Amendment 87 to the Fishery Management Plan for Groundfish of the Gulf of Alaska

1. Revise the following sections of Table ES-2 to read as follows:

Table ES- 1 Summary of Management Measures for the GOA Groundfish Fishery

Stocks	All finfish, except salmon, steelhead, halibut, herring, and tuna, which are distributed or exploited in the management area, and are listed in Table 3-1. Those stocks and stock complexes that are commercially important and for which an annual TAC is established include: walleye pollock, Pacific cod, sablefish, shallow and deep water flatfish, rex sole, flathead sole, arrowtooth flounder, Pacific ocean perch, shortraker/rougheye rockfish, northern rockfish, "other slope" rockfish, pelagic shelf rockfish, demersal shelf rockfish, thornyhead rockfish, Atka mackerel, sculpin, octopus, shark, squid, and skate.
Optimum Yield (OY) and Maximum Sustainable Yield (MSY)	The OY of the GOA groundfish complex (consisting of stocks listed in the 'target species' ~~and 'other species'~~ category~~ies~~, as listed in Table 3-1) is in the range of 116,000 to 800,000 mt. The upper end of the range is derived from historical estimates of MSY.
Procedure to set Total Allowable Catch (TAC)	Based on the annual Stock Assessment and Fishery Evaluation (SAFE) report, the Council will recommend to the Secretary of Commerce TACs and apportionments thereof for each target species. ~~TAC for the "other species" category will be set at 5% of the summed target species TACs.~~ Up to two years of TACs may be established for certain species. **Reserve:** 20% of the TAC for pollock, Pacific cod, flatfish, sculpins, octopus, sharks, and squid ~~and the "other species" category~~ is set aside to form the reserve, which may be reapportioned to these fisheries at any time and in any amount by the Regional Administrator.

2. Revise paragraph 2 of ES.3 to read as follows

Chapter 3 contains the conservation and management measures that regulate the GOA groundfish fisheries. Section 3.1 denotes the area and stocks governed by the FMP, and describes the three ~~five~~ categories of species or species groups likely to be taken in the groundfish fishery. Section 3.2 specifies the procedures for determining harvest levels for the groundfish species, and includes the maximum sustainable yield and optimum yield of the groundfish complex. Sections 3.3 to 3.6 contain permit and participation, gear, time and area, and catch restrictions for the groundfish fisheries, respectively. Section 3.7 describes the specific management measures for the quota share program in place in the

fixed gear sablefish fishery. Measures that allow flexible management authority are addressed in Section 3.8, and Section 3.9 designates monitoring and reporting requirements for the fisheries. Section 3.10 describes the schedule and procedures for review of the FMP or FMP components.

3. Revise the Table of Contents and List of Tables and Figures to correspond with this FMP amendment.

4. Revise section 3.1.2 to read as follows:

Stocks

Stocks governed by the FMP include all finfish, except salmon, steelhead, halibut, herring, and tuna, which are distributed or are exploited in the area described in Section 3.1.1, and which are listed in Table 3-1. Harvest allocations and management are based on the calendar year.

Three ~~Five~~ categories of species or species groups are likely to be taken in the groundfish fishery. Species may be split or combined within the "target species" category according to procedures set forth in Section 3.2.3 without amendments to this FMP, notwithstanding the designation listed in the FMP. The species categories are listed either within the fishery or within the ecosystem component. The optimum yield concept and essential fish habitat requirements are applied to the species category within the fishery.~~all except the "prohibited species" category~~. These categories are tabulated in Table 3-1 and are described as follows:

1. In the Fishery:

   a. Target species – are those species that support a single species or mixed species target fishery, are commercially important, and for which a sufficient data base exists that allows each to be managed on its own biological merits. Accordingly, a specific total allowable catch (TAC) is established annually for each target species or species assemblage. Catch of each species must be recorded and reported. This category includes walleye pollock, Pacific cod, sablefish, shallow and deep water flatfish, rex sole, flathead sole, arrowtooth flounder, Pacific ocean perch, shortraker/rougheye rockfish, northern rockfish, "other slope" rockfish, pelagic shelf rockfish, demersal shelf rockfish, thornyhead rockfish, Atka mackerel, squid, sculpin, sharks, octopus, and skates.

2. Ecosystem Component:

   a. Prohibited Species – are those species and species groups the catch of which must be avoided while fishing for groundfish, and which must be immediately returned to sea with a minimum of injury except when their retention is authorized by other applicable law (see also Prohibited Species Donation Program described in Section 3.6.1.1. Groundfish species and species groups under the FMP for which the quotas have been achieved shall be treated in the same manner as prohibited species.

   b. Forage fish species – are those species listed in Table 3-1, which 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 will be 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.

~~3.~~ Nonspecified 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 exist which would allow population assessments. No record of catch is necessary. The allowable catch for this category is the amount that is taken incidentally while fishing for target and other species, whether retained or discarded.~~

Table 3-1 Species and Species Groups in the FMP Species Categories

In the Fishery	
Target Species[2]	Walleye pollock Pacific cod Sablefish Flatfish (shallow-water flatfish, deep-water flatfish, rex sole, flathead sole, arrowtooth flounder) Rockfish (Pacific ocean perch, northern rockfish, shortraker and rougheye rockfish, other slope rockfish, pelagic shelf rockfish, demersal shelf rockfish[3], thornyhead rockfish) Atka mackerel Skates (big skates, longnose skates, and other skates) Squid Sculpin Shark Octopus
Ecosystem Component	
Prohibited Species[1]	Pacific halibut Pacific herring Pacific salmon Steelhead trout King crab Tanner crab
Forage Fish Species[4]	Osmeridae family (eulachon, capelin, and other smelts) Myctophidae family (lanternfishes) Bathylagidae family (deep-sea smelts) Ammodytidae family (Pacific sand lance) Trichodontidae family (Pacific sand fish) Pholidae family (gunnels) Stichaeidae family (pricklebacks, warbonnets, eelblennys, cockscombs, and shannys) Gonostomatidae family (bristlemouths, lightfishes, and anglemouths) Order Euphausiacea (krill)

[1]Must be immediately returned to the sea

[2]TAC for each listing. Species and species groups may or may not be targets of directed fisheries.

[3]Management delegated to the State of Alaska

[4]Management measures for forage fish are established in regulations implementing the FMP

5. Revise the introduction to Section 3.2, delete sections 3.2.5 and 3.2.7, renumber Section 3.2.6 to 3.2.3.4.3 and its corresponding subsection numbers for the new subsection numbers, and revise Sections 3.2.1-3.2.4 to read as follows:

Section 3.2 Determining Harvest Levels

This section of the FMP provides the basis for determining harvest levels in the groundfish fisheries. Section 3.2.1 defines terms used in the harvest specification process. Maximum sustainable yield and optimum yield, which are specified indefinitely for the groundfish fishery as a whole, are addressed in Section 3.2.2. Harvest specifications that are made annually, such as the overfishing limit, acceptable biological catch, and total allowable catch, are described in Section 3.2.3. Section 3.2.4 describes accountability measures.

The Council's harvest strategy was reviewed in 2002 by Goodman *et al*. The report contains a historical overview of the Council's approach to fishery harvest management, and an analysis of single-species, multispecies and ecosystem issues relating to the harvest strategy. The report is available by request from the Council office.

3.2.1 Definitions of Terms

Maximum sustainable yield (MSY) is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions**, fishery technological characteristics (e.g., gear selectivity), and distribution of catch among fleets**.

Optimum yield (OY) is the amount of fish which–

a) 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;
b) is prescribed as such on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor; and
c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery.

Maximum fishing mortality threshold (MFMT, also called the "OFL control rule") is the level of fishing mortality (F), on an annual basis, used to compute the smallest annual level of catch that would constitute overfishing. Overfishing occurs whenever a stock or stock complex is subjected to a level of fishing mortality or annual total catch that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. The MFMT may be expressed either as a single number (i.e., a fishing mortality rate or F value), or as a function of spawning biomass or other measure of reproductive potential.

Overfishing limit (OFL) is the annual amount of catch that results from applying the MFMT to a stock or stock complex's abundance. The OFL is the catch level above which overfishing is occurring.

Minimum stock size threshold (MSST) is the level of biomass below which the stock or stock complex is considered to be overfished. To the extent possible, the MSST should equal 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.

Acceptable biological catch (ABC) is a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and any other scientific uncertainty. The ABC is set below the OFL.

Annual catch limit (ACL) is the level of annual catch of a stock or stock complex that serves as the basis for invoking accountability measures. ACL cannot exceed the ABC, and may be divided into sector-ACLs.

Total allowable catch (TAC) is the annual catch target for a stock or stock complex, derived from the ABC by considering social and economic factors and management uncertainty (i.e., uncertainty in the ability of managers to constrain catch so the ACL is not exceeded, and uncertainty in quantifying the true catch amount).

3.2.2 Maximum Sustainable Yield and Optimum Yield for the Groundfish Fishery

MSY and OY are specified as fixed ranges in the FMP, and apply to the groundfish fishery as a whole. The harvest specifications and status determinations are made annually, and apply to individual stocks and stock complexes within the "target species" category.

3.2.2.1 Maximum Sustainable Yield

The groundfish complex and its fishery are a distinct management unit of the Gulf of Alaska. This complex forms a large subsystem of the GOA ecosystem with intricate interrelationships between predators and prey, between competitors, and between those species and their environment. Ideally, concepts such as productivity and MSY should be viewed in terms of the groundfish fishery as a unit rather than for individual stocks or stock complexes. Due to the difficulty of estimating the parameters that govern interactions between species, however, estimates of MSY for the groundfish fishery have sometimes been computed by summing MSY estimates for the individual stocks and stock complexes.

Early studies estimated MSY for the GOA groundfish complex ranging from 804,950 mt in 1983 to 1,018,750 mt for the 1987 fishing year. This range was obtained by summing the MSY ranges for each stock or stock complex in the fishery (see Section 4.3.1, History of Exploitation). However, current multi-species models suggest that the sum of single-species MSYs provides a poor estimate of MSY for the groundfish complex as a whole (Walters et al. 2005) because biological reference points for single stocks, such as F_{MSY}, may change substantially when multi-species interactions are taken into account (Gislason 1999; Collie and Gislason 2001). Fishing mortality rates for prey species that are consumed by other marine predators should be conditioned on the level of predation mortality, which may change over time depending on predator population levels.

An ecosystem perspective suggests that the MSY of the groundfish fishery may change if an environmental regime shift occurs or if the present mix of species is altered substantially. Also, as new data are acquired and as statistical methodology evolves over time, it is to be expected that estimates of MSY will change, even if the ecosystem has remained relatively stationary. Therefore, estimates of MSY contained in this section should be viewed in context, as historical estimates that guided development of the FMP.

3.2.2.2 Optimum Yield

The range of optimum yield specified in the FMP is 116,000-800,000 mt of groundfish for the target species, to the extent this can be harvested consistently with the management measures specified in this FMP. This range was established in 1987 by Amendment 15 based on the examination of historical and recent catches, recent

determinations of ABC, and recent and past estimates of MSY for each major groundfish species. This derivation from historical estimates of MSY and fishery performance reflects the combined influence of biological, ecological, and socioeconomic factors. The end points of the range were derived as described below.

For the minimum value, 116,000 mt was approximately equal to the lowest historical groundfish catch during the 21-year period 1965-1985 (116,053 mt in 1971, NPFMC 1986). In that year catches of pollock, Pacific cod and Atka mackerel were all at very low levels. Given the status of the groundfish resources and the present management regime, it was considered extremely unlikely that future total harvest would fall below this level. Thus, the TACs must be established so as to result in a sum of at least 116,000 mt.

The upper end of the OY range, 800,000 mt, was derived from MSY information. The MSY for all species of groundfish (excluding the other species category) between 1983 and 1987 ranged from 804,950 mt in 1983 to 1,137,750 mt for the 1987 fishing year. The average MSY over the five-year period was 873,070 mt. Therefore, the upper end of the range is approximately equal to 92 percent of the mean MSY for the five-year period. The ABC summed for all species ranged from 457,082 mt in 1985 to 814,752 mt in 1987. Most of the variation in the ABC and catch over the five-year interval resulted from changes in the status of two species: pollock and flounder. Pollock ABC ranged from 112,000 mt in 1987 to 516,600 mt in 1984; while flounder ABC ranged from 33,500 mt in 1985 to 537,000 mt in 1987. Therefore, the 800,000 mt upper end of the OY range was selected in consideration of the volatility in pollock and flounder ABC, and the potential for harvesting at MSY.

In 1987, the OY specification for GOA groundfish fishery was established as part of Amendment 15 to the GOA Groundfish FMP. The lower end of OY is equal to the lower end of MSY, 116,000 mt. The upper end of the range for OY were set with 800,000 mt being 92 percent of the MSY five-year average at that time. This eight percent reduction provides some allowance to ensure OY does not exceed MSY. The EA for Amendment 15 stated that environmental impacts of managing under the GOA-wide OY were difficult to measure but likely insignificant compared to natural perturbations (NPFMC 1986). Establishing the GOA-wide OY allowed for management that could prevent overfishing and provided for more effective management than having individual stock OYs that could only be changed with FMP amendments.

A programmatic supplemental environmental impact statement (PSEIS) was completed in June, 2004. The preferred alternative identified in the PSEIS retained the existing OY range. In addition to impacts on the stocks and stock complexes in the "target species" category the PSEIS analyzed impacts on prohibited species, forage fish, non-specified species, habitat, seabirds, and marine mammals. Ecosystem-level variables analyzed were pelagic forage availability, removal of top predators, introduction of non-native species, energy removal, energy redirection, species diversity, functional diversity (in terms of both trophic relationships and structural habitat), and genetic diversity. Effects were partitioned into direct and indirect effects, persistent past effects, reasonably foreseeable future external

effects, and cumulative effects. For the preferred alternative, approximately half of the ecosystem-level effects were determined to be insignificant, conditionally significant/positive, or significant/positive; none were determined to be significant/negative.

The ecological factors that may be considered in the reduction of OY from MSY are described in Section 4.6, ecosystem consideration for management of the groundfish fisheries, and is addressed in the ongoing consideration of this information in the development of the SAFE reports. Section 4.6.2 and 4.6.3 describes climate implicated changes and ecosystem interactions that may be considered an ecological factor that may affect the setting of OY.

The important social and economic factors may be summarized as follows:

1. The OY range is not likely to have any significant detrimental impact on the industry. On the contrary, specification of OY as a constant range helps to create a stable management environment in which the industry can plan its activities consistently, with an expectation that each year's total groundfish catch will be at least 116,000 mt.

2. The OY range encompasses the annual catch levels taken in the period immediately prior to its implementation, during which the fishery operated profitably.

The Magnuson-Stevens Act requires Councils to "review on a continuing basis, and revise as appropriate, the assessments and specifications made ... with respect to the optimum yield." In particular, OY may need to be respecified in the future if major changes occur in the estimate of MSY for the groundfish complex. Likewise, OY may need to be respecified if major changes occur in the ecological, social, or economic factors governing the relationship between OY and MSY.

3.2.3 Annual Specifications and Status Determinations for Stocks and Stock Complexes

In contrast to MSY and OY, many harvest specifications and status determinations are made annually rather than indefinitely, and for individual stocks and stock complexes rather than for the groundfish fishery as a whole. This subsection describes the information and procedures used to make such specifications and determinations.

3.2.3.1 Information and Procedures Applicable in General

Information and procedures that are applicable to annual harvest specifications in general are presented in this subsection. Information and procedures specific to each of the various management measures are presented in their respective subsections.

3.2.3.1.1 Identification of Stocks and Stock Complexes for Which Specifications are Made

Notwithstanding designated stocks or stock complexes listed by category in Table 3-1, the Council may recommend splitting or combining stocks or stock complexes in the "target species" category for purposes of establishing a new harvest specification unit if such action is desirable based on commercial importance of a stock or stock complex or if sufficient biological information is available to manage a stock or stock complex on its own merits. Use of a particular harvest specification unit for one management measure (e.g., OFL) does not limit the Council's ability to establish a different harvest specification unit for some other management measure (e.g., separate TACs could be specified for the GOA statistical areas while OFL is specified for the entire GOA).

3.2.3.1.2 Stock Assessment and Fishery Evaluation Report

Scientists from the Alaska Fisheries Science Center, the Alaska Department of Fish and Game, other agencies, and universities prepare a Stock Assessment and Fishery Evaluation (SAFE) report annually. The SAFE report is scientifically based, citing data sources and interpretations. The SAFE report provides information to the Council for determining annual harvest specifications, documenting significant trends or changes in the stocks, marine ecosystem, and fisheries over time; and assessing the relative success of existing State and Federal fishery management programs. This document is reviewed first by the Groundfish Plan Team, then by the SSC and AP, and then by the Council. The review by the SSC constitutes the official scientific review for purposes of the Information Quality Act. Upon review and acceptance by the SSC, the SAFE report and any associated SSC comments constitute the best scientific information available for purposes of the Magnuson-Stevens Act.

The SAFE report consists of three volumes: a volume containing stock assessments, a volume containing economic analysis, and a volume describing ecosystem considerations.

The stock assessment volume contains a chapter or sub-chapter for each stock or stock complex in the "target species" category, and a summary chapter prepared by the Groundfish Plan Team. To the extent practicable, each chapter contains estimates of all annual harvest specifications except TAC, all reference points needed to compute such estimates, and all information needed to make annual status determinations with respect to "overfishing" and "overfished." In providing this information, the SAFE report uses the official time series of historic catch for each stock or stock complex. This time series, which is provided by the NMFS Alaska Region, includes estimates of retained and discarded catch taken in the groundfish fisheries; bycatch taken in other fisheries; state commercial, recreational, and subsistence fisheries; catches taken during scientific research; and catches taken during the prosecution of exempted fisheries.

The other two volumes contain additional economic, social, community, essential fish habitat, and ecological information pertinent to the success of management or the achievement of FMP objectives.

3.2.3.1.3 Process and Timeline of Council Recommendations, Public Review, and Secretarial Decision

The Council will develop its harvest specifications recommendations for Secretarial consideration using the following: 1) recommendations of the Groundfish Plan Team and SSC and information presented by the Plan Team and SSC in support of these recommendations; 2) information presented by the Advisory Panel and the public; and 3) other relevant information.

In consultation with the Council, the Secretary will establish harvest specifications, including TACs and apportionments thereof, and reserves for each target species category, by January 1 of the new fishing year, or as soon as practicable thereafter, by means of regulations published in the Federal Register. Harvest specifications may be effective for up to two fishing years. Final harvest specifications are implemented by mid-February each year to replace those already in effect for that year, based on new information contained in the latest SAFE report.

As soon as practicable after its October meeting, the Council will recommend proposed harvest specifications to the Secretary. The Council's recommendation will include proposed harvest specifications for each stock or stock complex within the "target species" category, the basis for each proposed harvest specification, and a description of developing information that may be relevant to the final harvest specifications. As soon as practicable after the October meeting and after considering the Council's recommended proposed harvest specifications, the Secretary will publish in the Federal Register a notice of proposed harvest specifications and make available for public review and comment all information regarding the basis for the harvest specifications. The notice of proposed harvest specifications will identify whether and how harvest specifications are likely to be affected by developing information unavailable at the time the notice is published. The public review and comment period on the notice of proposed harvest specifications will be a minimum of 15 days.

At its December meeting, the Council will review the final SAFE report, recommendations of the Groundfish Plan Team, SSC, AP, and comments received. The Council will make final harvest specification recommendations to the Secretary. As soon as practicable thereafter and after considering the Council's recommendation, the Secretary will publish final harvest specifications for the groundfish fishery. New final harvest specifications will supercede current harvest specifications on the effective date of the new harvest specifications. However, if the Secretary determines that the notice of final specifications would not be "a logical outgrowth" of the notice of proposed harvest specifications (i.e., the notice of proposed harvest specifications was inadequate to afford the public opportunity to comment meaningfully on the issues involved), the Secretary will either: (1) publish a revised notice of proposed harvest specifications in the Federal Register, solicit public comment thereon, and publish a notice of final harvest specifications, as soon as is practicable; or (2) if "good cause" pursuant to the Administrative Procedure Act exists, waive the requirements for notice and comment and 30-day delayed effectiveness and directly publish a notice of final harvest specifications with a post-effectiveness public comment period of 15 to 30 days.

3.2.3.2 Overfishing Limit

Specification of OFL begins with the MFMT (also known as the OFL control rule). The MFMT is prescribed through a set of six tiers which are listed below in descending order of preference, corresponding to descending order of information availability. The 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 in making such determinations.

For tier (1), a "pdf" refers to a probability density function. For tiers 1 and 2, if a reliable pdf of B_{MSY} is available, the preferred point estimate of B_{MSY} is the geometric mean of its pdf. For tiers 1 to 5, if a reliable pdf of B is available, the preferred point estimate is the geometric mean of its pdf. For tiers 1 to 3, the coefficient α is set at a default value of 0.05. This default value was established by applying the 10 percent rule suggested by Rosenberg et al. (1994) to the 1/2 B_{MSY} reference point. However, the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information. For tiers 2 to 4, a designation of the form "$F_{X\%}$" refers to the fishing mortality rate (F) associated with an equilibrium level of spawning per recruit equal to $X\%$ of the equilibrium level of spawning per recruit in the absence of any fishing. If reliable information sufficient to characterize the entire maturity schedule of a species is not available, the SSC may choose to view spawning per recruit calculations based on a knife-edge maturity assumption as reliable. For tier 3, the term $B_{40\%}$ refers to the long-term average biomass that would be expected under average recruitment and $F=F_{40\%}$.

Tier 1 Information available: reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY} .

1a) Stock status: $B/B_{MSY} > 1$
$F_{OFL} = mA$, the arithmetic mean of the pdf

1b) Stock status: $\alpha < B/B_{MSY} \leq 1$

$F_{OFL} = mA \times (B/B_{MSY} - \alpha)/(1 - \alpha)$

1c) Stock status: $B/B_{MSY} \leq \alpha$

$F_{OFL} = 0$

Tier 2 Information available: reliable point estimates of B, B_{MSY} , F_{MSY} , $F_{35\%}$, and $F_{40\%}$.

2a) Stock status: $B/B_{MSY} > 1$

$F_{OFL} = F_{MSY}$

2b) Stock status: $\alpha < B/B_{MSY} \leq 1$

$F_{OFL} = F_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$

2c) Stock status: $B/B_{MSY} \leq \alpha$

$F_{OFL} = 0$

Tier 3 Information available: reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.

3a) Stock status: $B/B_{40\%} > 1$

$F_{OFL} = F_{35\%}$

3b) Stock status: $\alpha < B/B_{40\%} \leq 1$

$F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$

3c) Stock status: $B/B_{40\%} \leq \alpha$

$F_{OFL} = 0$

Tier 4 Information available: reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.

$F_{OFL} = F_{35\%}$

Tier 5 Information available: reliable point estimates of B and natural mortality rate M.

$F_{OFL} = M$

Tier 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

With the exception of Tier 6, the MFMT is applied to the best estimate of stock size (which may or may not be age structured) for the coming year to produce the OFL, which is expressed in units of catch biomass. In the case of Tier 6, the MFMT is already expressed in units of catch biomass, meaning that the MFMT and the OFL are identical.

3.2.3.3 Acceptable Biological Catch and Annual Catch Limit

3.2.3.3.1 Acceptable Biological Catch

Specification of ABC is similar to specification of OFL, in that both involve harvest control rules with six tiers relating to various levels of information availability. However, somewhat more flexibility is allowed in specifying ABC, in that the control rule prescribes only an upper bound. The steps are as follow:

1. Determine the appropriate tier (this will be the same tier used to specify OFL).
2. Determine the maximum permissible ABC fishing mortality rate from the appropriate tier of the ABC control rule (see below).
3. Except for stocks or stock complexes managed under Tier 6, compute the maximum permissible ABC by applying the maximum permissible ABC fishing mortality rate to the best estimate of stock size (which may or may not be age structured); for stocks and stock complexes managed under Tier 6, the

control rule automatically produces a maximum permissible ABC, so application of a fishing mortality rate is unnecessary.

4. Determine whether conditions exist that warrant setting ABC at a value lower than the maximum permissible value (such conditions may include—but are not limited to—data uncertainty, recruitment variability, and declining population trend) and, if so:
   a. document those conditions,
   b. recommend an ABC lower than the maximum permissible value, and
   c. explain why the recommended value is appropriate.

The above steps are undertaken first by the assessment authors in the individual chapters of the SAFE report. The Plan Team then reviews the SAFE report and makes its own recommendation. The SSC then reviews the SAFE report and Plan Team recommendation, and makes its own recommendation to the Council. The Council then reviews the SAFE report, Plan Team recommendation, and SSC recommendation; then makes its own recommendation to the Secretary, with the constraint that the Council's recommended ABC cannot exceed the SSC's recommended ABC.

The ABC control rule is as follows (definitions of terms and information requirements for the six tiers are identical to those used in the OFL control rule):

Tier 1 Information available: reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.

1a) Stock status: $B/B_{MSY} > 1$
$maxF_{ABC} = mH$, the harmonic mean of the pdf

1b) Stock status: $\alpha < B/B_{MSY} \leq 1$
$maxF_{ABC} = mH \times (B/B_{MSY} - \alpha)/(1 - \alpha)$

1c) Stock status: $B/B_{MSY} \leq \alpha$
$maxF_{ABC} = 0$

Tier 2 Information available: reliable point estimates of B, B_{MSY} , F_{MSY} , $F_{35\%}$, and $F_{40\%}$.

2a) Stock status: $B/B_{MSY} > 1$
$maxF_{ABC} = F_{MSY} \times (F_{40\%} /F_{35\%})$

2b) Stock status: $\alpha < B/B_{MSY} \leq 1$
$maxF_{ABC} = F_{MSY} \times (F_{40\%} /F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$

2c) Stock status: $B/B_{MSY} \leq \alpha$
$maxF_{ABC} = 0$

Tier 3 Information available: reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.

3a) Stock status: $B/B_{40\%} > 1$
$maxF_{ABC} = F_{40\%}$

3b) Stock status: $\alpha < B/B_{40\%} \leq 1$
$maxF_{ABC} = F_{40\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$

3c) Stock status: $B/B_{40\%} \leq \alpha$
$maxF_{ABC} = 0$

Tier 4 Information available: reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.
$maxF_{ABC} = F_{40\%}$

Tier 5 Information available: reliable point estimates of B and natural mortality rate M.

$maxF_{ABC} = 0.75 \times M$

Tier 6 Information available: reliable catch history from 1978 through 1995.

maxABC= 0.75 × OFL

The above control rule is intended to account for scientific uncertainty in two ways: First, the control rule is structured explicitly in terms of the type of information available, which is related qualitatively to the amount of scientific uncertainty. Second, the size of the buffer between $maxF_{ABC}$ in Tier 1 of the ABC control rule and F_{OFL} in Tier 1 of the OFL control rule varies directly with the amount of scientific uncertainty. For the information levels associated with the remaining tiers, relating the buffer between $maxF_{ABC}$ and F_{OFL} to the amount of scientific uncertainty is more difficult because the amount of scientific uncertainty is harder to quantify, so buffers of fixed size are used instead.

For groundfish species identified as key prey of Steller sea lions (i.e., walleye pollock, Pacific cod, and Atka mackerel), directed fishing is prohibited in the event that the spawning biomass of such a species is projected in the stock assessment to fall below $B_{20\%}$ in the coming year. However, this does not change the specification of ABC or OFL.

3.2.3.3.2 Annual Catch Limit

The ACL is equal to the ABC for each stock and stock complex in the "target species" category.

3.2.3.4 Total Allowable Catch, Reserves, and Apportionments

3.2.3.4.1 Total Allowable Catch

The following procedure is used to specify TACs for every groundfish stock and stock complex managed by the FMP:

1. Determine the ABC for each managed stock or stock complex. ABCs are recommended by the SSC based on information presented by the Plan Team.
2. Determine a TAC based on biological and socioeconomic information. The TAC must be lower than or equal to the ABC. The TAC may be lower than the ABC if warranted on the basis of bycatch considerations, management uncertainty, or socioeconomic considerations; or if required in order to cause the sum of the TACs to fall within the OY range.
3. Sum TACs for "target species" to assure that the sum is within the optimum yield range specified for the groundfish complex in the FMP. If the sum falls outside this range, the TACs must be adjusted.

3.2.3.4.2 Reserves

Reserves are set at 20 percent of the TAC of pollock, Pacific cod, flatfish, **sculpin, shark, squid, and octopus** ~~and "other species"~~. At any time, the Regional Administrator may assess these fisheries and apportion to them any amounts from the reserves that is determined will be harvested.

Any additional in-season allocation from reserves may carry with it an additional prohibited species catch (PSC) limit amount proportional to that reserve release and the respective bycatch rates in the affected fisheries.

3.2.3.4.3 Apportionment of Total Allowable Catch

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3.2.3.5 Status Determinations

To the extent practicable, two status determinations are made annually for each stock and stock complex. The first is the "overfishing" status, which describes whether *catch* is too *high*. The second is the "overfished" status, which describes whether *biomass* is too *low*.

3.2.3.5.1 Determination of "Overfishing" Status

The OFL for a given calendar year is specified at the end of the preceding calendar year on the basis of the most recent stock assessment. For each stock and stock complex, a determination of status with respect to "overfishing" is made inseason as the fisheries are monitored to prevent exceeding the TAC and annually as follows: If the catch taken during the most recent calendar year exceeded the OFL that was specified for that year, then overfishing occurred during that year; otherwise, overfishing did not occur during that year.

In the event that overfishing is determined to have occurred, an inseason action, an FMP amendment, a regulatory amendment or a combination of these actions will be implemented to end such overfishing immediately.

3.2.3.5.2 Determination of "Overfished" Status

A stock or stock complex is determined to be "overfished" if it falls below the MSST. According to the National Standard Guidelines definition, the MSST equals 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.

The above definition raises two questions: 1) How is the definition to be applied when "the MSY level" cannot be estimated? 2) In the context of an age-structured assessment, what is the meaning of the phrase, "the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years?" These questions are addressed in this FMP as follows:

1) Direct estimates of B_{MSY} (i.e., "the MSY level") are available for Tiers 1 and 2. For Tier 3, no direct estimate of B_{MSY} is available, but $B_{35\%}$ is used as a proxy for B_{MSY}. For Tiers 4-6, neither direct estimates of B_{MSY} nor reliable estimates of B_{MSY} proxies are available. Therefore, the "overfished" status of stocks and stock complexes managed under Tiers 4-6 is *undefined*.

2) For a stock assessed with an age-structured model (as is typically the case for stocks and stock complexes managed under Tiers 1-3), there is more than one stock size or numbers-at-age vector at which rebuilding to the MSY level would be expected to occur in exactly 10 years. Generally, there is no limit to the range of numbers-at-age vectors that satisfy this constraint, and each of these vectors corresponds to a stock size. Therefore, stock status in Tiers 1-3 is determined annually as follows: The determination of "overfished" status begins with an estimate of the stock's "current spawning biomass," which is defined as the estimated spawning biomass for the "current year," which in turn is defined as the most recent year from which data are used in the assessment. Given these definitions, and with the understanding that $B_{35\%}$ is used as a proxy for B_{MSY} in Tier 3, the determination proceeds as follows:

a. If current spawning biomass is estimated to be below ½ B_{MSY}, the stock is below its MSST.
b. If current spawning biomass is estimated to be above B_{MSY} the stock is above its MSST.
c. If current spawning biomass is estimated to be above ½ B_{MSY} but below B_{MSY}, then conduct a large number of stochastic simulations by projecting the numbers-at-age vector from the current year forward under the assumption that it will be fished at the MFMT in every year, and determine status as follows:
    1. If the mean spawning biomass in the 10^{th} year beyond the current year is below B_{MSY}, the stock is below its MSST.
    2. Otherwise, the stock is above its MSST.

Within two years of such time as a stock or stock complex is determined to be overfished, an FMP amendment or regulations will be designed and implemented to rebuild the stock or stock complex to the MSY level within a time period specified at Section 304(e)(4) of the Magnuson-Stevens Act. If a stock is determined to be in an overfished condition, a rebuilding plan would be developed and implemented for the stock, including the determination of an F_{ofl} and F_{msy} that will rebuild the stock within an appropriate time frame.

The Magnuson-Stevens Act also requires identification of any fisheries that are "approaching a condition of being overfished," which is defined as a determination that the fishery "will become overfished within two years." The "approaching overfished" determination is made by projecting the numbers-at-age vector from the current year forward two years under the assumption that the stock will be fished at $maxF_{ABC}$ in each of those years, then determining whether the stock would be considered "overfished" at that time. In more detail, the determination proceeds as follows:

a. If the mean spawning biomass for two years beyond the current year is below ½ B_{MSY}, the stock is approaching an overfished condition.
b. If the mean spawning biomass for two years beyond the current year is above B_{MSY}, the stock is not approaching an overfished condition.
c. If the mean spawning biomass for two years beyond the current year is above ½ B_{MSY} but below B_{MSY}, then conduct a large number of stochastic simulations by projecting the numbers-at-age vector from the current year forward under

the assumption that it will be fished at $maxF_{ABC}$ for two years, then at the MFMT for ten years, and determine status as follows:

1. If the mean spawning biomass in the 12th year beyond the current year is below B_{MSY}, the stock is approaching an overfished condition.
2. Otherwise, the stock is not approaching an overfished condition.

In the event that a stock or stock complex is determined to be approaching a condition of being overfished, an inseason action, an FMP amendment, a regulatory amendment or a combination of these actions will be implemented to prevent overfishing from occurring.

3.2.4 Accountability Measures

The Magnuson-Stevens Act requires FMPs to include accountability measures to ensure that overfishing does not occur in the fishery. The following subsections describe some of the accountability measures in place for the GOA groundfish fishery. Accountability measures have been used and further developed for the management of the GOA groundfish fisheries since the inception of this FMP. These accountability measures serve many purposes, including prevention of overfishing. Further details regarding monitoring and reporting requirements are provided in Section 3.9.

3.2.4.1 Observer Program

At the core of the North Pacific monitoring system is a comprehensive, industry-funded, on-board and on-shore observer program, coupled with requirements for total weight measurement of most fish harvested. Except for small vessels less than 60 feet and halibut vessels, all vessels fishing for groundfish in federal waters are required to carry observers, at their own expense, for at least a portion of their fishing time. The largest vessels, those 125 feet or longer, are generally required to carry observers 100% of the time, with multiple observers required on catcher/processors and in certain fisheries.

Used in conjunction with reporting and weighing requirements, the information collected by observers provides the foundation for inseason management and for tracking species-specific catch and bycatch amounts.

3.2.4.2 Catch Accounting System

Each year, accounts are established in the Alaska Catch Accounting System (CAS) that matches the categories listed in the annual harvest specification tables. A combination of observer data, dealer landing reports, and at-sea production reports are used to provide an integrated source for fisheries monitoring and in-season decision making. The purposes of the CAS are to: manage the groundfish fishery, establish accounts that match the annual harvest specification tables, allow catch reporting from multiple data sources without duplication, debit reported catch from the appropriate account, and estimate prohibited species catch and at-sea discards.

An important aspect of the CAS is to provide near real-time delivery of accurate data for inseason management decisions. To meet this objective, data from industry are reported through the Electronic Reporting System and fed into the NMFS database every hour. Data from observers are sent to the Alaska Fisheries Science Center electronically and are transmitted into the CAS every night.

3.2.4.3 Inseason Management

NMFS Alaska Region's Inseason Management Branch determines the amount of an individual TAC necessary as incidental catch in other target fisheries. The target fishery is usually closed before reaching the TAC, allowing for bycatch in other fisheries up to the amount of TAC for a species. A directed fishery closure limits retention of a species to a portion of other species TACs open to directed fishing. That portion is called the maximum retainable amount (MRA). The MRA is expressed as a percentage of an alternate target fishery. The percentage relates to the expected rate of catch and may be used as a tool to harvest a species that is low in volume but high in value. All retention is prohibited if the total TAC is caught before the end of the year. Prohibiting retention removes any incentive to increase incidental catch as a portion of other fisheries. If the ABC is taken and the trajectory of catch indicates the OFL may be approached, additional closures are imposed. To prevent overfishing, specific fisheries identified by gear and area that incur the greatest incidental catch are closed. Closures expand to other fisheries if the rate of take is not sufficiently slowed.

A fishery may also be closed if a PSC limit is reached. Except for scientific purposes or the prohibited species donations program, prohibited species cannot be retained in the groundfish fisheries.

In the rare occurrence of a TAC being exceeded, the Inseason Management Branch will evaluate the conditions that resulted in the overage and determine appropriate management actions that may be needed to prevent a reoccurrence. For example, Inseason Management may set the following year's directed fishing allowance lower and the incidental catch allowance higher to provide for an earlier closure of the directed fishery, leaving more fish available outside of the directed fishery before the TAC is reached. In addition, any amount of harvest that may exceed the TAC is accounted for in the stock assessment process for the species and applied to the total catch in the modeling for setting the following year's TAC for that species.

3.2.4.4. Harvest Specifications and TAC Overage

Any amount of harvest that may exceed the TAC will be included in the total catch estimate used in the next stock assessment. A higher catch during a year will result in a lower biomass in the subsequent year. For stocks managed under Tiers 1-5, this would result in a lower maxABC in the subsequent year, all else being equal, because maxABC tends to vary directly with biomass (as a first approximation, maxABC = maxF_{ABC} x biomass; therefore a lower biomass results in a lower maxABC). For the special case of a stock managed under sub-tier "b" of any Tier 1-3 where spawning biomass is below the

reference level (B_{msy} in Tiers 1-2, $B_{40\%}$ in Tier 3) of the ABC control rule, the decrease will be compounded because $maxF_{ABC}$ also tends to vary directly with biomass (using the same first approximation, lower $maxF_{ABC}$ and lower biomass results in an even lower maxABC). For Tier 6 stocks, the information used to establish harvest levels is insufficient to discern the existence or extent of biological consequences caused by an overage in the preceding year. The assessment for certain Tier 6 stocks may not be able to describe the biological consequences to the stock resulting from an overage. Consequently, the subsequent year's maxABC will not necessarily decrease. However, the SSC may recommend a decrease in the ABC for a Tier 6 stock.

6. Add to Literature Cited the following citations in alphabetical order:

Walters, C. J., V. Christensen, S. J. Martell, and J. F. Kitchell. 2005. Possible ecosystem impacts of applying MSY policies from single-species assessment. ICES Journal of Marine Science 62:448-568.

NPFMC. 1986. Environmental Assessment for Amendment 15 to the Fishery Management Plan for the Groundfish Fishery of the Gulf of Alaska. October 2006. North Pacific Fishery Management Council, 605 West 4th, Suite 306, Anchorage, Alaska 99501-2252.

7. In Appendix A, add the following description in numerical order, and fill in the implementation date when it is known:

Amendment 87, implemented _____,:

1. Places species groups managed under the other species category into the target species category and removes the other species category from the FMP.
2. Places target species in the fishery which requires annual catch limits, accountability measures, and the description of essential fish habitat (EFH) and 5-year review of EFH information for listed species and species groups.
3. Revises the FMP to describe current practices for setting annual catch limits and the use of accountability measures to ensure annual catch limits are not exceeded, as required by National Standard 1 guidelines.
4. Removes the nonspecified species category from the FMP
5. Establishes an Ecosystem Component category and places Prohibited Species and Forage Fish Species in this category.