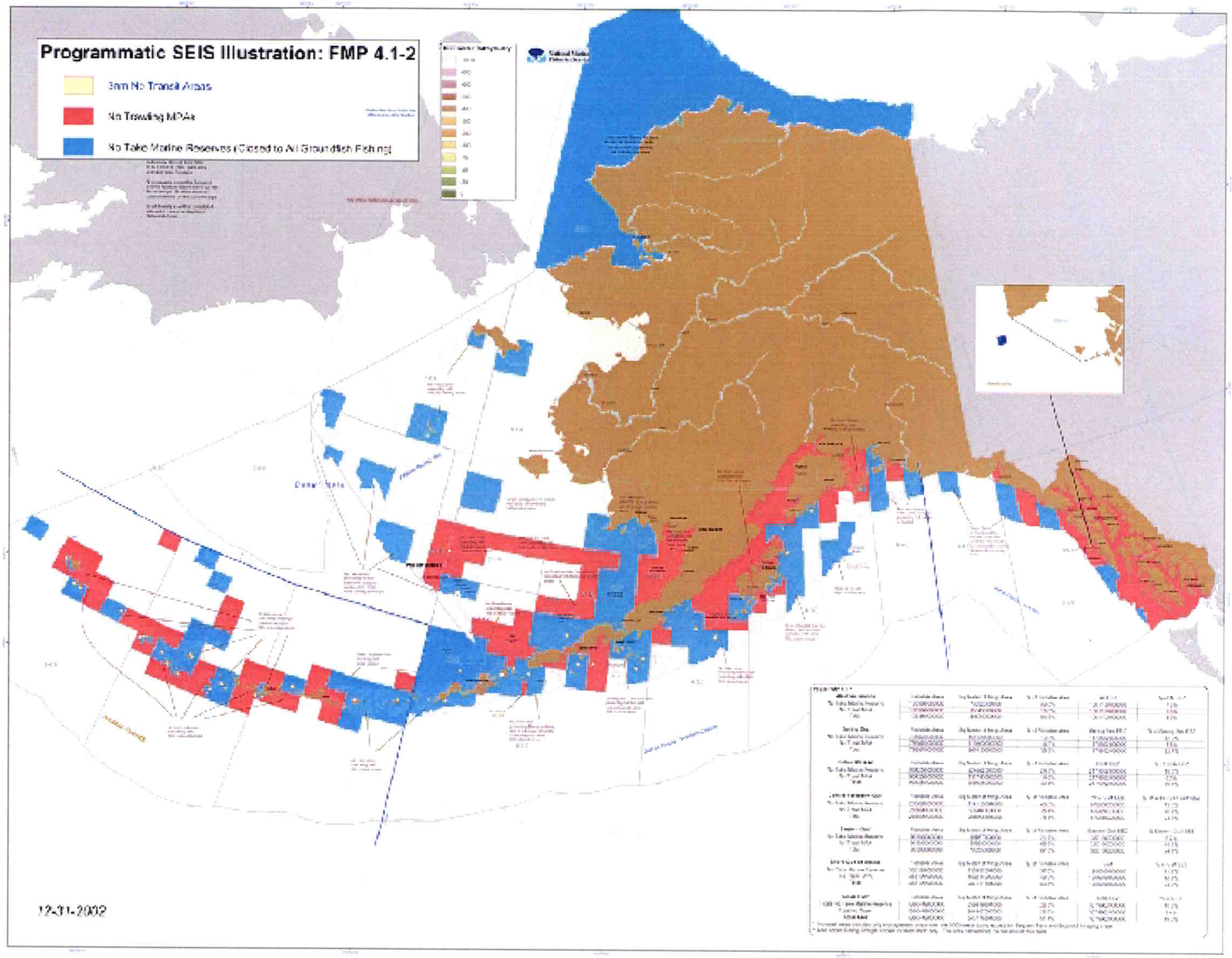


Figure 13. Closure Areas of FMP Bookend 4.1 (full color).

Table 8. Descriptive statistics for closure areas under FMP scenario 4.1.

Current 2002 Trawling Closures [1]			
	Fishable area (in square kilometers [km^2])	Management area (km^2)	Percentage (%) of fishable area closed
Aleutian Islands (AI)			
No take marine reserve	105,380,000,000	73,332,000,000	69.6%
No trawl marine protected area (MPA)	105,380,000,000	15,843,000,000	15.0%
Total	105,380,000,000	89,175,000,000	84.6%
Bering Sea (BS)			
No take marine reserve	798,870,000,000	151,550,000,000	19.0%
No trawl MPA	798,870,000,000	115,900,000,000	14.5%
Total	798,870,000,000	267,450,000,000	33.5%
Entire BS & AI			
No take marine reserve	904,250,000,000	224,882,000,000	24.9%
No trawl MPA	904,250,000,000	131,743,000,000	14.6%
Total	904,250,000,000	356,625,000,000	39.4%
Central \ Western Gulf - west of 144°			
No take marine reserve	265,690,000,000	114,150,504,308	43.0%
No trawl MPA	265,690,000,000	93,946,000,000	35.4%
Total	265,690,000,000	208,096,504,308	78.3%
Eastern Gulf - east of 144°			
No take marine reserve	90,509,000,000	19,787,000,000	21.9%
No trawl MPA	90,509,000,000	59,268,000,000	65.5%
Total	90,509,000,000	79,055,000,000	87.3%
Entire Gulf of Alaska			
No take marine reserve	356,199,000,000	133,937,504,308	37.6%
No trawl MPA	356,199,000,000	153,214,000,000	43.0%
Total	356,199,000,000	287,151,504,308	80.6%
Totals			
Totals no take	1,260,449,000,000	358,819,504,308	28.5%
Total no trawl	1,260,449,000,000	284,957,000,000	22.6%
Total FMP Area	1,260,449,000,000	643,776,504,308	51.1%

1 No trawl areas include only management areas over the 1,000-meter bathymetry, except for Seguam Pass and Bogoslof foraging areas

Effects on the Biological Environment

EFH - Benthic Biodiversity

As with FMP ,3.2 this FMP bookend has the potential for additional benefits to accrue to benthic organisms (biodiversity) and EFH, especially since a broad range of habitats, substrates, and depths are protected (see Figure 11). The illustrated closures are more extensive and more focused than current management regimes. FMP 4.1 would close nearly 29 percent of the fishable area to all fishing on a year-round basis. In addition, the concept that areas be closed until adequate information regarding impacts can be collected to determine whether areas should be opened constitutes a paradigm shift in the way the groundfish fishery has been managed. The extensive designation of no-take marine reserves, along with the change in management concept, is likely to greatly benefit EFH by expanding the amount of benthic areas closed to bottom contact gear.

EFH - HAPC

As shown on Figure 13 and Table 8, FMP 4.1 provides for additional closure areas in the deeper waters of the outer continental shelf and upper slope of the central and western GOA and BSAI. The Aleutian Islands region, in particular, is an area with high habitat complexity and high abundance and diversity of coral species (Heifetz 2002).

The existing closures to bottom trawling are in many cases not year-round, and do not restrict fixed gear use. In some cases, fixed-gear may adversely impact HAPC. Some specific geographic areas with sensitive habitat (e.g., gorgonian corals) are probably the most susceptible to fixed-gear impacts. FMP 4.1 provides for additional closure areas in deeper waters of the outer continental shelf and upper slope. Many of these areas encompass high habitat complexity and high abundance of HAPC. There would be extensive areas closed to all fishing year-round. These no-take marine reserves would provide protection to HAPC from disturbances caused by the groundfish fishery. Under this bookend there is minimal potential for substantial trawling efforts in areas with high concentrations of HAPC species, and along with fishery-specific reductions in TAC, fishing effort is unlikely to move to and concentrate in another area. These combinations of effects will likely benefit HAPC in the BSAI and GOA under this bookend.

Target, Non-Target, Forage Fish, and Prohibited Species

Under FMP bookend 4.1, the closure areas in place in the BSAI and GOA that have been designated to protect various prohibited species would continue. These closures may also provide indirect benefits to target, non-target, and forage fish species. Additional year-round no-take reserves defined by FMP 4.1 will likely provide additional benefits to these species. The existing low volume of incidental catch of forage fish currently observed under the existing FMPs could go even lower under FMP 4.1 due to the extensive closures and reduction in TACs.

Marine Mammals

The additional no-take reserves, as illustrated by FMP 4.1, would likely benefit marine mammals by lessening direct (mortality, direct disturbance) and indirect (loss of prey) effects caused by the groundfish fishery.

Seabirds

None of the closure areas currently in place is specifically designed to protect or enhance seabird populations. However, the additional near-shore closures proposed under FMP 4.1 may directly benefit seabirds by reducing the incidence of direct mortality due to seabird/vessel collisions and inadvertent take of seabirds by fishing vessels. Also any beneficial effects for this FMP on forage fish could indirectly benefit seabirds. Additional discussions on the impacts of this scenario on seabirds are found in the Seabird Qualitative Impact Assessment (see Appendix F-6).

Effects on the Social and Economic Environment

Policy Alternative 4 as illustrated by FMP 4.1 closes large areas of the BSAI and GOA to groundfish fishing. The closures would produce socioeconomic effects that vary by industry sector (catcher vessel, catcher processor, and inshore processor), fishery, and region. While these effects are quantified and discussed in detail in Chapter 4 of the Programmatic SEIS, a brief qualitative discussion is provided herein.

Due to longer transit times to reach open areas, the closures illustrated under FMP 4.1 decrease catch and increase the cost of harvesting a given amount of fish. As described for FMP 3.2, the extensive closure areas would lead to spatial displacement of fishing effort. The spatial displacement of fishing effort would be large for some bottom trawl fisheries. Operating costs would be increased as vessels travel further to harvest fish and may be required to fish in less productive areas in some cases. Under the illustration, average costs per unit of catch would be expected to rise dramatically while fixed costs (e.g., general office and accounting costs, vessel maintenance, and insurance) would be spread over a much smaller total catch (NMFS 2001a). However, the major reductions in catches should also result in increasing abundance of the affected fish stocks, which might eventually tend to increase catch rates. The greatest impact would be on trawl and pot catcher vessels, but hook-and-line catcher vessels would also be subject to substantially increased costs per unit of catch.

Trawl catcher vessels less than 60 ft would likely be the hardest hit by the closures illustrated under FMP 4.1. These vessels, which because of their size fish almost exclusively in nearshore waters in the GOA, would lose a substantial amount of groundfish revenue (NMFS 2001a). Because the open areas are farther from shore than the areas typically fished by trawl catcher vessels less than 60 ft, it is likely that they will not be able to fish at the same relative level as in the past. Even though these vessels are relatively diversified between groundfish and non-groundfish, their reliance on pollock and Pacific cod in the GOA makes them vulnerable to the closures and other components of the FMP 4.1 bookend.

The closures illustrated under FMP 4.1 result in greater distances between ports and open fishing grounds and require fishing further offshore. Smaller catcher vessels based out of the Alaska Peninsula, Aleutian Islands, and Kodiak communities would have to travel further to fish, requiring more time, incurring more costs, potentially reducing the quality of the catch, and exposing the vessels to additional risks due to hazardous weather conditions. These effects could be mitigated somewhat if IFQs for local fishermen were allowed in certain nearshore areas.

Variable costs for inshore processors and motherships are also likely to increase. The total average costs per unit of production would rise, and it is possible that they would exceed the value of production and lead to a shutdown or permanent closing of some processing plants, motherships, and catcher processors.

Alternative 4 as illustrated by FMP 4.1 would produce impacts beyond reducing profits in the harvest and processing sectors. Reductions in production of several different products would result in significant decreases in supply of groundfish to the domestic market. The supply of surimi for the domestic market and other products might also be reduced. This would result in higher prices and a loss of consumer surplus to the public.

Positive impacts of the Alternative 4 closures as illustrated by FMP 4.1 include benefits to non-market issues such as existence values and eco-tourism. While estimates of non-consumptive and non-use values for various levels of the BSAI and GOA ecosystems are not available, it can be assumed that the closures under the existing FMPs would serve to enhance these values to an unknown extent. Since the closures illustrated under FMP 4.1 provide extensive protection to habitat, an additional benefit above that achieved from the status quo and FMP 3.2 could be assumed.

Effects on the Ecosystem

As described above for the FMP 3.2 bookend, the extensive seasonal closures and no-take areas proposed under FMP 4.1 will benefit a wide range of habitats. While the percentages of shelf/slope afforded some level of protection are similar between FMPs 4.1 and 3.2, FMP 4.1 establishes more of the shelf/slope as no-take marine reserve. FMP 3.2 has most of the protected areas in MPAs (trawl restrictions). The no-take marine reserves would provide areas where prey populations would not be disturbed and could therefore benefit predators (NMFS 2001a). Reducing the disturbance of benthic prey through bottom trawling would provide a less disturbed prey base for benthic feeding animals. Also, habitat in the no-take marine reserves would be protected from continuing impacts and could recover from past fishing-related disturbances. The potential benefits of such closures include protection of ecosystem structure across the food web.

FMP 4.1 would provide an additional level of protection over FMP 3.2 for species-level diversity since many benthic invertebrates that are vulnerable to high levels of mortality through gear impacts would be protected. Therefore the policy alternative, as illustrated by FMP 4.1, would provide additional protection to benthic trophic guilds that supply prey to many groundfish species (NMFS 2001a).

Effects on Management and Enforcement

The 4.1 bookend requires that all groundfish vessels carry an operable, approved VMS transmitter. This FMP scenario would expand the existing VMS requirements that mandate the system in the pollock, Pacific cod, and Atka mackerel fisheries by requiring all groundfish vessels to use VMS. VMS data provide real-time information on vessel location and indicate fishing activity and are essential for enforcement under this FMP. The VMS reporting system is discussed further in the Data and Reporting Requirements Qualitative Impacts Analysis (see Appendix F-11).

6.3 Overview of EFH/MPA Management Measures of FMP Bookend 4.2

The FMP 4.2 bookend establishes initial closure areas at 100 percent (i.e., no fishing). Areas could be open to specific fisheries only after review and certification that the fishery would have no significant adverse impacts on the environment. This FMP would require use of scientific information to determine what revisions might be appropriate to mitigate any adverse effects. Figure 14 and Table 9 illustrate a no-fishing scenario until fisheries are certified and issued fishery-specific regulations.

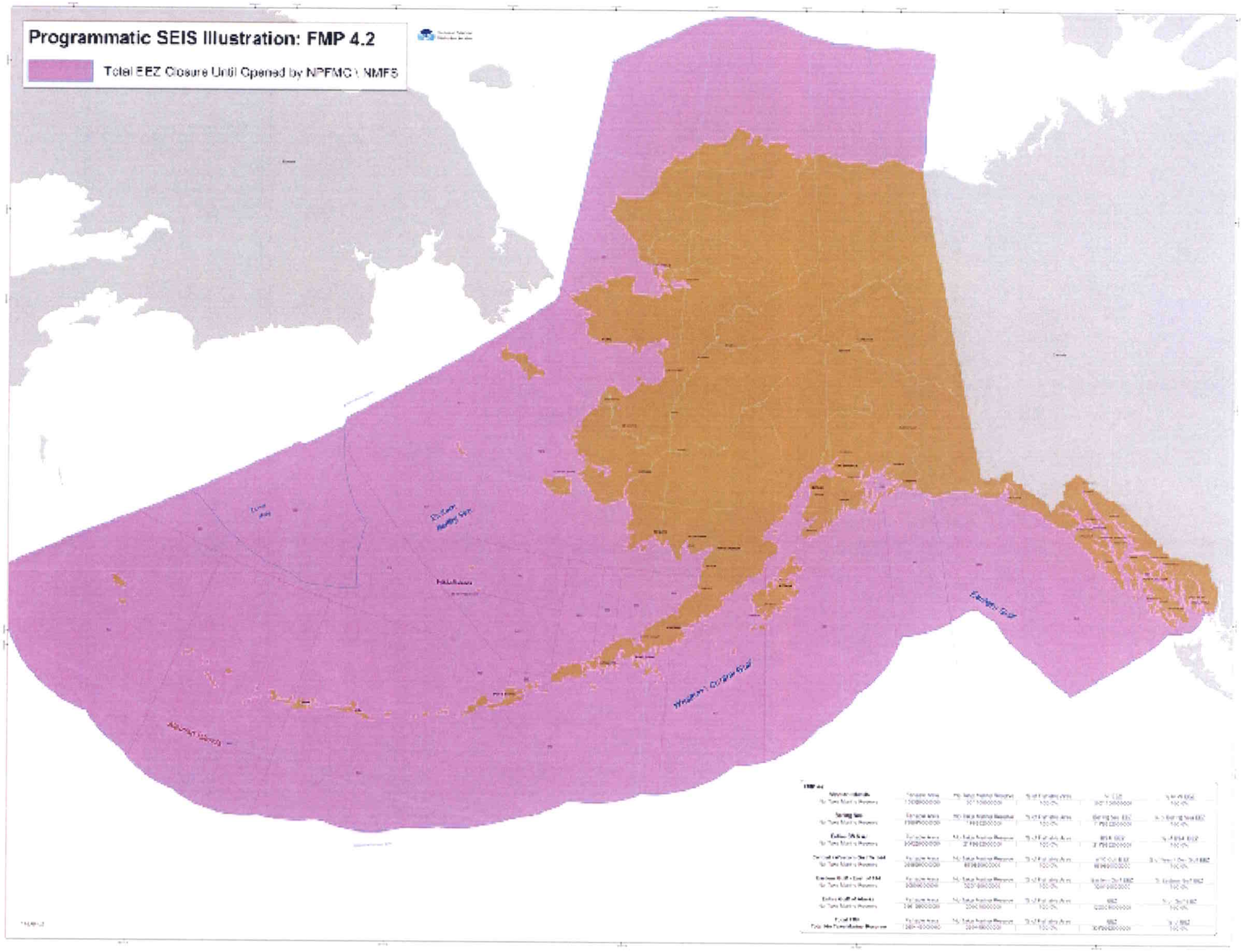


Figure 14. Closure Areas for FMP Bookend 4.2.

Table 9. Descriptive statistics for closure areas under FMP scenario 4.2.

	Fishable area (in square kilometers [km^2])	No take marine reserve (km^2)	Percentage (%) of Fishable area closed
Aleutian Islands (AI)			
No take marine reserve	105,380,000,000	1,001,100,000,000	100.0%
Bering Sea (BS)			
No take marine reserve	798,870,000,000	1,178,852,000,000	100.0%
Entire BS & AI			
No take marine reserve	904,250,000,000	2,179,952,000,000	100.0%
Central \ Western Gulf - west of 144°			
No take marine reserve	265,690,000,000	879,850,000,000	100.0%
Eastern Gulf - east of 144°			
No take marine reserve	90,509,000,000	320,160,000,000	100.0%
Entire Gulf of Alaska			
No take marine reserve	356,199,000,000	1,200,010,000,000	100.0%
Total FMP			
Total no take area - fishable	1,260,449,000,000	3,379,962,000,000	100.0%
Total no take area - Exclusive Economic Zone (EEZ)	1,260,449,000,000	3,379,962,000,000	100.0%

6.4 Effects of EFH/MPA Management Measures of FMP Bookend 4.2

Effects on the Physical Environment

Under this scenario, there would be no negative impacts from fishing on the physical environment in the short-term (up to 2 years), while the Alaska groundfish fisheries undergo the formal review and certification process.

Effects on the Biological Environment and Ecosystem

There would be no negative impacts on the biological environment during the short-term, if all groundfish fishing were suspended until review and certification. Indeed, benthic EFH and HAPC would likely benefit due to the complete removal of physical disturbance from fishery activities, and areas previously damaged from fishing activity could begin to recover. Also, there would be no bycatch of prohibited species. However, as areas are certified and open to groundfish fishing, minimal (not significant) environmental effects could be realized. The process of certification and development of fishery-specific regulations cannot be predicted; therefore, we cannot predict which areas and fisheries may be opened first or to what extent. However, since the fisheries would be slowly reinstated and regulated in a very precautionary manner, it is likely that biological and ecosystem effects would be less than those discussed above for the closures as illustrated by FMP 4.1.

Effects on the Social and Economic Environment

The impact of the initial FMP 4.2 scenario (no fishing) on the Alaska economy and on the economy of the United States would be severe. Catcher vessels would be shut down unless they could fish for species not managed under the groundfish FMPs (e.g., state fisheries, areas outside the U.S. EEZ).

Catcher processors and inshore processors would be negatively affected. For example, Dutch Harbor/ Unalaska was ranked number one both in volume and value of fish landed in the nation for 1992 through 1996 and has netted the top landings spot for 13 consecutive years. Commercial fishermen brought 834.5 million pounds of fish to the port of Dutch Harbor-Unalaska, Alaska, in 2001, making it the port with the highest volume of fish landings in the country. This port was second in the United States in commercial fishery value for 2000 and 2001 with $146 and $151 million, respectively. The Port of Dutch Harbor strongly supports the commercial fishing industry, providing moorage and offering complete fleet services. Kodiak, Alaska, was the 6th ranked port in national commercial fishery landings in both 2000 and 2001 (290 and 286 million pounds of fish, respectively) and was third in fishery value for each of those years ($98 and $74 million each year, respectively). Revenue from landings at Kodiak and Dutch Harbor and the associated support services would disappear under the no fishing scenario.

These effects would prevail until each Alaska groundfish fishery was subjected to an environmental review and, if the results of that review allowed, permitted to operate under strict guidelines. Only fisheries certified by NOAA Fisheries to have no significant adverse effects on the environment would be authorized to operate in the EEZ off Alaska. Such a review and certification process would likely take up to two years based on the length of a recent environmental review of the Alaska pollock fishery conducted by an international organization. Since it is not possible to predict the time-line and extent of certification, it is not possible to predict the overall extent of the economic and social effects. It is likely that the regulations to operate the certified fisheries would be more restrictive, at least for some time, than those illustrated under FMP 4.1. Therefore, it is likely that the social and economic impacts would be more severe than those described above for FMP 4.1, until such time that the certified fisheries and their specific regulations equaled or exceeded the illustration provided under FMP 4.1.

Effects on Management and Enforcement

By prohibiting the harvest of groundfish until fisheries could be certified, this FMP scenario would effectively suspend the need for management and enforcement of groundfish fishing activities. The NPFMC and NOAA Fisheries would still need to manage other fisheries in the EEZ and conduct needed research. This scenario would prevail until each Alaska groundfish fishery was subjected to an environmental review and, based on the results of that review, permitted to operate under strict guidelines. The review and certification process could take several years to accomplish, and could include a wide range of enforcement requirements. As fisheries become certified, a management and enforcement program would be reinitiated.

Section 7 Data Gaps and Information Needs

As stated under Alternative 1, specific impacts to habitat from different management regimes are difficult to predict. Detailed information on the distribution and abundance of habitat types, the life history of living substrates, and the natural disturbance regime is generally incomplete for Alaskan waters. It is also unclear at present how fishing affects different habitat types under a variety of circumstances. Therefore, this qualitative analysis has assumed that greater habitat disturbance is expected with less habitat protection.

With respect to groundfish fisheries prosecuted with bottom trawl gear, bycatch, unobserved damage to living structures, and alteration of non-living structures have been attributed to the bottom trawl groundfish fishery through direct observation, local research, or as a result of scientific studies conducted outside Alaska. However, information is not available to determine whether or not this mortality constitutes significant damage to EFH or HAPC in the waters off Alaska. This should be the subject of future research. It is not known how such damage to EFH and/or removals of HAPC affect the productivity of groundfish species; this requires detailed knowledge of the role that benthic organisms play in life histories of target species and the ecosystem. Such information is not available and not easily determined, particularly in a marine environment such as the BSAI and GOA.

Evaluation of the indirect effects of bottom trawling is needed (NRC 2002). The evaluation should include studying the effects of habitat fragmentation on biological communities and the resulting productivity of fish stocks; determining rates and magnitude of sediment resuspension during trawling and the response of the plankton community to the resultant nutrient regeneration; and obtaining long-term trend data on benthic production versus fisheries production.

Additional research on all gear types and their effects on local marine habitat is needed to develop predictions that link gear type and effort to bottom disturbance, fish production, and recovery times in particular habitats (NRC 2002). For example, the forces that injure and dislodge a range of benthic organisms should be identified and a determination of the relationship between fish production and bottom disturbance is needed. This information could be used to develop fishing gear that is less damaging to habitat, helps to meet other conservation goals such as reduction of bycatch and maintenance of biological communities, is economical to the fleet, and reduces the incidence of derelict fishing gears.

The introduction to this qualitative assessment described the Final Rule implementing the EFH provisions of the MSA (50 CFR Part 600), and includes a discussion of four levels of data that are necessary to describe EFH. At present for the BSAI and GOA fisheries, it is unlikely that data above Level 2 is available for a given species at a particular life history stage. In fact, for most BSAI and GOA species, only Level 1 data is available. Since the MSA mandates that Councils strive to obtain Level 4 data to describe EFH, the lack of higher level data in the groundfish fisheries is an identified, and potentially large data gap. (The data gap will be addressed in greater detail in the EFH EIS presently being prepared by NOAA Fisheries.)

An expanded research program that would seek to improve our understanding of marine habitat and its role in the health of the ecosystem is an integral component of the existing management regime (Alternative 1). Under policy Alternative 2, where we presume that commercial fisheries have no adverse environmental effects, this research program would be abandoned. Policy Alternatives 3 or 4 would place increasing

priority for this research and in the case of Alternative 4, fisheries would be suspended until the information is available.

Section 8 Comparative Analysis of the Alternatives

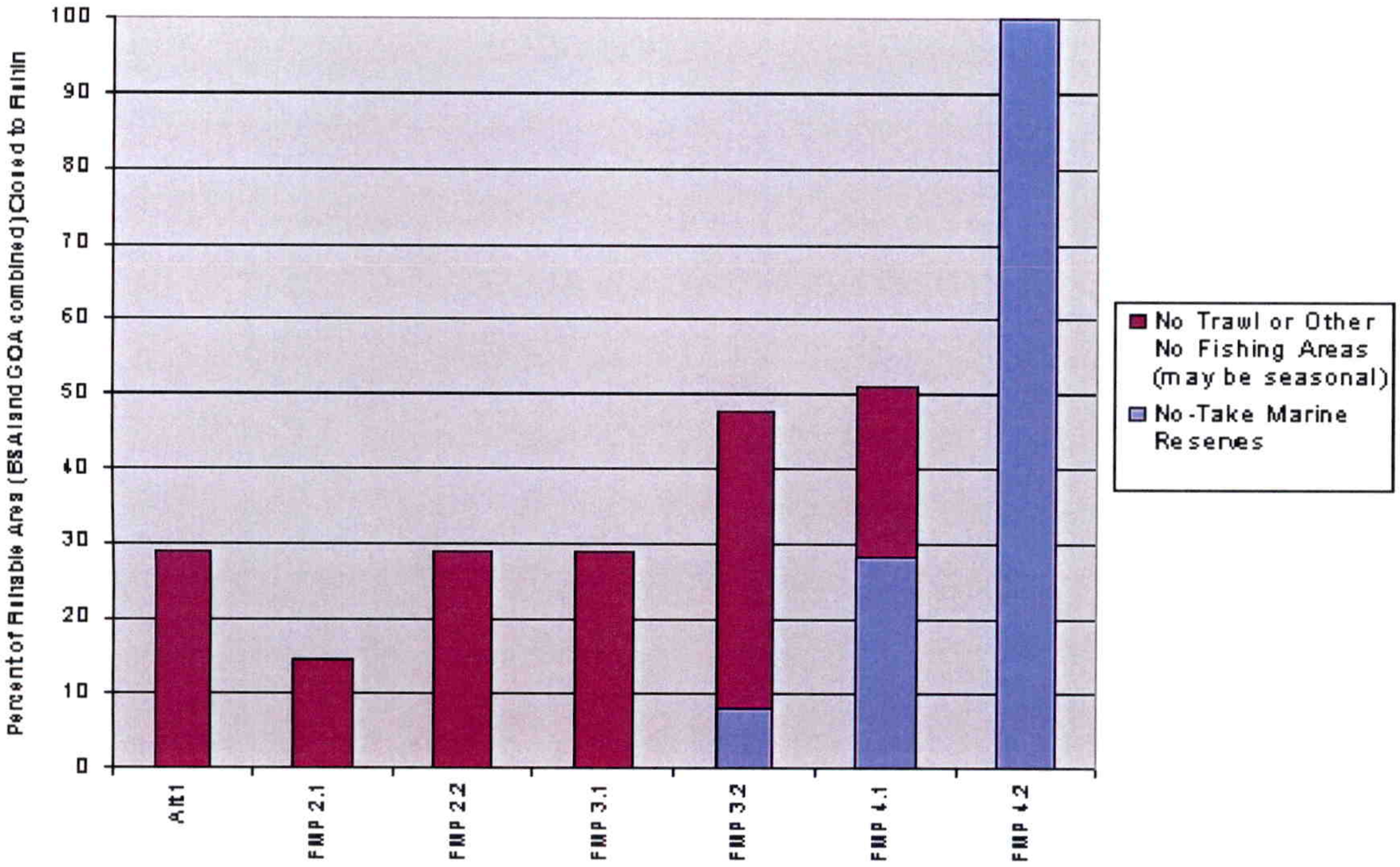
Table 10 and Figure 15 provide a comparison of the amount of area closed under each FMP scenario. As shown in Table 10 and Figure 15, all FMP scenarios with the exception of FMP 2.1 provide for 20 percent or more of the total fishable area (e.g., continental shelf and slope out to the 1000 m water depth) to be closed to bottom trawling for at least a portion of the year. However, the majority of the closure areas illustrated under the Alternative 1 FMP and under FMPs 2.2, 3.1, and 3.2 are not necessarily year-round, do not affect all gear types, nor do they focus on EFH. Therefore, these closures may not encompass the most sensitive habitat types and may not provide adequate protection of all life history stages of EFH species. In the case of Alternative 1 and FMPs 2.2 and 3.1, the total area proposed as no-take marine reserves on a year-round basis is less than 1 percent. With the exception of the Sitka Pinnacles closure area in Alternative 1 and FMPs 2.2 and 3.1, the no transit zones identified under the SSL protection measures are the only year-round, no-take areas designated under these alternatives.

FMP scenarios 3.2 and 4.1 close similar amounts of area (about 48 percent and 51 percent, respectively), but a larger percentage of the total area closed under FMP 4.1 is designated as no-take marine reserves and covers a broader range of habitat types. However, FMP 3.2, as illustrated here, exceeds the 0 to 20 percent rule for establishing MPAs because the suite of closures under this illustration attempts to optimize a number of FMP components (e.g., SSL protection measures, EFH protection). The Alternative 3 policy framework suggests an upper end range of closures at 5 percent of the fishable area as no-take marine reserves, with 20 percent being no-trawl MPAs. As shown in Table 10 and Figure 15, FMP 3.2 would close over 8 percent of the fishable area to all fishing and would designate nearly 50 percent of the fishable area as no-trawl MPAs. Protecting the marine environment through a system of MPAs and no-take reserves could have significant adverse effects on fishing communities, the fishing industry, and the economic health of the nation. Extensive care is needed in selecting candidate areas, and public input is critical.

The FMP 4.1 bookend also meets the recommended framework policy for Alternative 4. The bookend suggests 20 to 50 percent of the management area be designated as no-take marine reserves covering a full range of habitats. As shown in Table 10 and Figure 15, the scenario proposes to designate nearly 30 percent of the fishable area as no-take reserves with all closures totaling 51 percent. As discussed earlier, the concept of closures changes under this scenario. Previously, areas were considered open to all fishing until closed due to realized or perceived impacts. This alternative closes the GOA and BSAI and proposes that all areas be considered closed to fishing unless it can be shown that impacts from fishing would not be adverse. As shown on Figure 13, FMP 4.1 closes vast areas to all fishing (no-take marine reserves). However, many coastal areas would be open to commercial fishing other than trawl. These closures could cause economic hardships as trawl fishermen either have to go further from the community to fish, or have to switch to another type of gear. The economic effects of this illustration are likely to be significant to the participants and to the communities. The FMP 4.2 bookend essentially closes all areas of the EEZ to fishing until such time that impacts can be shown to be negligible. At that time, NOAA Fisheries would certify individual fisheries for operation in the EEZ under fishery-specific regulations. The actual mechanics of a certification process are unknown, and any process and subsequent regulation could take more than a couple of years to implement. Economic hardships associated under the scenario would be severe. While impacts on benthic EFH and HAPC would no longer occur, such benefits may be short-lived depending on which fisheries are subsequently permitted. It is not possible to predict these effects at this time.

Table 10. **Percent of fishable area (in square kilometers) closed under Alternative 1 and FMP scenarios.**

	Fishery Management Plan (FMP) 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Aleutian Islands (AI)							
No trawl marine protected area (MPA)	41.1%	41.1%	41.1%	41.1%	35.1%	15.0%	100%
No take marine res	1.6%	1.6%	1.6%	1.6%	19.1%	69.6%	100%
No Steller sea lion (SSL) hook and line (HL) pot trawl MPA	n/a	n/a	n/a	n/a	18.4%	n/a	100%
No SSL trawl MPA	n/a	n/a	n/a	n/a	7.3%	n/a	100%
Total	42.7%	42.7%	42.7%	42.7%	79.9%	84.6%	100%
Bering Sea (BS)							
No trawl MPA	19.2%	7.5%	19.2%	19.2%	21.3%	14.5%	100%
No take marine res	0.1%	0.1%	0.1%	0.1%	4.3%	24.9%	100%
No SSL HL pot trawl MPA	n/a	n/a	n/a	n/a	5.3%	n/a	100%
No SSL trawl MPA	n/a	n/a	n/a	n/a	1.8%	n/a	100%
Total	19.3%	7.6%	19.3%	19.3%	32.6%	33.5%	100%
Entire BS & AI							
No trawl MPA	21.8%	11.4%	21.8%	21.8%	22.9%	14.6%	100%
No take marine res	0.2%	0.2%	0.2%	0.2%	6.0%	24.9%	100%
No SSL HL pot trawl MPA	n/a	n/a	n/a	n/a	7.0%	n/a	100%
No SSL trawl MPA	n/a	n/a	n/a	n/a	6.8%	n/a	100%
Total	22.0%	11.7%	22.0%	22.0%	38.1%	39.4%	100%
Central \ Western Gulf - west of 144°							
No trawl MPA	33.1%	29.1%	33.1%	33.1%	31.0%	35.4%	100%
No take marine res	0.5%	0.5%	0.5%	0.5%	16.6%	43.0%	100%
No SSL HL pot trawl MPA	n/a	n/a	n/a	n/a	5.1%	n/a	100%
No SSL trawl MPA	n/a	n/a	n/a	n/a	13.0%	n/a	100%
Total	33.6%	29.6%	33.6%	33.6%	65.6%	78.3%	100%
Eastern Gulf - east of 144°							
No trawl MPA	81.7%	0.0%	81.7%	81.7%	16.7%	65.5%	100%
No take marine res	0.0%	0.0%	0.0%	0.0%	5.3%	21.9%	100%
No SSL H&I Pot Trawl	n/a	0.0%	n/a	n/a	70.3%	n/a	100%
Total	90.1%	0.0%	90.1%	90.1%	92.2%	87.3%	100%
Entire Gulf of Alaska							
No trawl MPA	45.4%	21.7%	45.4%	45.4%	27.3%	43.0%	100%
No take marine res	0.5%	0.5%	0.5%	0.5%	13.7%	37.6%	100%
No SSL HL pot trawl MPA	n/a	n/a	n/a	n/a	21.7%	n/a	100%
No SSL trawl MPA	n/a	n/a	n/a	n/a	9.7%	n/a	100%
Total	45.8%	22.1%	45.8%	45.8%	72.4%	80.6%	100%
Totals							
Total no take marine reserves	**0.3%**	**0.3%**	**0.3%**	**0.3%**	**8.2%**	**28.5%**	**100%**
Total all closures	**28.8%**	**14.6%**	**28.8%**	**28.8%**	**47.8%**	**51.1%**	**100%**



n/a - not applicable

Figure 15. Comparison of closure area percentages by FMP scenario.

Section 9 Summary Comparison of All Alternatives

The following section summarizes the effects of each policy alternative with regard to EFH and MPAs, as determined through the analysis of the FMP framework bookends presented in previous sections. Table 11 summarizes the potential effects of each policy alternative bookend. A discussion of the policy level effects follows:

Alternative 1: Under this policy alternative, the NPFMC would continue to manage the groundfish fisheries based upon the present conservative and risk-averse policy. While new effects are not expected, existing beneficial and/or adverse effects could continue as indicated in Table 11. Since the areas closed under the current FMPs may not protect the full range of habitat types, are not necessarily year-round, do not necessarily prohibit the use of fixed gear, and do not incorporate concurrent reductions in TAC, there is a potential for adverse effects on EFH (both due to fishing induced changes in benthic biodiversity and HAPC). The closures could possibly benefit target and non-target species and since, for the most part, they are designed to protect prohibited species and SSLs, prohibited species and marine mammals would benefit. As compared to a much more aggressive strategy, adverse and potentially adverse effects could be observed by catcher vessels, catcher processors, inshore processors, and consumers, while non-consumptive uses and non-use values would benefit.

Alternative 2: A more aggressive harvest policy would be implemented based upon the concept that the present policy is overly conservative and that higher harvests could be taken without threat of overfishing the target groundfish stocks. The identification of EFH, determination of appropriate habitat protection measures, and evaluation of candidate areas for MPAs would also continue, but certain areas presently closed to fishing in order to protect habitat could be considered open to fishing. Measures chosen to implement this policy could range from opening all areas presently closed (except those areas mandated as SSL Protection Measures) to maintaining existing closures under the current FMPs. As shown in Table 11, depending on the extent of the measures, all aspects of the physical and biological environments could realize adverse effects under this policy alternative. Again, depending on the extent of measures chosen to enact this policy, effects on the economic environment could be beneficial, while non-consumptive and non-use values would be negatively impacted.

Alternative 3: This policy would seek to accelerate the existing precautionary management measures through community or rights-based management, ecosystem-based management principles, and, where appropriate and practicable, increase habitat protection and impose additional bycatch constraints. Specifically, Alternative 3 seeks to reduce and avoid impacts to habitat by developing goals, objectives, and criteria to evaluate the efficacy of MPAs and no-take marine reserves as tools to maintain abundance, diversity, and productivity of marine organisms. Measures chosen to enact the Alternative 3 policy range from maintaining the existing closures under the current FMPs to designating 20 percent of the BSAI and GOA as no-trawl MPAs and no-take marine reserves (e.g., 5 percent = no-take, 15 percent = no-trawl MPA) across a range of habitat types. As shown in Table 11, the higher range of closures would have beneficial or possibly beneficial effects on all aspects of the physical

and biological environments and on the non-consumptive and non-use values. Conversely, the designation of extensive closure areas would have potentially adverse or adverse effects on the economic sectors and communities.

Alternative 4: This policy shifts the burden of proof from the resources to the user and would require that the agency certify that the intended fishery would not have a detrimental effect on the environment before significant fishing could be permitted. Under this policy alternative, impacts to habitat would be reduced and avoided through zoning and limiting fishing gear use to the action area and establishing no-take marine reserves (both pelagic and nearshore) encompassing 20-50 percent of management areas. In fisheries that can be prosecuted with more selective gear, trawling would be prohibited and trawl closure areas would be established. As shown in Table 11, management measures under Alternative 4 would provide possibly beneficial effects to all aspects of the physical and biological environments and non-consumptive and non-use values, while impacts on the social and economic environment would be severely adverse.

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APPENDIX F

Steller Sea Lion Protection Measures

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ACRONYMS AND ABBREVIATIONS

ABC	acceptable biological catch
BiOp	Biological Opinion
BSAI	Bering Sea and Aleutian Islands
CDQ	community development quota
EBS	eastern Bering Sea
EFH	essential fish habitat
ESA	Endangered Species Act
F	theoretical unfished level
FMPs	Fishery Management Plan
FR	Federal Register
GOA	Gulf of Alaska
HAPC	Habitat Areas of Particular Concern
HCR	harvest control rule
MMPA	Marine Mammal Protection Act of 1972 (amended 1994)
MPA	Marine Protected Area
nm	nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
NRC	National Research Council
OFL	overfishing level
OPR	Office of Protected Resources
PSC	prohibited species catch
RPA	Reasonable and Prudent Alternative
SAFE	Stock Assessment and Fishery Evaluation
SEIS	Supplemental Environmental Impact Statement
TAC	total allowable catch
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
VMS	Vessel Monitoring System
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Section 1 Steller Sea Lion Protection Measures

Since the listing of Steller sea lions under the Endangered Species Act (ESA) in 1990, Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) Groundfish Fishery Management Plans (FMPs) have been modified to include measures designed to protect Steller sea lions from deleterious effects that may result from groundfish fisheries. These measures (referred to as the Steller sea lion Protection Measures) were developed and adopted to ensure that the groundfish fisheries would not jeopardize the continued existence of Steller sea lions or adversely modify their critical habitat, as required by the ESA. The purpose of this qualitative impact assessment is to evaluate the effects of the Steller sea lion Protection Measures on Steller sea lions and other resources under a series of four alternative groundfish management policies, including the status quo, and to evaluate the effects of associated FMP scenarios as a proxy for each alternative.

The organization of this analysis provides background on the decline of the Steller sea lion, hypotheses for the decline, and a description of the current protection measures. The effects of these measures are discussed qualitatively by alternative and FMP "Bookend" followed by a comparison among all the options. A description of current research is also provided.

1.1 Regulatory Overview

There are two major laws that protect Steller sea lions and require the North Pacific Fishery Management Council (NPFMC) to address their conservation in the FMPs . The first is the Marine Mammal Protection Act of 1972 (amended 1994) (MMPA). This law places Steller sea lions under the jurisdiction of the National Marine Fisheries Service (NMFS), Office of Protected Resources (NOAA [National Oceanic and Atmospheric Administration] Fisheries, OPR). The goal of the MMPA is to provide protection for marine mammals so that their populations are maintained as a significant, functioning element of the ecosystem. The MMPA established a moratorium on the taking of all marine mammals in the United States with the exception of subsistence use by Alaska Natives. Under the authority of the MMPA, NOAA Fisheries OPR monitors populations of marine mammals to determine if a species or population stock is below its optimum sustainable population. Species that fall below this level are designated as "depleted." Populations or stocks (e.g., the western stock of Steller sea lions) listed as threatened or endangered under the ESA, are automatically designated as depleted under the MMPA.

The ESA was enacted in 1973 and reauthorized in 1988. This law provides broad protection for species that are listed as threatened or endangered under ESA. Steller sea lions were considered for protection under the ESA due to the rapid decline in the western portion of its range over the last 30 years (Loughlin *et al.* 1990, Loughlin *et al.* 1992, York *et al.* 1996). On November 26, 1990, the Steller sea lion was listed as threatened under the ESA (55 Federal Register [FR] 40204), and on August 27, 1993, critical habitat was designated based on observed movement patterns (58 FR 45269). In 1997, the Steller sea lion population was split into two separate stocks: the western stock, which occurs westward from Cape Suckling (144°W), and the eastern stock, which occurs east of 144°W from southeast Alaska to California (Bickham *et al.* 1996) (Figure 1). After separation of the two stocks, the western stock was listed as "endangered" in 1997 due to the continued precipitous decline in this portion of its range (62 FR 30772). The eastern stock remains classified as "threatened."

The mandatory protection provisions of the ESA have led to numerous administrative and judicial actions and has brought the issue of fisheries-sea lion interactions under intense scrutiny. Section 7(a)(2) of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of its designated critical habitat. For federal fishery management actions, the action agency, the National Marine Fisheries Service, Office of Sustainable Fisheries (NOAA Fisheries), is required under Section7(a)(2) to consult with the Steller sea lion expert agency, NOAA Fisheries OPR, to determine if the proposed action may affect Steller sea lions or their critical habitat. If the proposed action may affect Steller sea lions or their designated critical habitat, formal consultation is required. Formal consultation is a process between the action and expert agency that determines whether a proposed action is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. The process begins with the action agency's assessment of the effects of their proposed action on listed species and concludes with the issuance of a "Biological Opinion" (BiOp) by the expert agency. A biological opinion is a document which includes a) the opinion of NOAA Fisheries OPR as to whether or not a federal action (such as federally authorized fisheries) is likely to jeopardize the continued existence of listed species or adversely modify designated critical habitat; b) a summary of the information on which the opinion is based; and c) a detailed discussion of the effects of the action on listed species or designated critical habitat. If the BiOp concludes that the proposed action is likely to jeopardize the continued existence of threatened or endangered species or adversely modify critical habitat, then the expert agency recommends. Reasonable and Prudent Alternatives (RPAs) to avoid the likelihood of "jeopardy" or "adverse modification" of critical habitat. The resulting legal requirements limit the NPFMC from adopting FMP policies that result in a jeopardy finding for the Steller sea lions.

1.2 Steller Sea Lion Decline

Western Stock

The primary reason for listing the western stock of Steller sea lions was its dramatic decline (>15 percent per year) in their core breeding areas during the 1970s and 1980s, leading to their protection under the ESA in 1990 (Loughlin *et al.* 1990, Loughlin *et al.* 1992). The rate of decline has slowed since that time but the population has continued to decline by about 4.2 percent per year between 1991 and 2002 at 84 trend sites (SAFE 2002) (Figure 2). However, surveys at trend sites have shown a slight increase of 5.5 percent between 2000 and 2002, the first region-wide increase in the last two decades. A similar trend was also documented within the Kenai-to-Kiska subareas (70 sites between the Kenai Peninsula and Kiska Island, Western Aleutians), which showed an increase of 4.8 percent from the last surveys. The overall long-term trend, however, still showed a decline of 3.1 percent from 1991 to 2002 (SAFE 2002).

Eastern Stock

The eastern stock of Steller sea lions has been increasing in size since the 1990s and does not appear to be in any jeopardy of extinction. Since 1990, this stock has shown an increase of 15.4 percent based on adult and juvenile counts at trend sites (SAFE 2002). Recent surveys of non-pups at 10 trend sites in Southeast Alaska suggests no change in the long-term trend of regional increase at a rate of approximately 2 percent per year over the last decade (SAFE 2002). The eastern stock of the Steller sea lion may be at its highest

abundance in recent history (Calkins *et al.* 1999). While still protected under the ESA, the eastern stock has not been the subject of nearly as much administrative action as the western stock.

Hypotheses for Decline

Although factors and mechanisms for the decline of the western stock of Steller sea lions have been, and continue to be, the subject of intensive research, it is generally thought that the decline is due to a combination of factors. These factors may include nutritional stress resulting from competition with fisheries, disease/parasitism, predation, regime shift/climate change affecting prey, and anthropogenic factors such as entanglement in fishing gear, intentional killing, or pollution/contaminants (Kruse *et al.* 2001, Ferrero and Fritz 2002, NRC 2002). The magnitude or contribution of some of these factors may have changed over the course of the decline, specifically between the period of rapid decline from the 1970s to 1990 and the more moderated rate of decline from 1990 to the present (NRC 2002). Hypotheses for the mechanism behind the decline fall into two general categories:

1. Bottom-up theories - physical and biological factors that affect the capacity of the environment to support sea lions. Some of the major carrying capacity factors include the following:
   - Large-scale fishery removals have reduced the availability or quality of prey species
   - Climate change/regime shift in the late 1970s has changed the abundance or distribution of prey species
   - Non-lethal disease has reduced the foraging efficiency of sea lions
   - Pollutants concentrated through the food web have contaminated fish eaten by the sea lions, possibly reducing their fecundity or increasing mortality

2. Top-down theories - factors that affect the mortality of the sea lion independent of capacity of the environment to support sea lions. Top-down theories involve external forces such as predators, humans or pathogens. These mortality factors include the following:
   - Predators such as killer whales or sharks have switched their prey preference to sea lions
   - Incidental take of sea lions through capture or entanglement in fishing gear has increased as a result of the expansion of commercial fisheries
   - Takes of sea lions in the subsistence harvest have been higher than estimated
   - Shooting of sea lions has been underestimated in the past and/or present
   - Pollution or disease has increased mortality independently of effects of nutrition

The National Research Council (NRC) (2002) considered that the decline observed in the 1970s and 1980s were precipitated by one or more bottom-up factors, such as competition with fisheries or climate change. The more gradual downward trends in the 1990s appear to have been influenced by top-down factors, such as predation (NMFS 2001a, NRC 2002).

However, these factors may be acting most strongly against juveniles between the time they are weaned and when they are grown to adult size and foraging capability (Kruse *et al.* 2001, Ferrero and Fritz 2002). Adult females may also be affected because of the physiological stress and limited geographic mobility when caring for pups. Hence, much of the focus on minimizing human effects on these animals has been on protecting the integrity of food supplies near rookeries and haulouts (NMFS 2001a). This is a bottom-up factor that may be currently affecting Steller sea lions, a conclusion that the NRC (2002) also made. It is important to realize that the key issue for the survival and reproductive success of sea lions is not necessarily the total amount

of fish that are present, but how available the prey are to foraging sea lions (NMFS 2001a). Major changes in the abundance and distribution of preferred prey species or prey patches may decrease foraging efficiency, thus exposing them to increased predation pressure from killer whales and sharks.

NOAA Fisheries evaluates the impacts of all federal actions that could adversely affect Steller sea lions and if it is determined that an action potentially would adversely affect Steller sea lions, management measures to alleviate the adverse effect are recommended by NOAA Fisheries. Since NOAA Fisheries cannot control climate and oceanic changes, like ENSO Events, or the behavior of killer whales, their management efforts are necessarily focused on minimizing the potential for the fisheries to induce localized depletions of prey, even though other factors may be involved in the population decline. The allocation of total allowable catch (TAC) among different seasons, areas, and gear types and fishing closures near rookeries and haulouts has been the main thrust of these management measures (NMFS 2001a).

Public policy debates, and several legal actions, have focused on the uncertainty of scientific evidence for a significant fisheries impact. While new research was initiated to address some of the scientific uncertainty, NPFMC and NOAA Fisheries implemented a series of fishery management measures that assumed there were some adverse impacts from groundfish fishing to Steller sea lions as stated in the BiOps. The emphasis of the measures has been on distributing the fishery over broader temporal and spatial scales to minimize localized depletion of sea lions' prey, alleviating fishing pressure in nearshore zones around rookeries and haulouts and in important sea lion foraging areas, and instituting harvest limits to protect overall abundance of prey.

Along with these efforts to protect the food supply of Steller sea lions, the amount of acceptable incidental take of Steller sea lions by the fishery has also been greatly reduced. The previously legal and common practice of fishermen shooting at sea lions to kill them or chase them away from their gear has been prohibited.

Section 2 Analysis of Alternatives

Four policy alternatives are under consideration by NOAA Fisheries and NPFMC. Each policy alternative contains two "bookends," or examples, containing a range of management measures that illustrate how the framework could be implemented. These bookends provide a level of detail that allows analysis and provides contrasting policies. They also provide a means for communicating to the public how NOAA Fisheries and NPFMC intends to implement its preferred alternative, while allowing, under the ESA, the management flexibility to adaptively manage the fishery through future FMP amendments.

Alternative 1 – Continue Under the Current Risk-Averse Management Policy: Under this alternative, NOAA Fisheries and NPFMC would continue to manage the groundfish fisheries based upon the present conservative and risk-averse policy. This policy assumes that fishing results in some adverse impacts to the environment and that, as these impacts become known, mitigation measures will be developed and appropriate FMP amendments will be implemented. The approach would be to continue the current Steller sea lion Protection Measures that are now in effect and continue to cooperate with United States (U.S.) Fish and Wildlife Service (USFWS) in regards to ESA-listed species under their jurisdiction to protect ESA-listed marine mammals and seabird species.

Alternative 2 – Adopt a More Aggressive Management Policy: A less precautionary management policy (i.e., more aggressive harvest policy) would be implemented based upon the concept that the present policy is overly conservative and that higher harvests could be taken without threat of overfishing the target groundfish stocks. This policy assumes that fishing at the recommended levels would have no adverse impact on the environment, except in specific cases that are generally known. Steller sea lion Protection Measures under the Alternative 1 policy would be included in order to avoid a jeopardy finding under the ESA.

Alternative 3 – Adopt a More Precautionary Management Policy: This policy would seek to accelerate the existing precautionary management measures through community or rights-based management, ecosystem-based management principles and, where appropriate and practicable, increase habitat protection and impose additional bycatch constraints. Under this approach, additional conservation management measures would be taken as necessary to respond to social, economic, or conservation needs. Additional measures would be taken if scientific evidence indicated that the fishery was negatively impacting the "environment," not just a population of a given species. Steller sea lion Protection Measures under the Alternative 3 policy would further marine mammal and seabird policy objectives to include maintaining or adjusting Steller sea lion Protection Measures to further reduce the risk of fishery-related impacts on Steller sea lions. Adoption of this policy would also result in continuing cooperation with USFWS to protect ESA-listed species and to initiate joint research programs.

Alternative 4 – Adopt a Highly Precautionary Management Policy: This policy places the burden on the resource user to demonstrate that the intended use would not have a detrimental effect on the environment before significant fishing could be allowed. The policy, as illustrated by its FMP framework, would impose very restrictive conservation and management measures that would only be modified or relaxed when additional, reliable scientific information becomes available. It would involve a strict interpretation of the precautionary principle. Management discussions would involve and be responsive to the public, but decreased emphasis would be placed on industry and community concerns, and more emphasis would be placed on ecosystem concerns and principles, including the identification and incorporation of

non-consumptive use values. The overall premise is that fishing causes adverse impacts on the environment, but due to a lack of information and uncertainty, little is known about these impacts. Policy objectives under this alternative include increasing existing protection measures for Steller sea lions by further restraining fisheries in critical habitat and by setting more conservative harvest levels of prey species.

Section 3 Alternative 1: Continue Under the Current Risk-Averse Management Policy

3.1 Management Approach

Under Alternative 1, the NOAA Fisheries and NPFMC would continue working toward the goals of maintaining sustainable fisheries, protecting threatened and endangered species, and protecting, conserving and restoring habitats of living marine resources through existing institutions and processes. Fisheries are managed through the current risk-averse conservation and management policy that is based on a conservative harvest strategy. Under this policy, fishery impacts indicated by scientific evidence are mitigated as necessary. This management policy is based on the assumption that fishing produces some adverse impacts to the environment and, as these impacts become known, mitigation measures are developed and FMP amendments are implemented.

The goal of the present FMP in regard to endangered Steller sea lions is to maintain the current Steller sea lion Protection Measures in order to avoid a "jeopardy" determination under the ESA. To reach this goal, NOAA Fisheries and NPFMC rely upon ongoing scientific research to describe and quantify how the fisheries impact Steller sea lions and adjust their mitigation programs accordingly. Failure to maintain adequate protection measures not only harms the sea lions' chances of recovery by failing to ensure an adequate and sustainable prey field for Steller sea lions, but opens the fisheries to legal challenges under the ESA, which may shut down the industry.

3.2 Overview of the Current Fishery Management Plan Management Measures

NOAA Fisheries, OPR issued a series of BiOps through Section 7 consultation from 1990 to 2001 that analyzed whether the groundfish fisheries were contributing to the decline of sea lion populations, causing adverse modification to their designated critical habitat and/or preventing their recovery (Table 1). The latest BiOp issued in October 2001, analyzed a series of protection measures developed by the NPFMC's Steller Sea Lion Mitigation Committee (also referred to as the RPA Committee) to ensure that BSAI and GOA groundfish fisheries do not jeopardize the continued existence of Steller sea lions or adversely modify their critical habitat. A range of alternatives, including the alternative developed by the Steller Sea Lion Mitigation Committee were analyzed in the Supplemental Environmental Impact Statement (SEIS), in November 2001 (NMFS 2001b). The Steller Sea Lion Mitigation Committee was specifically charged with looking for ways to achieve several objectives:

1. protect waters around rookeries and haulouts to prevent localized depletion of prey and potential competition.

2. temporally disperse the fisheries to reduce the probability of localized depletion by pulse or derby fishing.

3. spatially disperse the fisheries to reduce the probability of localized depletions from concentrated catch in local areas.

The 2001 BiOp analyzed the impacts of the groundfish fishery as promulgated under the Preferred Alternative of the Steller sea lion SEIS, the "area- and fishery-specific approach." This latest BiOp concluded that the federally-managed groundfish fishery and the parallel state-managed groundfish fishery (i.e., pollock and cod), if conducted according to the Steller sea lion Protection Measures, would not likely jeopardize the continued existence of either the western or eastern stocks of Steller sea lions, nor would the fisheries be reasonably likely to adversely modify Steller sea lion designated critical habitats (NMFS 2001a).

Table 1. Chronology of events leading to the Steller Sea Lion protection measures in the Bering Sea and Aleutian Islands and Gulf of Alaska Fishery Management Plans.

Date	Milestone
November 1990	Steller sea lion (prior to splitting eastern and western stocks) is listed as "threatened" under the Endangered Species Act (ESA). Protection measures include prohibition on shooting, reduced wasteful take, limited disturbance at rookeries.
August 1993	Steller sea lion "critical habitat" is designated around rookeries and haulouts (20 nautical miles [nm]) west of 144°, along with terrestrial and air zones around these areas. Three special aquatic foraging areas in Alaska are also classified as Steller sea lion critical habitat: Shelikof Strait, Bogoslof, and Seguam Pass foraging areas. Critical habitat for the eastern stock, east of 144°, includes 3,000-foot buffer zone around rookeries and haulouts.
January 1996	Biological opinion (BiOp) on the Fishery Management Plans (FMPs) for the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) on proposed 1996 total allowable catch (TAC) specifications and their effects on the Steller sea lion. Concluded these actions would not jeopardize Steller sea lion or adversely modify critical habitat.
May 1997	Western stock of the Steller sea lion is listed as "endangered" and the eastern population remains "threatened" under the ESA.
December 3, 1998	BiOp 1 on the FMPs authorizing the BSAI Atka mackerel fishery, BSAI pollock fishery, and the GOA pollock fishery. Found Atka mackerel fishery would not cause jeopardy. Pollock fisheries were found likely to result in jeopardy. Reasonable and prudent alternatives(RPAs) developed for pollock fishery. RPAs challenged in court.
December 22, 1998	BiOp 2 on the FMP for all groundfish fisheries in BSAI and GOA on proposed 1999 harvest specifications. Found no jeopardy if pollock measures to avoid jeopardy are enforced.
January 1999	National Oceanic and Atmospheric Administration (NOAA) Fisheries implements management measures as part of BiOp 1 RPAs and publishes emergency interim rule.
June 1999	NOAA Fisheries extends emergency rule for the remainder of 1999 season.
July 1999	Legal challenge to BiOp 1. Court upholds no jeopardy for Atka mackerel and jeopardy for pollock findings, but remands the RPAs.
October 1999	NOAA Fisheries revises RPAs and issues the Final RPAs for the 2000 fishery.
December 1999	BiOp on authorization of the BSAI and GOA groundfish fisheries, TAC for 2000, and American Fisheries Act. Concludes action would not cause jeopardy to Steller sea lions.
January 2000	NOAA Fisheries modifies Protection Measures to conform to revised BiOp 1 RPAs and puts out an emergency rule implementing them.
January 2000	Court finds BiOp 2 no jeopardy conclusion inadequate.
July 2000	Court issues an injunction prohibiting fishing with trawl gear in Steller sea lion critical habitat west of 144° until NOAA Fisheries comprehensive BiOp is completed.
November 2000	Comprehensive FMP BiOp (BiOp 3) for all groundfish fisheries and non federal fisheries published. Environmental baseline finds that the Pacific cod, Atka mackerel, and pollock fisheries results in jeopardy in regard to the Steller sea lion. RPAs are included to avoid jeopardy.

Table 1 (cont.). **Chronology of events leading to the Steller Sea Lion protection measures in the Bering Sea and Aleutian Islands and Gulf of Alaska Fishery Management Plans.**

Date	Milestone
January 2001	NOAA Fisheries issues an emergency rule containing a suite of management measures that phases in certain provisions of the RPAs.
January 2001	North Pacific Fisheries Management Council (NPFMC) establishes an RPA Committee to develop Protection Measures for rest of 2001 and for 2002 and seasons beyond. Amended RPA developed to meet the requirements of ESA.
June 2001	NPFMC recommends four alternatives to be analyzed in the Steller sea lions Protection Measures Supplemental Environmental Impact Statement (SEIS) with Alternative 4, the RPA Committee's recommendation, as the Preferred Alternative.
July 2001	NOAA Fisheries re-initiates Section 7 consultation under the ESA and draft 2001 BiOp. The preferred altemative in the Steller sea lion SEIS is analyzed in the 2001 BiOp, which is included as Appendix A in the Steller sea lion SEIS.
September 2001	NPFMC selects Alternative 4 with modifications as it met the requirements of the ESA and has the least impact on the human environment.
October 2001	Final SEIS on Protection Measures and 2001 BiOp is released. The conclusion in the 2001 BiOp in regard to Steller sea lions supercedes the conclusions in the FMP BiOp. Protection Measures are implemented by emergency interim rule.
January 2002	Emergency interim rule is extended through July 8, 2002.
May 2002	Emergency interim rule is extended through December 31, 2002.
September 2002	NOAA Fisheries issued a proposed rule to implement Steller Sea Lion Protection Measures.

Source: Federal Register January 8, 2002 Preamble to Interim Rule, Steller Sea Lion Protection Measures, Proposed Rule, September 4, 2002.

It is important to note that the 2001 BiOp does not predict the recovery of the western stock of Steller sea lions to any specific level. In fact, it predicts they will continue to decline even after all the protection measures are implemented (NMFS 2001a). This conclusion is based on the continuing presence of external environmental factors hypothesized to be contributing to the decline, such as killer whale predation and climate-induced oceanographic changes. The BiOp determined that the groundfish fisheries did not add any appreciable risk to the population's potential to exist or recover in the wild. In addition to the management measures described in the Steller sea lion SEIS preferred alternative, the BiOp required NOAA Fisheries to implement four additional management measures in order to remain in compliance with the ESA. These include the following:

- NOAA Fisheries will monitor the take of Steller sea lions in the pollock, Pacific cod, and Atka mackerel fisheries. NOAA Fisheries will maintain and utilize the existing Observer Program to assess the incidental take of sea lions in each fishery.

- NOAA Fisheries will monitor vessel location and compliance with gear and directed fishing restrictions for the pollock, Pacific cod, and Atka mackerel fisheries. NOAA Fisheries will require electronic Vessel Monitoring System (VMS) devices and other record-keeping and reporting measures in order to monitor directed fishing.

- NOAA Fisheries will monitor harvest of pollock, Pacific cod, and Atka mackerel in sufficient detail to determine appropriate fishery closures by sector, gear type, and area.

- NOAA Fisheries will manage critical habitat harvest limits in the Atka mackerel fishery using conservative management strategies to minimize the likelihood of exceeding a critical habitat harvest limit. This means that if any part of a haul occurs inside critical habitat or it is not clear where the fishing occurred, the entire catch will be counted against the critical habitat limit. Where the harvest limit is relatively small, NOAA Fisheries must project when the limit will be reached and pre-announce the closure date.

Final Steller Sea Lion Protection Measures

Current regulations for Steller sea lion Protection Measures can be found at the NOAA Fisheries website: http://www.fakr.noaa.gov/protectedresources/stellers/protection.htm. A summary of the major measures are presented in Table 2. These Steller sea lion Protection Measures were deemed necessary based on the hypothysis that the continued decline of the western stock of the Steller sea lion is due to nutritional stress and that groundfish fisheries contribute to this stress by competing with Steller sea lions for their key prey species. Management measures were specifically developed to reduce competitive interaction between Steller sea lions and the groundfish fisheries (NMFS 2001a). Mitigation efforts have focused on protecting the integrity of food supplies near rookeries and haulouts. Competitive interactions with the fishery may have the greatest effect on juvenile Steller sea lions between the time they are weaned and the time they reach adult size and foraging capability as the diving capacity of juveniles (and thus available foraging space) is less than that of adults (Burns *et al.* unpublished). Adult females may also be susceptible to nutritional stress due to reduced prey availability in the vicinity of rookeries because of the limited foraging distribution and increased energetic demands when caring for pups. Specifically, the intent of the protection measures was to avoid competition around rookeries and important haulouts with extra precaution in the winter, and to disperse fisheries outside of those time periods and areas.

These regulations reflect the proposed action analyzed in the latest BiOp (NMFS 2001a) with some minor adjustments by the NPFMC in October 2001 (Figure 3). Some of the major measures include the following:

- Fishery closures and no-transit zones within 3 nautical miles (nm) of 39 major rookeries.

- Fishery closures for Atka mackerel, pollock, and Pacific cod within 10 to 20 nm of specified haulouts and rookeries.

- Closure of the Seguam Pass foraging area and most of the Bogoslof area to all gear types.

- Gear and TAC restrictions in areas designated as Steller sea lion critical habitat (the areas within 20 nm of major rookeries and haulouts).

- TAC apportionments by gear type, season, and geographic area.

- Closure of the Aleutian Islands Management area to pollock fishing.

Table 2. Summary of Steller Sea Lion protection measures for 2002.

Areas or Category	Protection Measure
All federally permitted vessels- Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA)	Fishery closures and no-transit zones within 3 nautical miles (nm) of 39 major rookeries (considered the most sensitive for females with pups); the nearshore marine critical habitat is considered the most important to protect from the interactions between the groundfish fisheries and the Steller sea lion.
All directed fisheries for pollock, Pacific cod and Atka mackerel	Modified harvest control rule (HCR) to prohibit directed fishing when the biomass reaches 20 percent of its unfished level.
	Closures within 10 to 20 nm of selected haulout and rookery sites to pollock, Pacific cod, and Atka mackerel directed fisheries in BSAI and GOA.
	Closure of the Seguam foraging area and most of the Bogoslof area to all gear types.
	A Vessel Monitoring System (VMS) requirement.
	Closure of the Chignik area for pot, trawl, and hook-line gear.
	Closure within 10 to 20 nm of 46 rookeries and haulouts for hook and line fishing for Pacific cod, and 44 rookeries and haulouts for pot fishing for Pacific cod.
	Modification of the community development quota (CDQ) groundfish program.
Aleutian Islands	Closure of the directed fishery for pollock
	Pacific cod total allowable catch (TAC) apportionment by season and gear, and specific area restrictions that alternate with Atka mackerel fishery in critical habitat (statistical areas 542 and 543).
	Critical habitat harvest limit of 60 percent for Atka mackerel (statistical areas 542 and 543).
	Grouping of vessel for Atka mackerel fishing in critical habitat (statistical areas 542 and 543).
	Two observers required for critical habitat Atka mackerel directed fisheries.
	At least a 3 nm closure around all haulouts for Atka Mackerel and Pacific cod trawl fishing .
	No Atka mackerel critical habitat fishing west of 178° west longitude.
Bering Sea	Two seasons (40:60 percent apportionment) for the pollock fishery with no more than 28 percent of the annual directed fishing allowance taken from the Steller sea lion conservation area before April 1.
	Continuation of BS pollock fishery cooperatives established under the American Fisheries Act.
	Establishment of the Bering Sea Pollock Restriction Area during the A season.
Bering Sea (cont.)	Closure of the Catcher Vessel Operation Area to non-CDQ pollock catcher processor during the B season.
	Pacific cod TAC apportionments by season and gear, as well as gear-specific area restrictions.
	Closure of all Bering Sea sub area critical habitat to Atka mackerel fishing.

Table 2 (cont.). Summary of Steller Sea Lion protection measures for 2002.

Areas or Category	Protection Measure
Gulf of Alaska (GOA)	Even distribution of pollock harvest among 4 seasons.
	Closure of directed fishing for pollock in areas that vary from 0 to 20 nm to 0 to 3 nm around rookeries and haulouts.
	Two seasons (60:40 percent apportionment) for Pacific cod fishing and area restrictions that are dependent on gear type and vessel size.
	Continuation of the National Oceanic and Atmospheric Administration (NOAA) Fisheries Chiniak Gully Research Project to explore the effects of commercial fisheries on pollock abundance and distribution in the GOA.

Source: Proposed Rules, Federal Register Vol. 67, No. 171 September 4, 2002.

In addition, the harvest control rule (HCR) has been modified. Under the previous HCR, the Acceptable Biological Catch (ABC) for target species was calculated as the fishing mortality rate that would reduce the spawning biomass per recruit to 40 percent of its theoretical unfished level ($F_{40\%}$). When the biomass of the target species fell below that calculated level (designated as $B_{40\%}$ and defined as the level of Maximum Sustainable Yield [Appendix B]), fishing was allowed to continue but at a reduced rate. Only when spawning biomass per recruit was reduced to 2 percent of its unfished level was directed fishing for that species stopped. The new HCR, implemented by emergency rule in 2002, is essentially the same except that all targeted fishing is halted if spawning biomass per recruit is reduced to 20 percent of its unfished level.

The VMS is required on all groundfish and individual fishing quota halibut vessels in order to allow NOAA Fisheries to monitor the fishing activity of the fleet in relation to closed and regulated areas. VMS units are tamper proof and transmit a coded signal via satellite that gives NOAA Fisheries the position and identity of each vessel on a real-time basis. These records are used to verify fishing logs and calculate the amount of fish caught within designated critical habitat.

The VMS requirements would facilitate enforcement of the following Steller sea lion Protection Measures and other regulation restrictions:

- Closure of the Chignik area to pot, trawl, and hook and line gear.
- Closure within 10 to 20 nm of 46 rookeries and haulouts to hook and line fishing for Pacific cod and 44 rookeries and haulouts to pot fishing for Pacific Cod.
- Modification to the community development quota (CDQ) groundfish program.
- Revisions to the Federal Fisheries Permit requirements.
- Changes to the catcher vessel fishing trip definitions.

3.3 Alternative 1 Effects

The Steller sea lion Protection Measures under Alternative 1 are essentially the same as those analyzed under the Preferred Alternative of the Steller sea lion SEIS (NMFS 2001b). Therefore, when addressing the direct, indirect, and cumulative effects of the Steller sea lion Protection Measures on the Steller sea lion and other components of the physical, biological, and human environment, it is assumed that these measures would have similar effects as those described in that document. The potential effects of these measures are summarized below.

Physical Environment

The Steller sea lion Protection Measures, as implemented under Alternative 1, would have little, if any, impact on the physical environment except for preventing additional alteration of the physical structure of the non-living substrate and the suspension of sediments in the 3 nm buffer zones around rookeries, haulouts, and areas within critical habitat closed to non-pelagic trawling. Bottom trawling would continue to some extent in Steller sea lion critical habitat under the Alternative 1 FMP. Fishing effort would be displaced to other areas, thus potentially affecting other habitats. Overall, there would be no adverse effects on the physical environment from implementing the Steller sea lion Protection Measures.

Biological Environment

Threatened and Endangered Species

Steller Sea Lions: The primary focus of the Steller sea lion Protection Measures under Alternative 1 is to minimize the effects of groundfish fisheries off Alaska on the western stock of the Steller sea lions and ensure that they do not jeopardize the continued existence of Steller sea lions or adversely modify their critical habitat as defined under the ESA. As such, the management measures under the Alternative 1 FMP were designed to reduce adverse effects on Steller sea lions by dispersing fishing effort through area closures, catch apportionment, and fishery-specific restrictions in a manner consistent with the FMP BiOp and the 2001 BiOp (NMFS 2000, NMFS 2001a).

Direct effects on Steller sea lions resulting from take, either direct mortality or injuries leading to mortality, incidental to activities related to groundfish fisheries under the Alternative 1 FMP would be expected to be similar to past years. The incidental take rate is approximately 10 per year or 1 sea lion for every 140,000 mt of groundfish harvested (NMFS 2001b). Fishing closures in Steller sea lion critical habitat could result in a slight decrease in direct mortality if this is where a large proportion of animals are taken. But when there is an overall TAC increase in Steller sea lion critical habitat, incidental take would be expected to increase since the overall factor correlated with take is the level of TAC for key prey species (e.g., pollock, Pacific cod, and Atka mackerel). If TAC for these primary target groundfish is similar to recent years, incidental take would be expected to be the same. At this relatively low level of incidental take, direct mortality from the groundfish fisheries would not substantially contribute to the further decline of the species.

Under the Alternative 1 FMP, harvest of important Steller sea lion prey species is not expected to have large beneficial or adverse effects to Steller sea lions since region-wide TAC would be the same as recent years. Under the Alternative 1 FMP, some fishing effort is simply displaced to areas outside Steller sea lion critical habitat, but other efforts are more concentrated in Steller sea lion critical habitat. Overall effects of the Steller sea lion Protection Measures on harvest of prey were considered insignificant in the Steller sea lion SEIS (NMFS 2001b). Although decreased catch within Steller sea lion critical habitat theoretically leaves more fish for sea lions, catch outside critical habitat would increase to compensate for any forgone TAC within Steller sea lion critical habitat.

The indirect effects of the spatial and temporal provisions in Steller sea lion Protection Measures would be a reduction in competitive overlap of the fisheries with Steller sea lions in time and space. Elements of these measures are of some benefit to Steller sea lions, especially during the breeding season, in that the spatial and temporal dispersion of fishing effort spreads out the catch. However, the benefits to sea lions during other times of the year are equivocal. The effect of the closures on Steller sea lions would depend on the region. Closure of Management Areas 4 and 5, Seguam Pass, and Steller sea lion critical habitat (20 nm) around five northern haulouts would have little benefit for Steller sea lions, since fishing effort has been minimal in this area in recent years. Closure of the Aleutian Islands to pollock fishing would also have little effect since pollock makes up only a minor portion of the sea lion diet in this region. However, closures in the GOA, would be more beneficial considering the importance of pollock to the sea lions in this region. The Steller sea lion SEIS rated this effect as conditionally significant adverse for spatial and temporal concentration of fisheries, largely based on the lack of positive change from recent years. To the extent that competition with the fisheries is a key factor in the decline of the Steller sea lion, these measures would reduce this competition with groundfish fisheries during the breeding season in the vicinity of important rookeries and haulouts and benefit animals to varying degrees depending on geographic location.

The 3 nm closures around rookeries and haulouts decrease the level of disturbance to Steller sea lions around these areas to the extent that fishing had previously been conducted in these areas prior to 1990, but disturbance from fishing activities away from rookeries has not been demonstrated to have an adverse effect on Steller sea lions (NMFS 2001b). Overall, the 3 nm closures would not be expected to modify Steller sea lion behavior to the extent that population level impacts could occur and thus would likely be considered insignificant.

Eiders: The Steller sea lion Protection Measures would be expected to have little if any effect on the threatened spectacled eider populations. Eider winter habitat occurs within the ice pack of the northern Bering Sea and there is little overlap in habitat with the groundfish fisheries (Peterson *et al.* 1999). The Steller's eider winter habitat is typically inshore and also has little overlap with groundfish fisheries (USFWS 2002).

Short-tailed Albatross: The groundfish fishing closures of the Seguam Pass foraging area for Steller sea lions and the critical habitat east of 173° W to the western boundary of Area 9, could reduce the potential for incidental take of endangered short-tailed albatross in the cod longline fishery. In addition, the seasonal apportionment of TAC of Pacific cod in the BSAI could also avoid times when these albatross are present in higher numbers. But overall, incidental take of short-tailed albatross is very low (less than [<]4 albatross over 2 years) and is not directly correlated with spatial or temporal distribution of fishing effort (NMFS

2001b). Specific closures under the Steller sea lion Protection Measures themselves are unlikely to have any substantial effect on incidental take.

Cetaceans: The five endangered cetaceans in the BSAI and GOA would not be expected to be adversely affected by the Steller sea lion Protection Measures. Prey overlap between these whales and the groundfish fisheries is considered low. These fisheries target adult groundfish, whereas whales tend to target juveniles or smaller fish. The direct effect of incidental take, entanglement in fishing gear or disturbance from fishing activity on whales in the BSAI and GOA has not been found to have population-level effects (NMFS 2001b).

Target Species

Pollock: Under Alternative 1, the TAC for target groundfish species is managed to ensure populations and stocks are harvested below the overfishing level (OFL) by a harvest rule setting F=0 when $B=B_{20\%}$ (Appendix B). The Steller sea lion Protection Measures seek to reduce the potential for localized depletion of Steller sea lion prey by redistributing pollock catch to the eastern Bering Sea (EBS). However, the distribution of pollock is not static, and is dependent on various environmental conditions. If the distribution of pollock is different than predicted, there is the potential that partitioning of the harvest could lead to excessive local harvest rates within a region (NMFS 2001b). However, this is more a problem for predators, such as Steller sea lion, than for the pollock stocks.

In the Aleutian Islands, no fishing for pollock would be allowed in 2003. In the EBS, the 10 nm closure areas around rookeries and haulouts would ensure that some portions of the pollock stock are protected from directed fishing. The Steller sea lion Protection Measures do not necessarily reduce the temporal and spatial aggregation of fishing in all areas of Steller sea lion critical habitat. However, one objective is to increase the amount of pollock available to the ecosystem in coastal regions. More commercial sized pollock would be available as prey in critical habitat, also.

Overall, fishing as modified by the Steller sea lion Protection Measures would impact trophic interactions in coastal regions of the BSAI and GOA but the effect of these changes are difficult to predict because of the complex nature of the food web. Effects on pollock stocks were considered insignificant in the Steller sea lion SEIS (NMFS 2001b).

Pacific Cod: Under the target fish measure associated with the Steller sea lion Protection Measure under Alternative 1, the average fishing mortality imposed on the BSAI and GOA Pacific cod stock is well below the maximum sustainable yield. These measures also seek to reduce localized depletion by redistributing Pacific cod catch, although this is difficult because the stocks are very mobile.

The fishing seasons prescribed under the Alternative 1 policy Steller sea lion Protection Measures are expected to result in spatial and temporal distribution of catch similar to recent years with most of the catch occurring during January. The regions closed to the various gear types are regions that historically have had relatively low levels of fishing effort with those gears. Closed areas would ensure that some portion of the stock was protected from directed fishing. These actions are likely to ensure that BSAI and GOA cod stocks are harvested at a sustainable rate. Effects on cod were found to be insignificant in the Steller sea lion SEIS (NMFS 2001b).

Atka Mackerel: The Steller sea lion Protection Measures under the Alternative 1 policy are intended to reduce localized depletion by redistributing Atka mackerel catch within the BSAI by having two fishing seasons and specific catch limits within critical habitat. The TAC for Atka mackerel is apportioned 60 percent inside Steller sea lion critical habitat and 40 percent outside.

For BSAI Atka mackerel, the projected average fishing mortality rate under the Steller sea lion Protection Measures would increase from recent years but is still below the OFL and the spawning biomass level is maintained such that the stock would not be overfished.

With the additional fishing effort for Atka mackerel in Steller sea lion critical habitat under the apportioned TAC , the spatial aggregation of fishing in Steller sea lion critical habitat could increase but is not likely to affect the sustainability of the Atka mackerel stock. High catches of Atka mackerel in Steller sea lion critical habitat would impact the amounts of Atka mackerel available to the ecosystem. Fewer commercial-sized Atka mackerel would be available as prey in Steller sea lion critical habitat.

Other Target Species: The Alternative 1 FMP management measures under Steller sea lion Protection Measures would not be expected to have significant effects on flatfish, BSAI rockfish, GOA rockfish, and thornyheads. Measures are not likely to significantly affect the sustainability of these stocks, either through direct effects of fishing mortality or concentration of the catch, or indirect effects of change in prey availability and habitat suitability.

Non-Target Species

Non-target species include a wide range of species groups such as forage fish, other species, and non-specified. Since little is known of the seasonal distribution of most of the non-target species, the effect of changes in apportionment of harvest is also unknown. In addition, fishing closures and harvest limits in Steller sea lion critical habitat would likely result in the failure to fully harvest target fish TAC. This, in turn, would reduce the bycatch of non-target species in these areas. Changes to the fisheries under the Steller sea lion Protection Measures would likely not affect the non-target fish populations in the region (NMFS 2001b).

Prohibited Species

Chinook and other Pacific salmon are taken as bycatch in the groundfish trawl fisheries so any change in the distribution or time of fisheries could affect bycatch of these species. It appears that chinook salmon, other Tanner crab, and halibut bycatch rates are higher in Steller sea lion critical habitat (NMFS 2001b). The Steller sea lion 10 nm buffer in the vicinity of Unimak Island has been shown to have higher bycatch of chinook salmon (NMFS 2001b). Trawl closures under the Steller sea lion Protection Measures in nearshore areas around haulouts and rookeries would relocate fishing from areas of high bycatch and potentially decrease salmon bycatch as well as other protected species. However, the actual amount of change in the salmon bycatch would be difficult to predict and would not be expected to be radically different than in previous years (NMFS 2001b).

Halibut, Pacific herring, and crab bycatch in the groundfish fisheries would not be expected to be substantially different than recent years due to Steller sea lion closures or any displacement of fishing activity offshore (NMFS 2001b). Halibut bycatch is controlled by Prohibited Species Catch (PSC) limits (caps) for specific fisheries and if these caps are reached, the fisheries are closed. Thus, fishermen have a real incentive to avoid these species so as to maximize their groundfish harvest opportunity. Red king crab and Tanner crab in bycatch would be expected to remain at historic levels since PSC limits are in place for these species.

Essential Fish Habitat

The effects of the Steller sea lion Protection Measures on Essential Fish Habitat (EFH) are the indirect benefits to the benthic habitat that accrue as a result of the no-transit areas, no-fishing area closures and area-specific gear closures, especially for those that apply to non-pelagic trawling. Maintaining the closures within the 3 nm buffer zones around Steller sea lion haulouts and rookeries and restrictions within 10 to 20 nm of key rookeries, to the extent that these areas were fished in the past, would protect benthic communities in these areas from further disturbance. Under the Steller sea lion Protection Measures, areas closed to trawling for the three main target species, which are important prey for Steller sea lions, amount to approximately 50 percent of all Steller sea lion critical habitat. There is likely a wide range of benthic habitat types within the areas designated as Steller sea lion critical habitat, and protection of these areas provides additional areas of undisturbed benthic habitat. Closures of Steller sea lion critical habitat in the Aleutian Islands closely coincide with concentrations of Habitat Areas of Particular Concern (HAPC) biota in this area and also provide good habitat for Atka mackerel adults and late juveniles. However, the displacement of fishing effort out of Steller sea lion critical habitat and concentration of fishing effort in the areas remaining open may result in increased impacts to benthic habitat and EFH in other areas, some of which may have only been marginally fished in the past. Overall, the effects are likely a combination of decreased impact in some areas, and increased impacts in other areas. Effects of the Steller sea lion Protection Measures on EFH were considered insignificant in the Steller sea lion SEIS (NMFS 2001b).

Seabirds

Incidental take of seabirds in longline fisheries could be affected to some degree by any changes in the distribution and timing of the Pacific cod longline fisheries due to Steller sea lion Protection Measures since most of the incidental take of seabirds comes from these fisheries. Overall, the recently instituted seabird avoidance measures in the longline fisheries will produce greater benefits to the northern fulmar and other species in comparison to the benefits of closure of areas or restricted fishing under the Steller sea lion Protection Measures.

The 3 nm buffer zone, the no fishing closures, and the other Alternative 1 FMP groundfish fishing restrictions in Steller sea lion critical habitat would serve to further limit disturbance of forage fish schools in these areas and provide some level of benefit to piscivorus seabirds, especially where these closed areas overlap with seabird foraging concentration areas and large seabird colonies. However, this effect is difficult to quantify because of the very limited area involved and the ability of most seabirds to forage over a very large area. Overall, effects of the Steller sea lion Protection Measures on seabirds were considered insignificant in the Steller sea lion SEIS (NMFS 2001b).

Marine Mammals

Effects of the Alternative 1 FMP Steller sea lion Protection Measures on harbor seals relate to the spatial and temporal dispersion of the fisheries and the competition with the fisheries for prey species. Incidental take of harbor seal would be expected not to change from the relatively low level in the BSAI of 4 per year and GOA of <1 per year. Where the 3 nm buffer areas overlap with harbor seal haulouts and breeding areas, some protection is provided from fishery-related disturbance. However, coverage of important nearshore harbor seal habitats by these buffer zones is not global and many areas, such as the nearshore areas around Kodiak Island and the Alaska Peninsula, are not afforded protection under these closures. Where management measures displace the pollock, Pacific cod and Atka mackerel fisheries farther offshore and leave more fish in coastal areas, some benefits to harbor seals are expected. TAC of the major prey species for harbor seals would generally be similar to recent years.

For the northern fur seal, the primary effects of the current Steller sea lion Protection Measures are related to the spatial and temporal shift in fishing effort in the Bering Sea. The spatial shift in the Bering Sea pollock fishery northward from the closed Steller sea lion Conservation Area to the summer and fall foraging habitat of the northern fur seals results in concentration of the fishing effort in this area, increased disturbance, and a potential competitive overlap with the groundfish fishery for prey. Expanding the pollock fishery from fishing only in the fall to the entire period when the fur seals are breeding, potentially increases the competition for prey species. Overall effects would be considered negative, but whether it would be significant at the population level is difficult to predict. Concerns have been raised by Alaska Natives in the Pribilof Island region about the potential adverse effects of the pollock fishery on the northern fur seal population and subsequently on subsistence harvest. As a result, this effect was considered conditionally significant adverse in the Steller sea lion SEIS (NMFS 2001b).

Ecosystem

Effects of the Alternative 1 FMP Steller sea lion Protection Measures on the ecosystem were analyzed in the Steller sea lion SEIS using a range of environmental indicators (NMFS 2001b). With regard to predatory-prey relationships, effects were considered significantly beneficial in regards to forage availability when management measures result in more than a 10 percent increase in prey, such as pollock or other major prey species. Also considered significantly beneficial was the effect on species diversity, which was based on improved protection for a wide range of species. Indicators that were predicted not to change as a result of these measures were the effect on top predators, energy flow and balance, and the introduction of non-native species (NMFS 2001b).

Human Environment

Since the current Steller sea lion Protection Measures have the effect of greatly modifying the ways of fishing for groundfish, the effect on the human environment can be substantial, but some sectors and geographic areas are more affected than others (M. Hartley, Northern Economics, personal communications 2002). Economic effects of these measures have been analyzed in the Steller sea lion SEIS, and following is a general summary from this analysis (NMFS 2001b). Impacts generally fall into 3 main categories:

- Non-market impacts.
- Industry costs and market impacts.
- Indirect impacts.

The non-market effects caused by the Steller sea lion Protection Measures, such as existence value, subsistence, and eco-tourism, are generally considered beneficial in that anything that promotes the increase in recovery of the Steller sea lion would have a positive effect on these non-market activities. Subsistence costs would decrease with an increase in the number of animals. Rural residents would have more Steller sea lions to hunt and have to travel less to take them. The Steller sea lion SEIS found non-market effects of the Steller sea lion Protection Measures to be significantly beneficial (NMFS 2001b).

Industry costs and market impact were evaluated using an economic model (NMFS 2001b). Operation costs affect the fishing industry directly by increasing cost per unit harvested. The Alternative 1 FMP Steller sea lion Protection Measures affect the industry by increasing travel time to and from distant fishing grounds compared to prior years when such measures were not in effect. These impacts vary considerably between the various fisheries. The EBS pollock and cod fisheries are largely unaffected by changes under the Steller sea lion Protection Measures, whereas the changes to the GOA pollock, Pacific cod, and Atka mackerel fisheries have a much greater affect on industry costs. Time associated with learning how to fish new fishing grounds, reducing catch per unit of fishing effort from fishing less concentrated stocks, increasing down time and layups, all contribute to increasing costs to processors. If the operating costs increase, some negative impacts on the market would be expected.

The impact on markets for pollock, Pacific cod, and Atka mackerel are measured as changes in prices and product revenues. A market analysis conducted for the Steller sea lion SEIS found that implementing the Steller sea lion Protection Measures would have a relatively small effect on the markets of most of the product forms and the overall impact would be insignificant (NMFS 2001b).

Safety costs are an indirect economic factor affected by the current Steller sea lion Protection Measures. With the smaller boats, especially in the GOA, there would be operational costs for fishing farther offshore, in more remote fishing grounds, and operating during periods when weather conditions are more extreme. There is also an increased risk of accident and injury from working in unfavorable conditions (NMFS 2001b). However, it must be noted that many of these impacts can be mitigated by rationalization of the fisheries.

Section 4 Alternative 2: Adopt a More Aggressive Management Policy

4.1 Management Approach

The Steller sea lion-related goals of the Alternative 2 policy are the same as Alternative 1: to be compliant with the Magnuson-Stevens Fishery Conservation and Management Act, the ESA, and other applicable laws. This alternative is designed to maximize the biological and economic yield from the fishery resource through a more aggressive harvest strategy while avoiding jeopardy. Alternative 2 is based on the assumption that fishing has no adverse impact on the environment except in specific cases when science provides convincing empirical evidence of harm.

4.2 Overview of Management Measures

Under this management policy, no fishing restrictions beyond those mandated under the Steller sea lion Protection Measures would be implemented unless scientific research yielded clear evidence of adverse impacts from the fisheries or that new measures would be beneficial to Steller sea lions. Alternative 2 proposes to amend the current FMPs to establish a less precautionary management policy while still preventing overfishing of target groundfish stocks. To illustrate the environmental consequences of this alternative, an FMP framework was developed. This FMP framework is comprised of two FMPs that serve as bookends to portray a range of management actions. Adoption of the Alternative 2 policy would result in changes made to the groundfish FMPs that fall within the FMP bookends.

4.3 Fishery Management Plan 2.1 Management Measures

Changes to the Steller sea lion Protection Measures under the FMP 2.1 would likely be very minor since the groundfish fisheries would still have to avoid jeopardy under the ESA. In the FMP illustration, no changes are contemplated to the current Steller sea lion Protection Measures. There would be changes to other FMP components that could have an effect on the Steller sea lions, such as changes to the TAC-setting process resulting in increased harvest of Steller sea lion prey species, repeal of current closed/restricted areas, and elimination of all trawl closure areas and fixed gear restrictions.

No additional sea lion programs or research efforts beyond those established under FMP 1 would be required to implement FMP 2.1. However, at this end of the Alternative 2 policy spectrum, changes to some of the other FMP components illustrated in FMP 2.1, such as elimination of the Observer Program and VMS requirements, would alter the effectiveness of the existing Steller sea lion Protection Measures. Such changes in fishery management would likely require a new Section 7 consultation with NOAA Fisheries and OPR to determine if the new system places the Steller sea lions in jeopardy. It would then need to be demonstrated that the subsequent changes were either positive or inconsequential to Steller sea lions or its critical habitat to avoid jeopardy.

4.4 Fishery Management Plan 2.1

Physical Environment

FMP 1 policy Steller sea lion Protection Measures would remain in place under the FMP 2.1. Therefore, the effects on the physical environment (both positive and negative) would be the same as FMP 1. These effects include preventing additional alteration of physical structure to the non-living substrate and sedimentation in the 3 nm buffer zones and areas within critical habitat closed to non-pelagic trawling. These effects were found to be insignificant in the Steller sea lion SEIS (NMFS 2001b).

Biological Environment

Threatened and Endangered Species

The area and fishing closures under the Steller sea lion Protection Measures for FMP 2.1 would be the same as those under FMP 1, as required to avoid jeopardy (Figure 4). Therefore, effects of the area closures and other elements of the Steller sea lion Protection Measures on Steller sea lions would be the same. However, changes made to other FMP components would potentially have adverse effects, such as substantially higher TAC and the increased disturbance that would come with the higher harvest rate, changes to the Observer Program and repeal of the VMS requirements. These components, separate from the Steller sea lion Protection Measures, would likely trigger preparation of another BiOp to determine if the changes result in jeopardy.

The aggressive harvest strategy under FMP 2.1 would result in a substantially greater harvest of Steller sea lion prey through removal of the buffer between the ABC level and the OFL, removal of PSC limits, bycatch restrictions, and the optimum yield cap in the BSAI. This would potentially reduce the effectiveness of the Steller sea lion Protection Measures.

The amount of observer coverage in the fleet is an important consideration for determining the incidental take of sea lions. Since Steller sea lions are infrequently taken incidentally in the fishery, trying to extrapolate the number of sea lions taken by the whole fleet from only a small percentage of observed vessels is statistically problematic. Without VMS, NOAA Fisheries would have to rely on self-reported logs to determine the amounts of fish taken in Steller sea lion critical habitat. This could result in lower allowable catch levels to address concerns over unreported catch in these areas.

No change in effects on other ESA-listed species resulting from FMP 2.1 Steller sea lion Protection Measures would be expected since they are the same as FMP 1.

Target, Non-Target, and Prohibited Species

FMP 2.1 would establish a more aggressive harvest policy for the three main sea lion prey species (pollock, Pacific cod and Atka mackerel) while still preventing overfishing of these target groundfish stocks by maintaining harvest below the OFL for each species. More prey species would be harvested outside of critical habitat. Within critical habitat, harvest levels would be maintained at the current levels. Overall, the effects of the Steller sea lion Protection Measures on target, non-target, and prohibited species would be the same as those under the Alternative 1 policy.

Human Environment

Since the Steller sea lion Protection Measures under the FMP 2.1 would be the same as FMP 1, effects of these measures on the socioeconomic factors would also be the same.

4.5 Fishery Management Plan 2.2 Management Measures

Under the Alternative 2 policy range, FMP 2.2 would continue the current Steller sea lion Protection Measures similar to FMP 1 (Figure 5). No additional sea lion programs or research efforts beyond the status quo would be implemented under FMP 2.2. Most of the other FMP 2.2 components would also be the same as FMP 1 except that TAC may be set higher than current levels with a cap equal to the sum of all target ABCs. Although FMP 2.2 would likely retain the ban on targeting forage fish, the NPFMC would not need to account for changes in the food-web relative to the needs of marine mammals, or to include ecosystem-level considerations in fishery allocation decisions. The Observer Program and VMS requirements would be the same as Alternative 1 so monitoring of incidental take and harvest within Steller sea lion critical habitat would continue. For more information on the effects of these FMP components, see the TAC-Setting Bycatch Restrictions, and Observer Program discussions elsewhere in this section.

4.6 Illustrative Fishery Management Plan 2.2 Effects

Physical, Biological, Human Environment

Since FMP 2.2 Steller sea lion Protection Measures are the same as FMP 1, the effect of these measures on the physical, biological, and human environment would be essentially the same as described under the Alternative 1 policy and the current FMP.

Section 5 Alternative 3: Adopt a More Precautionary Management Policy

5.1 Management Approach

The Steller sea lion-related goal of the Alternative 3 policy is very similar to the adaptive management policy of Alternative 1 in that it seeks to maintain or adjust current Steller sea lion Protection Measures as necessary to avoid jeopardy, or adverse modification of their designated critical habitat. The Alternative 3 policy, however, would place more emphasis on incorporating ecosystem-based management principles into allocation decisions and would implement more precautionary management measures beyond those currently in place under the Alternative 1 policy. Specific objectives under the Alternative 3 policy are to develop indices of ecosystem health as targets for management, adjust ABCs as necessary to account for uncertainty, incorporate ecosystem factors such as predator-prey relationships and regime shifts into allocation decisions, and initiate research on the habitat needs of different species in the food web.

5.2 Overview of Management Measures

As part of the goal to accelerate incorporating ecosystem considerations into management of the fisheries, NOAA Fisheries would develop indices of key ecosystem processes that would be used to track ecosystem health. Environmental measurements involving population trends and abundance of prey species of Steller sea lions and other marine mammals may well be included in these new ecosystem indices. The development of ecosystem indices would likely benefit from collaboration with academic research institutions and efforts to incorporate traditional ecological knowledge into fisheries management.

An additional goal under the Alternative 3 policy would be to increase the rationalization of the fisheries in order to reduce the "race for fish." Rationalization programs provide opportunities for tighter spatial-temporal controls on fishing effort, which are the basis of most of the Steller sea lion Protection Measures. For more information on how rationalization measures could effect the biological environment (see Appendix F-8, Overcapacity).

5.3 Fishery Management Plan 3.1 Management Measures

The Alternative 3 policy, as illustrated by FMP 3.1, would retain the Alternative 1 Steller sea lion Protection Measures that are designed to produce spatial and temporal dispersion of fishing effort within Steller sea lion critical habitat. These existing measures would be augmented by changes to other FMP 3.1 components such as setting TAC equal to or less than ABC for all target and other species categories, setting ABC < OFL and a prohibition on bottom trawling for pollock in the BSAI (see Appendix F-1, TAC Setting Process).

Other FMP 3.1 components that could affect Steller sea lion Protection Measures include establishing goals and guidelines for selecting Marine Protected Areas (MPAs) and no-fishing zones (see Appendix F-3, Marine Protected Areas and Essential Fish Habitat). The MPA program would complement the effort to develop an index of ecosystem health. The establishment of no-fishing zones explicitly intended to benefit marine mammals such as the Steller sea lion would provide an opportunity to study the dynamics of fishery-ecosystem interactions. Reproductive success, foraging behavior, diet, physiological health, and other

parameters could be measured and compared between populations within no-fishing zones, and populations within areas where fishing was allowed. The results of such comparisons would provide scientific justification for future fishery management decisions, including those to protect Steller sea lions. These types of comparative studies would be greatly facilitated if protected areas could be matched with open-fishing areas that were similar in key respects such as similar habitats and fish communities. Establishing the criteria for selection of protected areas would be an important step in realizing this research potential.

The rationalization of fisheries under FMP 3.1 may benefit localized concentrations of fish that are important to Steller sea lions by spreading fishing pressure over time. It is thought that more dispersed fishing effort would cause less disruption of the prey field and, therefore, facilitate sea lion foraging success and reduce impacts on prey availability. Due to scientific uncertainty about this issue, the dynamics of fishing effort-prey field interactions would continue to be a research priority.

The Observer Program would be modified under FMP 3.1 to improve the collection of scientific data and to make it more independent from the fishing industry and NOAA Fisheries. The idea would remove any conflicts of interest and allow more third-party monitoring of the fishery data. While these changes would be oriented mostly toward data on target and non-target fish, they could impact Steller sea lion Protection Measures in at least two ways. First, improved scientific data on fishing effort and distribution may help refine future analyses of sea lion-fishery interactions. It would also contribute to an improved understanding of non-target fish and, therefore, to a better understanding of the food web. Second, the proposed changes would improve confidence in the accuracy of harvest data, which is important in Steller sea lion critical habitat considerations.

5.4 Fishery Management Plan 3.1 Effects

Physical Environment

Since the Steller sea lion Protection Measures under FMP 3.1 are the same as FMP 1, effects of these measures on the physical environment would be the same. (Figure 6). Substantive change to these measures as a result of research efforts would be difficult to predict at this point. Effects on the physical environment would include preventing additional alteration of the physical structure to the non-living substrate and suspension of bottom sediment in the 3 nm buffer zones and areas within critical habitat closed to non-pelagic trawling.

Biological Environment

<u>Threatened and Endangered Species</u>

The FMP 3.1 Steller sea lion Protection Measures would be the same as Alternative 1 in order to avoid jeopardy of Steller sea lions. Other FMP 3.1 components, such as MPAs and no fishing reserves, and use of other ecosystem indicators could offer additional benefits to the recovery of this species by limiting the competitive overlap of fisheries and Steller sea lions. The TAC-setting process component of FMP 3.1 would be the same as the Alternative 1 policy with the HCR prohibiting directed fishing when the biomass reaches 20 percent of its unfished level. Therefore, there would be no change in prey availability to Steller sea lions and other marine mammals as a result of this illustrative FMP.

Similarly, the effects of these measures on short-tailed albatross, Steller's and spectacled eiders, and endangered whale species would be expected to be similar to the Alternative 1 policy for this particular component. The development of ecosystem indices could potentially result in increased protection for these species, but it is difficult to speculate the degree and type of protection. The FMP 3.1 allows for adjustments to the Steller sea lion Protection Measures as appropriate based on new scientific research.

Target, Non-Target, and Prohibited Species

Since the FMP 3.1 Steller sea lion Protection Measures are the same as FMP 1, the effects of these measures on target, non-target, and prohibited species would be the same.

Essential Fish Habitat

The FMP 3.1 Steller sea lion Protection Measures would be the same as under the Alternative 1 policy; therefore, the effects on EFH, if any, would be the same. However, any adjustment to the current protection measures as a result of new research or application of ecosystem-based criteria would likely involve establishing new Steller sea lion Protection Measures, and this would indirectly benefit EFH in new areas to the extent they were disturbed by fishing in the past. Overall, effects of new or expanded Steller sea lion closures would be both positive and negative. As more EFH considerations are incorporated into the Steller sea lion closures and gear restrictions under the ecosystem-based approach, the more likely these measures will result in direct positive effects to Steller sea lions.

Marine Mammals

If the ecosystem-based approach takes into account important habitat of other key marine mammals, such as harbor seals and northern fur seals, Steller sea lion closures could also provide some benefits to these other marine mammals. As new research identifies additional areas important to marine mammals, some modification of existing Steller sea lion Protection Measures could occur and potentially reduce effects on other marine mammals in the region. Ecosystem-based criteria for new Steller sea lion Protection Measures would likely take into consideration unintended results of these measures. For example, the displacement of fisheries from Steller sea lion critical habitat to northern fur seal foraging areas in the EBS could result in adverse effects on fur seal foraging areas. A similar effect could occur in the GOA should new Steller sea lion closed areas overlap with sensitive harbor seal areas (e.g., the benefits that accrue to Steller sea lions could come at a cost to harbor seal).

Seabirds

Since the FMP 3.1 Steller sea lion Protection Measures are the same as under FMP 1, we predict no change in the effects on seabirds as a result of FMP 3.1.

However, other FMP 3.1 components that would afford additional protection to Steller sea lions such as increased area closures, development of MPAs/no-take marine reserves, rationalization of the fisheries, and spreading out the catch over a broader area could indirectly benefit seabirds by reducing disturbance of their prey. Changes in allocation from trawl to longline to protect EFH, however, would have the unintended effect of increasing seabird incidental take as a result of more hooks fished. These adverse effects will likely be mitigated through continued seabird avoidance measures currently in effect.

Ecosystem

Since the Steller sea lion Protection Measures would be basically the same as under the Alternative 1 policy, no difference in impacts on the ecosystem as a result of Steller sea lion Protection Measures is predicted. To the degree that the spatial and temporal separation of the groundfish fisheries from Steller sea lion critical habitat involves positive effects to the ecosystem and food web, we would expect these benefits to continue under the policy alternative. Effects on the ecosystem would be similar to what is described under Alternative 1.

Human Environment

The socioeconomic effects of Steller sea lion Protection Measures under FMP 3.1 would include additional or expanded closures should scientific evidence indicate that the existing Steller sea lion Protection Measures are inadequate and need to be revisited or expanded. In the event the closed areas are expanded, increased operating costs and/or reduced harvest levels would be expected, although the economic effects would be negative. In addition, if major changes in the time and area provisions of the existing Steller sea lion Protection Measures are proposed, such changes might require additional consultation under Section 7 of the ESA. This consultation could lead to additional protection measures that result in increased cost to fishermen and processors. Alternatively, improving the scientific data on the interaction of Steller sea lions and fisheries may allow for relaxation of some of the Steller sea lion Protection Measures and result in positive socioeconomic benefits.

5.5 Fishery Management Plan 3.2 Management Measures

At this end of the Alternative 3 policy range, the fishery management system is greatly influenced by ecosystem-based considerations and is much more precautionary in the face of scientific uncertainty. Steller sea lion Protection Measures illustrated in FMP 3.2 would be modified to increase the no-fishing buffer zones around rookeries and haulouts based on new telemetry data on sea lion foraging activity and customized for individual locations to reflect actual foraging behavior. For the purposes of this analysis, these new buffer zones are assumed to be 15 nm from shore in the Bering Sea and GOA, except where there is an overlap with MPAs and no-take reserves to protect EFH. Two types of MPAs would also protect Steller sea lion prey species and include "No Steller sea lion prey species hook and line, pot, and trawling MPAs" and "No Steller sea lion prey species trawling MPAs." These MPAs are distributed in a patchwork of 30 nm by 35 nm blocks. In the Aleutian Islands, a 15 nm buffer was applied to each of the Steller sea lion rookeries and haulouts. All rookeries within the Aleutian Islands carry a 3 nm no-transit area with an additional 10 nm (or more) buffer of no trawling for Steller sea lion prey species.

In addition, the HCR would be revised to include a constant buffer biomass for Steller sea lion for the three key Steller sea lion prey species. This means that directed fishing for target species would be halted if biomass ($B_{x\%}$) reached a certain level. This minimum biomass limit would represent the level of fish stocks needed to sustain local sea lion populations under natural foraging conditions.

Under other FMP 3.2 components, indicators of ecosystem health would become important tools for setting TAC. TAC determinations would be more species-specific than they are now and ABC levels would be calculated using more precautionary procedures. It is likely that overall TAC would be considerably less than it is at present. Allocations of TAC among gear types, and in space and time would be based, in part, on protecting living marine resources, including Steller sea lions and other marine mammals. This could include a prohibition on non-pelagic trawling for pollock in both the BSAI and GOA.

Management efforts would also likely benefit from the increased contribution of traditional ecological knowledge anticipated under FMP 3.2. Contributions from academic institutions would also be necessary to help better understand the theoretical underpinnings of an ecosystem-based fishery management system. The collection of this information and its dissemination to the NPFMC and the public would require a new and innovative communication effort by NOAA Fisheries. More on the integration of traditional ecological knowledge can be found in Appendix F-9, Alaska Native Issues).

Under the EFH FMP 3.2 component, up to 15 percent of the BSAI/GOA would be included in MPAs and up to 5 percent of the area placed in no-take reserves to protect EFH. As explained above, these protected areas could also serve as marine mammal refuge and offer the opportunity for scientific research on the effectiveness of ecosystem-based management. Rationalization of all BSAI/GOA groundfish fisheries under the overcapacity FMP component would be a priority and could lead to substantial changes in the spatial-temporal distribution of fishing effort. New quota share programs could provide indirect benefits to Steller sea lions and other marine mammals.

5.6 Fishery Management Plan 3.2 Effects

Physical Environment

Steller sea lion Protections Measures under FMP 3.2 would include a very large increase in the size of the buffer zones; therefore, the area protected from increased non-pelagic trawling would be substantial. In these newly protected areas, effects on the physical environment would be benefits accrued from preventing additional alteration of the physical structure of the non-living substrate in areas previously fished. These new closures would also reduce the effects of suspension of bottom sediments from non-pelagic trawls.

Biological Environment

Threatened and Endangered Species

Increasing the buffer zones around the shoreline of the EBS and GOA, around rookeries and haulouts in the Aleutian Islands, and around the Steller sea lion no prey species MPAs, would further reduce the potential for competitive overlap of groundfish fisheries and Steller sea lion prey, and minimize the potential for localized depletion of prey species near and in Steller sea lion critical habitat (Figure 7). These new buffer zones are assumed to be 15 nm for this analysis, but it is anticipated that the size of these new zones would be based on telemetry data on various age classes of sea lions, conducted at individual sites, by such programs as the ongoing Satellite Telemetry and Steller Sea Lion Research Project (ADF&G and NMFS, 2002). Delineated areas would either be larger or smaller than the 15 nm zone but would likely contain the appropriate biological components of critical habitat for a specific area rather than be based strictly on distance from shore. The application of these new buffer zones, if delineated using a broad spectrum of

telemetry data, and the extensive areas within the no-take Steller sea lion prey species MPAs, would likely result in achieving the optimal separation of the fisheries and Steller sea lions during critical periods throughout the year in comparison to current Steller sea lion Protection Measures under FMP 1, FMP 2.1 and 2.2, and FMP 3.1.

These increased Steller sea lion buffer zones would be expected to have little positive effect on the incidental catch of the short-tailed albatross, especially if these measures resulted in displacing the fisheries further offshore. Effects on the spectacled and Steller's eiders and the endangered cetaceans would be expected to be similar to what is described under the Alternative 1 policy.

Target, Non-Target, and Prohibited Species

The Steller sea lion Protection Measures under FMP 3.2, which include the increased buffer zones, the extensive no-take Steller sea lion prey species MPAs, and a revised HCR for Steller sea lion prey species, would be expected to result in some positive benefits to certain target, non-target, and protected species stocks. A reduction in TAC would ensure that target fish stocks are harvested at a sustainable rate well below the OFL. The increased buffer zone in Steller sea lion rookeries and haulouts and the lower TAC under FMP 3.2 would further ensure that more commercial-size fish would be available as predators and prey in Steller sea lion critical habitat.

A reduction in TAC under FMP 3.2 would also decrease bycatch of non-target, forage fish, and other species. Since distribution of these species is generally not known, the effects of this reduction in bycatch are also unknown.

Effects on prohibited species would generally be similar to FMP 1 except that reductions in TAC for the groundfish fisheries would likely decrease prohibited species catch, assuming bycatch takes remained constant. Limits on prohibited species for individual fisheries would remain in place until it was determined they were no longer needed.

Essential Fish Habitat

Increases in Steller sea lion closures as illustrated in FMP 3.2 would increase the amount of benthic habitat protected from damage or modification by non-pelagic trawls. This would occur only to the extent that these areas were fished in past years. If TAC is not reduced proportionally to the areas closed to fishing, fishing effort would be displaced and some of these open areas could experience increased disturbance to fishing habitat. Long-term effects on benthic habitats are unknown. Other FMP 3.2 components, such as designating up to 20 percent of the BSAI and GOA into MPAs and no-take reserves and prohibition of bottom trawling for pollock GOA, would also have a substantial effect on the amount of EFH protected under this FMP. Overall, effects of the Steller sea lion Protection Measures on EFH under FMP 3.2 would be positive.

Seabirds

Effects of the FMP 3.2 Steller sea lion Protection Measures on seabirds would be similar to those under FMP 1, since all of the primary Steller sea lion management measures would remain in place. Additional Steller sea lion measures to increase buffer zone size in Steller sea lion critical habitat would have little effect on the incidental take of seabirds if fishing effort is displaced to other areas, especially if areas remaining open are seabird foraging areas. Other FMP 3.2 components, such as the substantial reduction in TAC, especially in longline fisheries, would reduce incidental take of seabirds such as the northern fulmar and gulls, although this would likely be overshadowed by the benefits of the current seabird avoidance measures.

Marine Mammals

Increasing the size of buffer zones around Steller sea lion critical habitat under FMP 3.2 would be beneficial to harbor seals based on the increased protection the expanded areas provide to nearshore habitats and the reduction in competition for prey as described under FMP 1. Harbor seals benefit from any management measures that displace the harvest of pollock, Pacific cod, and Atka mackerel farther offshore, and measures that reduce TAC of these species (NMFS 2001b). Areas where new Steller sea lion buffer zones overlap with important breeding habitat for harbor seals, such as Tugidak Island south of Kodiak, would further benefit these animals. This protection would also extend to major harbor seal areas on the Alaska Peninsula and Kodiak Island, since they would be either within the 15 nm band or an MPA. Increased closures of the nearshore areas would have the tendency to displace fishing effort farther offshore, and potentially increase the overlap with fur seal foraging areas. Overall, the Steller sea lion Protection Measures under FMP 3.2 would be somewhat more beneficial to marine mammals than those under the Alternative 1 FMP.

Ecosystem

Since the FMP 3.2 Steller sea lion Protection Measures would be modified by increasing the size of the Steller sea lion buffers, (no Steller sea lion prey species MPAs) these measures would result in substantial decrease in the effects of fishing on the ecosystem within Steller sea lion critical habitat. More prey would be available in time and space to a wide variety of predators; therefore, the Steller sea lion measures would have a positive effect on the predator-prey relationships. Effects on species diversity would also be positive because of the potential effects on the declining Steller sea lions. Overall, the effects on the ecosystem under FMP 3.2 would be generally similar to those described in FMP 1, although the intensity of the effects would be greater under FMP 3.2. Ecosystem parameters not expected to change are effects on top predators and energy flow and balance (NMFS 2001b). Overall, effects of the new Steller sea lion Protection Measures under the FMP 3.2, although positive to several species, are considered insignificant on the ecosystem, similar to the finding for all the alternatives in the Steller sea lion SEIS (NMFS 2001b).

Human Environment

The increase in buffer zones to 15 nm around all shoreline and outside of no-take MPAs and the creation of no Steller sea lion prey species take MPAs under FMP 3.2 would likely result in vessels, primarily in the GOA (Alaska Peninsula and Kodiak), spending more time fishing farther from port and fishing in more difficult areas. These effects would be more severe for smaller catcher vessels. Reductions in TAC would result in less income for the fleet. Effects on the economies of the small rural communities and fishermen in these communities would be significantly adverse. Fishermen would need to travel further from their

communities to fish (M. Hartley, Northern Economics, personal communication, 2002). Smaller boats would have to fish farther offshore and, therefore, experience higher operating costs and elevated safety risks, although these risks are difficult to quantify.

However, other FMP 3.2 components such as rationalization of all of the GOA and BSAI non-pollock/sablefish fisheries, can potentially mitigate many of these impacts on the human environment (see Appendix F-8, Overcapacity).

Section 6 Alternative 4: Adopt a Highly Precautionary Management Policy

6.1 Management Approach

The goal of the Alternative 4 policy with regard to Steller sea lion Protection Measures is incorporated into a change in policy that transfers the burden of proof from the resource to the user when faced with uncertainty. This management policy is based on the same basic assumption as Alternative 1, that fishing produces adverse impacts on the environment but, due to incomplete data and scientific uncertainty, little is known about these impacts. Adoption of the Alternative 4 policy would require more information and conclusive studies to support large commercial harvests. Alternative 4 FMPs 4.1 and 4.2 illustrate two FMPs (a fishing strategy and a no fishing strategy, respectively) where results from scientific studies are used to mitigate any adverse effects on the biological environment. Effect would need to be understood prior to preceding with a fishery. This policy would result in a number of changes to the existing FMPs that would substantially reduce the groundfish fisheries until more information is known about the frequency and intensity of fishery impacts upon Steller sea lions and the marine environment. Expanded fisheries research and monitoring programs will fill critical data gaps. Once more is known about fishery effects on the ecosystem, scientific information would be used to modify and relax the precautionary measures initially adopted.

6.2 Overview of Management Measures

The conservative management measures specific to Steller sea lions under the Alternative 4 policy would involve continued enforcement of the Steller sea lion Protection Measures as described under FMP 1. New fishing restrictions would likely be instituted to further protect Steller sea lion critical habitat such as gear restrictions, time and area closures, reapportionment of catch among gear types, and TAC adjustments to compensate for area closures. Programs would be developed to evaluate the status of other marine mammals and their interaction with groundfish fishing. For example, management measures that reduce impacts to the northern fur seal and the northern right whale would be developed.

6.3 Fishery Management Plan 4.1 Management Measures

Steller sea lion Protection Measures illustrated under FMP 4.1 would include a comprehensive ban on all trawling in all designated Steller sea lion critical habitat. It would also prohibit trawling in all fisheries that can be prosecuted with other gear types (i.e., Pacific cod). These restrictions would relocate trawling to areas outside critical habitat. TAC for Steller sea lion prey species would be calculated based on an $F_{75\%}$ strategy (refer to Appendix B).

Other FMP 4.1 components, such as TAC-setting, would also have a substantial effect on Steller sea lions. The TAC-setting policies of FMP 4.1 would have the potential to positively impact the foraging ecology of marine mammals, including the Steller sea lion, through changes in the food-web. If TAC-setting policies were proven ineffective, they would be modified with measures more likely to achieve policy objectives. Target fishing rates for most species would be set at $F_{75\%}$ and $B_{40\%}$ and would become an actual limit rather than a target. ABC for a species complex would be based on the TAC of the least abundant member of the

group. ABCs would be calculated from the lower boundary of the confidence limits for the stock assessment rather than the center of the confidence range as is presently the case. Bycatch of prohibited species would have to be reduced by 30 to 50 percent or the fishing area would be closed.

Another FMP 4.1 component affecting Steller sea lions would be the establishment of no-take marine reserves in 20 to 50 percent of the BSAI/GOA. This would provide opportunities for scientific research on the impacts of fishing on Steller sea lions. Under FMP 4.1, the Observer Program would be expanded to include 100 percent coverage on vessels > 60 ft in length and at least 30 percent coverage on vessels < 60 ft in length and 100 percent observer coverage of the hauls. This would tend to increase the quantity and quality of marine mammal-fishery interaction data The increases in observer coverage, along with mandatory VMS for all groundfish vessels, would improve the monitoring and enforcement of fishing effort in the many restricted fishing areas.

FMP 4.1 places a high value on protecting the ability of local communities, most of which are predominately Alaska Native communities, to harvest fish and wildlife for subsistence and community development purposes. This may mean that at least some areas closed to commercial fishing may still be open to subsistence harvests. Monitoring of subsistence take, including Steller sea lions, would likely be a function of agency-community co-management organization efforts.

6.4 Fishery Management Plan 4.1 Effects

Physical Environment

The Steller sea lion Protection Measures under FMP 4.1 would be modified by eliminating all trawling in Steller sea lion critical habitat. The comprehensive ban on trawling in Steller sea lion critical habitat, when added to other FMP 4.1 components such as areas closed to trawling for other reasons and the marine no-take reserves, result in the elimination of trawling in over 50 percent of the fishable area. Effects of this large reduction in on-bottom and pelagic mobile fishing gear would be the protection of these areas from further modification of the non-living substrate and suspension of bottom sediments where trawling had occurred in the past.

Biological Environment

Threatened and Endangered Species

FMP 4.1 would restrict certain gear types, such as trawls, in Steller sea lion critical habitat and would set more conservative harvest levels for important prey species (Figure 9). This would greatly minimize the potential for localized depletion of prey species such as pollock, Pacific cod, and Atka mackerel within 20 nm of rookeries and major haulouts and substantially reduce competition with the groundfish fishery for prey. Restricting all trawling for target fish that could be caught by other gear types would significantly reduce the rate of harvest and spread out the fisheries efforts for species such as Pacific cod.

ABC calculations for the key sea lion prey species under the Alternative 1 policy Steller sea lion Protection Measures are based on a fishery mortality rate of $F_{40\%}$ and a spawning biomass of $B_{20\%}$ (refer to Appendix B). Under FMP 4.1, more conservative calculations of ABC ($F_{75\%}$ and $B_{40\%}$) would be used instead. The results of these changes would be substantial reductions in the TAC ~~of key~~ Steller sea lion prey species (e.g., pollock, Pacific cod and Atka mackerel).

In the near term, take of Steller sea lions in the groundfish fisheries would be substantially reduced to levels approaching zero until research determines how fishing can be conducted in a manner that assures minimal harm to the environment. Currently, incidental take of Steller sea lions in the groundfish fishery is very low and not considered to have an effect at the population level. A majority of the incidental take occurs in the Bering Sea groundfish trawl fishery, so any major reduction in this fishery as a result of the reduced TAC would lower incidental take. Additional measures and modifications of fishing methods would be developed to try and reduce this further, but this would be difficult considering the level of take in the groundfish fisheries is already very low (mean of 10 per year) (Angliss and Lodge 2002).

New ecosystem-level research would be the focus of the Alternative 4 policy, although the details of such research efforts are as yet undefined. The ecosystem-level research objectives of FMP 4.1 would necessarily require extensive coordination between NOAA Fisheries, other research agencies, and academic institutions. These efforts would also need to include cooperative research programs with Alaska Native communities for data gathering and monitoring in order to enhance the use of traditional ecological knowledge in fishery management decisions.

Effects of the FMP 4.1 Steller sea lion Protection Measures on short-tailed albatross would likely be similar to FMP 1. If more of the target fish TAC from the trawl fisheries were taken using longline gear, the possibility for incidental take of short-tailed albatross would tend to increase. However, reductions in TAC would likely offset this increase. Proposed seabird avoidance measures would also likely compensate for any potential increase in incidental take of this endangered species. Further reducing the current take to levels approaching zero would require the design and implementation of even more efficient avoidance measures in the remaining fisheries. Such measures do not presently exist.

Target, Non-Target, and Prohibited Species

Effects of the FMP 4.1 Steller sea lion Protection Measures on target fish, including the new TAC-setting methods and gear restrictions, would generally be similar to those under FMP 1 in that stocks would not be overfished. However, under FMP 4.1, stocks would be maintained well above minimum stock size threshold, therefore, stocks would be much less likely to be over harvested. The effects of reducing TAC for target species would likely result in reduced levels of bycatch of non-target species. Prohibited species catch would continue to be limited by PSC limits for specific fisheries to achieve the reduction of 20 to 50 percent in bycatch of prohibited species. Lower limits would affect the ability of the fisheries to achieve the TAC before the fishery is closed because a prohibited species limit is reached. There would be substantial reductions in prohibited species catch from trawl gear closures in Steller sea lion critical habitat as well as in other areas closed to trawling. The trawl gear restrictions in specific fisheries such as Pacific cod would also reduce catch of prohibited species. These effects are all viewed as beneficial impacts on target, non-target, and prohibited species at this FMP.

Marine Mammals

Steller sea lion Protection Measures instituted under FMP 4.1 that would affect other marine mammals, would include a reduction in TAC and a ban on trawl gear in Steller sea lion critical habitat. Trawling would also be banned for species that could be caught by other methods. These measures would benefit other marine mammal species such as the northern fur seal and harbor seal. The level of reduction in TAC would be the major factor in determining the degree of benefit for these species. Banning trawling in all Steller sea lion critical habitat would further reduce competitive overlap between groundfish fishing and harbor seals. Reduction in TAC in areas outside of Steller sea lion critical habitat would particularly benefit the northern fur seal, which were affected by the displacement of fishing effort out of Steller sea lion critical habitat.

Seabirds

The existing and additional Steller sea lion Protection Measures under FMP 4.1, especially the no-trawl areas within Steller sea lion critical habitat, would have some beneficial effects on seabirds where these areas overlap with important foraging areas and major breeding colonies (Figure 8). These areas would provide undisturbed prey fields for several species of piscivorus seabirds and, to the extent that it benefits foraging success, effects would be positive.

The ban on trawling in Steller sea lion critical habitat, as well as other areas, and lower TAC levels would have the effect of reducing the bycatch of non-target species including forage fish. However, since bycatch of forage fish is currently already very low, reduction in bycatch would likely have an insignificant effect on seabirds (NMFS 2001b). Prohibitions on trawling in Steller sea lion critical habitat would likely result in a substantial increase in the use of longline gear and, therefore, potentially increase incidental take of seabirds, such as northern fulmars, in these fisheries. However, other FMP 4.1 components, such as the lower TAC, would offset some of the potential increase. This potential increase in longline incidental take, however, would also be offset by any new seabird protection measures. Therefore, the net effect on seabirds of any increased longline effort is presumed insignificant.

Human Environment

The effect of FMP 4.1 Steller sea lion Protection Measures would have negative effects on the fishing industry as the larger closed areas could redistribute fishing effort farther from port. It should be noted that the TAC component of FMP 4.1 would lower harvest rates and this component would likely result in more significant effects on the fishing industry than the expanded closed areas under the FMP 4.1 Steller sea lion Protection Measures. Non-market effects such as eco-tourism and subsistence likely would be positive.

6.5 Fishery Management Plan 4.2 Management Measures

Under FMP 4.2, all commercial groundfish fishing would be halted while research on environmental parameters continued and fisheries could be reviewed and certified as having no significant adverse environmental effects. Such a review and certification process could take up to two years. Without fishing during this time frame, there would be no Observer Program. All research would have to be either conducted with various agency personnel and vessels or contracted out to academic institutions and private consultants until fisheries are permitted. Although this scenario would essentially eliminate incidental take

of marine mammals in the near term, it is not clear what specific effect this would have on food availability for Steller sea lions and other marine mammals. This would undoubtedly be a major focus for ecological research after the fishery closures. Whether such changes in the food web could be measured on a population level for a given species would likely depend on the intensity of population monitoring for those species both before and after fishing is closed.

6.6 Fishery Management Plan 4.2 Effects

Physical Environment

The temporary closure of all commercial groundfish fishing activity would eliminate damage or modification to the non-living substrate in the short-term within Steller sea lion critical habitat as well as throughout the region. Groundfish fisheries, once certified by NOAA Fisheries, could be permitted to operate under fishery-specific regulations that mitigate all significant environmental effects.

Biological Environment

Threatened and Endangered Species

Under the FMP 4.2, there would be no fisheries in the near term, although research would continue (Figure 10). The research and development of protection measures and fishing methods to reduce incidental take of Steller sea lions and other marine mammals would require innovative approaches. Without an active groundfish fishery, research on the interactions between Steller sea lions and fisheries would likely not occur during the short-term but it would provide an opportunity to study Steller sea lion in the absence of fisheries. In the long-term, fisheries would need to be certified as having no adverse impacts before they could occur. Therefore, effects of these new fisheries would need to be either positive or insignificant in regard to Steller sea lions, considering their endangered status. After specific groundfish fisheries are certified as having no adverse effects on the environment, it would seem prudent to conduct Section 7 consultation to determine which of the current Steller sea lion Protection Measures were needed to avoid jeopardy under the Alternative 4 policy. The 3 nm no-transit zones around rookeries and haulouts would likely remain in place to minimize disturbance to these sensitive areas by non-fishing vessels.

Target, Non-Target, and Prohibited Species

It is assumed that limited fishing would resume within 2 years as a result of agency review, but in the near term, TAC would be reduced to zero. Effects on fish populations would be expected to be positive in the short-term due to the absence of fishing mortality, but beyond 2 years, effects are more uncertain since the nature of the fisheries at that time is uncertain.

Ecological research required under FMP 4.2 would need to involve harvest of fish under controlled conditions to collect the appropriate data on target fish stocks, non-target populations, ecological relationships, and effects of fishing on the Steller sea lions, as well as other components of the environment. This fisheries research would likely need to include some harvest areas and reference areas to be able to compare and define the actual effects. It is expected that there would be some harvest of target fish within Steller sea lion critical habitat under any research program, but harvest levels would need to be below any level that could adversely affect sea lions.

Essential Fish Habitat

Considering that all trawling, hook and line, and pot fishing would be stopped throughout the BSAI and GOA in the short-term, any area closures under the Steller sea lion Protection Measures be inconsequential. However, the overall effect on EFH of the closure of the fishery would be positive. It is presumed that regulations issued for those fisheries certified as having no significant adverse effects would contain restrictions based on EFH and HAPC considerations.

Marine Mammals

With no groundfish fisheries authorized in the short-term, the Steller sea lion Protection Measures would have little, if any, direct or indirect effect on other marine mammals, nor would there be any cumulative effect. The 3 nm no-transit zones around Steller sea lion rookeries and haulouts would likely remain in effect under FMP 4.2 and, to the extent that it provides some protection to other marine mammals, would likely be beneficial. Overall, effects of the Steller sea lion Protection Measures on other marine mammals would be negligible and are overshadowed by the closure of the entire groundfish fishery.

Seabirds

The closure of groundfish fisheries in the Exclusive Economic Zone (EEZ) under FMP 4.2 would greatly overshadow any effects of the Steller sea lion Protection Measures on seabirds. The elimination of all commercial fishing would necessarily decrease the seabird incidental take to almost zero.

Ecosystem

Under FMP 4.2, effects of the Steller sea lion Protection Measures on the ecosystem would be inconsequential without an active fishery.

Human Environment

The impact of eliminating the groundfish fisheries under FMP 4.2 on the Alaska economy, and on the U.S. economy in general, would be significantly adverse. The closure of these fisheries would eclipse all economic effects of the Steller sea lion Protection Measures. The absence of fishing activity for at least 2 years and a slow initiation of fisheries that could demonstrate no adverse impact, especially to Steller sea lions, would give a fairly clear picture of the fisheries contribution to the overall decline. If the populations showed a region-wide response in counts of pups and non-pups, some strong inferences could be made. But if the population continues to stabilize at its current low level or declines, other factors would be suspect.

Small communities that rely on the catcher vessel fleet for direct and indirect income would be economically devastated by the closure of the groundfish fisheries. These impacts would prevail until each Alaska groundfish fishery was reviewed and certified to operate. Catcher vessels in the groundfish fishery would be shut down in the short-term unless they could convert to other uses or fisheries for species not regulated under the groundfish FMPs. These economic impacts would remain in place until such time that the certified fisheries could begin operating under specific regulations. The certification process and the specific regulations, including any modification of the Steller sea lion Protection Measures for these fisheries, are

unknown at this time. Steller sea lion Protection Measures would be at least as effective as the current measures.

Section 7 Data Gaps and Information Needs

7.1 Information Needed to Monitor and Quantify Effects

Recent Research

A recent paper by Ferrero and Fritz (2002) outlines historical trends and recent developments in Steller sea lion research and describes how these efforts are coordinated for resource management needs. Research budgets have grown from less than $1 million annually prior to 1992, most of which went to basic population censussing, to over $40 million in 2002. The vast majority of this increase in funding has been instituted by Congress since 2000 in response to litigation that briefly halted the fishery and threatened to curtail it significantly. At issue was the scientific uncertainty regarding the mechanisms and magnitude of impact that the fishery had on Steller sea lions and a general lack of information on competing hypotheses regarding their population decline. The increase in funding was clearly meant to address this scientific uncertainty and its practical application to fishery management. There are presently over 150 separate research projects being conducted on Steller sea lions by a host of federal and state agencies, academic institutions, and non-governmental research organizations. NOAA Fisheries has worked with these various groups to develop a coordinated research framework that links individual project designs to the larger goal of explaining the continuing decline of Steller sea lions in part of their range. These projects have addressed one or more of the following areas of uncertainty that were specified in congressional appropriation documents and which may contribute to population declines:

- The availability of prey species.
- Predator-prey relationships.
- Predation by killer whales and sharks.
- Interactions between fisheries and Steller sea lions, including the localized depletion hypothesis.
- Regime shift, climate change, and other impacts associated with changing environmental conditions in the North Pacific and Bering Sea.
- Disease.
- Juvenile and pup survival rates.
- Population counts.
- Nutritional stress.
- Foreign commercial harvest of sea lions outside the Exclusive Economic Zone.
- Residual impacts of former government-authorized Steller sea lion eradication bounty programs.

- Residual impacts of intentional lethal takes of Steller sea lions.

In addition to these topics, NOAA Fisheries has initiated research on other crucial issues:

- The efficacy of management measures (e.g. no-trawl zones) designed to mitigate fisheries impacts.
- Expanded sea lion branding and tagging studies to investigate basic population demography.
- Expanded scat collection and telemetry studies to investigate diets and foraging behavior.
- Forage fish abundance and distribution surveys in sea lion habitats.
- Investigate effects of oil and other toxic contaminants on sea lions.

The research framework organizes the various projects in two different ways: according to the questions they are seeking to answer and according to the methodology and scientific discipline being used in the research. This system helps NOAA Fisheries monitor whether there are gaps or redundancies in coverage of the various topics and also helps communication and coordination among researchers. The sharing of information and collaboration among different scientific disciplines is very important to the research policy because the "answer" to the decline may be a combination of factors rather than any one cause. Perhaps the most succinct way to summarize these various research projects is to list the major questions they are asking, all of which could be considered separate hypotheses for the sea lion's decline and lack of recovery (Ferrero and Fritz 2002).

It is important to note that much of the research now underway may not yield meaningful results for 5 to 10 years. The study of ecosystem interactions is not suited to quick and definitive experimental investigation. It is believed, however, that major data gaps are now being addressed in some fashion and that as information becomes available, the questions will be refined and the research will become more focused on those issues, which appear to be the most pertinent to the decline of Steller sea lions. In the meantime, the population trends of sea lions and direct fishery interactions will be monitored closely.

National Research Council Review

In 2000, the NRC was contracted to conduct a review of available information regarding the interactions between the groundfish fisheries and Steller sea lions and the role of the fisheries in trends of the Steller sea lion populations. Their review and analysis came up with a series of five general management options to address impacts of fisheries on the sea lions and ways to monitor their effectiveness. Most suggested management options are addressed to some extent in the Alternative Policies analyzed in this document.

1. Wait and see - give the Steller sea lion Protection Measures time to work.
   – monitor using annual surveys of trend sites and information from pup branding

2. Eliminate direct fisheries' impacts with expanded closures.
   – monitor fish population dynamics, both locally and at the stock level, to determine effects of fisheries on distribution and community composition

3. Establish experimental spatial management units consisting of two sets of closed and open areas for fishing per region, where each treatment is centered on a rookery.
   - monitoring with detailed local Steller sea lion censuses and spatial analyses of fish population changes for each experimental unit

4. Implement a "titration" experiment - restrictions on fisheries are increased progressively over time until a positive response is achieved.
   - monitoring of sea lion population trends

5. Micro-monitor and manage localized interactions between sea lions and fisheries to reduce mortality where and when it occurs in the future.
   - expansion of all monitoring activities around all rookeries to pinpoint times and places of increased mortality so action can be taken

Of these five options, only Option 3 would directly test the role of groundfish fishing in the decline of the Steller sea lion and was recommended as the preferred option (NRC 2002).

Modeling

As the previous discussion indicates, a multitude of physical and biological interactions are presently under investigation. Fitting all these pieces together to see the "big picture" will require the development of new mathematical models that describe the bioenergetics not only of Steller sea lions, but also of their major prey species and the impacts of fishing and ocean changes. This effort is presently underway and is the first attempt toward a larger ecosystem model that is called for in some of the Alternatives policies. This ecosystem model would include non-target fish and seabirds and many other elements in the BSAI/GOA ecosystems. However, there are many smaller pieces of the puzzle that need to be worked out in modeling before these grand, unifying models are even feasible. These run the gamut from the impacts of climate change on ocean currents to the relative importance of killer whale predation at different sea lion population levels.

Section 8 Comparative Analysis of the Alternatives

The four policy Alternatives considered in this analysis cover the mandatory requirements of the 2001 BiOp and the subsequent Steller sea lion Protection Measures which keep the groundfish fisheries in compliance with the ESA. The Steller sea lion Protection Measures described in the Alternative 1 policy are also common to the Alternative 2 and Alternative 3 policies. Alternative 4 is different from the others in that the burden of proof is shifted to the user of the resource. The first three alternatives are similar in their application of the same risk-averse conservation and adaptive management approach used for the last 20 years by NOAA Fisheries and the NPFMC. In regards to Steller sea lion Protection Measures, the alternative policies differ in the degree of caution used in modifying these measures as scientific evidence becomes available and in how they deal with uncertainty in management decisions. A summary of major findings by alternative and resource category is presented in Table 3.

While certain biological and physical parameters can be sampled and estimated quantitatively, the impact of specific changes in fishing activities on particular species or ecosystem processes will always be subject to a substantial amount of uncertainty. The imprecise nature of fish and wildlife population estimates, plus natural fluctuations in population levels, makes it very difficult to say with certainty whether a given level of anthropogenic disruption is causing the population of a particular species to decline.

At one end of the policy spectrum is Alternative 2, a more aggressive harvest strategy, which has an underlying policy stating that impacts of the fisheries on Steller sea lions under the Steller sea lion Protection Measures are negligible and any additional regulations or restrictions on the fishing fleet are unwarranted unless new scientific research provides unequivocal evidence of adverse population-level impacts. Any change to the Steller sea lion Protection Measures would require the NOAA Fisheries, Office of Sustainable Fisheries to show through Section 7 consultations with NOAA Fisheries OPR, that the new set of measures still avoids jeopardy. The use of the Observer Program and VMS to monitor fishing effort in critical habitats is also integral to this issue.

Table 3. Summary of potential effects of the policy alternatives and Fishery Management Plans.

Effect indicator	Alternative 1.0	Alternative 2.0		Alternative 3.0		Alternative 4.0	
	Fishery Management Plan (FMP) 1.0	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Physical environment							
Effect on non-living substrate	**Potentially beneficial effect** Steller sea lion Protection Measures prevent additional alteration of the physical structure of the non-living substrate and the suspension of sediments in the 3 nautical mile (nm) buffer zones around rookeries, haulouts, and areas within critical habitat closed to non-pelagic trawling.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Beneficial effect** This FMP closes areas 15 nm from shore except where there are marine protected areas (MPAs) or no-take reserves. Additional area closed to trawling for Steller sea lion prey species.	**Beneficial effect** All Steller sea lion critical habitat closed to trawling and closure of all trawling for species that can be taken by other gear would prevent additional damage to non-living substrate.	**Beneficial effect** This FMP closes all fisheries until they are certified as having no adverse effects. New fisheries would likely not adversely affect the physical environment.
Biological environment							
Effects on threatened and endangered species	**Potentially beneficial effect** Steller sea lion measures result in a reduction in overlap of fisheries and Steller sea lion.	**Potentially adverse effect** Steller sea lion measures are the same as FMP 1 but other components such as increased total allowable catch (TAC), removal of protected area, and increased disturbance would have adverse effects.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Beneficial effect** Near term closure of fisheries results in more Steller sea lion prey.

Table 3 (cont.). Summary of potential effects of the policy alternatives and Fishery Management Plans.

Effect indicator	Alternative 1.0	Alternative 2.0		Alternative 3.0		Alternative 4.0	
	Fishery Management Plan (FMP) 1.0	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Biological environment (cont.)							
Effects on target fish	**Potentially beneficial effect** Steller sea lion measure help ensure stocks are harvested at a rate above minimum stock size threshold (MSST).	**Potentially adverse effect** Steller sea lion Protection Measures the same as FMP 1; However, harvest of target species substantially increased.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Beneficial effect** Closure of the fishery in the short- term is beneficial and new certified fisheries would ensure stocks are maintained well above MSST.
Effects on non-target fish	**Minimal effect** Steller sea lion Protection Measures would have little effect on non-target species.	**Potentially adverse effect** Steller sea lion Protection Measures same as FMP 1. However, removal of bycatch limits could have adverse effects.	**Minimal effect** Steller sea lion Protection Measures same as FMP 1.	**Minimal effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** New Steller sea lion measure would have some benefit to non-target species.	**Potentially beneficial effect** Increased Steller sea lion buffers and MPAs could provide some benefit. Bycatch is reduced as overall harvest is lower.	**Beneficial effect** Closure of fisheries would reduce bycatch of benefit non-target species.
Effects on prohibited species	**Minimal effect** Steller sea lion Protection Measures would not likely change the prohibited species bycatch limits.	**Potentially adverse effect** Steller sea lion Protection Measures same as FMP 1. However, other FMP components such as removal of prohibited species catch (PSC) limits could have adverse effects.	**Minimal effect** Steller sea lion Protection Measures same as FMP 1.	**Minimal effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** New Steller sea lion measure would have some benefit to prohibited species by reducing harvest.	**Beneficial effect** Increased Steller sea lion Protection Measures and reduced TAC would reduce harvest of prohibited species.	**Beneficial effect** During the period of no fishing, until such time that certain fisheries are certified, there would be no bycatch of prohibited species. It is unlikely that fisheries having high bycatch or creating other impacts on prohibited species would be certified.

Table 3 (cont.). Summary of potential effects of the policy alternatives and Fishery Management Plans.

Effect indicator	Alternative 1.0	Alternative 2.0		Alternative 3.0		Alternative 4.0	
	Fishery Management Plan (FMP) 1.0	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Biological environment (cont.)							
Effects on essential fish habitat	**Potentially beneficial effect** Steller sea lion Protection Measures closure of 3-nm around rookeries and haulouts provides protection to benthic habitat. Areas closed to trawling for the three main target species, all important prey for Steller sea lions, amount to approximately 50% of all Steller sea lion critical habitat.	**Potentially beneficial effect** Steller sea lion measures same as FMP 1.	**Potentially beneficial effect** Steller sea lion measures same as FMP 1.	**Potentially beneficial effect** Steller sea lion measures same as FMP 1.	**Beneficial effect** New Steller sea lion shoreline buffers and MPAs would increase protection for EFH.	**Beneficial effect** Expanded Steller sea lion buffers and MPAs would increase protection for EFH.	**Beneficial effect** During the period of no fishing, until such time that certain fisheries are certified, there would be no adverse impacts on essential fish habitat (EFH). Fisheries that adversely impact EFH or Steller sea lion would not be certified.
Effects on marine mammals	**Potentially beneficial effect** Steller sea lion closure could benefit other marine mammals where important habitats overlap with closed areas.	**Potentially adverse effect** Same as FMP 1; however, increased TAC of marine mammal prey could have negative effects.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** Same as FMP 1.	**Potentially beneficial effect** New Steller sea lion shoreline buffers and MPAs increase protection to some marine mammals.	**Beneficial effect** No trawling in Steller sea lion critical habitat around rookeries and haulouts, and reduced trawling outside critical habitat, and reduction in TAC increases protection for other marine mammal species.	**Beneficial effect** During the period of no fishing until such time that certain fisheries are certified, there would be no adverse impacts on marine mammals. Also, it is not likely that fisheries creating other impacts on marine mammals would be certified.

Table 3 (cont.). Summary of potential effects of the policy alternatives and Fishery Management Plans.

Effect indicator	Alternative 1.0	Alternative 2.0		Alternative 3.0		Alternative 4.0	
	Fishery Management Plan (FMP) 1.0	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Biological environment (cont.)							
Effects on seabirds	**Minimal effect** Steller sea lion Protection Measures have little if any effect on seabirds.	**Minimal effect** Steller sea lion Protection Measures same as FMP 1.	**Minimal effect** Steller sea lion Protection Measures same as FMP 1.	**Minimal effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** Steller sea lion Protection Measures same as FMP 1 with added shoreline buffer zones and MPAs.	**Potentially beneficial effect** No trawling in Steller sea lion critical habitat around rookeries and haulouts, reduced trawling outside critical habitat, and reduction in TAC increases protection for some seabird colonies and foraging areas.	**Beneficial effect** During the period of no fishing until such time that certain fisheries are certified, there would be no direct adverse impacts on seabirds. Also, it is not likely that fisheries creating other impacts on seabirds would be certified.
Ecosystem effects	**Potentially beneficial effect** Potential increase in prey species such as pollock, Pacific cod, and Atka mackerel. Potential increase in species diversity.	**Potentially beneficial effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** Creation of Steller sea lion shoreline buffer zones and MPAs potentially benefits several species.	**Beneficial effect** Steller sea lion Protection Measure to close all trawling in Steller sea lion critical habitat and in fisheries that can use other gear. Increase in forage availability for predators and potential increase in species diversity. Effect on top predator would be beneficial.	**Beneficial effect** During the period of no fishing until such time that certain fisheries are certified, there would be no adverse effects from the groundfish fishery on the ecosystem. Forage availability, effects on species diversity, and top predators would be beneficial.

Table 3 (cont.). Summary of potential effects of the policy alternatives and Fishery Management Plans.

Effect indicator	Alternative 1.0	Alternative 2.0		Alternative 3.0		Alternative 4.0	
	Fishery Management Plan (FMP) 1.0	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Social and Economic Environment							
Non-market impacts	**Potentially beneficial effect** If Steller sea lion measures aid recovery of the species, impacts are beneficial to eco-tourism and subsistence.	**Potentially beneficial effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** Steller sea lion Protection Measures same as FMP 1.	**Potentially beneficial effect** Increased Steller sea lion measure could benefit eco-tourism and subsistence.	**Potentially beneficial effect** Increased Steller sea lion measure could benefit eco-tourism and subsistence.	**Potentially beneficial effect** Eco-tourism and subsistence would benefit from increased Steller sea lion numbers and very limited fishing.
Industry costs and market impacts	**Potentially adverse effect** Increased operation costs in some fisheries. Industry cost and market impacts would be negatively affected by Steller sea lion measures.	**Potentially adverse effect** Steller sea lion Protection Measure are the same as FMP 1; therefore, industry cost and market impacts are the same.	**Potentially adverse effect** Steller sea lion Protection Measure are the same as FMP 1; therefore, industry cost and market impacts are the same.	**Potentially adverse effect** Steller sea lion Protection Measure are the same as FMP 1; therefore, industry cost and market impacts are the same.	**Adverse effect** Creation of Steller sea lion shoreline buffers would negatively impact the fishing industry by increasing operating costs.	**Adverse effect** Closure of trawling within 15 nm of rookeries and haulouts and reduction in TAC would negatively impact the industry.	**Adverse effect** Closing fisheries would have adverse effects on rural communities and the catcher vessel fleet.

Under either the Alternative 1(a) or 1(b) policy statement, NOAA Fisheries and the NPFMC would continue to minimize and adjust fishery restrictions in order to avoid a jeopardy finding through conservative cautionary management and ongoing Section 7 consultations. Alternative 1(b) acknowledges that the groundfish fishery has an impact on various parts of the environment but prioritizes management actions based on the scientific evidence of significant impact. Steller sea lion Protection Measures may be expanded beyond what is absolutely necessary in order to account for some uncertainty in understanding the interactions between the Steller sea lions and the fisheries. Research is directed toward understanding how various fisheries could contribute to the Steller sea lion decline so that the role of fisheries is properly cast.

Under the Alternative 2 policy, the Observer Program and VMS requirements could range from being repealed (FMP 2.1) to having the same coverage and function as at present (FMP 2.2). It seems highly unlikely that, given the continuing decline of the western stock of Steller sea lions and the existing Steller sea lion Protection Measures, NOAA Fisheries OPR would concur with eliminating both of these programs to monitor the groundfish fleet. NOAA Fisheries would need to find a compromise within the range of the Alternative 2 policy that does not result in a jeopardy finding.

The Alternative 3 policy assumes that the groundfish fishery has a greater impact on a number of environmental factors than presently realized, but that not all of it is negative. Mitigation efforts would still be prioritized by scientific evidence of adverse impact. For Steller sea lion Protection Measures, increased restrictions on the fishing fleet would occur based on scientific research but would not require that the research be definitive before taking action. Alternative 3 would thus be more "precautionary" in dealing with uncertainty and more emphasis would be placed on researching indirect fishery interactions with the ocean ecosystem, and similar to Alternative 1, understanding how fisheries could contribute to the Steller sea lion decline to properly cast the role of fisheries. It would also expand the Observer Program and VMS requirements to improve monitoring and enforcement of fishing restrictions in Steller sea lion critical habitats.

The Alternative 4 policy would assume that the fisheries are having many adverse impacts on the marine environment, similar to Alternative 1 and 3, including detrimental impacts on the food web of marine mammals, but currently enough is not known about fishery interactions to know what they are. Existing Steller sea lion Protection Measures would be expanded to attempt to eliminate all adverse impacts of the fisheries on Steller sea lions. The fishery would be greatly restricted relative to Alternative 1 until scientific evidence could make certain that there were no direct or indirect adverse impacts on protected resources. Environmental research would receive a much higher priority than in any other scenario. In the first three Alternative policies, various degrees of uncertainty about an impact would be used to limit restrictions on the industry. Under the Alternative 4 policy, the burden of proof is reversed and uncertainty about an impact would be used to stop fishing until each fishery could be reviewed and certified as resulting in no significant environmental impacts. Those fisheries that are certified as acceptable" would be heavily monitored with observers and electronic gear to ensure compliance with any restrictions.

The fact is, no matter how much effort is applied to studying this dynamic marine environment, there will always be unanswered questions about the impacts of specific fisheries or mitigation efforts. This is not to say that the situation is hopelessly complicated and anything useful cannot be learned from ecological research. The policy alternatives vary in how much emphasis they place on understanding how the various system components, including marine mammals, respond to fishing, and how each alternative policy would try to incorporate this information into management decisions. From the least emphasis on ecosystem

function to the most, the policies would range in order from Alternative 2, Alternative 1, Alternative 3, to Alternative 4.

Section 9 Conclusion

Since the Steller sea lion Protection Measures under the Alternative 1(a) or 1(b) policy represent the level of protection necessary to avoid a jeopardy finding, the primary issue is how adaptable the alternative policies are to additional measures, such as expanded or fewer restrictions on fisheries as new information becomes available through scientific research. Anticipated modifications to the Steller sea lion Protection Measures under these alternative policies are difficult to predict since they rely on information not yet known.

Steller sea lion Protection Measures keep the groundfish fisheries in the BSAI and GOA in conformity with the ESA, and allow the fisheries to continue at a tremendous benefit to the economy. These measures are based on the principle that there are some adverse effects of the groundfish fisheries on Steller sea lions and these adverse effects include nutritional stress due to the indirect effects of localized depletion of prey species by the groundfish fisheries. The efficacy of these mitigation measures hinges on the validity of this theory. This theory is the underlying basis for Alternative 4.

The Alternatives examined in this paper represent a range of policy options but a key component of each alternative is the requirement to be in compliance with the ESA. The current Steller sea lion Protection Measures have been found to meet these requirements (NMFS 2001a). Changes to the management of the fisheries that substantially alter the underlying requirements would require further Section 7 consultations. Because the Steller sea lion Protection Measures range from Alternative 1 through 3, their effects on Steller sea lions, their critical habitat, and on other environmental resources are generally similar. The conservative management and Steller sea lion Protection Measures under Alternative 4 are substantially increased. The primary effect of the Steller sea lion Protection Measures is the separation of fishing effort in time and space to the extent that the competitive overlap between the groundfish fisheries and prey for the Steller sea lion has a minimal effect on their continued existence and chance for recovery.

Currently, a tremendous amount of monitoring and research is focused on a very wide range of issues concerning the decline of the Steller sea lion. The results of this research will likely be used to reevaluate all aspects of the current Steller sea lion Protection Measures and it is anticipated that additional Section 7 consultations will be required in coming years to bring the Steller sea lion Protection Measures in line with current scientific research.

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APPENDIX F

Bycatch

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ACRONYMS AND ABBREVIATIONS

ABC	acceptable biological catch
ADF&G	Alaska Department of Fish and Game
AFSC	Alaska Fisheries Science Center
AFA	American Fisheries Act
BSAI	Bering Sea and Aleuttian Islands
CDQ	Community Development Quota
ESA	Endangered Species Act
EFH	essential fish habitat
EEZ	Exclusive Economic Zone
EFP	experimental fishing permit
FCZ	Fishery Conservation Zone
FMP	Fishery Management Plan
ft	feet/foot
GOA	Gulf of Alaska
IR/IU	Improved Retention/Improved Utilization
IFQ	individual fishing quota
IPHC	International Pacific Halibut Commission
JV	joint venture
MMPA	Marine Mammals Protection Act
MRA	maximum retainable amount
MSA	Magnuson-Stevens Fishery Conservation and Management Act
mt	metric tons
NEPA	National Environmental Policy Act
nm^2	square nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fisheries Management Council
NPO	North Pacific Ocean
PSC	prohibited species catch
SCA	Steller Sea Lion Conservation Area
TAC	total allowable catch
U.S.	United States
VIP	Vessel Incentive Program

Section 1 Bycatch

The principal goal of the North Pacific Fisheries Management Council (NPFMC) and National Marine Fishery Service (NMFS or National Oceanic and Atmospheric Administration [NOAA] Fisheries) is to maximize the benefits of North Pacific groundfish resources for the overall good of the people and the environment. NPFMC[1] decisions are based upon a number of biological and socioeconomic considerations all of which must be weighed when determining management and conservation strategies. A core objective of the NPFMC is to maximize the sustainable yield of the groundfish fishery at minimal cost, while at the same time ensuring the sustainability of targeted stocks. Management policies must also act in conjunction with other conservation goals such as the protection of non-target fish species, marine mammals, seabirds, and Essential Fish Habitat (EFH). Socioeconomic considerations include the effects that groundfish management policies might have on other commercial, recreational, and subsistence fisheries of the Pacific Northwest. Amid all of these concerns, the NPFMC must also comply with specific bycatch mandates in the Magnuson-Stevens Fishery Conservation and Management Act (MSA). These include: 1) National Standard 9 which states that "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." and 2) Section 303 which states that Fishery Management Plans (FMPs) are required to "establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided."

Bycatch is defined in the MSA as fish that are harvested in a fishery but which are not sold or kept for personal use. This includes the portion of the catch that is discarded back into the sea and unobserved mortality due to a direct encounter with fishing gear that does not result in the capture of that species by a fisherman. The latter also includes dropoff and escapement mortality. Discards include species that must be returned to the sea by law (regulatory discards), and fish that are discarded at the discretion of the fisherman because they are not economically worthwhile to keep (economic discards). Fish taken as bycatch often suffer high mortality. Bycatch mortality can decrease the sustainability of a fishery and the net benefits provided by that fishery, in four ways. First, if bycatch mortality is not monitored adequately, it increases the uncertainty concerning total fishing-related mortality, which in turn makes it more difficult to assess the status of stocks of fish and other bycatch species, to set the appropriate optimum yield and overfishing levels for fish stock, and determine acceptable levels of bycatch for other bycatch species. Inadequately monitored bycatch mortality also makes it difficult to ensure that the optimum yields are attained, that overfishing does not occur and that the acceptable levels of bycatch for other species are not exceeded. Second, if discards are sufficiently concentrated in time and space, they will result in localized environmental degradation. Third, bycatch mortality precludes some other uses of living marine resources. For example, juvenile fish that are subject to bycatch mortality cannot contribute directly to the growth of that stock and to future catch. Nor can they be available as prey for other species. Bycatch is a wasteful use of living marine resources if it precludes a higher valued use of those resources. Fourth, in the absence of management measures designed to reduce bycatch, there will typically be too much bycatch; however, without adequate information concerning the biological, ecological, social, and economic effects of a set of bycatch management measures, it is difficult to ensure that those measures will not decrease the overall benefits to the Nation.

If the problem is due principally to uncertainty concerning fishing related mortality, improved bycatch monitoring systems should be considered and may be sufficient to solve the bycatch problem. If the problem is principally localized environmental degradation, it may be possible to solve the problem effectively and efficiently by controlling the temporal and spacial distribution of discards. If the problem is excessive human induced mortality for a particular stock and there are several sources of that mortality, the merits of reducing the alternative sources of mortality should be considered. For example, in the case of overfishing, the solution

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[1] NPFMC decisions are subject to approval by NOAA Fisheries. For further detail on the relationship between the NPFMC and NOAA Fisheries, please refer to Section 2.4 of the Programmatic SEIS.

could be to decrease the catch or bycatch of that stock or both. The appropriate choice will depend on the marginal net benefit of each of these two uses of the stock that is being overfished.

If it is determined that the bycatch rate of a fishery is too high, there are two general types of solutions, both dealing with regulations. First, regulations can be developed and implemented that prohibit fishermen from fishing in ways that result in high levels of bycatch. For example, regulations can prohibit fishing in specific times or areas, can require the use of specific gear or gear modifications, and can restrict the use of catch or the level of bycatch. These are command and control solutions. Second, regulations can be developed and implemented to eliminate or decrease incentives (i.e., externalities) that result in fishermen taking high levels bycatch. Typically, much of the benefit of reducing bycatch accrues to others, not to the fisherman who modifies his fishing practices to decrease bycatch. The benefits others receive are external to the fisherman's decision-making process; therefore, from society's perspective, the fisherman does not do enough to reduce bycatch. The externalities are the source of the excess bycatch problem, and in some cases decreasing the externalities will be the appropriate solution. But that will require holding individual fishermen accountable for their bycatch, and the monitoring required to do that may not be feasible. The regulations that decrease incentives can be referred to as market oriented solutions.

With sufficient information, fishery managers could identify the best way for each fisherman to decrease its bycatch. The difficulty is that fishery managers have relatively limited and usually static information. Individual fishermen usually have more complete and more timely information concerning methods for decreasing bycatch, but as noted above, they may lack the appropriate incentives. In selecting the management approach that will be used to decrease bycatch, it is important to be realistic about information deficiencies and the difficulty of providing the correct incentives to fishermen. Research concerning the response of fish and other bycatch species to fishing gear and fishing operations can assist in developing effective and efficient methods for reducing bycatch and bycatch mortality. Such research is also necessary to determine the extent to which a change in gear or fishing practices decreases bycatch as opposed to, for example, just replacing discard mortality with unobserved fishing mortality.

Although the information required to precisely estimate the net benefits of bycatch reduction solutions will seldom be available, an effort should be made to consider both the benefits and costs of the alternative strategies, where the benefits and costs are broadly defined to address the biological, ecological, social, and economic effects of bycatch and bycatch management. Such an approach is required for obtaining good stewardship and to meet federal regulatory mandates, including those in the MSA, the Marine Mammals Protection Act (MMPA), the Endangered Species Act (ESA), the National Environmental Policy Act (NEPA), the Regulatory Flexibility Act, and Executive Order 12866. Outreach and public debate to obtain information concerning the benefits and costs of the alternatives can be done through the NPFMC and NOAA Fisheries processes which may be used to develop and evaluate alternatives. In general, more complete information concerning the biological, ecological, social, and economic effects of bycatch and methods for reducing bycatch are required to develop more effective and efficient methods for managing bycatch. As more efficient methods for reducing bycatch are developed, further reductions in bycatch will become practicable.

Many of the species that are protected under FMP amendments that limit bycatch are the targets of other commercial, recreational, and subsistence fisheries in Alaska. Excessive bycatch mortality in the groundfish fishery could affect the viability of these other domestic fisheries and the people and economies that depend on them. However, bycatch restrictions place greater economic burdens on the groundfish industry either by limiting fishing or reducing fishing efficiency. Compliance with time/area closures and bycatch release standards can require considerable expenditures of time and effort by the fishermen.

Mortality is a key consideration when assessing measures that might decrease bycatch. If all discards could safely be returned to the sea unharmed, bycatch would be less of a conservation issue and higher levels of bycatch would be acceptable. However, because discard mortality rates for many species approach or equal 100 percent, efforts to reduce bycatch mortality typically focus on decreasing bycatch. But for some species, such as Pacific halibut, there have been substantial efforts to decrease discard mortality rates. In some instances, the adverse effects of bycatch were sufficiently high and the expectations for decreasing bycatch

were sufficiently low that specific fisheries have been prohibited; e.g., there is a total ban on the use of seines and gillnets in the groundfish fishery and bottom trawl gear is prohibited in the BSAI pollock fishery. In general, FMP policy attempts to minimize bycatch and bycatch mortality to the extent practicable, where practicality is determined by the broadly defined benefits and costs of decreasing bycatch and bycatch mortality.

This paper provides a broad qualitative overview of the four proposed management policies as they pertain to the regulation of bycatch in the North Pacific groundfish fishery of the Bering Straits/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) regions. Its goal is to provide the reader with a basic understanding of each potential policy and the biological, physical, and socioeconomic consequences of each alternative. It also identifies information gaps or other shortcomings that may impede specific components within any of the proposed alternatives.

Section 2 Historical Perspective on Bycatch

Management of bycatch in the North Pacific groundfish fishery has historically focused on Pacific halibut, Pacific herring, salmon, and crabs (Table 1). Prior to 1976, the groundfish fishery in the BSAI and GOA management regions was conducted almost exclusively by foreign fleets and management regulations were implemented through bilateral or multilateral agreements. The Fishery Conservation and Management Act of 1976, which later became the MSA, established a Fishery Conservation Zone (FCZ) which became the Exclusive Economic Zone (EEZ) extending some 200 miles off United States (U.S.) shores and fishing within this area fell under U.S. jurisdiction. Following passage of the MSA, preliminary FMPs established management measures to reduce bycatch by these foreign fleets. Measures included time and area closures; prohibitions on the retention of halibut, crabs, salmon, herring, and shrimp (prohibited species catch [PSC]); the establishment of a limited observer program; and restrictions on the use of bottom trawls. By the early 1980s, bycatch control measures began to be directed at the burgeoning domestic groundfish fishery. For the first time in the GOA, domestic trawlers had bycatch limits placed on halibut, which, when reached, prohibited fishing with other than off-bottom trawls.

By 1985, the presence of foreign fishing fleets within the EEZ had greatly diminished, and management attention began to focus on the rapidly developing joint venture (JV) fisheries and the completely domestic groundfish fisheries. Bycatch limits were applied to domestic fisheries operating throughout the GOA, while these limits were not mandated for the BSAI until later. Additional measures to reduce bycatch included requiring biodegradable panels on sablefish pots was, and that observers be present on all joint venture processing vessels.

From 1986 to 1990, major policy emphasis was placed on reducing bycatch of PSC in the domestic fishery. Extensive time and area closures were implemented around Kodiak Island and the eastern Bering Sea to protect red king crab. Bycatch limits were set in the BSAI for halibut, red king crab, and bairdi Tanner crab. In 1990, a bycatch limit was placed on herring for the trawl fleet. Bycatch limits were applied to the entire domestic fishing fleet based upon area, season, and fishery sector. PSC restrictions closed down select fisheries on several occasions.

By 1991, the groundfish fisheries were fully domestic. From 1991 to 1995, PSC bycatch reduction continued to be a major policy goal. Restrictions were placed on the construction and use of fishing gear to reduce the bycatch of both PSC species and juvenile components of target groundfish stocks. Other restrictions included a prohibition on the use of seine and gillnets, minimum mesh size for all trawls, a blanket requirement for biodegradable panels and halibut excluder devices on all groundfish pots, and careful release mechanisms for the longline fishery. In the Bering Sea, PSC limits were established for chum salmon and additional areas were closed to protect red king crab. A herring PSC limit was established for the BSAI trawl fishery. Halibut bycatch limits were redefined in terms of mortality instead of just total bycatch. The implementation of the individual fishing quota (IFQ) program for Pacific halibut and sablefish in 1995 was intended to provide a variety of benefits, including reductions in halibut bycatch. Similarly, the allocation of the Pacific cod total allowable catch (TAC) between trawl and fixed gear was, in part, implemented to reduce halibut bycatch.

Since 1995, conservation efforts to reduce bycatch in the groundfish fishery have continued. In recent years, additional closures in the Bristol Bay area to protect red king crab have been implemented. In the BSAI, PSC limits were established for opilio Tanner crab and chinook salmon, and revised for red king and bairdi Tanner crabs. The BSAI pollock fishery was restricted to the use of off-bottom trawls only. Groundfish retention and utilization programs have been implemented and improved.

Table 1. Chronology of management measures to control bycatch of prohibited species in the groundfish fisheries of the Bering Sea and Aleutian Islands and Gulf of Alaska, 1935-2000.

Effective year	Management action
1935	Trawls prohibited except for shrimp and flounder fishing in Bering Sea and Aleutian Islands (BSAI).
1937	Use of dynamite prohibited in BSAI.
1938	Use of gillnets prohibited for catching halibut in BSAI.
1942	Trawls permitted except for salmon and herring fishing in BSAI.
1944	Use of trawls prohibited for catching halibut in BSAI.
1948	Five-inch minimum mesh size required for trawls in BSAI.
1959	Trawls prohibited for taking any crab species in BSAI. Trawling prohibited in Bristol Bay and king crab pot sanctuary in BSAI
1967	Halibut nursery area closed to halibut fishing in BSAI. Foreign fisheries prohibited around Fox Islands in BSAI.
1969	Pribilof Islands area closed to foreign fishing.
1972	Pot gear prohibited for catching halibut in BSAI.
1973	Use of tangle nets prohibited for catching crab in BSAI.
1974	Catch quotas established for Japanese groundfish fisheries limited effort for BSAI pollock and flatfish and Gulf of Alaska (GOA) Pacific Ocean perch and sablefish.
1975	Catch quotas established for United Soviet Socialist Republic (USSR) groundfish fisheries in BSAI.
1976	Fishery Conservation and Management Act passed, providing National Standards and regulations for managing federal fisheries to 200 miles.
1977	Preliminary groundfish Fishery Management Plans (FMPs) implemented with groundfish optimum yields; closures of foreign fisheries when any one species limit is attained; several closure areas in BSAI and GOA extended from bilateral agreements; prohibited status for halibut, salmon, crabs, and shrimp.
1979	GOA FMP implemented with no retention of prohibited species (salmonids, halibut, shrimp, herring, crab, scallops); expansion of time-area closures to reduce halibut expansion of time-area closures to reduce halibut of total allowable level of foreign fishing (TALFF) taken December 1 to May 31 to minimize halibut bycatch; domestic trawlers restricted by halibut prohibited species catch (PSC) limits for five areas for December 1-May 31; halibut and Tanner crab PSC limits for domestic fishermen included; depth restrictions on use of foreign longlines seaward of 500 meters (m) May 1-September 30 to minimize bycatch of halibut. Created new species optimum yield (OY) for grenadiers (rattails) to protect them from bycatch (since rescinded, GOA-5). Pacific cod TALFF allocated to foreign longlines around Chirikov to reduce bycatch of other species, permitted directed longlining for Pacific cod to reduce halibut bycatch, required foreign vessel operators to report bycatch and discard of salmon and halibut.
1980	Set GOA OY, required biodegradable panels on sablefish pots to minimize bycatch of small sablefish, and established four species categories (target, PSC, unallocated, other) (GOA-8).
1982	BSAI FMP implemented with specific management objective to rebuild halibut; established PSC category for halibut, salmon, crabs; expanded time-area closures for foreign fisheries to reduce bycatch of juvenile halibut, set bycatch policy for domestic fishermen; set target observer coverage in foreign fisheries at 35-40 percent. Set chinook PSC of 65,000fish for foreign trawl fishery (BSAI-1a). Closed waters east of 140° W to West (GOA-10). Prohibited pot longline gear for sablefish, partially to eliminate ghostfishing (GOA-12).

Table 1 (cont.). Chronology of management measures to control bycatch of prohibited species in the groundfish fisheries of the Bering Sea and Aleutian Islands and Gulf of Alaska, 1935-2000.

Effective year	Management action
1983	PSC bycatch reduction schedule established for BSAI foreign trawl fishery, allowed domestic trawling in pot sanctuary and halibut savings area in BSAI, set 1986 goal of 17,473 salmon (BSAI-3). Closed GOA southeast to foreign trawl fisheries to protect halibut, allowed foreign longlines to fish shallower than 500 m in winter halibut savings area, until halibut bycatch reached 105 metric tons (mt).
1984	Set BSAI groundfish OY cap at 2 million mt, allowed domestic trawling in winter halibut savings area with observers and Bristol Bay pot sanctuary until halibut PSC limit is reached (BSAI-7). Raised halibut PSC to 270 mt in western GOA and 768 mt in central GOA and exempted domestic pelagic trawl fishery from halibut PSC limit.
1985	Set BSAI salmon PSC at 27,957 salmon (26,000 chinook) (BSAI-8). Established reporting requirements and directed fishing definitions (BSAI-9, GOA-14). Revised OYs and implemented framework for setting and revising halibut PSC limits (GOA-14).
1987	PSC bycatch limits and zones established in BSAI domestic and joint venture (JV) flatfish trawl fisheries, set Bristol Bay trawl closure area (Area 512) to all trawling year-round, allowed RD discretion to set target species as PSC once TAC is reached (BSAI-10). Established four red King crab bottom trawl closed areas during February 15-June 15 around Kodiak Island to protect crab, revised Oys, implemented framework for setting and revising PSC limits, revised reporting requirements (GOA-15).
1988	Began pilot observer program in Dutch Harbor and Kodiak, revised acceptable biological catch (ABC) definition (BSAI-11). Added steelhead and salmon to PSC list and established target, other, and nonspecified categories, required 30-day comment period for annual specifications and PSC limits (BSAI-11a/GOA-16).
1989	Required weekly reporting, established PSC limits for foreign and JV fisheries, set limits on retention of bycatch after target fishery closes (BSAI-12/GOA-17). Area 516 closed to trawling seasonally during crab molting period. Endorsed voluntary herring bycatch plan. Adopted policy on full utilization of BSAI and GOA groundfish.
1990	Established crab and halibut PSC limits (BSAI-12a). New observer program, data reporting system, and directed fishing standards implemented (BSAI-13/GOA-18). Pot, jig, hand, and troll gear exempted from GOA halibut PSC limits.
1991	Allowed seasonal apportionment of PSC limits, established vessel incentive program (VIP) to reduce bycatch rates of red king crab and halibut bycatch, refined overfishing, specification process and fishing gear definitions (BSAI-16/GOA-21). Established herring savings areas and hotspot authority (BSAI-16a). Season for BSAI yellowfin sole fishery changed to May 1. BSAI flatfish fisheries delayed to May 1 to reduce halibut and crab bycatch.
1992	Regional Administrator authorized to approve experimental fishing permits to reduce bycatch (BSAI-17/GOA-22). Established time and area closures for bycatch reduction, delayed rockfish trawl opening to Monday closest to July 1 to reduce salmon bycatch and groundfish trawl fisheries to January 20 to reduce salmon and halibut bycatch, expanded VIP for all trawl fisheries and GOA, halibut PSC limits established for BSAI non-trawl fisheries, and redefined VIP and PSC limits in GOA (BSAI-19/GOA-24).
1993	Gillnets and seines prohibited for groundfish fishing in BSAI. Careful release requirements established for halibut bycatch in groundfish longline fisheries in BSAI and GOA, halibut PSC limit set at 3,755 mt for halibut trawl fishery with regulatory framework for revisions (BSAI-21). Crab bycatch performance standards set for pelagic trawl fishery in BSAI. Kodiak Island crab protection zones made permanent (GOA-26). Set performance-based pelagic trawl definition in BSAI and GOA. Established a separate species category for Atka mackerel (GOA-31).

Table 1 (cont.). Chronology of management measures to control bycatch of prohibited species in the groundfish fisheries of the Bering Sea and Aleutian Islands and Gulf of Alaska, 1935-2000.

Effective year	Management action
1994	Allocations of Pacific Cod by gear are implemented in the BSAI (BSAI-24). The Allocations will provide fixed allocations for trawl (54 percent), longline/pot (44 percent) and jig gears (2 percent). Seasonal apportionments of Halibut PSC were also included allowing/forcing fishers to avoid high bycatch periods. NPFMC adopts minimum mesh-size requirements for trawl codends used in pollock, cod, and rock sole fisheries in BSAI. NOAA Fisheries published vessel specific bycatch rates on the Internet, required observers to monitor salmon discards, eliminated primary halibut PSC but kept 3,775 mt trawl limit (BSAI-25). Gillnets and seines prohibited.
1995	Halibut and sablefish IFQ program implemented (BSAI-15/GOA-20). BSAI chum salmon savings area, chinook salmon savings area, red king crab savings area, and Pribilof Islands Halibut Conservation Area established to protect crabs (BSAI-21a; 21b; 35). Established minimum trawl mesh size in BSAI. BSAI jig gear exempted from halibut PSC.
1996	BSAI Red King Crab Savings Area permanently established as year-round trawl closure area. Voluntary salmon donation program implemented to reduce bycatch and waste (BSAI-26/GOA-29).
1997	Nearshore Bristol Bay closed to all trawling year-round. PSC limits for red king crab and bairdi Tanner crab reduced and for opilio Tanner crab implemented (BSAI-37; 41). Over-fishing definitions implemented (BSAI-44/GOA-44).
1998	Established PSC limits for opilio Tanner crab in trawl fisheries and opilio Tanner crab bycatch limitation zone (BSAI-40). Improved retention/improved utilization program implemented for pollock and cod (BSAI-49/GOA-49). Prohibited species donation program redefined to include halibut (BSAI-50/GOA-50). Forage fish category and ban on fishing implemented (BSAI-36/GOA-39).
1999	Revised overfishing definitions implemented (BSAI-56/GOA-56).
2000	Bottom trawl ban in BSAI pollock fisheries (BSAI-57). Chinook salmon PSC limits reduced to 29,000 fish in four years (pending) (BSAI-58). GOA demersal shelf rockfish full retention to account for bycatch (pending). Sponge and coral identified as habitat area of particular concern-biota types under prohibited species category in BSAI and GOA (pending).

Section 3 Species Categories Management Tools

The management of bycatch in the North Pacific groundfish fishery involves a number of mechanisms that contribute to an integrated, and at times complex, regulatory framework for implementing the overall policy objectives of the NPFMC. Fishing restrictions such as harvest quotas and gear constraints may vary over time and space in response to population shifts, migratory patterns, and life-cycle characteristics of individual species or species complexes. When sufficient scientific information is available, bycatch measures may be applied to individual species within the BSAI and GOA. In cases where little is understood about the life-history and ecology of particular species, groups of species may be managed as a single complex. The following section provides a breakdown of two major bycatch management elements: 1) the five principal species management categories, and 2) the major bycatch tools used by NPFMC to manage bycatch within those species categories.

3.1 Species Categories

FMP policy is based on five species management categories: 1) target species, 2) prohibited species, 3) forage species, 4) other species listed in the FMPs, and 5) nonspecific species, which includes all remaining species of fish in the BSAI and GOA. Table 2 presents a listing of the species included in these first four categories.

3.1.1 Target Species

Target species are the species targeted by the fishing effort in the groundfish fisheries. The NPFMC may manage target species as individual species or species groups (complex) depending upon the commercial importance of a species and the amount of biological information that is available with which to manage each species or species complex. Species such as pollock, Pacific cod and sablefish are managed as distinct species in both the BSAI and GOA. In contrast, the numerous species of rockfish in the GOA and BSAI are managed as individual species (e.g., Pacific ocean perch) or as several species complexes, the makeup of which may change from year to year.

3.1.2 Prohibited Species

The category prohibited species is an FMP designation for non-groundfish species that are harvested in other domestic fisheries. Listed prohibited species include several species of crabs, Pacific halibut, Pacific herring, steelhead trout, and the five species of Pacific salmon. With the exception of Pacific halibut, fisheries for these species are not directly managed by the NPFMC. The fisheries for these species are managed by a number of state, federal, and/or international agencies or commissions.

3.1.3 Forage Species

Forage fish play a central role in the North Pacific Ocean food chain, consumed by a wide variety of fish, marine mammals, and seabirds. This category includes all species in the families Osmeridae, Bathylagidae, Myctophidae, Ammodytidae, Trichodontidae, Pholidae, Stichaeidae, Gonostomidae, and euphausiid shrimps. Because of their tropic importance, the BSAI and GOA FMPs were amended to prevent the development of a directed fishery on these species, which limits the amount of these species that can be retained in the groundfish fishery.

3.1.4 Other Species

This category consists of species that are not currently commercially important to the groundfish fishery but which might have greater future economic potential. This group includes sharks, skates, sculpins, squids, and octopi. An aggregate TAC is set for these species.

Table 2. Taxa listing for the five Fishery Management Plan management categories.

Targeted Species - Harvested in the North Pacific groundfish fishery
Walleye Pollock (*Theragra chalcogramma*) Pacific cod (*Gadus macrochephalus*) Flathead sole (*Hippoglossoides elassodon*) Rock sole (*Lepidopsetta* spp.; 2 species) Greenland Turbot (*Reinhardtius hippoglossoides*) Yellowfin sole (*Limanda aspera*) Arrowtooth flounder (*Atheresthes stomias*) Other flatfish (8 species) Sablefish (*Anoploma fimbria*) Rockfish (32 species of the genera *Sebastes* and *Sebastolobus*) Atka mackeral (*Pleurogrammus monopterygius*)
Prohibited Species - Non groundfish species targeted in other domestic fisheries
Red king crab (*Paralithodes camtschaticus*) Blue king crab (*P. camtschaticus*) Golden or brown king crab (*Lithodes aequispinus*) Bairdi Tanner crab (*Chionoecetes bairdi*) Opilio Tanner crab (*C. opilio*) Pacific halibut (*Hippoglossus stenolepis*) Pacific herring (*Clupea harengus pallasi*) Steelhead trout (*Oncorhynchus mykiss*) Pink salmon (*O. gorbuscha*) Chum salmon (*O. keta*) Chinook salmon (*O. tshawytscha*) Sockeye salmon (*O. nerka*) Coho salmon (*O. kisutch*) Sponges and Corals
Forage Species - Important food fish for other fishes, mammals, and seabirds
Eulachon, Capelin and other smelts (*Osmeridae*) Deep-sea smelts (*Bathylagidae*) Lanternfishes (*Myctophidae*) Pacific sand lance (*Ammodytidae*) Pacific sand fish (*Trichodontidae*) Gunnels (*Pholidae*) Pricklebacks, Warbonnets, Eelblennys, Cockscombs, and Shannys (*Stichaeidae*) Bristlemouths, Lightfishes, and Anglemouths (*Gonostomidae*) Krill (*Euphausiid* shrimps)
Other Species - Non-forage species of no commercial value but with future commercial potential
Sharks Skates Sculpins Octopii Squids
Nonspecified Species - Not managed or monitored
All BSAI and GOA fish not listed above including invertebrates. Note that the MSA defines fish as "finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds."

3.1.5 Nonspecified Species

The "nonspecified" species category consists of all species not listed in the four groups above, including invertebrates. None of the species within this group are currently managed or monitored as with the other four categories of species. However, catches of these species in the commercial fishery are recorded by observers, as are catches during survey cruises.

3.2 Management Tools

The NPFMC employs two types of management measures for the BSAI and GOA: 1) framework measures and 2) conventional measures. Framework measures allow the NPFMC to more rapidly respond to biological and socioeconomic changes without amending an underlying FMP. They involve annual or seasonal adjustments such as those applied to TACs and the apportionment of PSC limits. Conventional measures can only be changed by formally amending an FMP. Conventional measures include permits, reporting requirements, gear restrictions, and allocations among user groups. The following subsection provides brief descriptions of major bycatch management tools that are utilized by the NPFMC.

3.2.1 Total Allowable Catch

The NPFMC sets annual TAC or quotas for target species and other species. The TAC defines the total tonnage of a species that may be taken by any means among all groundfish fisheries over the calendar year. TACs for target species include fish taken both as catch and as bycatch in the groundfish fisheries. The TACs can be apportioned by gear type and by season, in part to reduce bycatch and bycatch mortality. For example, seasonal apportionments of pollock TAC in the western and central GOA are intended to prevent the pollock fishery from occurring during periods characterized by high bycatch of salmon. Seasonal or area allocations of TAC also have the effect of directing fishing effort toward periods or areas of high target fish abundance. Therefore, harvests can be maximized while keeping bycatch levels in check. High bycatch rates in a fishery that targets a particular species, have been a factor in the decision to set lower TACs for some such species.

The NPFMC may set TACs for target species and other species either by individual species or species groups. The groupings are based on the commercial importance of a species or species group and the amount of biological information that is available to manage each group or species. The NPFMC may assemble or disassemble target species groups as they see fit based upon changes in population status and available information. The other species category requires an FMP amendment to break out a particular species or species group from a larger grouping.

Prohibited Species Catch Limits

Regulations governing the treatment of prohibited species (halibut, crab, salmon, and herring) seek to reduce the catch of these key non-groundfish species by banning their retention in all groundfish fisheries and requiring that all prohibited species taken in the groundfish fishery be returned to the sea with a minimum of injury. In addition to the general prohibition on retention, the total seasonal bycatch of individual PSC species is limited for red king crab, bairdi and opilio Tanner crabs, Pacific halibut, Pacific salmon, Pacific herring in the BSAI, and Pacific halibut in the GOA. When a PSC limit apportionment of the halibut or crab for a specific fishery and area is reached, that fishery is closed for the remainder of the season in that area even if the target groundfish quota has not been reached. For herring and salmon, the attainment of PSC limits triggers area-and-time specific closures of specific fisheries. Upon attainment of the PSC limit apportionment for a specific fishery, certain sensitive areas of high density and/or critical habitat are closed to that groundfish fishery. The area closure may be temporary, being applicable only to biologically sensitive times of the year (e.g., reproduction, molting, or migration).

Maximum Retainable Amount

Maximum retainable amount (MRA) limits determine the amount of a species by weight that may be retained. MRA is expressed as a percent of total retained catch by a fishing vessel of the species for which targeting is currently permitted. MRA limits are set for forage species, target species relegated to bycatch status, and other species groups relegated to bycatch status. The species or species group in question may be retained up to a level determined by its individual MRA. MRA serves as a management tool that limits the rate of removal of forage species and prohibited species, and slows the rate of harvest of a target species and other species once TAC quotas have been reached or are being approached.

Time/Area/Gear Restrictions

Closure of areas and seasons to fishing for some or all gear types has been an effective method for reducing bycatch since the 1970's when foreign fleets were first forbidden to fish in areas of high halibut and crab concentrations. Historically, area and seasonal closures have been implemented for selected members of the prohibited species category. Management measures have included the establishment of savings areas for herring, chinook salmon, chum salmon, and king crab, as well as permanent closures to protect crab stocks in the nearshore areas of Bristol Bay and around Kodiak Island. BSAI Amendment 57 permanently prohibits the use of non-pelagic trawl gear in the BSAI pollock fishery. Trawl gear is prohibited in the southeast portion of the GOA.

Gear Modifications

Modifications in gear construction and general application can also contribute to lowering bycatch. Minimum mesh sizes allow for escapement of juvenile fishes that would otherwise be taken as bycatch. However, in some cases, this may principally result in one type of bycatch (discards) being replaced with another (unobserved fishing mortality) which is much more difficult to monitor. Biodegradable panels and halibut excluder devices are required on all groundfish pots. Management use of future gear restrictions is largely dependent on the development of technological innovations that can be applied to the fishery in a practical and cost-effective manner.

Observer Program

Observer programs provide essential technical oversight for management of the EEZ groundfish fisheries. Observers provide estimates of total catch and species composition, which allows for inseason management of the fishery. They also collect biological data for individual species that are used in stock assessments. Observers are required aboard vessels greater than or equal to 60 feet (ft) in overall length. Vessels from 60 to under 125 ft in overall length are required to have observers for 30 percent of their fishing days, and larger vessels that use pot gear have the same observer coverage requirement. Other vessels greater or equal to 125 ft are required to have one or more observers 100 percent of the time. Observers are also required at shoreside processors that process more than 500 metric tons (mt) of groundfish in any single month. Processors that process 500-1,000 mt in a monthly period require 30 percent observer coverage while those that process more than 1,000 mt require observers 100 percent of the time. Vessels and processors involved in programs that use vessel specific fishing quotas, such as the Western Alaska Community Development Quota (CDQ) program or the American Fisheries Act (AFA) pollock fisheries, have additional observer requirements which include more than on observer on some types of fishing vessels, more senior observers on some vessels, flow scales or other motion compensating scales, and certified sampling stations.

Improved Retention/improved Utilization

Responding to what was considered unacceptably high levels of bycatch, the NPFMC adopted an improved retention/improved utilization (IR/IU) program for all groundfish target fisheries. In 1997, about 260,000 mt of groundfish were discarded in the BSAI groundfish fishery, which was equivalent to about 14 percent of the total catch of TAC groundfish species. Walleye pollock, Pacific cod, and flatfish comprised approximately

87 percent of this total. In the GOA, it was estimated that pollock, cod, and flatfish represented about 76 percent of discards of TAC species. The IR/IU program required 100 percent retention of pollock and cod in the BSAI and GOA, regardless of how or where they were caught (BSAI and GOA Amendments 49). The measure has dramatically reduced the discards of pollock and cod in the groundfish fishery. In 1998, the year the amendment was implemented, discards dropped dramatically from 1997 levels. In the BSAI, pollock discards dropped from 94,800 mt to 16,200 mt, and cod discards fell from 22,100 mt to 4,300 mt. Beginning in 2003, full retention was required for rock sole and yellowfin sole in the BSAI (BSAI Amendment 49), and for all shallow water flatfish in the GOA (GOA Amendment 49). When fully implemented, retention requirements are expected to reduce overall discard rates (all species) from about 15 percent to about 5 percent.

Vessel Incentive Program

Over the years, the NPFMC has implemented a number of incentive programs designed to promote the conservation and management of groundfish fisheries. One such program is the IFQ program (BSAI Amendment 15, GOA Amendment 20) for sablefish and halibut. The program allows qualified individuals to harvest a certain percentage of the sablefish and halibut quota. Each fisherman has a quota that can be used at anytime during the open season and allows them to set their own pace. The intent of the program was to allow fishermen to become more efficient and quality conscious. Bycatch reduction was also inherent in the program. Halibut taken as bycatch in the sablefish fisheries can be retained under the yearly halibut IFQ. The source of the problem of excessive bycatch is the externalities that exist, which give fishermen the wrong incentives with respect to decisions that affect bycatch. If adequate monitoring is feasible, the externalities can be eliminated or substantially reduced and fishermen would have the incentives to minimize bycatch to the extent practicable. Eliminating the "race for fish" can decrease some of the perverse incentive fishermen currently have with respect to bycatch decisions. But additional measures can be taken to provide improved incentives to fishermen. For example, increasing the number of species for which there is accountability by individual fishing operations will address a larger number of externalities and result in, from the National perspective, better bycatch decisions by fishermen for a broader range of bycatch species.

The voluntary Salmon Donation Program (BSAI Amendment 26, GOA Amendment 29) authorizes the distribution of Pacific salmon taken as bycatch to economically disadvantaged individuals through a sanctioned distributor. Most salmon taken as bycatch are dead when brought on board the fishing vessel. Under PSC designation they must be returned to the sea, which is wasteful. The Salmon Donation Program permits the retention of this fish for the foodbank program. While the program does not reduce bycatch, it is effective at reducing bycatch waste. FMP Amendments 50 for the BSAI and GOA expanded this program to include halibut.

Experimental Fishing Permits

BSAI Amendment 17 and GOA Amendment 22 authorized the issuing of experimental fishing permits (EFPs) to persons for the purpose of obtaining information necessary to promote fishery conservation and the management of fisheries.

Record Keeping

Permitted catcher vessels equal to or greater than 60 ft in overall length must maintain a daily fishing logbook regarding fishing activity and location (50 CFR 679.50). Catcher processor vessels, motherships, shoreside processors and purchasing stations must maintain daily cumulative production logbooks that record information on fishing activity, haul receipt, production, and discards. Information on groundfish harvest, discard, receipt, and production are reported to NOAA Fisheries. Some of this data is used by the agency to manage groundfish and prohibited species quotas.

Section 4 Policy Alternatives and Rationale

All four of the alternatives under consideration by the NPFMC address the bycatch problem in the following manner.

Alternative 1 Continue under the Current Risk-Averse Management Policy: Under this alternative, the NPFMC would continue to manage the groundfish fisheries based upon the present conservative and risk-averse strategy. This strategy assumes that fishing does result in some adverse impacts to the environment and that, as these impacts become known, mitigation measures will be developed and appropriate FMP amendments will be implemented. The approach would be to continue the current strategy which relies upon management of bycatch through seasonal allocation of TAC, time and area closures, gear restrictions/modification and allocations, PSC limits, IR/IU requirements, vessel incentive programs (VIP), observer and reporting programs, and experimental or exempt fishing permits to ensure that bycatch is minimized to the extent practicable.

Alternative 2 Adopt a More Aggressive Management Policy: Under this alternative a more aggressive harvest strategy would be implemented based upon the concept that the present strategy is overly conservative and that higher harvests could be taken without threat of overfishing the target groundfish stocks. This strategy assumes that fishing at the recommended levels would have no adverse impact on the environment, except in specific cases that are documented and are known to be reoccurring. Bycatch would continue to be monitored, but PSC limits would be adjusted or eliminated. If necessary, bycatch would be managed by closures of areas to selected gear types.

Alternative 3 Adopt a More Precautionary Management Policy: This policy would seek to accelerate the existing precautionary management measures through community or rights-based management that would be extended to as many species as practicable (including a broad range of non-target species), ecosystem-based management principles and, where appropriate and practicable, increase habitat protection and impose additional bycatch constraints. Under this approach, additional conservation management measures would be taken as necessary to respond to social, economic, or conservation needs. Additional measures would be taken if scientific evidence indicated that the fishery was negatively impacting the environment, not just a population of a given species. The main elements of this alternative would include development of incentive programs for reducing the bycatch of a broad range of species, encouragement of research programs to better define population estimates and appropriate bycatch limits for non-target species, and development of management measures that would encourage the use of gear and fishing techniques that would reduce discards.

Alternative 4 Adopt a Highly Precautionary Management Policy: This policy would require that the user of the resource demonstrate that the intended use would not have a detrimental effect on the environment before significant fishing would be allowed. The strategy would be to impose very restrictive conservation and management measures that would only be modified or relaxed when additional, reliable scientific information became available. It would involve a strict interpretation of the precautionary principle. Management discussions would increase involvement of and agency responsiveness to the public, while decreased emphasis would be placed on industry and community concerns, and more emphasis would be placed on ecosystem concerns and principles, including the identification and incorporation of non-consumptive use values. The overall premise is that fishing does produce adverse impacts on the environment, but due to a lack of information and uncertainty, we know little about these impacts. With regards to bycatch, this alternative would require that bycatch mortality would be included in TAC-accounting for all target, non-target and PSC bycatch species, including unobserved fishing mortality; bycatch and PSC limits would be reduced (e.g., by

10 percent per year for five years); fisheries having greater than 25 percent bycatch rates would be phased out; PSC limits would be established for salmon, crab and herring in the GOA; and that stringent bycatch limits would be imposed for vulnerable, non-target species. This strategy would greatly curtail the regional groundfish fisheries until more information was obtained about the frequency and intensity of fishing impacts on the environment.

Each of the three alternatives to the Alternative 1 (status quo) contain two endpoints, which represent the limits of fishery management measures within each alternative. These endpoints, referred to hereafter as FMP bookends, are not intended to be stand alone alternatives, but are instead examples of the management options within an alternative. For example, Alternative 2 contains FMP bookends 2.1 and 2.2, which presents a range of different possible management tools that NPFMC could use to implement the measures defined in Alternative 2. These FMP bookends also discuss predictions of the range of potential environmental effects from the use of these management tools. This alternative structure recognizes and accounts for the fact that the resource being managed, as well as the marine ecosystem, is quite dynamic in nature and only partially understood. The process of examining a range of management tools and their potential effects for each policy alternative is an attempt to take into account the dynamic nature of the fisheries as a whole and to provide enough management regime flexibility in each alternative to allow the decision-makers to base decisions on the best available science. Specific illustrative FMP measures for each alternative are summarized in Table 3.

Table 3. Comparative Fishery Management Plan frameworks of the four alternatives dealing with bycatch.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	Fishery Management Plan (FMP) 1	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Bycatch and incidental catch restrictions	Prohibited species catch (PSC) limits for herring, crab, halibut and salmon in Bering Sea and Aleutian Islands (BSAI), and for halibut in Gulf of Alaska (GOA).	Eliminate PSC limits.	PSC limits as for FMP 1. Where sufficient stock status information is available, adjustable PSC limits established based on a percentage of the annual stock status.	BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (0-10%). GOA: Establish PSC limits on salmon not to exceed (NTE) a 25,000 fish cap for chinook and a 20,500 fish cap for other salmon; establish PSC limits on crab and herring based on biomass or other fishery data. Reduce GOA halibut PSC limit 0-10% for those PSC species where annual population estimates exist, the Team will explore a mortality rate-based approach to setting limits.	BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (10-30%). GOA: Establish PSC limits on salmon NTE a 25,000 fish cap for chinook and a 20,500 fish cap for other salmon; establish PSC limits on crab and herring based on biomass or other fishery data; reduce all by 0-10%. Reduce GOA halibut PSC limit 10-30%. For those PSC species where annual population estimates exist, the Team will explore a mortality rate-based approach to setting limits.	BSAI: Reduce PSC limits for herring, crab, salmon, halibut by 30-50%. GOA: Establish PSC limits on salmon NTE a 25,000 fish cap for chinook and a 20,500 fish cap for other salmon; establish PSC limits on crab and herring based on biomass or other fishery data; reduce all by 30-50%. For those PSC species where annual population estimates exist, the Team will explore a mortality rate-based approach to setting limits.	Prohibition on all fishing pending review.
	Improved retention/improved utilization (IR/IU) for pollock, P. cod.	Repeat IR/IU	No changes from FMP 1.	No changes from FMP 1.	No changes from FMP 1.	Extend IR/IU to all target species.	Prohibition on all fishing pending review.
	Current bycatch and incidental catch restrictions. Vessel incentive program (VIP). Demersal Shelf Rockfish full-retention.	No bycatch restrictions.	Same as 2.1.	Review effectiveness of coop-managed PSC reduction. Repeal VIP program. Control bycatch by closing hotspot areas when bycatch limits are attained.	Incentive program for incidental catch and bycatch reduction, e.g.: (a) Individual Bycatch Quota (b) Harvest Priority (10% of total allowable catch (TAC) reserved to reward clean fishing) (c) Bycatch reduction standards established (d) Coop managed Harvest Priority (0-10% TAC or PSC reserved to reward clean fishing) (e) Halibut Mortality Avoidance Program (HMAP).	Reduce bycatch: BSAI: reduce all by 30-50%. GOA: reduce all by 30-50%. Bycatch limits for non-target stocks as information becomes available.	Prohibition on all fishing pending review. Prohibition on all fishing pending review.
	Crab trawl closures Cook Inlet prohibition for bottom trawl.	Eliminate all closure areas and no Cook Inlet trawl ban.	No changes from FMP 1.	No changes from FMP 1.	Develop appropriate closure areas in GOA to address bycatch for halibut and/or crab.	Establish gear closure areas and marine reserves to reduce and avoid bycatch.	Prohibition on all fishing pending review.
	Inseason bycatch, management measures: (a) establishment of fishing seasons for bycatch mgmt (b) herring closures for areas (not fishery)	Eliminate all inseason bycatch measures.	No changes from FMP 1.	No changes from FMP 1.	Repeal maximum retainable amounts (MRAs) and establish a system of caps and quotas.	No changes from FMP 1.	No inseason mgmt measures. Prohibition on all fishing pending review.

Table 3 (cont.). Comparative Fishery Management Plan frameworks of the four alternatives dealing with bycatch.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	Fishery Management Plan (FMP) 1	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Gear restrictions and allocations	Retain existing no-trawl zones and fixed gear restrictions; Bottom trawl ban in BSAI for pollock.	Eliminate all trawl closure areas and trawl and fixed gear restrictions.	No changes from FMP 1.	BSAI prohibition on bottom trawl for pollock.	BSAI and GOA prohibition on bottom trawl for pollock.	Prohibit trawling in all fisheries that can be prosecuted with other gear types (e.g., fisheries with > 25% bycatch).	Prohibition on all fishing pending review.
	No pot fishing in GOA for sablefish.	No changes from FMP 1	No changes from FMP 1.	No changes from FMP 1.	Restrict fishing to areas where fishing has previously been concentrated.	Restrict bottom trawling for flatfish to specific areas: No trawling in areas identified (previous) as marine protected areas (MPAs).	Prohibition on all fishing pending review.
	Retain existing gear restrictions and allocations	No changes from FMP 1	No changes from FMP 1.	No changes from FMP 1.	No changes from FMP 1.		
	Sablefish and Pacific cod allocated by gear in BSAI; sablefish allocated by gear in GOA	No changes from FMP 1	No changes from FMP 1.	No changes from FMP 1.	No changes from FMP 1.	See Gear Restrictions and Allocations above.	Prohibition on all fishing pending review.
Observer program	Fixed 0/30/100% coverage.	Repeal all observer programs except American Fisheries Act (AFA) and community development quota (CDQ).	No changes from FMP 1.	Observer coverage same as FMP 1 or modified based on data and compliance needs, and should be scientifically-based.	Extend to 100% > 60' CDQ & AFA to stay the same as FMP 1.	Expand level of observer coverage.	Prohibition on all fishing pending review.
	100% for AFA & CDQ catcher boats > 60 feet (ft) and 200% for AFA & CDQ catcher processors and motherships.			e.g., random placement, flexibility, variable rate.	(a) 100% coverage on vessels (vessels less than 60' = 30% coverage) (b) 100% hauls are observed.		

Section 5 Alternative 1: Continue Under the Current Risk-Averse Management Policy

Many of the management strategies established by the NPFMC to reduce bycatch in the North Pacific groundfish fishery have centered on prohibited species and more recently target species and forage fish species. Thirty-four BSAI and 20 GOA FMP amendments have been implemented in the past 20 years to control bycatch and associated mortality within these groups. Regulatory measures have established or modified bycatch limits, fishing seasons, gear restrictions and allocations, time and area closures, bycatch rate standards, record keeping and reporting incentive programs, retention/utilization requirements, retention restrictions or prohibitions, and observer requirements. A few of these restrictions are applied to target and other species once their seasonal TACs have been reached or exceeded. The direct effect of Alternative 1 provisions on the different species groups and management tools are detailed below.

5.1 Target Species

The TACs of target species are rigorously managed by the NPFMC and NOAA Fisheries under an elaborate system of data collection, inseason management, and stock assessments. Target species are subject to retention limits once the seasonal TAC quota has been met or is being approached. Thereafter, the species cannot be targeted but may be retained up to an MRA determined by the NPFMC. If the harvest of a given target species on bycatch status approaches the acceptable biological catch (ABC), that species is put on prohibited species status, which bans the retention of that species for the remainder of the year. Bycatch status effectively slows the rate of harvest of the TAC species in question once the TAC has been reached or is being approached. In 2002, the only groundfish fisheries for which seasonal TAC was reached were pollock and Alaska plaice in the BSAI (Table 4). The only other fishery for which harvests came within 5 percent of the seasonal TAC was sablefish in the GOA.

5.2 Prohibited Species

Pacific Halibut

Pacific halibut fisheries are managed by a treaty between the United States and Canada through recommendations by the International Pacific Halibut Commission (IPHC). Stock assessments conducted by the IPHC take into account all halibut removals, including bycatch in the groundfish fisheries. Catch and discard mortality data are provided by observers associated with the groundfishing fleet. Stock assessments are then used to allocate harvest quotas in the directed halibut fishery. Because IPHC stock management accounts for bycatch mortality, halibut quotas in the directed fishery compensate for bycatch in the groundfish fisheries. The halibut resource is considered quite healthy and directed harvests in recent years have been near record levels.

Halibut bycatch is controlled in the BSAI groundfish fishery using PSC limits applied to specific target fisheries. Unlike other PSC limits, which allocate total allowable bycatch, PSC limits for halibut bycatch are for mortalities only. Halibut returned live to the sea do not accrue toward the PSC limit. Most halibut taken as bycatch are juveniles, so the loss must be viewed not just as immediate tonnage, but also as fish that would have grown larger.

For the 2003 fishing season, total halibut PSC limits have been set at 3,675 mt for trawl and 900 mt for nontrawl fisheries (Table 5). Bycatch limits are apportioned by gear type and target species, and within target species, they are further apportioned by season. For example, 26 percent of the 2003 halibut PSC limit assessed to trawl fisheries operating in the BSAI was allocated to yellowfin sole. This 26 percent is further sub-allocated among four fishing seasons. Halibut bycatch allocations essentially direct fisheries, by area or time, to regions where the highest volume or highest value target species may be harvested with minimal halibut bycatch. When any fishery exceeds its seasonal limit, the entire Bering Sea is closed for that fishery.

Table 4. Total allowable catch allocations and groundfish harvests (metric tons) by target species for the 2002 fishing season.

Target fishery	2002		Percent of TAC
	Total allowable catch (TAC)	Catch	
BSAI			
Pollock	1,486,100	1,486,006	100.0
Pacific cod	200,000	184,937	92.5
Atka mackeral	98,000	87,986	89.8
Yellowfin sole	86,000	74,861	87.0
Rock sole	54,000	41,621	77.1
Other species	30,825	26,467	85.9
Pacific Ocean perch	30,600	22,392	73.2
Flathead sole	25,000	15,419	61.7
Greenland turbot	16,000	5,506	34.4
Arrowtooth flounder	16,000	4,010	25.1
Alaska plaice	12,000	12,291	102.4
Northern rockfish	6,760	4,010	59.3
Sablefish	4,480	1,887	42.1
Other flatfish	3,000	2,628	87.6
Squid	1,970	784	39.8
Other rockfish	1,037	946	91.2
Shortraker/rougheye rockfish	1,028	573	55.7
GOA			
Pollock	58,250	50,390	86.5
Pacific cod	44,230	40,524	91.6
Arrowtooth flounder	38,000	20,941	55.1
Shallow water flatfish	20,420	6,842	33.5
Pacific Ocean perch	13,190	11,735	89.0
Sablefish	12,820	12,246	95.5
Other species	11,330	3,748	33.1
Rex sole	9,470	3,009	31.8
Flathead sole	9,280	2,108	22.7
Pelagic shelf rockfish	5,490	3,318	60.4
Northern rockfish	4,980	3,335	67.0
Deepwater flatfish	4,880	558	11.4
Thornyhead rockfish	1,990	1,125	56.5
Shortraker/rougheye rockfish	1,620	1,291	79.7
Other slope rockfish	990	771	77.9
Atka mackeral	600	84	14.0
Demersal rockfish	350	182	52.0

Table 5. Prohibited species catch allocations for the Bering Sea and Aleutian Islands Fishery Management Unit, 2003. Projected crab populations are denoted parenthetically.

Species	Gear	Prohibited species catch (PSC) limits	Fishery		Season allowances	
Halibut	Trawl	3,675 metric tons (mt) (mortality)	**Trawl**			
			Yellowfin sole	[24%]	1/20 to 3/31	[30%]
					4/1 to 5/20	[22%]
	Non-trawl	900 mt (mortality)	N/A		5/21 to 7/3	[6%]
					7/14 to 12/31	[43%]
	Pot gear	exempt	Rocksole, other flatfish, flathead sole	[21%]	1/20 to 3/31	[58%]
					4/1 to 7/3	[21%]
					7/4 to 12/31	[21%]
	Jig gear	exempt	Turbot, sablefish, arrowtooth	[0%]	None	
			Rockfish	[2%]	7/4 to 12/31	[100%]
	Hook-and-line (sablefish only)	exempt	Pacific cod	[39%]	None	
			Pollock, Atka mackerel, other	[6%]	None	
			Community development quota (CDQ) fisheries	[7%]	None	
			Non-trawl			
			Pacific cod	[86%]	1/1 to 6/10	[41%]
					8/15 to 12/31	[59%]
			Other non-trawl	[6%]	5/1 to 12/31	
			CDQ Fisheries	[7%]	None	
Herring	Trawl	1,526 mt (1% of estimated biomass)	Yellowfin sole	[9%]	None	
			Rocksole, other flatfish, flathead sole	[1%]		
			Turbot, sablefish, arrowtooth	[<1%]		
			Rockfish	[<1%]		
			Pacific cod	[1%]		
			Pollock, Atka mackerel, other	[87%]		
Red king crab (zone 1)	Trawl	97,000 crabs	Yellowfin sole	[17%]	None	
			Rocksole, other flatfish, flathead sole	[62%]		
			Pacific cod	[12%]		
			Pollock, Atka mackerel, other	[2%]		
			CDQ Fisheries	[8%]		

Table 5 (cont.). Prohibited species catch allocations for the Bering Sea and Aleutian Islands Fishery Management Unit, 2003. Projected crab populations are denoted parenthetically.

Species	Gear	Prohibited species catch (PSC) limits	Fishery		Season allowances
Opilio Tanner crab (Bycatch limitation zone)	Trawl	4,350,000 crabs	Yellowfin sole	[64%]	None
			Rocksole, other flatfish, flathead sole	[22%]	
			Turbot, sablefish, arrowtooth	[1%]	
			Rockfish	[1%]	
			Pacific cod	[3%]	
			Pollock, Atka mackerel, other	[2%]	
			CDQ Fisheries	[8%]	
Bairdi Tanner crab (zone 1)	Trawl	980,000 crabs	Yellowfin sole	[35%]	None
			Rocksole, other flatfish, flathead sole	[37%]	
			Pacific cod	[19%]	
			Pollock, Atka mackerel, other	[2%]	
			CDQ Fisheries	[8%]	
Bairdi Tanner crab (zone 2)	Trawl	2,970,000 crabs	Yellowfin sole	[60%]	None
			Rocksole, other flatfish, flathead sole	[20%]	
			Rockfish	[<1%]	
			Pacific cod	[11%]	
			Pollock, Atka mackerel, other	[1%]	
			CDQ Fisheries	[8%]	
Chinook salmon	Trawl	29,000 fish			1/1 to 4/15
Other salmon	Trawl	42,000 fish			8/15 to 10/14

Source: DiCosimo (2002).

In recent years halibut PSC limits for the GOA have been 2,000 mt for trawl and 300 mt for nontrawl fisheries. PSC limits in the GOA may also be allocated by season, among fisheries, and among gear types. If some gear types have excessively high bycatch mortality rates, the NPFMC may withhold that fishery's halibut PSC limit in order to promote other gear types that might otherwise close prematurely. In both the BSAI and GOA, bycatch limits of Pacific halibut often prevent the annual TAC of many groundfish species from being harvested.

Other measures that have reduced halibut bycatch include seasonal and area allocations of TAC for selected target species, seasonal and year-round area closures, gear restrictions, careful release requirements, an IFQ VIP, public reporting of individual bycatch rates, and gear modifications. Examples of gear modifications include biodegradable panels and halibut excluder devices that are required on all groundfish pots. Implementation of the IFQ program (see Management Tools, Section 3.2) resulted in an immediate reduction in annual PSC limits for the GOA from 750 mt to 150 mt.

Pacific Herring

Directed fisheries for herring occur entirely in state waters and are managed by the Alaska Department of Fish and Game (ADF&G). Harvest quotas are determined by the Alaska Board of Fisheries and are based upon biomass forecasts as determined from landings data. Pacific herring bycatch limits (BSAI Amendment 16a) in the groundfish fisheries apply to trawl gear operating within three specified areas designated as Herring Savings Areas 1, 2, and 3, all of which are located in the Bering Sea (Figure 1). These areas are characterized by large seasonal aggregations of herring. The annual PSC limit determined by the NPFMC is set at 1 percent of projected herring biomass and is designed to fluctuate with herring abundance as estimated for each year. For the 2003 fishing season, the herring PSC limit has been set at 1,526 mt (Table 5). This bycatch limit is also apportioned among specified trawl fisheries. If a bycatch allowance is attained for a specific fishery, that fishery is prohibited from operating in Area 1 from June 15 to July 1, in Area 2 from July 1 to August 15, and in Area 3 from September 1 through March 1. These time/area closures are designed to track seasonal herring migrations and aggregations. In the BSAI, herring bycatch occurs primarily in the pollock and yellowfin sole fisheries.

In the GOA, bycatch is rather nominal and occurs almost exclusively in the pollock fisheries; 78 percent in pelagic trawls and 12 percent in bottom trawls. Herring bycatch is estimated to be such a small percentage of total herring biomass in the GOA that there are no PSC limits or area closures designated by the NPFMC.

King and Tanner Crabs

Many of the crab stocks in the BSAI are currently at or below critical levels. The Bristol Bay red king crab population is below critical stock size and the directed fishery was closed in 1994 because of depressed populations. Conditions were so dire that a red king crab savings area was established by emergency rule in 1995, and made permanent under BSAI Amendment 37. The blue king crab population in the Pribilof Islands is considered to be low (NMFS 1998d) and population in the Saint Matthew Island area is estimated to be below minimum stock size threshold (NMFS 1999b). The stock was declared overfished and the fishery was closed in 1999. The NPFMC considers the Bering Sea Tanner crab stock overfished and is likely that the population will continue to decline for years (Morrison *et al.* 1998).

In response to the depressed status of many crab stocks, the NPFMC established permanent year-round closures in areas deemed to be critical crab habitat (Figures 2 and 3). These include the 19,000 square nautical miles (nm^2) nearshore Bristol Bay area (BSAI Amendment 37), the 7,000 nm^2 Pribilof Island Habitat Conservation Area (BSAI Amendment 21a), the 4,000 nm^2 Red King Crab Savings Area (BSAI Amendment 37), the 1,000 nm^2 Red King Crab Protection Area around Kodiak Island (GOA Amendment 26), and Management Area 512 closure (BSAI Amendment 10). In 2000, the NPFMC approved Amendment 60 which permanently prohibits nonpelagic trawling in a 7,000 nm^2 area of Cook Inlet that is considered critical habitat for depressed king and Tanner crab stocks.

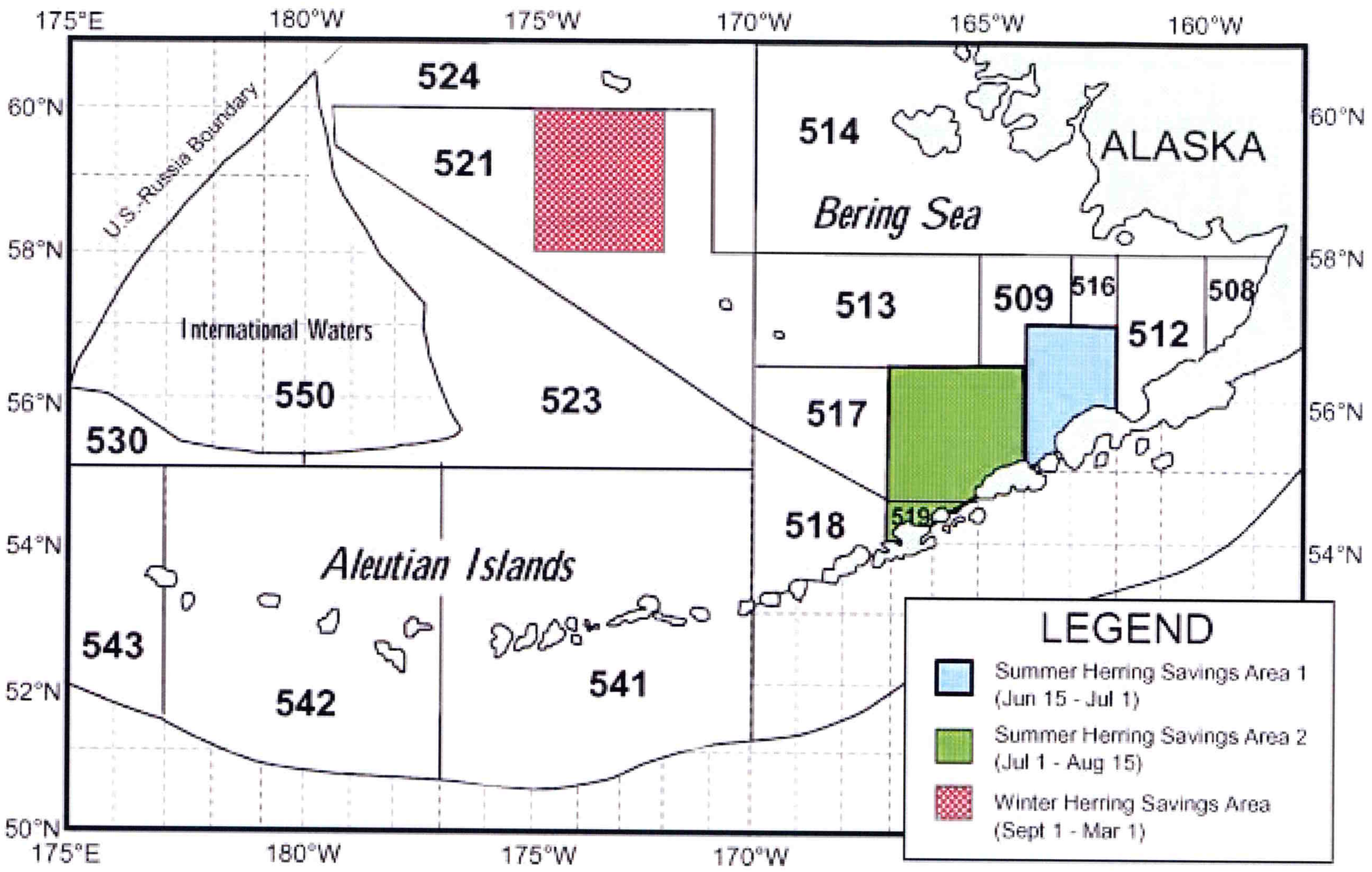


Figure 1. Designated Pacific herring savings areas.

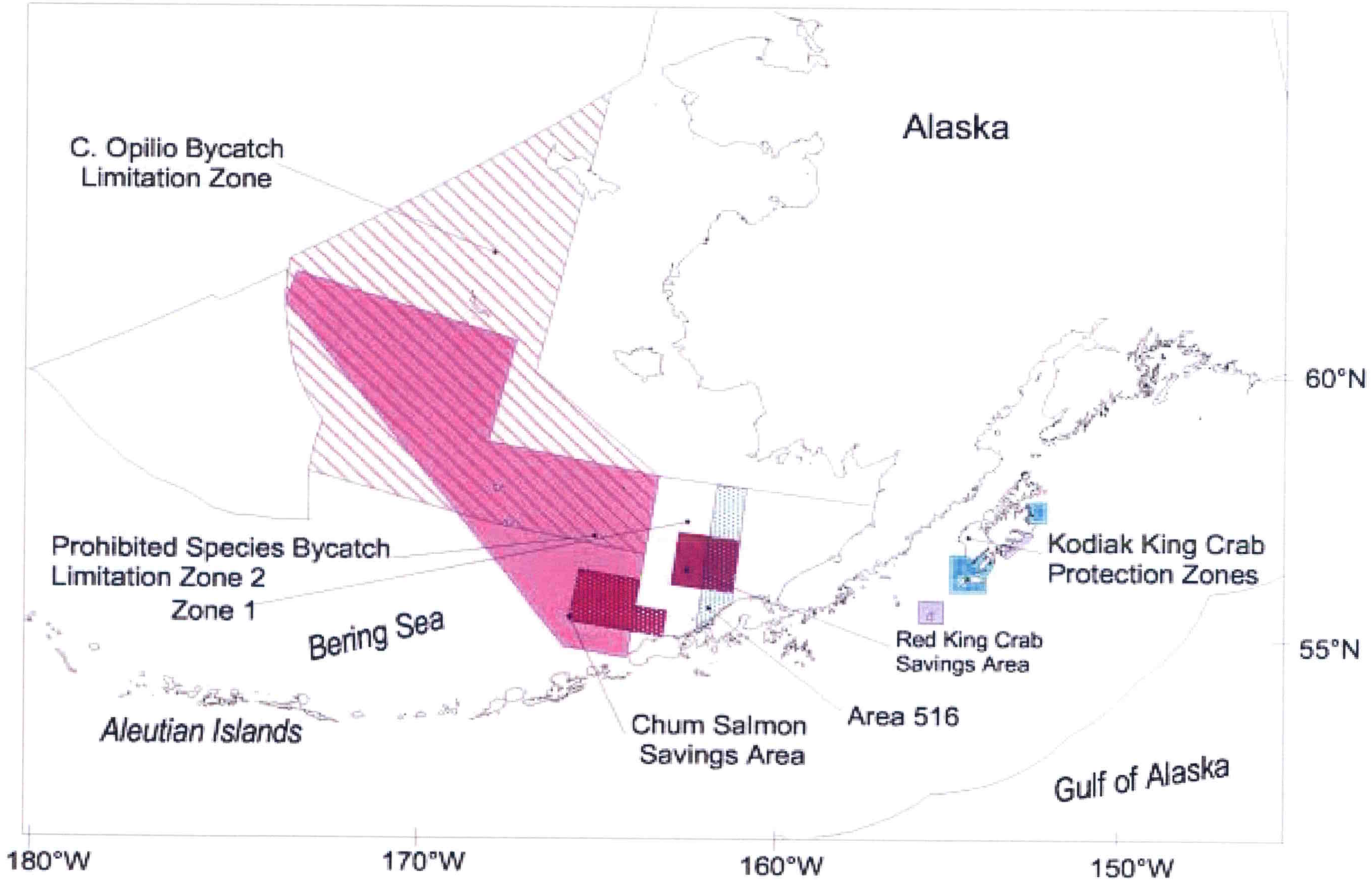


Figure 2. Management areas involving prohibited species in the Bering Sea and Gulf of Alaska. Source: NMFS.

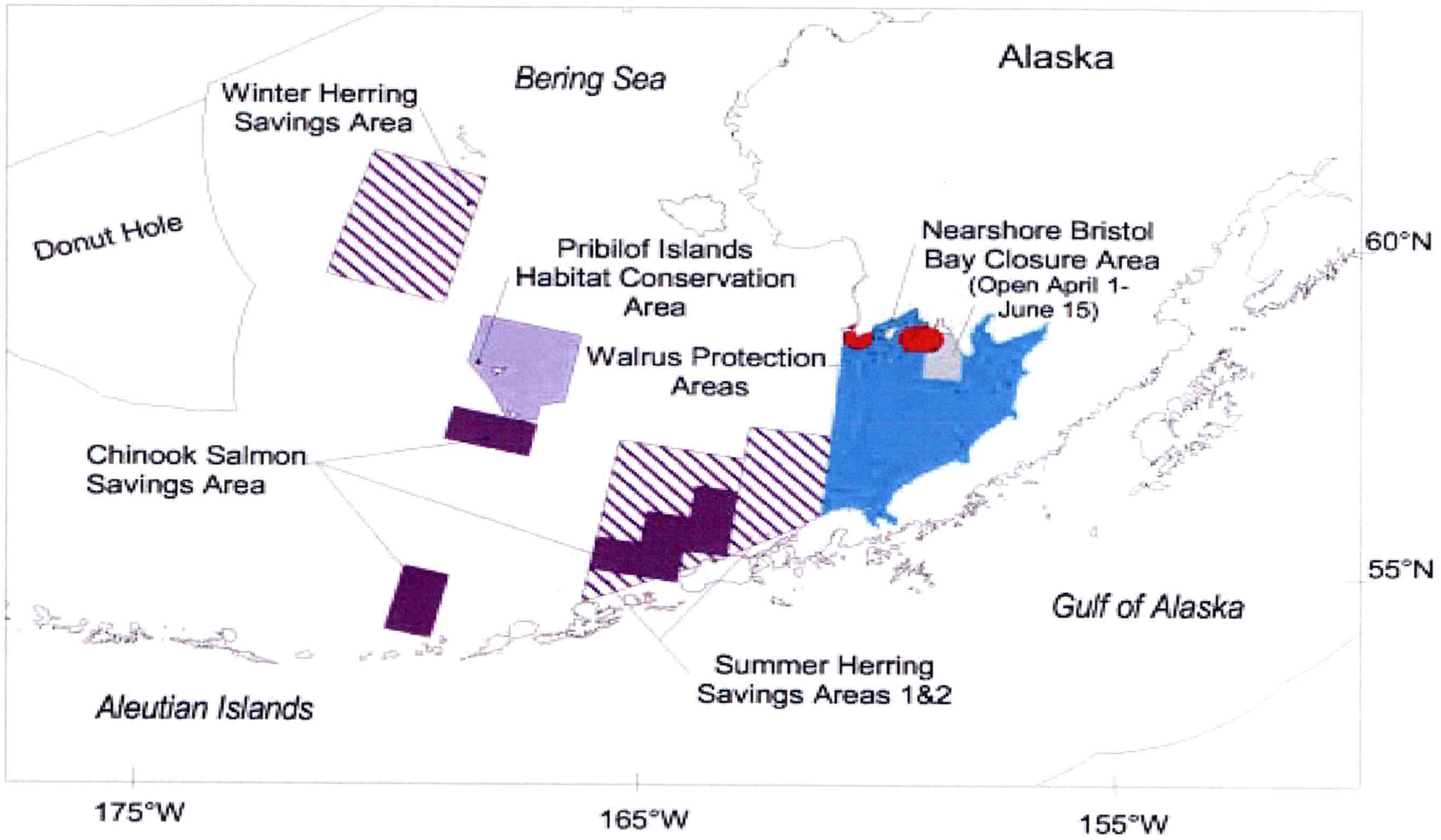


Figure 3. Management areas involving prohibited species and walrus in the Bering Sea. Source: NMFS.

Crab bycatch in the BSAI is also managed through the use of seasonal time and area closures and PSC limits (BSAI Amendments 40 and 41). Bycatch limits for king and Tanner crabs are generally a function of crab abundance as estimated from annual trawl surveys conducted by NOAA Fisheries (Table 6). Current PSC limits represent about 1 percent or less of the estimated annual abundance of each species. This fixed percentage approach means that annual PSC limits adjust in conjunction with increases or decreases in the underlying population. Bycatch limits are considered an acceptable loss rate that does not significantly deplete stocks or impede the recovery rates for rebuilding depleted stocks. BSAI Amendment 57, which prohibits the use of non-pelagic trawl gear in the BSAI pollock fishery, further reduces crabs bycatch limits as indicated in Table 5. PSC limits are also allocated among areas and target fisheries. When a PSC limit is reached for a specific fishery/zone, that fishery is closed in that zone for the season. Most of the bycatch of crabs in the BSAI comes from directed trawl fisheries for yellowfin sole, rock sole, flathead sole, and Pacific cod.

Table 6. Prohibited species bycatch limits for crabs in the Bering Sea and Aleutian Islands.

Species	Prohibited species catch (PSC) limits	Abundance
Red king crab (Zone 1)	35,000 crabs (-3,000 additional crabs)	Less than 14.5 million pounds of female Spawning biomass in eastern Bering Sea
	100,000 crabs (-3,000 additional crabs)	From 14.5 to 55 million lbs of female spawning biomass in eastern Bering Sea
	200,000 crabs (-3,000 additional crabs)	Greater than 55 million lbs of female spawning biomass in eastern Bering Sea
Opilio Tanner crab Bycatch Limitation Zone	0.1133% of total crab abundance (-150,000 additional crabs)	Minimum: 4.5 million crabs Maximum: 13 million crabs
Bairdi Tanner crab (Zones 1 and 2)	Zone 1 (-20,000 additional crabs)	
	0.5% of abundance	0-150 million crabs
	750,000 crabs	150-270 million crabs
	850,000 crabs	270-400 million crabs
	1,000,000 crabs	Over 400 million crabs
	Zone 2 (-30,000 additional crabs)	
	1.2% of abundance	0-175 million crabs
	2,100,000 crabs	175-290 million crabs
	2,550,000 crabs	290-400 million crabs
	3,000,000 crabs	Over 400 million crabs

There are no PSC limits or time and area closures for crabs in the GOA. Although the bycatch of crabs in the GOA is very small relative to those in the BSAI, there is little information regarding the sizes and status of GOA stocks. Without such information, there is no way to determine the proportion of each stock being affected by bycatch or if critical crab habitat is being damaged.

Of the two principal management tools used to control crab bycatch -PSC limits and time/area closures- PSC limits are probably less effective in terms of decreasing the adverse effects of the BSAI groundfish fishery with respect to the crab stocks. Crab bycatch in the trawl fishery is not a major source of crab mortality, relative to other sources of crab mortality such as the directed crab fishery. However, because trawling negatively impacts crab stocks through unobserved mortality and habitat degradation, closed areas tend to be more effective than PSC limits in reducing the impact of trawling on crab stocks (Witherell and Harrington 1996). The critical importance of crab habitat to the success of crab populations was the key element that prompted the NPFMC to establish crab savings and conservation areas. These protected areas likely have a significantly beneficial effect on the conservation of crab stocks in the BSAI.

Pacific Salmon

Pacific salmon and trout fisheries are managed under a combination of domestic and international regulations and treaties. Fisheries are managed by ADF&G within state waters, where most of Alaska's commercial fishing occurs. Commercial fishing within the EEZ is limited to southeast Alaska and NPFMC management is deferred to ADF&G. Harvests of chinook, coho, and sockeye salmon in southeast Alaska are managed by agreement with Canada under the Pacific Salmon Treaty. Management of salmon fisheries in international waters of the Northern Pacific is under the auspices of the North Pacific Anadromous Fish Commission, which consists of a four countries (Canada, Japan, Russia, and the U.S.).

Within the State of Alaska, ADF&G manages salmon stocks for individual rivers of origin based upon escapement (the number of surviving spawners). Most salmon return to their natal rivers of origin to spawn and this fidelity leads to reproductively distinct stocks within the overall population. Each year, spawners are counted during their upstream migration. This means that escapement estimates are made after stocks have been reduced by natural mortality at sea, bycatch at sea, and directed fisheries downriver. If the perceived number of surviving spawners in a given river is below management goals, ADF&G limits or prohibits fishing in Alaska's commercial, subsistence, and recreational fisheries. Stock management by the state thus compensates for salmon bycatch in the groundfish fishery by reducing yields to directed salmon fisheries.

The five species of Pacific salmon are divided into two FMP bycatch management groups: chinook salmon, and "other" salmon (chum, sockeye, coho, pink). Steelhead trout have not been observed recently in either the BSAI or GOA and are not considered in this assessment. All groundfish fisheries in the BSAI and GOA are prohibited from retaining any species of salmon except for those retained under the Voluntary Salmon Donations Permit that authorizes their retention for local food banks (BSAI Amendment 26, GOA Amendment 29). In 1999, over 3 million pounds were donated.

Of the five salmon species, only the bycatch of chinook and chum salmon are of any serious concern in the BSAI and GOA. Pink, coho, and sockeye salmon populations in Alaska are considered healthy and bycatch in the groundfish fisheries represents only a minuscule portion of state harvests. These three species also are small components of bycatch in the groundfish fishery relative to chinook and chum salmon. The 926,879 Pacific salmon taken as bycatch in the BSAI from 1990 to 1997 consisted of 590,892 (64 percent) chum salmon, 331,759 (35 percent) chinook salmon, 3,557 (0.38 percent) coho salmon, 173 (0.02 percent) sockeye salmon, and 491 (0.05 percent) pink salmon. The 366,491 Pacific salmon taken as bycatch in the GOA from 1990 to 1997 consisted of 200,637 (55 percent) chum salmon, 160,264 (44 percent) chinook salmon,3,952 (1.08 percent) coho salmon, 337 (0.09 percent) sockeye salmon, and 1,301 (0.35 percent) pink salmon. Most of these salmon are taken in pelagic trawl gear targeting pollock.

Although the overall bycatch of chinook and chum salmon is also very small relative to state harvests, bycatch take could pose a threat to specific stocks (rivers of origin). Some western stocks of chinook salmon are currently depressed. In 2000, there were fishing closures in the Yukon and Kuskokwim river systems and it is possible that ADF&G escapement goals may not be realized over the immediate future. If individual stocks become so depressed that full closure of direct fisheries is insufficient to enable a rebound in the population, then any additional mortality, including bycatch, could negatively impact the stock. It is estimated that 58-70 percent of chinook salmon bycatch in the BSAI groundfish fisheries may originate from western Alaska stocks, but it is unknown what proportion of these salmon are specifically from depressed stocks.

Analysts contend that there is insufficient information to determine the effects of BSAI bycatch and PSC limits on specific at-risk stocks within this western group.

The NPFMC adopted BSAI Amendment 21b, which established a PSC limit in the BSAI of 48,000 chinook salmon allocated between January 1 and April 15 for trawl gear. Upon attainment of the bycatch limit, all trawling was prohibited in the 9,000 nm^2 Chinook Salmon Savings Area (Figure 3). Chinook salmon bycatch tends to be high in this area during the January-April time frame. Trawl fisheries were reopened after April 16 for the remainder of the year. The PSC limit represents about 19.2 to 36.9 percent of the combined Arctic-Yukon-Kuskokwim and Bristol Bay chinook salmon landings reported between 1997 and 1999. This is a substantial portion of the domestic harvest.

In 1999, the NPFMC adopted BSAI Amendment 58, which: 1) further reduced the chinook salmon bycatch limit from 48,000 to 29,000 fish by 2003, 2) implemented year-round accounting of chinook salmon bycatch in the pollock fishery, 3) revised the boundaries of the Chinook Salmon Savings Areas, and 4) set more restrictive closure dates. This reduced PSC limit represents about 11.6 to 22.3 percent of the combined Arctic-Yukon-Kuskokwim and Bristol Bay chinook salmon landings reported between 1997 and 1999. Still a sizable proportion of the domestic harvest.

PSC limits have not been established for salmon in the GOA, however, seasonal fishing seasons for pollock in the central and western GOA have been adjusted to avoid periods of high chinook and chum salmon bycatch. Bycatch in the GOA groundfish fishery is presently only about 2-4 percent of directed chinook salmon landings in Alaska and is not likely have an effect on populations in general. Western stocks are thought to make up a smaller proportion of chinook salmon bycatch than in the BSAI, however, there is insufficient information to determine how much smaller and what proportion may actually consist of specific at-risk stocks.

Some western Alaska stocks of chum salmon are also depressed. In the BSAI (BSAI Amendment 35), a limit of 42,000 "other" salmon (primarily chum salmon) can be taken between August 1 and September 1 in the 5,000 nm^2 Chum Salmon Savings Area (Figure 2). Analysts estimate that about 19 percent of chum salmon bycatch in the BSAI is from western stocks. Because this is equivalent to only 1.3 to 1.5 percent of the combined Arctic-Yukon-Kuskokwim and Bristol Bay chum salmon landings reported between 1997 and 1999, bycatch represents a tiny fraction of landings even for depressed stocks. In all likelihood, bycatch of chum salmon in the BSAI has a negligible effect on Alaskan stocks. Further, there is considerable spatial overlap of the Chum Salmon Savings Area with the Steller Sea Lion Conservation Area (SCA), which, under provisions of the AFA, greatly limits pollock fishing in that region of the Aleutian Islands.

There are currently no bycatch limits or area closures for "other" salmon in the GOA. From 1997 to 1999, chum salmon comprised about 56 percent (5,000 fish) of "other" salmon taken as bycatch in the GOA. This amount of bycatch was equivalent to 0.02-0.03 percent of all chum salmon landings and only 0.34-0.82 percent of the combined Arctic-Yukon-Kuskokwim and Bristol Bay chum salmon landings reported between 1997 and 1999. Such low proportions suggest that chum salmon bycatch in the GOA will have little impact on any Alaskan stocks.

Although there are no salmon stocks in Alaska that are listed as either endangered or threatened under the Endangered Species Act (ESA), there are several listed stocks of chinook and chum salmon from rivers in Washington, Oregon, and California that could migrate into marine waters off Alaska. After detailed study, NMFS (1994) concluded, "the groundfish fisheries are not likely to jeopardize the continued existence of any ESA-listed salmon."

5.3 Forage Species

Direct fisheries for forage fish species are prohibited in the EEZ (BSAI Amendment 36, GOA Amendment 39). MRA limits are set at 2 percent for the entire group regardless of species composition. Fish taken within the 2 percent limit may be commercially retained and typically are processed into fishmeal. In all cases, most of the forage fish bycatch is taken in pelagic trawls; 74 percent in the BSAI, 93 percent in the GOA. The vast majority of forage fish taken as bycatch are osmerids (capelin, eulachon, other smelts). Collectively, forage fish form only a small part of bycatch of groundfish fisheries typically comprising less than 0.1 percent of the directed harvests. From 1990 to 1993, osmerid bycatch ranged from 127.2 to 530.7 mt in the GOA, and from 31.8 to 292.1 mt in the BSAI. In the most recent three years, 1997 to 1999, an average of 39 mt of forage species were taken annually in the BSAI and 61 mt in the GOA. Bycatch in the GOA was higher at 218 mt.

There are no biomass estimates for forage fish in the BSAI or the GOA and it is difficult to quantitatively determine the effect of bycatch on forage fish populations. For many forage fish species, little is known about their abundance, growth rates, maturity, migrations, and trophic relationships. Some of the more common forage fishes such as capelin, smelt, and eulachon are considered R-selected species, which is a term used in population analysis that refers to characteristics of a species' high reproductive rates, fast growth, and rapid maturity. These R-selected species may undergo considerable natural fluctuations in abundance. While this R-selective strategy may help stocks rebound quickly from depressed levels, variable abundance could make stock (impact) assessments that much more difficult.

Nevertheless, given the position that forage fish, particularly osmerids, occupy in the North Pacific ecosystem, it is unlikely that bycatch would have a significant effect on any of the forage fish species over time. The mere fact that forage fish play such a central role in the trophic chain, serving as food for a wide variety of fish, marine mammals, and seabirds, suggests that they must exist at biomass levels capable of sustaining such a vast biological system. Between the BSAI and GOA there are an estimated 48 million seabirds, nearly 230,000 seals and sea lions, a groundfish fishery that annually permits the harvest of 1.5-2.0 million mt of fish, a coastal halibut fishery that annually harvests nearly 40,000 mt, and an Alaskan salmon industry that in 1998, landed 154 million (330,000 mt) adult fish. The annual loss of a few hundred mt of forage fish is unlikely to have a significant effect on this system or forage fish stocks.

5.4 Other Species

Annual aggregate TAC limits are set for the group of other species, and separately for squid in the BSAI, based upon stock assessments. Based upon 1999 stock assessments, the NPFMC is considering an expanded FMP amendment that would specify TACs on individual species of sharks and skates. The NPFMC has also recommended that "other" species be placed on bycatch only status. These decisions are pending.

There is some concern that under the current management plan a species or species group could be disproportionately exploited within the aggregate TAC. The "other" species category includes species with diverse life histories, and in many cases little is known about their population dynamics and structure. Species that are long-lived and have low reproductive potential are particularly vulnerable to depletion because it takes them longer to rebound from natural and fishing mortality. In addition to the paucity of life history data, a lack of research and fishing data also hampers assessments of stock status and bycatch effects. Individual species within the skate and sculpin complexes are not identified aboard ship because of a lack of trained personnel and time constraints. This greatly limits the value of any catch data. A lack of biomass estimates for squid precludes stock status relative to bycatch. All of these data limitations make it difficult to determine the extent to which individual species are protected from the pressures of bycatch given the aggregate TAC allocation. Current NPFMC efforts to develop individual TACs and bycatch restrictions on individual taxa within the "other" species category could eventually prove beneficial to disproportionately exploited species should they exist.

5.5 Nonspecified Species

There is currently no management and only limited monitoring of the species in this category. Retention of any nonspecified species is permitted under current FMP policy. The same concerns about disproportionate exploitation of certain species expressed above for other species is also germane to nonspecified species. Little is known about the ecology of many of the species in this category and limited fishing data are recorded. For example, the bycatch of grenadiers is higher in the GOA than all species in the other species category combined, yet the extent to which this bycatch may affect these long-lived species is unknown.

5.6 Indirect Effects

5.6.1 Spatial and Temporal Concentrations in Bycatch

Indirect impacts caused by spatial or temporal concentrations of bycatch might include the overharvesting of a distinct genetic component of a stock, local alterations in predator-prey relationships, or adverse impacts to spawning grounds or aggregations. In many instances, particularly with species within other, nonspecified, and forage fish categories, so little is known about their population dynamics and life histories that it is difficult to determine the indirect impacts of the Alternative 1. The dynamic nature of the North Pacific ecosystem would make assessments equally difficult even for more well understood fish species. Assessments would have to contend with a host of variables such as natural fluctuations in population size, migratory patterns, shifts in population age structures, and localized productivity. Overall, there is insufficient information with which to assess the effects of spatial and temporal concentrations in bycatch.

5.6.2 Socioeconomic

FMP management measures have had some level of success in decreasing overall bycatch mortality, but not without cost to the groundfish fishery. Halibut bycatch mortality limits have resulted in numerous closures over the years and have reduced the commercial catch of target species. In part because of halibut PSC limits, portions of the annual TACs specified for most flatfish species have remained unharvested (Witherell 1995). Careful release requirements established for the long-line fishery have improved discard survival but have also increased the amount of time and effort expended by fishermen. Pacific herring PSC limits have repeatedly closed Herring Savings Areas 2 and 3 to trawl fisheries directed at pollock, rock sole, yellowfin sole, and other flatfishes. Area closures for salmon and crabs also impede commercial fishing efforts.

In general, many steps taken to reduce bycatch also reduce commercial harvests and/or the economic value of those harvests within the North Pacific groundfish fisheries. The extent of economic cost to the groundfish industry depends on a number of factors, the specifics of which are far beyond the scope of this overview.

Aside from promoting general conservation, protecting depressed species, and reducing waste, bycatch restrictions implemented for the groundfish industry confer positive economic benefits to nongroundfish fisheries. Regardless of the regulatory bodies involved, halibut, herring, and salmon fisheries are managed with the primary goal of maintaining healthy, productive, and sustainable populations that will support commercial, subsistence, and recreational fisheries over the long-term. Population declines systematically trigger regulatory restrictions on fishing while population expansions allow for increased harvests. Over the long-term, reductions in bycatch (mortality) in the groundfish fishery typically allow increased harvests in the other domestic fisheries. Whether the gain to domestic fisheries is substantial is a matter for more detailed economic analysis.

5.7 Cumulative Effects

The current analysis has identified three ways in which FMP policy might affect the diversity or stability of the BSAI and GOA ecosystems: 1) altering biodiversity 2) altering predator-prey relationships, and 3) altering energy flow.

5.7.1 Biodiversity

Biological diversity (or biodiversity) is a general term that defines the diversity of life and its processes (CEQ 1993). Biodiversity may be expressed in terms of species diversity, functional (trophic) diversity, or genetic diversity. Measures of species diversity include the number of species in a community (species richness) and the relative abundance among species (evenness). Functional diversity deals with the stability and relative abundance among interdependent taxa within the trophic web. Genetic diversity is the inherent genetic heterogeneity within a species. Species characterized by greater genetic diversity are generally more capable of responding and adapting to physical and biological changes in their environment. The removal of fish through bycatch could disproportionately affect one species over another thereby disrupting the natural balance in species or trophic diversities. Removal of localized spawning aggregations could alter genetic diversity if the particular aggregation of fish removed from the system is genetically different from other components of the population.

At present, there is insufficient information on the ecological and genetic diversity of fish species and benthic fauna in the BSAI and GOA to assess the cumulative effects of the alternative on biodiversity in terms of bycatch. Species characterized by long life spans, slow growth, late maturity, and/or low reproductive potential run the greatest risk of being depleted by bycatch removal. Whether the bycatch incurred under Alternative 1 is sufficient to substantially impact vulnerable species having these characteristics is unknown. Bycatch mortality is generally considered to have a negative effect because of increased loss to the ecosystem; however, the magnitude and significance of this loss cannot be accurately assessed at this time.

Factors unrelated to the groundfish fishery are far more likely to be the principal agents driving species diversity in the region. These would include the introduction of non-indigenous species, natural fluctuations in the relative abundance of species within the food web, and long-term climatic changes. The potential changes caused by global climatic changes alone could potentially dominate the system regardless of any groundfish management plan.

5.7.2 Predator-Prey Relationships

Predator-prey relationships can be altered by selectively removing predators or competing forage species from the food web, overfishing important forage species by concentrating fishing effort in time or space, removing top predators, or by introducing non-indigenous competitors into the food web. Given the natural and anthropogenic forces at work in the North Pacific, it seems unlikely that bycatch associated with Alternative 1 policy has any significant effect on the predator-prey relationships overall. The external pressures exerted directly on predator-prey components of the food web by all of the directed fisheries operating in Alaskan and North Pacific would more than overwhelm any effect of bycatch. Compared to bycatch, the removals of predator and prey biomass associated with seasonal harvests of salmon, halibut, herring, groundfish, and crabs are massive.

At a localized level, however, depletion of specific size or age groups could have short terms affects on predator-prey relationships. Such impacts might be difficult to detect. Their ramifications to the ecosystem are uncertain.

5.7.3 Ecosystem Energy Balance

Fishing can remove energy (i.e., biomass) from an ecosystem. If sufficient energy is removed from or returned as discards to the system relative to total biomass, the energy balance of the system could be destabilized or changed with unknown consequences. In fact, it is likely that anthropogenically-induced changes have already occurred in the North Pacific ecosystem given the long history of commercial and subsistence fishing in the region. Nevertheless, it is highly unlikely that bycatch associated with Alternative 1 have significantly altered the energy characteristics of the BSAI and GOA. The amount of biomass being removed that is directly associated with these two components is minuscule compared to the biomass removal that results from the combined commercial, subsistence, and recreational fisheries operating in Alaska and the North Pacific. Further, the ecosystem energy balance in the North Pacific is dynamic and in a constant

state of flux in both time and space. Over time, the effect of bycatch removal and alterations of energy flow patterns associated with discarding of bycatch would be easily absorbed by such a massive oceanic system.

Section 6 Alternative 2: Adopt a More Aggressive Management Policy

6.1 Policy Goals and Objectives

Under this alternative a more aggressive harvest strategy would be implemented. Details of policy goals and objectives are outlined in Section 4 entitled Policy Alternatives and Rationale. Specific illustrative FMP measures for Alternative 2 are summarized in Table 3.

6.2 Direct Effects

The overall bycatch effect of Alternative 2 would be a general increase in bycatch mortality for all five species categories (e.g., target, prohibited, and forage, other, and nonspecified species). The severity of increased bycatch would depend upon the degree to which management policy would shift from Alternative 1 (FMP 2.2) toward the opposite Alternative 2 extreme (FMP 2.1). The increase in bycatch would be further exacerbated by provisions in Alternative 2 which allow for an increase in TACs for the directed fisheries from current levels (FMP 2.2) all the way up to a projected 15-20 percent increase in fishing (FMP 2.1). The gradual repeal of time and area closures across the Alternative 2 policy spectrum could increase mortality within crab, herring, salmon, and halibut populations. The direct effect of Alternative 2 provisions on the different species groups and management tools are detailed below.

6.2.1 Target Species

Normally, rigorous management of directed fisheries would allow target stocks to endure higher mortality associated with bycatch regardless of the management measures adopted within the range offered under Alternative 2. Any increase in mortality would eventually be incorporated into stock assessments that are used by the NPFMC and NOAA Fisheries to set TAC limits for subsequent fishing seasons. However, the alternative also provides for a downsizing of the present observer program (FMP 2.2) up to its complete elimination (FMP 2.1). Because information collected by the observer program is crucial to stock assessments, its elimination means that targeted stocks may not be efficiently managed. The net affect could be quite detrimental to groundfish populations particularly given the increase in fishing pressure under the alternative.

A more aggressive harvest strategy could increase economic discards. Easing of the IR/IU program (detailed below) up to its full elimination under FMP 2.1 would almost certainly increase the number of pollock and cod discards. In the BSAI, the original implementation of the IR/IU program resulted in an immediate decrease in the discard for pollock from 94,800 mt to 16,200 mt, and for Pacific cod from 22,100 mt to 4,300 mt. A combination of phasing out of the program and increased fishing under Alternative 2 could result in pollock and cod discard rates notably higher than pre-IR/IU levels. The mandatory retention program currently scheduled to take effect under Alternative 1 for selected species of flatfish would also be abandoned. Increased harvests of target species could result in proportionate increases in economic discards in many of groundfish fisheries.

6.2.2 Prohibited Species

Halibut

The elimination of bycatch restrictions is not likely to have a significant biological impact on the halibut population over the long-term regardless of the management measures adopted within the range offered under Alternative 2. The halibut population is presently healthy and total catch has been near record levels. Any increase in bycatch would be incorporated into IPHC stock assessments and harvest quotas. Lower harvest quotas would offset increased bycatch. The effect would be an economic loss to the directed halibut fisheries.

Herring

The Pacific herring population would be largely unaffected by increased bycatch mortality over the long-term regardless of the management measures adopted within the range offered under Alternative 2. ADF&G adjusts annual harvest quotas relative to projected herring biomass in the BSAI and GOA. Lower harvests in the nearshore state fisheries would offset increased bycatch mortality. The effect would be an economic loss to the directed herring fisheries.

King and Tanner Crabs

Crabs are the group most likely to be at long-term risk as the result of relaxed bycatch restrictions, particularly the elimination of time and area closures. Many of the crab stocks in the BSAI are currently at or below critical levels. As discussed under Alternative 1, agency analysts contend that the greater danger to crabs comes from trawls that disrupt essential crab habitat. Closed areas thus tend to be more effective than PSC limits in reducing the impact of trawling on crab stocks. If time and area closures and gear restrictions are lifted under Alternative 2, there is a real potential for damage to crab stocks in areas of high aggregation. It is a virtual certainty that the complete repeal of time area closures and gear restrictions that would be reached under FMP 2.1 would have serious detrimental consequences to crab stocks.

As was the case for Alternative 1, there is little information on the sizes and status of GOA crab stocks. There is no way to determine the proportion of each stock being affected by bycatch or if critical crab habitat is being damaged in any substantial way.

Pacific Salmon

Under Alternative 2, PSC limits in the BSAI would remain at the levels that currently exist under Alternative 1 (FMP 2.2) or be eliminated completely(FMP 2.1). There are currently no bycatch restrictions in the GOA so no change would occur.

For the reasons described under Alternative 1, it is possible that current PSC restrictions in the BSAI management region may not be providing adequate protection to some depleted western chinook salmon stocks. If this is the case, the removal of PSC limits could exacerbate the situation and more at-risk chinook salmon might be taken. Further, Alternative 1 PSC limit of 29,000 fish represents about 11.6 to 22.3 percent of the combined Arctic-Yukon-Kuskokwim and Bristol Bay chinook salmon landings reported between 1997 and 1999. This is a substantial portion of the domestic harvest. Elimination of PSC limits would increase these proportions even further.

Western Alaska stocks of chum salmon are also depressed. Under Alternative 1, analysts estimate that about 19 percent of chum salmon bycatch in the BSAI is from western stocks and that this is equivalent to only 1.3 to 1.5 percent of the combined Arctic-Yukon-Kuskokwim and Bristol Bay chum salmon landings reported between 1997 and 1999. This bycatch represents a tiny fraction of landings, even for depressed stocks. Under FMP 2.1, there might be a 15 to 20 percent increase in the harvests of target species, which could result in a proportionate increase in chum salmon bycatch throughout the entire BSAI. This would still be equivalent to only a small fraction of the combined Arctic-Yukon-Kuskokwim and Bristol Bay chum salmon landings reported between 1997 and 1999.

Current PSC restrictions on chum salmon are limited to the catcher vessel operation area where 42,000 "other" salmon can be taken between August 15 and October 15, a period when chum salmon bycatch in the trawl pollock fishery is very high. Even if the PSC limit were lifted, pollock fishing in the Savings Area would be limited by seasonal allocations of TAC which, under Alternative 2, remain the same as Alternative 1. Further, there is considerable spatial overlap of the chum salmon Savings Area with the SCA, which greatly limits pollock fishing in that region of the Bering Sea. It is unlikely that the removal of the PSC limits and increased pollock TAC would seriously affect at-risk western chum salmon stocks.

As discussed under Alternative 1, the bycatch of sockeye, coho, and pink salmon are insignificant in the BSAI and GOA relative to seasonal harvests in directed Alaskan fisheries. The bycatch of ESA-listed salmon stock for Washington, Oregon, and California are also nominal. These stocks would remain unaffected regardless of the management measures adopted within the range offered under Alternative 2.

6.2.3 Forage Species

Alternative 2 would affect the bycatch of forage fish in two ways: 1) under FMP 2.1, the repeal of bycatch restrictions would mean the elimination of 2 percent MRA limits for forage fish, and 2) the increase in groundfish fishing effort could result in a proportionate increase in bycatch.

In most instances, the bycatch for forage fish is far less than 1 percent in any of the targeted fisheries. From 1997 to 1999, the proportionate bycatch of forage fish relative to the total target fish harvest was less than 0.01 percent in the BSAI and 0.39 percent in the GOA. When averaged over the fishery, bycatch was well below MRA limits. If these trends are indicative of long-term bycatch trends in the groundfish fishery, then easing of the 2 percent cap, up to its full elimination under FMP 2.1, is not likely to substantially increase bycatch overall simply because the MRA limits are not normally reached anyway when averaged over the entire fishery. Because bycatch rates are so low, even an increase in harvest under Alternative 2, up to a maximum increase of 15-20 percent that would occur under FMP 2.1, is not likely to increase the bycatch of forage fish by more than that. For the reasons discussed under Alternative 1, it is unlikely that bycatch would seriously impact forage fish stocks regardless of the management measures adopted within the range offered under Alternative 2.

There is a provision under Alternative 2.2 for the establishment of a directed fishery for forage fish. Although the effects of a directed fishery is a TAC and not a bycatch issue, increased fishing pressure on any of the targeted species that would accompany such a measure could require re-evaluation of bycatch effects, particularly on a localized scale.

6.2.4 Other Species

The management of "other" species under Alternative 2 is the same as for Alternative 1. Although the "other" species group is currently managed as an aggregate, the NPFMC has proposed that TACs and bycatch restrictions be developed on an individual species basis for skates and rays. It is assumed that additional species may be singled out as additional information is gathered. Any enhanced focus on individual species within the "other" species category could eventually prove beneficial to disproportionately exploited species, should they exist.

6.2.5 Nonspecified Species

Under Alternative 1, there is currently no management and only limited monitoring of any species in this category. Little is known about the ecology of many of the species and it is difficult to assess the effects of this policy. No additional protection would be offered this group under Alternative 2. As with Alternative 1, there is insufficient information on the species within this group with which to assess the potential effects of the plan.

6.2.6 Observer Program

The alternative provides for a downsizing of the present observer program (FMP 2.2) up to its complete elimination (FMP 2.1). The observer program serves a crucial role in gathering data essential for monitoring bycatch in the groundfish fishery. Any reduction in the observer program would impede the effectiveness of what is essentially the onsite eyes and ears of the entire fisheries management system. Record keeping and reporting requirements mandated by the NPFMC for operational fishing vessels provide some essential management information, but they do not provide the kinds of detailed and independent catch data that is supplied by onboard observers. A repeal of the program could have a significantly adverse effect on bycatch management and, in turn, the health and stability of all groundfish stocks and other living marine resources.

6.2.7 Improved Retention/Improved Utilization

The alternative ranges from maintaining the present IR/IU program (FMP 2.2) up to its complete repeal (FMP 2.1). In 1998, the year the amendment was implemented, discards in the BSAI dropped for pollock from 94,800 mt to 16,200 mt, and for Pacific cod from 22,100 mt to 4,300 mt. Relaxation of the 100 percent retention policy up to full repeal would allow for a corresponding increase in economic discards. As discussed above under Target Species, pollock and cod populations are managed via stringent stock assessment models and TAC allocations, and discard losses are taken into account when determining yearly harvest quotas. The presence or absence of an IR/IU program would have no effect on stocks. However, the elimination of the IR/IU program would increase economic discards. The mandatory retention program currently scheduled to take effect under Alternative 1 for selected flatfish species would also be abandoned.

6.2.8 Vessel Incentive Program

There are no proposed changes in the VIP that is currently implemented under Alternative 1. However, it cannot be implemented without an observer program, and the observer program would be eliminated under FMP 2.1.

6.3 Indirect Effects

6.3.1 Spatial and Temporal Concentrations in Bycatch

Overall, there is insufficient information with which to assess the effects of spatial and temporal concentrations in bycatch (see Spatial and Temporal Concentrations in Bycatch under Alternative 1).

6.3.2 Socioeconomic

The primary benefit of Alternative 2 would be an economic boost to the groundfish industry at the expense of other fisheries (e.g., halibut, crab, and herring). The plan would gradually open the North Pacific to a less restrictive fishing environment and allow for larger and more economically-efficient harvests. Fishing would still be limited by management strategies to maximize the sustainable yields of targeted stocks but fishing efforts would be less encumbered by bycatch restrictions. Halibut PSC limits alone typically limit the harvest of some flatfish species. Virtually all herring bycatch occurs in the pollock fishery, which is the largest groundfish fishery in Alaskan waters.

The degree of economic benefit under Alternative 2 is problematic and would depend on a number of factors including the costs and benefits of extended fishing seasons, fishing seasons less constrained by specific time or area allocations, and the voluntary retention of marketable species. Some fisheries would benefit more than others. Pollock occur primarily in well defined aggregations and if fishing fleets encounter a hot spot they may be able to "top off" their seasonal TAC allocation rapidly (cost effectively) and with minimal bycatch. Some flatfish species that are more widely dispersed may be more costly to harvest even without bycatch restrictions.

The economic advantage conferred on the groundfish industry by Alternative 2 would come at the expense of other domestic fisheries in the region. Decreased fishing effort in the domestic fisheries would compensate for increased bycatch mortality in the groundfish fishery. Whether the economic loss to domestic fisheries would in any way be substantial is a matter for economic analysis.

6.4 Cumulative Effects

6.4.1 Biodiversity

There is insufficient information on the ecological and genetic diversity of fish species and benthic fauna in the BSAI and GOA to assess the cumulative effects of the alternative on biodiversity. Factors unrelated to the groundfish fishery are far more likely to be the principal agents driving species diversity in the region (see Biodiversity under Alternative 1, Section 5.7.2).

6.4.2 Predator-Prey Relationships

In general, it is unlikely that the increased bycatch that would occur under Alternative 2 would have any significant effect on predator-prey relationships (see Predator-Prey Relationships under Alternative 1, Section 5.7.2). At a localized level, however, depletion of specific size or age groups could have short terms affects on predator-prey relationships. Such impacts might be difficult to detect and their ramifications difficult to ascertain.

6.4.3 Ecosystem Energy Balance

It is unlikely that the increase in bycatch associated with the alternative will have a significant effect on the energy budgets of the BSAI and GOA (see Ecosystem Energy Balance under Alternative 1, Section 5.7.3).

Section 7 Alternative 3: Adopt a More Precautionary Management Policy

7.1 Policy Goals and Objectives

Under this alternative a more precautionary harvest strategy would be implemented. Details of policy goals and objectives are outlined in the section entitled Policy Alternatives and Rationale. Specific Illustrative FMP measures for Alternative 3 are summarized in Table 3.

7.2 Direct Effects

The overall bycatch effect of Alternative 3 would be a general decrease in bycatch and bycatch mortality for all five species categories (e.g., target, prohibited, forage, other, and nonspecified species). The extent of bycatch reduction would depend upon the degree to which management policy would shift from a moderately more restrictive bycatch policy (FMP 3.1) to a substantially more extensive use of both market oriented bycatch reduction incentives and restrictive bycatch policy (FMP 3.2). Bycatch would further be reduced by provisions in Alternative 3 which would decrease TACs in the directed fisheries from current Alternative 1 levels (FMP 3.1) to lower levels with the TAC provisions outlined under FMP 3.2. More stringent management of individual species groups within the "other" and nonspecified categories would allow for more precise control of bycatch mortality and their effects on stocks. Expanded time and area closures would offer enhanced protection to crab, herring, salmon, and halibut populations and fisheries. The direct effects of Alternative 3 provisions to the different species groups and management tools are detailed below.

7.2.1 Target Species

Under a more restrictive management policy, fishing effort and harvests would decrease throughout the groundfish fishery. Change in the bycatch of a target species and adjustments in gear restrictions and allocations are not likely to have a significant effect on that population. Because bycatch mortality is incorporated into stock assessments that are used by the NPFMC and NOAA Fisheries to set TAC limits and to monitor total catch with respect to those TACs, the resulting decreases in discards will tend to be replaced with increases in retained catch. Therefore, compared to the target species stock effects fo the TAC policies of Alternative 3, the effects of the bycatch policies are expected to be minimal.

7.2.2 Prohibited Species

Halibut

Under Alternative 3, PSC limits in the BSAI and GOA could be lowered from 0-10 percent (FMP 3.1) to 10-30 percent (FMP 3.2). The use of market oriented incentives to decrease bycatch would be expanded substantially under FMP 3.2. The expected reductions in halibut bycatch and bycatch mortality are not likely to have a significant biological impact on the halibut population over the long-term regardless of the management measures adopted within the range offered under Alternative 3. Any decrease in bycatch mortality would be incorporated into IPHC stock assessments and harvest quotas. Any benefit conferred on the halibut population by lower bycatch would eventually be offset by higher harvests in the halibut fishery. The halibut fishery would incur positive economic benefits, in some cases, at the expense of the groundfish fishery.

Herring

The Pacific herring population would be unaffected by the expected reductions in herring bycatch and bycatch mortality over the long-term, regardless of the management measures adopted within the range offered under Alternative 3. ADF&G adjusts annual harvest quotas in state domestic fisheries based upon herring stock projections. Any benefit conferred on the herring population by lower groundfish fishery

bycatch would eventually be offset by higher harvests in the directed state fisheries. Economic benefits would accrue to the herring fishery, in some cases, at the expense of the groundfish fishery.

King and Tanner Crabs

Under Alternative 3, PSC limits in the BSAI could be lowered from 0-10 percent (FMP 3.1) to 10-30 percent (FMP 3.2). PSC limits would be established for the GOA based upon stock and fishery data, then lowered 0-10 percent. Time/area/gear closures in the BSAI would remain consistent with Alternative 1. Appropriate closures would be implemented in the GOA based upon scientific study. Finally, the use of market oriented incentives to decrease bycatch would be expanded substantially under FMP 3.2. The expected reductions in crab bycatch and in the adverse effects trawling would have on crab habitat would allow a more rapid recovery of the crab stocks and fisheries.

As discussed under Alternative 1, closed areas tend to be more effective than PSC limits in reducing the impact of trawling on crab populations. Nevertheless, reduced PSC limits, and bycatch reduction incentives would help curtail bycatch and bycatch mortality. Maintaining closures in the BSAI would continue to have a significantly beneficial effect on crab stocks. The development of appropriate closures in the GOA could similarly be beneficial to crab populations in that region.

Salmon

Under Alternative 3, PSC limits in the BSAI would be lowered to the extent practical from 0-10 percent (FMP 3.1) to 10-30 percent (FMP 3.2). In the GOA, PSC limits would be established at 25,000 fish for chinook and 20,500 fish for other salmon. Finally, the use of market oriented incentives to decrease bycatch would be expanded substantially under FMP 3.2. Because salmon stocks in Alaska are rigorously managed by ADF&G and are generally considered healthy, any benefit conferred by lower bycatch would eventually be offset by higher harvests in the state's commercial, subsistence, and recreational fisheries. Economic benefits would accrue to these fisheries. Any additional protection afforded salmon populations under Alternatives 3 would, therefore, have no long-term effect on stock status.

The possible exceptions are at-risk western stocks of chinook salmon that may be taken as bycatch in the BSAI (see Alternative 1). At present, there is insufficient information with which to determine if these at-risk stocks are being seriously impacted by bycatch in the BSAI under Alternative 1. It would be equally difficult to quantitatively determine if increased protection offered under Alternative 3 would be sufficient to protect these stocks from further depletion. Qualitatively, reduced PSC limits ranging from 0-10 percent under FMP 3.1 to 10-30 percent under FMP 3.2 should offer proportionate protection to at-risk western chinook salmon stocks.

Alternative 3 would establish blanket PSC limits (FMP 3.1 to FMP 3.2) of 25,000 chinook salmon and 20,500 "other" salmon in the GOA. Since there is no indication that salmon stocks of any species are being adversely affected by the current absence of PSC limits in the GOA, it is unlikely that additional protection would have any effect on salmon populations.

7.2.3 Forage Fish

For the reasons outlined for Alternative 1, the bycatch of forage fish under Alternative 1 is not likely to have an effect on forage fish stocks. Additional reductions in bycatch under Alternative 3 would, therefore, provide no additional benefit to forage fish populations.

7.2.4 Other Species

Alternative 3 includes measures that would remove sharks and skates from the other species category and establish individual TACs for each. The NPFMC would also have the choice, based upon available scientific information, of removing the remaining species groups (sculpin, octopi, and GOA squid) from the other species category and likewise managing them via individual TACs (FMP 3.2). Enhanced focus on individual

species or species groups would provide for a more rigorous management of stocks both in terms of TAC and possible bycatch restrictions. In addition, the use of market oriented incentives to decrease bycatch would be expanded substantially under FMP 3.2. Such measures could offer greater protection to species that are disproportionately exploited under the current aggregate management plan if they indeed are at risk.

7.2.5 Nonspecified Species

Alternative 3 would seek to develop criteria to bring nonspecific species into a managed category. Because little is known about the population dynamics of many of the species in this category, it is difficult to assess the effects of this policy. However, the establishment of management practices typically promotes directed research toward specific species or species groups. This could enhance the NPFMC's understanding of population dynamics for species within this group and result in greater protection for stocks that may currently be at risk from unregulated bycatch take. In addition, the use of market oriented incentives to decrease bycatch would be expanded substantially under FMP 3.2 and could be applied to these species as a group or to identifiable subgroups.

7.2.6 Observer Program

Alternative 3 calls for an expansion in the observer program from Alternative 1 (FMP 3.1) to complete coverage of all vessels greater than or equal to 60 ft in length (FMP 3.2). The current FMP management plan requires 100 percent coverage on vessels greater than 124 ft, but only 30 percent coverage on vessels ranging from 60 to 124 ft in overall length. An expanded observer program could only enhance the ability of the NPFMC and NOAA Fisheries to monitor and regulate bycatch and to successfully implement market oriented solutions to the bycatch problems in the groundfish fishery. The key issue would be the cost of implementing such an expanded program.

7.2.7 Improved Retention/Improved Utilization

The provisions under Alternative 3 are the same as under Alternative 1.

7.2.8 Vessel Incentive Program

Under Alternative 3, the current VIP would be replaced with a number new conservation measures. Most options would include market oriented incentives to reduce bycatch and bycatch mortality. Such incentives would decrease the cost and increase the benefit of reducing bycatch for individual fishing operations and, therefore, make further reductions in bycatch practicable.

7.3 Indirect Effects

7.3.1 Spatial and Temporal Concentrations in Bycatch

Overall, there is insufficient information with which to assess the effects of spatial and temporal concentrations in bycatch (see Spatial and Temporal Concentrations in Bycatch under Alternative 1).

7.3.2 Socioeconomic

Alternative 3 includes more restrictive command and control solutions to the bycatch problems, as well as market oriented solutions. The latter would decrease the economic burden imposed on the groundfish industry by the former and could decrease substantially the need for the former. The direction and magnitude of the net effect on the groundfish industry is a matter for economic analysis and would depend on a number of factors including the costs and benefits of the specific restrictions and market oriented solutions that would be implemented. Some fisheries would be impacted more than others.

Decreased bycatch of groundfish or prohibited species by some groundfish fishing operations would benefit others and decreased bycatch of non-groundfish species would benefit those who participate in other fisheries in the region. Halibut, herring, crab, and salmon fisheries are managed with the primary goal of maintaining healthy, productive, and sustainable populations that will support commercial, subsistence, and recreational fisheries over the long-term. Reduced bycatch mortality in the groundfish fishery would eventually be realized as higher yields in domestic fisheries. Whether the gain to domestic fisheries would in any way be substantial is a matter for detailed economic analysis.

7.4 Cumulative Effects

7.4.1 Biodiversity

There is insufficient information on the ecological and genetic diversity of fish species and benthic fauna in the BSAI and GOA to assess the cumulative effects of Alternative 3 on biodiversity. Factors unrelated to the groundfish fishery are far more likely to be the principal agents driving species diversity in the region (see Biodiversity under Alternative 1).

7.4.2 Predator-Prey Relationships

It is highly doubtful that decreased bycatch associated with Alternative 3 will have any significant effect on predator-prey relationships (see Predator-Prey Relationships under Alternative 1).

7.4.3 Ecosystem Energy Balance

It is highly unlikely that the decrease in bycatch associated with the alternative will have a significant effect on the energy budgets of the BSAI and GOA (see Ecosystem Energy Balance under Alternative 1).

Section 8 Alternative 4: Adopt a Highly Precautionary Management Policy

8.1 Policy Goals and Objectives

Under this alternative an extremely precautionary harvest strategy would be implemented. Details of policy goals and objectives are outlined in the Policy Alternatives and Rationale section. Specific Illustrative FMP measures for Alternative 4 are summarized in Table 3.

8.2 Direct Effects

The overall bycatch effect of Alternative 4 would be a major decrease in bycatch and bycatch mortality for all five species categories (e.g., target, prohibited, forage, other, and nonspecified species). More stringent management of individual species groups within the "other" and nonspecified categories would allow for more precise control of bycatch mortality and their effects on stocks. A greater prevalence of time and area closures would offer enhanced protection to crab, herring, salmon, and halibut populations. Protections would be maximized under FMP 4.2 which would close the groundfish fishery altogether. The direct effect of Alternative 4 provisions to the different species groups and management tools is detailed below.

8.2.1 Target Species

Under a more restrictive management policy, fishing effort and harvests would decrease throughout the groundfish fishery. Any change in the bycatch of a target species is not likely to have a significant effect on that population. Because bycatch mortality is incorporated into stock assessments that are used to set TAC limits and to monitor total catch with respect to those TACs, the resulting decreases in discards will tend to be replaced with increases in retained catch. Therefore, compared to the target species stock effects of the TAC policies of Alternative 3, the effects of the bycatch policies of Alternative 4 are expected to be minimal. Decreased harvests and an IR/IU program for all target species could substantially reduce economic discards. FMP 4.2 would eliminate all bycatch. It would also eliminate the fishery.

8.2.2 Prohibited Species

Halibut

More stringent bycatch restrictions and a more limited groundfish fishery are not likely to have a significant biological impact on the halibut population over the long-term regardless of the management measures adopted within the range offered under Alternative 4. Any decrease in bycatch mortality would be incorporated into IPHC stock assessments and harvest quotas. Any benefit conferred on the halibut population by lower bycatch would eventually be offset by higher harvests in the directed halibut fishery. The directed halibut fishery would incur positive economic benefits at the expense of the groundfish fishery.

Herring

The Pacific herring population would be unaffected by more stringent bycatch restrictions and a more limited groundfish fishery regardless of the management measures adopted within the range offered under Alternative 4. ADF&G adjusts annual harvest quotas in state domestic fisheries based upon herring stock projections. Any benefit conferred on the herring population by lower groundfish fishery bycatch would eventually be offset by higher harvests in the directed state fisheries. The directed herring fishery would see positive economic benefits at the expense of the groundfish fishery.

King and Tanner Crabs

Under Alternative 4, PSC limits in the BSAI would be lowered to the extent practical from 30-50 percent (FMP 4.1) to PSC = 0, the complete closure of the fishery (FMP 4.2). In the GOA, PSC limits would be established based upon biomass and fisheries data, then lowered 30-50 percent. Additional closures would be established for the BSAI and GOA (FMP 4.1) and expanded to full closure of all crab habitats (FMP 4.2).

As discussed under Alternative 1, closed areas tend to be much more effective than PSC limits in reducing the impact of trawling on crab populations. Thus, the beneficial crab stock effects of more restrictive PSC limits are expected to be greater if those limits trigger area closures. Expanding closures in the BSAI and GOA would provide added protection to crab stocks. The closure of the groundfish fishery under FMP 4.2 would maximize this protection.

Salmon

Under Alternative 4, PSC limits in the BSAI would be lowered to the extent practical from 30-50 percent (FMP 4.1) to PSC = 0, or the closure of the fishery (FMP 4.2). In the GOA, PSC limits would be established at 25,000 fish for chinook and 20,500 fish for other salmon (FMP 4.1) and would remain in effect until complete closure of the fishery (FMP 4.2). Because salmon stocks in Alaska are rigorously managed by ADF&G and are generally considered healthy, any benefit conferred by lower bycatch would eventually be offset by higher harvests in the state's commercial, subsistence, and recreational fisheries. Domestic fisheries would benefit economically at the expense of the groundfish fishery.

The possible exceptions are at-risk western stocks of chinook salmon that may be taken as bycatch in the BSAI. There is insufficient information with which to determine if these at-risk stocks are being seriously impacted by bycatch in the BSAI under Alternative 1. Likewise, it is difficult to quantitatively determine if decreased bycatch under FMP 4.1 would sufficiently protect these stocks. Unless improved stock assessment and identification methods are developed, the no fishing provision under FMP 4.2 is the only measure that would guarantee full protection from the groundfish fishery to at-risk western chinook salmon stocks. It is not known how that high level of protection would affect the recovery of those salmon stocks.

8.2.3 Forage Fish

For the reasons outlined for Alternative 1, the bycatch of forage fish under Alternative 1 is not likely to have an effect on forage fish stocks. Additional reductions in bycatch under Alternative 4 would, therefore, provide no additional benefit to forage fish populations.

8.2.4 Other Species

Alternative 4 would set the TAC of species complexes within the other species category based upon the least abundant member of the group. It is assumed that any management strategy focusing on TACs could ultimately affect bycatch restrictions for that group. It is also assumed that the least abundant criterion is based upon the idea that least abundant, or rare, species are somehow at greater risk and that management strategy should center on protecting these most vulnerable stocks. While rare species may be more vulnerable to fishing pressures, sufficient scientific information would need to be gathered to verify such a conclusion for any given case. Low abundance of a particular other species could merely be the result of the directed fishery operating outside the primary distribution range of that species. Nevertheless, a more restrictive fishing policy could offer greater protection to species that are disproportionately exploited under the current aggregate management plan.

8.2.5 Unspecified Species

The FMP 4.2 extreme is a complete fishing ban; i.e., TAC = 0 for all species. Because little is known about the ecology of many of the species in the "unspecified species" category it is difficult to assess the effects of this policy. However, a no fishing alternative would completely eliminate the possibility of any unspecified species being overfished as bycatch.

8.2.6 Observer Program

Alternative 4 would expand observer coverage from 30 percent to 100 percent on all vessels 60-124 ft in length, and from 0 percent to 30 percent on all vessels less than 60 ft in length. It would also require that 100 percent of the hauls be observed. An expanded observer program could only enhance the ability of the NPFMC and NOAA Fisheries to monitor and regulate bycatch in the groundfish fishery and to successfully implement incentives to reduce bycatch. The key issue would be the cost of implementing such an expanded program.

8.2.7 Improved Retention/Improved Utilization

Alternative 4 calls for an expansion of the IR/IU program to all target species (FMP 4.1) up to the full prohibition on bycatch (FMP 4.2) which is effectively a no fishing alternative. Any expansion of the 100 percent retention policy would allow for a corresponding decrease in economic discards for all target species. Because target species are managed via stringent stock assessment models and TAC allocations, a reduction in discards would be taken into account when determining yearly harvest quotas. Any benefit conferred on target species would eventually be offset by higher harvests in the directed groundfish fisheries. Expansion of the IR/IU program up to a full prohibition on fishing would likely have no significant effect on groundfish stocks but would decrease discards. Full retention might also cause boats to top off sooner, which could result in shorter trips and less take overall.

8.2.8 Vessel Incentive Program

There are no proposed changes in the VIP as currently implemented under Alternative 1.

8.3 Indirect Effects

8.3.1 Spatial and Temporal Concentrations in Bycatch

Overall, there is insufficient information with which to assess the effects of spatial and temporal concentrations in bycatch (see Spatial and Temporal Concentrations in Bycatch under Alternative 1). FMP 4.2 would completely shut down the groundfish fishery and render the issue moot.

8.3.2 Socioeconomic

The primary impact of Alternative 4 would be to increase the economic burden on the groundfish industry. The plan would implement a more restrictive fishing environment and result in less economically efficient harvests. The degree of economic loss is a matter of economic analysis and would depend on a number of factors including the costs and benefits of more restricted fishing seasons, and fishing seasons more constrained by specific time/area allocations and closures. Some fisheries would be impacted more than others. FMP 4.2 would completely shut down the groundfish fishery.

Decreased bycatch of groundfish or prohibited species by some groundfish fishing operations would benefit others and decreased bycatch of non-groundfish species would benefit those who participate in other fisheries in the region. Halibut, herring, crab, and salmon fisheries are managed with the primary goal of maintaining healthy, productive, and sustainable populations that will support commercial, subsistence, and recreational fisheries over the long-term. Reduced bycatch mortality in the groundfish fishery would eventually be

realized as higher yields in the fisheries for those species. Whether the net gain to all regional fisheries combined would in any way be substantial is a matter for detailed economic analysis.

8.4 Cumulative Effects

8.4.1 Biodiversity

There is insufficient information on the ecological and genetic diversity of fish species and benthic fauna in the BSAI and GOA to assess the cumulative effects of the alternative on biodiversity. Factors unrelated to the groundfish fishery such as introduction of non-indigenous species, natural fluctuations in the relative abundance of species within the food web, and long-term climatic changes are far more likely to be the principal agents driving species diversity in the region (see Biodiversity under Alternative 1).

8.4.2 Predator-Prey Relationships

It is highly doubtful that decreased bycatch associated with Alternative 4, even up to the point of eliminating the groundfish fishery, will have any significant effect on predator-prey relationships (see Predator-Prey Relationships under Alternative 1).

8.4.3 Ecosystem Energy Balance

It is highly unlikely that the decrease in bycatch associated with Alternative 4 will have a significant effect on the energy budgets of the BSAI and GOA (see Ecosystem Energy Balance under Alternative 1).

Section 9 Opportunities for Quantification

The most likely species for which quantitative impact assessments of bycatch can be made are those high profile groups that are the target of major fisheries in Alaska and the North Pacific. These would include Pacific halibut, Pacific herring, Pacific salmon (with selected exceptions), king and Tanner crab (in the BSAI), and target groundfish species such as walleye pollock, Pacific cod, and yellowfin sole or any other species managed under Tiers 1-3 (Appendix B). Because of their inherent economic value, these species are typically the subject of the most intense research and monitoring efforts and, therefore, are the species for which the most comprehensive scientific information is available. The irony is that because these stocks are some of the most rigorously managed, they are the least vulnerable to losses attributable to bycatch. Any increase or decrease in bycatch would ultimately be offset by increased or decreased harvests in the directed fishery. Management effectively buffers the populations from the effects of bycatch. The major exceptions are crabs, in which loss or a gain in critical habitat under the different alternatives could tangibly affect stock health.

A second group for which nominal qualitative data may be available or compiled at a reasonable cost, is forage fish. While the forage fish category comprises eight fish families and euphausiid shrimp, the vast majority of fish taken as bycatch in the BSAI and GOA groundfish fisheries are osmerids (eulachon, capelin, and other smelts). Non-osmerids are, therefore, not a serious bycatch issue. Recent declines in North Pacific seabird populations have prompted research into the health and status of regional forage fish stocks that are such an important food source for seabirds. Because osmerids are R-selected, populations tend toward wide fluctuations in abundance. Nevertheless, even coarse estimates of osmerid abundance and predator biomass based upon Alaska Fisheries Science Center (AFSC) and NPFMC/NOAA Fisheries sponsored research, might be adequate to determine whether the bycatch of several mt of forage fish is truly detrimental to the North Pacific food web.

Section 10 Data Gaps and Information Needs

There are substantial gaps in our understanding of the biological, ecological, social, and economic effects of bycatch and of alternative methods for reducing bycatch. Therefore, it is difficult to determine the extent to which it is practicable to reduce bycatch. The problem is increased by the fact that bycatch is a multi-species problem in which a management measure that decreases the bycatch of some species can often increase the bycatch of other species.

There is very little scientific information available on the biology and ecology of individual species within the other species and nonspecified species categories. There is concern that species within these groups might be disproportionately impacted by losses attributable to bycatch. This is particularly true for long-lived species with low reproductive potential that are less resilient to fishing pressures. Other species are presently managed with an aggregate TAC and there is no way to determine if individual species are being overfished relative to their population level. Unspecified species may be taken without restriction. The NPFMC is presently trying to develop individual TACs and bycatch restrictions on individual taxa within the other species category in an attempt to protect vulnerable species. However, any realistic management plan will require more research into the population structure and community dynamics of individual taxa. One approach to the problem would be to prioritize species based upon their presumed risk. For example, bycatch of grenadiers is higher in the GOA than all species in the other species category combined. This alone would make this species a prime candidate for further research.

There is little information on the degree to which at-risk western stocks of chinook salmon have been affected by bycatch in the BSAI. Yukon and Kuskokwim river stocks are seriously depleted. Low stock sizes have resulted in reduced harvests that have seriously impacted some Alaskan fisheries in recent years. Excess bycatch in the groundfish fishery could further jeopardize these populations. The NPFMC has responded by adopting Amendment 58 which will 1) reduce the chinook salmon bycatch limit to 29,000 fish over a four-year period, 2) implement year-round accounting of chinook salmon bycatch in the pollock fishery, 3) revise the boundaries of the Chinook Salmon Savings Areas, and 4) set more restrictive closure dates. Future responses to localized salmon stock depletions could be enhanced through a comprehensive (genetic) stock identification program, which would allow for more precise identification and management of salmon populations. A stock identification program would be mutually beneficial to state and federal interests and, as such, would likely require a joint effort encompassing ADF&G, AFSC, NOAA Fisheries, the NPFMC, and Academia.

Obtaining the biological data needed to enhance bycatch management of other and nonspecified species would likely require a protracted research effort by NOAA Fisheries and AFSC. Given the number of taxa involved, species of interest or concern would need to be prioritized in terms of their importance to the ecosystem, their potential vulnerability to impact, the costs of obtaining the data required to manage individual species, and a determination would have to be made as to whether the resources are available to obtain such data. That determination would require detailed assessments by AFSC, NOAA Fisheries, and the NPFMC. In addition, a protracted research effort by NOAA Fisheries and AFSC would be required to obtain the data and develop the models necessary to estimate the social and economic effects of bycatch and of alternative methods for reducing bycatch.

Section 11 Comparative Analysis of Alternatives

The three groundfish fishery management alternatives to Alternative 1 call for a more aggressive harvest strategy (Alternative 2), a more precautionary harvest strategy (Alternative 3), and an extremely precautionary harvest strategy (Alternative 4). In terms of the direct effects of bycatch and discard waste on individual fish populations, none of these alternatives is likely to have a significant impact on target groundfish species, Pacific halibut, Pacific herring, forage fish species, coho salmon, sockeye salmon, pink salmon, chum salmon, or any North Pacific salmon stock currently listed as endangered or threatened under the ESA. Being the targets of directed fisheries, target groundfish and PSC (halibut, herring, salmon) species are rigorously managed to ensure that populations remain healthy and robust over time. Losses to the population resulting from directed harvests far outweigh any loss attributable to bycatch. Further, any increase/decrease in bycatch that might occur under any of the alternatives would be offset by harvest allocation adjustments within the targeted fishery. Refer to Table 7 for a summary of the direct, indirect and cumulative effects of the alternatives on bycatch.

The exception to the above is the fate of target species under Alternative 2 which provides for a downsizing of the present observer program (FMP 2.2) up to its complete elimination (FMP 2.1). Because information collected by the observer program is crucial to stock assessments, its elimination means that targeted stocks may not be efficiently managed. The net affect could be quite detrimental to groundfish populations particularly given the increase in fishing pressure which would also occur under the alternative.

The bycatch of forage fish under all of the alternatives, including Alternative 1, is presumed to be only a small fraction of North Pacific stocks, and none of the alternatives would likely impact these populations although local depleted would have to be considered.

The two species groups that are targets in other fisheries and which could be directly affected by the alternatives are king and Tanner crabs, and depleted western stocks of chinook salmon. The crab and chinook salmon stocks that are currently depressed are more vulnerable to fishing impacts. The more aggressive harvest strategy of Alternative 2 could remove some of the protections that are offered these stocks under Alternative 1. Crabs are particularly vulnerable to benthic trawl disturbances and any repeal of area closures could seriously affect localized crab stocks. Conversely, added protection under Alternatives 3 and 4 could increase protection to these at-risk populations.

The projected impact of the three alternatives on other and nonspecified species can only be considered speculative. Little is known about the life histories and population dynamics of many of the species within these groups, and this makes it difficult to assess the effects of bycatch on individual stocks. There is concern that bycatch may disproportionately exploit and possibly deplete individual species, but the extent to which this might occur under Alternative 1 or any of the alternatives is unknown. Because the species within the other and nonspecified categories are not targets of directed fisheries, bycatch is the principal source of fishing mortality. Since Alternative 2 would generally increase catch and bycatch in the groundfish fishery, its bycatch impact on other and nonspecified species would conditionally be considered adverse simply because more fish would be taken as bycatch. Conversely, Alternatives 3 and 4 would be considered conditionally beneficial merely because of the generally reduced levels of bycatch. The expanded observer programs under the latter two alternatives would also enhance bycatch management for all species.

The indirect and cumulative effects of the different bycatch alternatives are also difficult to predict. Under Alternative 2, increased spatial or temporal concentrations of bycatch could overharvest distinct genetic components of a stock, alter local predator-prey relationships, change biodiversity, and/or adversely impact spawning grounds or aggregations. However, the dynamic nature of the North Pacific ecosystem and the complex interaction of physical and biological forces that drive and influence that system make it extremely difficult to assess the long-term effect of localized impacts, whether they be adverse or beneficial. Factors unrelated to the bycatch are far more likely to be the principal agents governing species diversity, food webs, and marine energy budgets in the region. Over the long-term, the potential changes caused by global climatic

shifts alone are likely to dominate the North Pacific ecosystem regardless of any groundfish management plan.

Economic effects of the different bycatch alternatives might be substantial. The more restrictive bycatch limitations implemented under Alternatives 3 and 4 would place greater economic burdens on the groundfishing industry. Harvest quotas would be more difficult to achieve and would require greater expenditures of time and money. However, with FMP 3.2, the substantially expanded use of market oriented solutions to the bycatch problem and other related management problems would tend to decrease the cost and increase the benefit of reducing bycatch for individual fishing operation. This would make further reductions in bycatch practicable, address the source of the problem of excess bycatch, and decrease the need for less efficient command and control solutions.

The FMP 4.2 would eliminate the groundfish industry. Any economic benefits would go to other fisheries (e.g., halibut, herring, salmon) by allowing them to eventually realize any reduction in bycatch as increased harvests. Conversely, under Alternative 2, the groundfish fishery would operate in a less restrictive atmosphere with higher permissible bycatch. Other directed fisheries would have to compensate for that bycatch by lowering harvest quotas. Whether these economic tradeoffs would result in substantial changes in the net benefit from all fisheries in aggregate is a matter for biological and economic analysis. Alternative 2 might also have geopolitical implications. Increased bycatch might be incompatible with management goals mandated by international treaties and agreements.

Table 7. Summary of the effects of the alternatives on bycatch.

Effect indicator	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	Fishery Management Plan (FMP) 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Biological Effects							
Target species	None: managed fishery.	Adverse: elimination of observer program compromises ability to manage stocks.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.
Prohibited Species Effects							
Halibut	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.
Pacific herring	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.
Pink and sockeye salmon	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.	None: managed fishery.
Coho salmon	General: none, managed fishery.	General: none, managed fishery.	Same as FMP 1.	General: none, managed fishery.	General: none, managed fishery.	General: none, managed fishery.	General: none, managed fishery.
Chinook and chum salmon	At-risk BSAI stocks: unknown.	At-risk BSAI stocks: adverse; less protection than FMP 1.		At-risk BSAI stocks: beneficial; more protection than FMP 1.	At-risk BSAI stocks: beneficial; more protection than FMP 3.1.	At-risk BSAI stocks: beneficial; more protection than FMP 3.2.	At-risk BSAI stocks: beneficial; eliminate bycatch.
King and Tanner crab	BSAI: beneficial; area closures protect crab habitat, psc limits lower mortality. GOA: unknown, insufficient data.	BSAI: adverse; easing of area closures that protect crab habitat, eliminate psc limits. GOA: unknown insufficient data.	Same as FMP 1.	BSAI: beneficial; stricter psc limits than FMP 1. GOA: beneficial; develop management measures.	BSAI: beneficial; stricter psc limits than FMP 3.1. GOA: beneficial; develop management measures.	BSAI: beneficial; increase area closures and stricter psc limits than FMP 3.2. GOA: beneficial; establish area closures and psc limits.	Beneficial; temporay elimination of bycatch; fishing authorized only for environmentally safe fisheries.
Forage species	Adverse effect unlikely.	Adverse effect unlikely establishment of a direct forgae fish fishery may require re-evaluation of localized bycatch loss.	Adverse effect unlikely.	Adverse effect unlikely.	Adverse effect unlikely.	Adverse effect unlikely.	Beneficial; temporay elimination of bycatch; fishing authorized only for environmentally safe fisheries.

Table 7 (cont.). Summary of the effects of the alternatives on bycatch.

Effect indicator	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	Fishery Management Plan (FMP) 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Other species	Unknown: increased management focus potentially beneficial, enhanced species protection.	Same as FMP 1.	Same as FMP 1.	Beneficial: increased management focus relative FMP 1, enhanced species protection.	Beneficial: increased management focus relative FMP 1, enhanced species protection.	Beneficial: increased management focus relative FMP 1, enhanced species protection.	Beneficial; temporary elimination of bycatch; fishing authorized only for environmentally safe fisheries.
Nonspecified species	Unknown: unmanaged.	Same as FMP 1.	Same as FMP 1.	Beneficial: increased management focus relative FMP 1 potentially beneficial, enhanced species protection.	Beneficial: increased management focus relative FMP 1 potentially beneficial, enhanced species protection.	Beneficial: increased management focus relative FMP 1 potentially beneficial, enhanced species protection.	Beneficial; temporay elimination of bycatch; fishing authorized only for environmentally safe fisheries.
Management effects							
Observer program	Beneficial: monitoring enhances management.	Adverse: elimination detrimental to management.	Adverse: downsizing detrimental to management.	Beneficial: expanded coverage relative FMP 1, enhances management Consideration: cost.	Beneficial: expanded coverage relative FMP 3.1, enhances management Consideration: cost.	Beneficial: expanded coverage relative FMP 3.2, enhances management Consideration: cost.	Irrelevant; temporary elimination of bycatch; Beneficial for authorized fisheries enhances management.
Improved retention/ improved utilization	Beneficial: decrease discards (waste).	Adverse: elimination increases discards (waste).	Same as FMP 1.	Same as FMP 1.	Same as FMP 1.	Beneficial: expanded program decreases discards (waste).	Irrelevant; temporary elimination of bycatch; fishing authorized only for environmentally safe fisheries.
Vessel incentive program	Marginally beneficial.	Same as FMP 1.	Same as FMP 1.	New programs considered, possibly beneficial in reducing waste.	New programs considered, possibly beneficial in reducing waste.	New programs considered, possibly beneficial in reducing waste.	Irrelevant; temporary elimination of bycatch; Beneficial in reducing waste for authorized fisheries.

Table 7 (cont.). Summary of the effects of the alternatives on bycatch.

Effect indicator	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	Fishery Management Plan (FMP) 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Indirect effects							
Spatial/temporal concentrations	Unknown.	Unknown.	Unknown.	Unknown.	Unknown.	Unknown.	Irrelevant: no fishery.
Socioeconomic	Adverse: groundfish fisheries Beneficial: non-groundfish fisheries.	Adverse: non-groundfish fisheries Beneficial: groundfish fisheries.	Adverse: non-groundfish fisheries Beneficial: groundfish fisheries.	Adverse: groundfish fisheries Beneficial: non-groundfish fisheries.	Adverse: groundfish fisheries Beneficial: non-groundfish fisheries.	Adverse: groundfish fisheries Beneficial: non-groundfish fisheries.	Adverse: groundfish fisheries (no fishery) Beneficial: non-groundfish fisheries.
Cumulative effects							
Biodiversity	Unknown: influenced more by factors unrelated to bycatch.	Unknown: influenced more by factors unrelated to bycatch.	Unknown: influenced more by factors unrelated to bycatch.	Unknown: influenced more by factors unrelated to bycatch.	Unknown: influenced more by factors unrelated to bycatch.	Unknown: influenced more by factors unrelated to bycatch.	Unknown: influenced more by factors unrelated to bycatch.
Predator-prey	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.
Relationship	Localized: unknown.	Localized: unknown.	Localized: unknown.	Localized: unknown.	Localized: unknown.	Localized: unknown.	Localized: unknown.
Ecosystem energy	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.	General: no adverse impact.
Balance	Localized: unknown.	Localized: unknown.	Localized: unknown.	Localized: unknown.	Localized: unknown.	Localized: unknown.	Localized: unknown.

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