Acceptable Biological Catch Control Rule Revisions

ABC

Options Paper
For a Generic Amendment
to the Fishery Management Plans for
Reef Fish, Red Drum, Coastal Migratory Pelagics, Coral and Coral Reefs, Spiny Lobster, and Shrimp

March 2017

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ENVIRONMENTAL ASSESSMENT COVER SHEET

Name of Action

Draft Generic Amendment to
Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico,
Fishery Management Plan for Coastal Migratory Pelagic Resources of the Gulf of
Mexico and South Atlantic, and
Fishery Management Plan for the Red Drum Resources of the Gulf of Mexico:
Acceptable Biological Catch Control Rule Revisions

Responsible Agencies and Contact Persons

Gulf of Mexico Fishery Management Council (Council)   813-348-1630
2203 North Lois Avenue, Suite 1100   813-348-1711 (fax)
Tampa, Florida 33607   gulfcouncil@gulfcouncil.org
Steven Atran (Steven.Atran@gulfcouncil.org)   http://www.gulfcouncil.orgn

South Atlantic Fishery Management Council   866-723-6210
4055 Faber Place, Suite 201   843-769-4520 (fax)
North Charleston, South Carolina 29405   http://www.safmc.net
Contact tbd (somebody @safmc.net)

National Marine Fisheries Service (Lead Agency)   727-824-5305
Southeast Regional Office   727-824-5308 (fax)
263 13th Avenue South   http://sero.nmfs.noaa.gov
St. Petersburg, Florida 33701
Richard Malinowski (rich.malinowski@noaa.gov)

Type of Action

( ) Administrative   ( ) Legislative
(X) Draft   ( ) Final

Summary/Abstract

ABBREVIATIONS USED IN THIS DOCUMENT

ABC	acceptable biological catch
ACL	annual catch limit
ACT	annual catch target
AM	accountability measure
Council	Gulf of Mexico Fishery Management Council
CMP	coastal migratory pelagics
CV	coefficient of variation
EA	environmental assessment
ESA	Endangered Species Act
FMP	fishery management plan
GMFMC	Gulf of Mexico Fishery Management Council
Gulf	Gulf of Mexico
IFQ	individual fishing quota
IRFA	initial regulatory flexibility analysis
MFMT	maximum fishing mortality threshold
MSST	minimum stock size threshold
MSY	maximum sustainable yield
NMFS	National Marine Fisheries Service
NS1	National Standard 1 guidelines
OFL	Overfishing limit
OY	optimum yield
P*	probability of overfishing
Q*	qualitative measure of relative risk
PDF	probability density function
RA	Regional Administrator
RIR	regulatory impact review
RFA	regulatory flexibility analysis
SEFSC	Southeast Fisheries Science Center
SPR	spawning potential ratio
SSB	spawning stock biomass
SSBR	spawning stock biomass per recruit
SSC	Science and Statistical Committee
TAC	total allowable catch
TL	total length

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CHAPTER 1. INTRODUCTION

1.1 Background

The acceptable biological catch (ABC) is a level of annual catch, which is based on an ABC control rule that accounts for the scientific uncertainty in the estimate of the overfishing limit (OFL), any other scientific uncertainty, and the Council's risk policy. Section 600.310(f)(2) of the Magnuson Stevens Fishery Conservation and Management Act (Magnuson Act) National Standard 1 (NS1) guidelines requires that, for stocks and stock complexes required to have an ABC, each Council must establish an ABC control rule that: a) accounts for scientific uncertainty in the overfishing limit (OFL); b) incorporates the Council's risk policy; and c) is based on a comprehensive analysis that shows how the control rule prevents overfishing.

The current ABC control rule was implemented in 2012 as part of the Generic Annual Catch Limits/Accountability Measures Amendment (GMFMC 2011a)[1], Coastal Migratory Pelagics (CMP) Amendment 18[2], and Spiny

MSY

Maximum Sustainable Yield is the largest amount of fish that can be harvested on a continuing basis. The true value for MSY is often not known, so a proxy is usually used, such as the yield when fishing at $F_{30\% SPR}$.

MFMT

Maximum Fishing Mortality Threshold is the highest fishing mortality rate allowed. It is usually set to the rate corresponding to harvesting the maximum sustainable yield (F_{MSY}) of proxy. Fishing at a rate higher than MFMT constitutes overfishing and can lead to stock declining.

OFL

Overfishing Threshold is the yield from fishing at MFMT. Exceeding OFL in any year is an alternate way to determine if overfishing is occurring.

ABC

Acceptable Biological Catch is a catch level recommended by the SSC and set at or below OFL to account for scientific uncertainty.

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[1] Full title: Final Generic Annual Catch Limits/Accountability Measures Amendment for the Gulf of Mexico Fishery Management Council 's Red Drum, Reef Fish, Shrimp, Coral and Coral Reefs Fishery Management Plans.
[2] Full title: Amendment 18 to the Fishery Management Plan for Coastal Migratory Pelagic Resources of the Gulf of Mexico and Atlantic.

Lobster Amendment 10[3]. Almost immediately, Tier 1 (ABC for stocks with a stock assessment) of this control rule, produced ABCs that, for most stocks, were just 2% to 6% below the OFLs. Both the SSC and the Council thought the ABCs were too close to the OFLs to adequately account for scientific uncertainty, or to provide an ABC that was significantly different from the OFL. For several stocks, the SSC recommended ABCs based on the formula ABC = yield at 75% * F_{MSY} (the fishing mortality level at maximum sustainable yield) instead of the control rule. Consequently, the SSC began working on revisions to the ABC control rule.

From 2012 until 2014, the SSC, along with an ABC Control Rule Working Group composed of SSC members, Council staff, and National Marine Fisheries Service (NMFS) staff, evaluated modifications and alternatives to the existing ABC control rule. In September 2014, the SSC settled on recommending two options for replacing the existing ABC control rule. Option 1 was adapted from a method used by the Pacific Fishery Management Council (Pacific Council) and was based on a method described by Ralston et al. (2011). This method is similar to the current Tier 1 method in that both are based on a P* and probability distribution function. However, this method uses externally derived coefficient of variation (CV) rather than one derived from varying selected parameters of the assessment. This change allows this method to be used even with data-limited stocks. Option 2 used a formula to calculate ABC that is similar to the formula used to calculate optimum yield: ABC = yield at $0.75*F_{MSY}$ (or F_{MSY} proxy), or, if F_{MSY} (or proxy) cannot be calculated, ABC = 75% of the OFL.

The SSC recommendations were presented to the Council in October 2014. However, due to higher priority issues and limited staff time, work on revising the ABC control rule was suspended. In the interim, there has been a turnover of approximately half the SSC membership, and new NS1 guidelines were published in October 2016. Some new management methods allowed through the new NS1 guidelines include carrying over unused quota from one year to the next, and phasing in changes to the ABC. In addition, the NS1 guidelines state that "economic, social, or ecological trade-offs could be evaluated when determining the risk policy for an ABC control rule. To ensure that revisions to the ABC control rule are in compliance with the new guidelines, the scope of alternatives has been expanded beyond those previously recommended by the SSC.

1.2 Purpose and Need

The purpose of this action is to revise or replace the current ABC control rule, and to consider incorporating provisions to allow carry-over of uncaught ACLs, phase-in of changes to ABCs, and to consider developing a process to evaluate "economic, social, or ecological trade-offs when determining the risk policy for an ABC control rule.

The need is to provide ABCs that incorporate scientific uncertainty more appropriately than the current ABC control rule, and to incorporate the flexibility allowed under the October 2016 revisions to the NS1 guidelines.

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[3] Full title: Amendment 10 to the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic.

1.3 History of Management

The following is a history of management as it relates to setting ABC.

Reef Fish Fishery Management Plan

The Reef Fish Fishery Management Plan was implemented in November 1984 (GMFMC 1981). The regulations, designed to rebuild declining reef fish stocks, included: (1) prohibitions on the use of fish traps, roller trawls, and powerhead-equipped spear guns within an inshore stressed area; (2) a minimum size limit of 13 inches total length (TL) for red snapper with the exceptions that for-hire boats were exempted until 1987 and each angler could keep 5 undersize fish; and, (3) data reporting requirements. Optimum yield (OY) was defined in the aggregate for snapper/grouper as 45 million pounds, which was approximately equal to the current catch level, but approximately 12% below the calculated aggregate MSY of 51 million pounds. ABC was equivalent to OY.

Amendment 1, including environmental assessment (EA), regulatory impact review (RIR), and regulatory flexibility analyses (RFA), to the Reef Fish Fishery Management PlanFMP (GMFMC 1989), implemented in 1990, was a major revision of the original FMP. It set as a primary objective of the FMP the stabilization of long-term population levels of all reef fish species by establishing a survival rate of biomass into the stock of spawning age to achieve at least 20% percent spawning stock biomass per recruit (SSBR), relative to the SSBR that would occur with no fishing. The target date for achieving the 20% percent SSBR goal was set at January 1, 2000.

OY was redefined on a species level as any harvest level for each species which maintains, or is expected to maintain, over time a survival rate of biomass into the stock of spawning age to achieve at least a 20% percent spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing.

Amendment 3, including EA and RIR, implemented in July 1991 (GMFMC 1991), provided additional flexibility in the annual framework procedure for specifying total allowable catch (TAC) by allowing the target date for rebuilding an overfished stock to be changed depending on changes in scientific advice, except that the rebuilding period cannot exceed 1.5 times the generation time of the species under consideration. It revised the FMP's primary objective, definitions of OY and overfishing and framework procedure for total allowable catch (TAC) by replacing the 20 percent SSBR target with 20% percent spawning potential ratio (SPR).

Amendment 11, including EA, RIR and IRFA, was partially approved by NMFS and implemented in January 1996 (GMFMC 1996). This amendment primarily addressed permitting provisions. NMFS disapproved a proposal to redefine OY from 20% percent SPR (the same level as overfishing) to an SPR corresponding to a fishing mortality rate of F0.1 until an alternative operational definition that optimizes ecological, economic, and social benefits to the nation could be developed. In April 1997, the Council resubmitted the OY definition with a new proposal to redefine OY as 30% percent SPR. The resubmission resubmitted document was disapproved by NMFS.

The **Generic Sustainable Fisheries Act Amendment** (EA/RIR/RFA), was partially approved and implemented in November 1999 (GMFMC 1999). It set the MFMT for most reef fish stocks including hogfish at $F_{30\% \text{ SPR}}$. Estimates of maximum sustainable yield, MSST, and OY were disapproved because they were based on spawning potential ratio proxies rather than biomass based estimates.

The **Generic Annual Catch Limits/Accountability Measures Amendment** (GMFMC 2011a) established an ABC control rule for determining ABC from OFL. The control rule consisted of three tiers based on that information available for each stock, with tier 3 (no assessment available but landings data exist) divided into tier 3a (based on expert opinion of the SSC, the stock is unlikely to undergo overfishing) or tier 3b (based on expert opinion of the SSC, the stock is likely to undergo overfishing).

History of Management for the following FMPs to be added

Red Drum Fishery Management Plan

Coastal Migratory Pelagics Fishery Management Plan

Coral and Coral Reefs Fishery Management Plan

Spiny Lobster Fishery Management Plan

Shrimp Fishery Management Plan

CHAPTER 2. MANAGEMENT ALTERNATIVES

For purposes of developing a range of options, this discussion divides the acceptable biological catch (ABC) control rule into three parts.
- – Risk policy
- – ABC control rule (base)
- – Add-ons

The ABC control rule accounts for scientific uncertainty in the overfishing limit (OFL) and for the Gulf of Mexico (Gulf) Fishery Management Council's (Council) risk policy, and is based on a comprehensive analysis that shows how the control rule prevents overfishing (§ 600.310(f)(2)(i)).

The ABC control rule should consider reducing fishing mortality as stock size declines below B_{MSY} (the stock biomass level at maximum sustainable yield) and as scientific uncertainty increases, and may establish a stock abundance level below which fishing would not be allowed (§ 600.310(f)(2)(ii)).

The National Standard 1 (NS1) guidelines define a risk policy for ABC control rules as a policy decision made by the Council, based on the fishery management objectives (ecological, economic, and social) identified within the fishery management plan (FMP). The National Marine Fisheries Service (NMFS) believes that social and economic factors, as well as biological and ecological ones, are relevant when developing risk policies in light of a Council's fishery management objectives (comments section – response to comment 38).

The NS1 guidelines further state that the Council's risk policy could be based on an acceptable probability (at least 50%) that catch equal to the stock's ABC will not result in overfishing, but other appropriate methods can be used. When determining the risk policy, Councils could consider the economic, social, and ecological trade-offs between being more or less risk averse. The Council's choice of a risk policy cannot result in an ABC that exceeds the OFL (§ 600.310(f)(2)(i)).

2.1 Action 1 –Risk Policy

The alternatives in this section create a value that is applied to the base ABC control rule to determine either the ABC or the buffer between OFL and ABC. This value could be one of two types:

1. P* = A probability of overfishing, which is applied to a probability distribution function (PDF) of the OFL. Although P* is intended to be representative of the probability that ABC will be higher than the true OFL, it cannot realistically incorporate all sources of uncertainty, and therefore does not represent a true probability.

2. Q* = A qualitative multiplier that is applied to either the OFL or the formula used to determine OFL. For example, in the formula,

ABC = yield at 0.75 * F_{MSY} Q* = 0.75

The Q* is a qualitative measure of the relative risk. It does not represent a quantitative measure of the probability of overfishing.

Alternative 1a. No Action. Maintain the status quo risk policy (Figure 1 and Table 1).

- For Tier 1, determine a P* using the tier 1 spreadsheet (Figure 1). Apply the P* to a PDF to determine ABC.
- For Tier 2, 3a, and 3b, apply a fixed P* or multiplier as shown in Table 1

Alternative 1b. Revise the Status Quo risk policy.

- For Tier 1, determine a Q* using the revised tier 1 spreadsheet (Figure 2). Multiply OFL by the Q* to determine ABC.

- For Tier 2, replace the P* options with multiplier (Q*) options such as:
  - a. Q* = 85%
  - b. Q* = 75% (default)
  - c. Q* = 65%
  Set ABC = OFL * Q*
- Tier 3a remain status quo
- Tier 3b remove Option a

Alternative 2. Use a bin method to determine risk level. Bins are based on the status of the stock, importance to the fishery, biological characteristics, and/or other specifications. Stocks will be assigned a risk policy value depending on the bin for that the which a stock meets the qualifying specifications.

Option 2a. Use P* and apply to a PDF (Table 2)
Option 2b. Use Q* and apply to the OFL (Table 3)

Alternative 3. Use the method based on Ralston et al. (2011) (Ralston method) to determine P* and the CV for the PDF (Table 4).
<mark>(SSC recommended alternative for further consideration)</mark>

Alternative 4. Use a fixed risk policy parameter for all stocks.

> **Option 4a**. Use a fixed P* for all stocks (e.g., P* = 0.40). A PDF for each stock would be constructed, and the P* would be applied to that PDF to determine ABC.

> **Option 4b**. Use a fixed Q* for all stocks (e.g., Q* = 75%). For each stock where ABC is set, an OFL would be determined, and ABC would equal the OFL * Q*.

<mark>(SSC recommended this alternative and option with Q* = 75% for further consideration)</mark>

Alternative 5. Use a Q* based on 80:15 method as shown in Figure 3 (similar to PFMC method).

> **Option 5a**. Use P* for the y-axis and apply to a PDF (Table 2)
> **Option 5b**. Use Q* for the y-axis and apply to the OFL (Table 3)

Discussion:

Alternative 1a continues the risk policy for the existing ABC control rule, which consists of three tiers as shown in Figure 2.1.1 and Table 2.1.1. For Tier 1 stocks (a quantitative assessment provides an estimate of overfishing limit based on maximum sustainable yield), the risk policy is the spreadsheet shown in Figure 2.1.1. This spreadsheet provides qualitative scores on the level of information and three sources of uncertainty in the assessment. These scores are summed and compared to the maximum possible score, and are then re-scaled to a P* value that is between the minimum and maximum values selected by the Council as the range of possible values. The range of P* values can be adjusted, as can the weighting factors assigned to each of the components being evaluated. A PDF of the OFL is created by re-running the assessment output multiple times while varying some aspect of uncertainty, typically the natural mortality rate. On the resulting PDF, the 50% probability of overfishing is the OFL. The P* probability value from the spreadsheet is applied to the PDF to determine ABC.

In actual practice, the ABCs generated by this control rule have often been within 2% to 6% of the OFL. There are several reasons why the ABC may be this close to the OFL. One possible reason is the PDF is usually constructed by varying only one input parameter, the natural mortality rate. This results in a narrow distribution that fails to account for much of the uncertainty. Another possible reason is that the P* resulting from the spreadsheet is constrained to a narrow range of 0.30 to 0.50 representing the range of probabilities of overfishing approved by the Council. However, the full range of potential P* values under the National Standard 1 (NS1) guidelines could be from 0.01 to 0.50. Finally, the "level of information" component in the spreadsheet is over-weighted so that is has as much weight in the resulting P* as all of the

three remaining components combined. Because they are under-weighted, the remaining components of uncertainty have relatively little impact on the resulting P*, which generally results in values within a narrow range (e.g., 0.38 – 0.42). All of these shortcomings can be addressed by varying the settings in the spreadsheet or revising the way in which the PDF is constructed. However, the SSC concluded that any changes would be arbitrary and not based on science.

Tier 2 of the current ABC control rule is for stocks where the assessment does not provide an estimate of maximum sustainable yield (MSY) or its proxy, but where OFL can be determined from some alternative method. P* is selected from a fixed set of choices. As shown in Table 2.1.1, these choices are P* = 0.50, 0.40, or 0.30, with a default of 0.30 if no reason is given to select otherwise. In actual practice, a P* of 0.50 would result in ABC = OFL, which should rarely, if ever, occur under the NS1 guidelines. Furthermore, the SSC has rarely found a stock that meets the conditions for use of Tier 2. The SSC felt that, if the status quo ABC control rule is retained, Tier 2 should either be rewritten or eliminated.

Tier 3 of the status quo ABC control rule is divided into two sub-tiers. Tier 3 is used when only landings data are available. Tier 3a is for stocks that, in the expert opinion of the SSC, are unlikely to undergo overfishing at current or slightly higher landings levels. A mean and standard deviation (SD) of the landings is calculated for a period when there is no upward or downward trend (preferably 10 years, but not essential). Typically, the OFL is then set at the mean plus 2 SD, and the ABC is set at the mean plus 1 SD, although ABC can be set at some other multiplier of OFL as long as it does not exceed OFL.

Tier 3b is for stocks that, in the expert opinion of the SSC, may be unsustainable at current landings. As with Tier 3a, the mean of the landings is calculated for a period when there is no upward or downward trend (preferably 10 year, but not essential). The OFL is then set equal to the mean of the landings, and the ABC is set at a lower level selected from a fixed set of choices (100%, 85%, 75%, or 65% of the mean OFL) as shown in Table 2.1.1. The SSC thought that, if Tier 3b is retained, the choice of setting ABC = 100% of OFL should either be eliminated or reduced to 95%. Their rationale is that, if the stock is considered to be unsustainable at current catch levels, it makes no sense to set ABC at that level. Also, it would set ABC = OFL, which should rarely, if ever, occur under the NS1 guidelines.

Advantages and disadvantages of **Alternative 1a** are as follows:

> Pros:
> -Currently in use, no changes needed (but can be made)
> -Flexible. Dimensions and tiers can be given different weightings
> > Range of possible P* values can be adjusted (currently 0.3 to 0.5)
> -Addresses both level of information and uncertainty in specific assessment elements

> Cons:
> -PDF coeffiecent of variations (CVs) are lower (typically 0.10 – 0.20) than the assigned
> CVs in Option 1 (0.37+), thus contributing to narrower OFL-ABC buffers.
> -SSC members felt that the CVs did not adequately reflect scientific uncertainty.

-As currently configured, produces P* values within a narrow range,
-Dimensions and tiers can be reconfigured as noted above to produce wider buffers, but any reconfiguration would be arbitrary.

Alternative 1b is similar to **Alternative 1a**, except instead of calculating a P*, the Tier 1 spreadsheet calculates a Q*. Figure 2.1.2 shows the same spreadsheet as in Figure 2.1.1 except that P* has been replace with Q*, and the range of possible results has been changed to 50% to 100% of OFL. In the example shown in Figure 2.1.2, Q* = 0.763, so the resulting ABC would be 76.3% of OFL. For Tier 2, the selection of P* values would be replaced with a selection of Q* values (85%, 75%, or 65% of OFL). Tier 3 would remain unchanged except for the eliminating the option to set ABC = 100% of OFL. The remaining discussion of **Alternative 1a** also applies to **Alternative 1b**.

Advantages and disadvantages of **Alternative 1b** are similar to those of Alternative 1a except that revisions will be needed to tiers 1 and 2 to adapt the process to using Q*.

$$P^{*} = \exp\left[-a - b \sum_{i\,dimension} Dimension\ score_i\right] \qquad \textbf{P* = 0.410}$$

S_{hi} = 3.998
Maximum Risk **0.50**   a= 0.693
Minimum Risk **0.30**   b= 0.1277703

$$a = -\ln(0.50) \qquad b = -\frac{a + \ln(0.30)}{S_{hi}} \qquad S_{hi} = highest\ possible\ score$$

Element scores are scaled from zero to a maximum.
In this example the maximum is 2.00, but this can be changed

Dimension	Dimension Wt	Tier No.	Tier Wt	Element Score	Element	Score it	Element Result	Tier Result	Dimension Result
Assessment Information	1	1	1	0.00	Quantitative, age-structured assessment that provides estimates of exploitation and biomass; includes MSY-derived benchmarks.		0.67		0.67
				0.67	Quantitative, age-structured assessment provides estimates of either exploitation or biomass, but requires proxy reference points.	x		0.67	
				1.33	Quantitative, non-age-structured assessment. Reference points may be based on proxy.				
				2.00	Quantitative assessment that provides relative reference points (absolute measures of status are unavailable) and require proxies.				
Characterization of Uncertainty	1	1	.333	0.0	The OFL pdf provided by the assessment model includes an appropriate characterization of "within model" and "between model/model structure" error. The uncertainty in important inputs (such as natural mortality, discard rates, discard mortality, age and growth parameters, landings before consistent reporting) has been described with using Bayesian priors and/or bootstrapping and/or Monte Carlo simulation and the full uncertainty has been carried forward into the projections.		0.67		0.89
				0.67	The OFL pdf provided by the assessment model includes an approximation of observation and process error. The uncertainty in important inputs (such as natural mortality, discard rates, discard mortality, age and growth parameters, landings before consistent reporting) has been described with *SENSITIVITY RUNS* and the full uncertainty has been carried forward into the projections.	x		0.2231	
				1.33	The OFL pdf provided by the assessment model includes an incomplete approximation of observation and process error. The uncertainty in important inputs (such as natural mortality, discard rates, discard mortality, age and growth parameters, landings before consistent reporting) has been described with *SENSITIVITY RUNS* but the full uncertainty *HAS NOT* been carried forward into the projections.				
				2.0	The OFL provided by the assessment *DOES NOT* include uncertainty in important inputs and parameters.				
		2	.333	0.0	Retrospective patterns have been described, and are not significant.			2.0	
				1.0	Retrospective patterns have been described and are moderately significant.			0.666	
				2.0	Retrospective patterns *have not* been described *or* are large.	X			
		3	0	0.0				0	
					NOT USED			0	
						z			
		4	.333	0.0	Known environmental covariates are accounted for in the assessment.	x		0.0	
				1.0	Known environmental covariates are **partially** accounted for in the assessment.			0	
				2.0	Known environmental covariates *are not* accounted for in the assessment.				

Figure 2.1.1. Status quo spreadsheet for determining P* for tier 1 stocks (Option 1a)

$$M^* = \exp\left[-a - b \sum_{i\ dimension} Dimension\ score_i\right]$$

	S_{hi}= 3.998						**Q* = 0.763**		
Maximum Risk **1.00**	a= 0.000						Element scores are scaled from zero to a maximum.		
Minimum Risk **0.50**	b= 0.1733735		$a = -\ln(0.100)$ $b = -\dfrac{a+\ln(0.50)}{S_{hi}}$ S_{hi} = highest possible score				In this example the maximum is 2.00, but this can be changed		

Dimension	Dimension Wt	Tier No.	Tier Wt	Element Score	Element	Score it	Element Result	Tier Result	Dimension Result
Assessment Information	1	1	1	0.00	Quantitative, age-structured assessment that provides estimates of exploitation and biomass; includes MSY-derived benchmarks.		0.67		0.67
				0.67	Quantitative, age-structured assessment provides estimates of either exploitation or biomass, but requires proxy reference points.	x		0.67	
				1.33	Quantitative, non-age-structured assessment. Reference points may be based on proxy.				
				2.00	Quantitative assessment that provides relative reference points (absolute measures of status are unavailable) and require proxies.				
Characterization of Uncertainty	1	1	.333	0.0	The OFL pdf provided by the assessment model includes an appropriate characterization of "within model" and "between model/model structure" error. The uncertainty in important inputs (such as natural mortality, discard rates, discard mortality, age and growth parameters, landings before consistent reporting) has been described with using Bayesian priors and/or bootstrapping and/or Monte Carlo simulation and the full uncertainty has been carried forward into the projections.		0.67		0.89
				0.67	The OFL pdf provided by the assessment model includes an approximation of observation and process error. The uncertainty in important inputs (such as natural mortality, discard rates, discard mortality, age and growth parameters, landings before consistent reporting) has been described with *SENSITIVITY RUNS* and the full uncertainty has been carried forward into the projections.	x		0.2231	
				1.33	The OFL pdf provided by the assessment model includes an incomplete approximation of observation and process error. The uncertainty in important inputs (such as natural mortality, discard rates, discard mortality, age and growth parameters, landings before consistent reporting) has been described with *SENSITIVITY RUNS* but the full uncertainty *HAS NOT* been carried forward into the projections.				
				2.0	The OFL provided by the assessment *DOES NOT* include uncertainty in important inputs and parameters.				
		2	.333	0.0	Retrospective patterns have been described, and are not significant.		2.0		
				1.0	Retrospective patterns have been described and are moderately significant.			0.666	
				2.0	Retrospective patterns *have not* been described *or* are large.	X			
		3	0				0		
					NOT USED			0	
						z			
		4	.333	0.0	Known environmental covariates are accounted for in the assessment.	x	0.0		
				1.0	Known environmental covariates are **partially** accounted for in the assessment.			0	
				2.0	Known environmental covariates *are not* accounted for in the assessment.				

Figure 2.1.2. Revised spreadsheet for determining Q* for tier 1 stocks (Option 1b)

Table 2.1.1. Acceptable Biological Catch Control Rule as Approved in the Generic ACL/AM Amendment

Tier 1 Acceptable Biological Catch Control Rule	
Condition for Use	A quantitative assessment provides both an estimate of overfishing limit based on maximum sustainable yield or its proxy and a probability density function of overfishing limit that reflects scientific uncertainty. Specific components of scientific uncertainty can be evaluated through a risk determination table.
OFL	OFL = yield resulting from applying F_{MSY} or its proxy to estimated biomass.
ABC	The Council with advice from the SSC will set an appropriate level of risk (P*) using a risk determination table that calculates a P* based on the level of information and uncertainty in the stock assessment. ABC = yield at P*.
Tier 2 Acceptable Biological Catch Control Rule	
Condition for Use*	An assessment exists but does not provide an estimate of MSY or its proxy. Instead, the assessment provides a measure of overfishing limit based on alternative methodology. Additionally, a probability density function can be calculated to estimate scientific uncertainty in the model-derived overfishing limit measure. This density function can be used to approximate the probability of exceeding the overfishing limit, thus providing a buffer between the overfishing limit and acceptable biological catch.
OFL	An overfishing limit measure is available from alternative methodology.
ABC	Calculate a probability density function around the overfishing limit measure that accounts for scientific uncertainty. The buffer between the overfishing limit and acceptable biological catch will be based on that probability density function and the level of risk of exceeding the overfishing limit selected by the Council. 　　　　d.　Risk of exceeding OFL = 50% (P* = 0.50) 　　　　e.　Risk of exceeding OFL = 40% (P* = 0.40) 　　　　f.　Risk of exceeding OFL = 30% (P* = 0.30) (default) Set ABC = OFL − buffer at risk of exceeding OFL
Tier 3a Acceptable Biological Catch Control Rule	
Condition for Use*	No assessment is available, but landings data exist. The probability of exceeding the overfishing limit in a given year can be approximated from the variance about the mean of recent landings to produce a buffer between the overfishing limit and acceptable biological catch. Based on expert evaluation of the best scientific information available, recent historical landings are without trend, landings are small relative to stock biomass, or the stock is unlikely to undergo overfishing if future landings are equal to or moderately higher than the mean of recent landings. For stock complexes, the determination of whether a stock complex is in Tier 3a or 3b will be made using all the information available, including stock specific catch trends.
OFL	Set the overfishing limit equal to the mean of recent landings plus two standard deviations. A time series of at least ten years is recommended to compute the mean of recent landings, but a different number of years may be used to attain a representative level of variance in the landings.

ABC	Set acceptable biological catch using a buffer from the overfishing limit that represents an acceptable level of risk due to scientific uncertainty. The buffer will be predetermined for each stock or stock complex by the Council with advice from the SSC as: a. ABC = mean of the landings plus 1.5 * standard deviation (risk of exceeding OFL = 31%) b. ABC = mean of the landings plus 1.0 * standard deviation (default) (risk of exceeding OFL = 16%) c. ABC = mean of the landings plus 0.5 * standard deviation (risk of exceeding OFL = 7%) d. ABC = mean of the landings (risk of exceeding OFL = 2.3%)

Tier 3b Acceptable Biological Catch Control Rule	
Condition for Use*	No assessment is available, but landings data exist. Based on expert evaluation of the best scientific information available, recent landings may be unsustainable.
OFL	Set the overfishing limit equal to the mean of landings. A time series of at least ten years is recommended to compute the mean of recent landings, but a different number of years may be used to attain a representative level of variance in the landings.
ABC	Set acceptable biological catch using a buffer from the overfishing limit that represents an acceptable level of risk due to scientific uncertainty. The buffer will be predetermined for each stock or stock complex by the Council with advice from its SSC as: e. ABC = 100% of OFL f. ABC = 85% of OFL g. ABC = 75% of OFL (default) h. ABC = 65% of OFL

Alternative 2 uses a bin (or bucket) method to select either P* (**Option 2a**, Table 2.1.2) or Q* (**Option 2b**, Table 2.1.3). In either case, the table runs from most conservative (top) to least conservative (second from bottom), with a catch-all category at the bottom for stocks that don't fit elsewhere. This is a qualitative process based on the "bin" method suggested during an SSC meeting and accepted conceptually by the Council in June 2012. The specific bins, P* or Q* values, and stocks assigned to each bin are preliminary and subject to revision.

The concept of risk includes not only the probability of a negative result occurring, but also the value of the loss associated with that negative result. In the bins, this is taken into account in a qualitative manner (e.g., "highly desired stocks" infers that there will be a greater loss if the stock experiences overfishing due to the demand, while "highly resilient" infers that there will be a smaller loss because of the stock's ability to quickly rebound from an overfishing condition).

Advantages and disadvantages of **Alternative 2** are as follows:

Pros:

-Transparent. Specifications are easy to understand.

- Socioeconomic considerations can be incorporated into the risk policy selection

Cons:

- No direct reference to model uncertainty.

-The decision as to what P* or Q* to assign each category is subjective.

[Need to add other species to table]

Table 2.1.2. Assignment of Risk Level Probability (P*) based on bin method (Option 2a)

P* = 0.30	•**Overfished Stocks not meeting rebuilding schedule , no schedule established, or progress unknown** • Gray triggerfish, Greater amberjack, Red drum
P* = 0.34	•**Overfished Stocks meeting rebuilding schedule** •Red snapper
P* = 0.38	•**Overfished Stocks ahead of rebuilding schedule** •none
P* = 0.42	•**Not overfished, but experiencing overfishing** •none
P* = 0.46	•**Neither overfished nor overfishing - Highly desired stocks** •Mutton snapper, Gray snapper, Yellowtail snapper, Vermilion snapper, Red grouper, Black grouper, Gag, Scamp, Hogfish, King mackerel, Spanish mackerel, Cobia
P* = 0.50	•**Other - Highy Resilient (PSA risk score < 2.50**) •none
P* = 0.40	•**All other** •Queen snapper, Blackfin snapper, Cubera snapper, Lane snapper, Silk snapper, Wenchman, Speckled hind, Yellowedge grouper, Warsaw grouper, Snowy grouper, Yellowmouth grouper, Yellowfin grouper, Goldface tilefish, Blueline tilefish, Tilefish, Lesser amberjack, Almaco jack, Banded rudderfish

Table 2.1.3. Assignment of Risk Level Multiplier (Q*) based on bin method (Option 2b)

Q*	Category
Q* = 50%	• **Overfished Stocks not meeting rebuilding schedule , no schedule established, or progress unknown** • Gray triggerfish, Greater amberjack, Red drum
Q* = 55%	• **Overfished Stocks meeting rebuilding schedule** • Red snapper
Q* = 65%	• **Overfished Stocks ahead of rebuilding schedule** • none
Q* = 76%	• **Not overfished, but experiencing overfishing** • none
Q* = 85%	• **Neither overfished nor overfishing - Highly desired stocks** • Mutton snapper, Gray snapper, Yellowtail snapper, Vermilion snapper, Red grouper, Black grouper, Gag, Scamp, Hogfish, King mackerel, Spanish mackerel, Cobia
Q* = 95%	• **Other - Highy Resilient (PSA risk score < 2.50)** • none
Q* = 75%	• **All other** • Queen snapper, Blackfin snapper, Cubera snapper, Lane snapper, Silk snapper, Wenchman, Speckled hind, Yellowedge grouper, Warsaw grouper, Snowy grouper, Yellowmouth grouper, Yellowfin grouper, Goldface tilefish, Blueline tilefish, Tilefish, Lesser amberjack, Almaco jack, Banded rudderfish

Alternative 3 is based on the "Ralston method", described by Ralston et al. (2011), as shown in Table 2.1.4. This is one of two methods that the SSC recommended at its August 2014 meeting for further consideration by the Council. This method is only applicable to the P* risk policy. The PDF is constructed using a CV that is set based on the level of information used to estimate OFL. The less information available, the greater the CV value, resulting in a wider PDF and lower ABC at a given P*. The P* could also be varied for each level of information, but the SSC thought it would be simpler to use a fixed P* value for all levels. At a P* of 0.4, this method would result in ABCs that are reduced from OFL by 15% to 80% (Figure 2.1.3).

Advantages and disadvantages of **Alternative 3** are as follows:

Pros:
-Simpler than the current method
-Multiplier for the CV is based on scientific information available, albeit from a meta-
 analysis of Pacific stocks

Cons:
- Model specification and estimation error are the only sources of uncertainty accounted
  for in this method.
-The decision as to what CV multiplier to assign each category is subjective.
-Deriving CVs that are specific to Gulf stock assessments will be time- and effort-
  intensive

- Method is only applicable to stocks for which a PDF can be constructed, i.e., Tier 1 and tier 2 stocks (SSC members disagreed on whether a PDF could be constructed for Tier 3 stocks)
-Having constant percent reduction from OFL to ABC might be problematic from a management perspective as the spawning stock biomass (SSB) increased above the SSB at maximum sustainable yield (SSB_{MSY})

Table 2.1.4. Acceptable Biological Catch Control Rule – Option 3

1. The Gulf Council selects a P* to apply generically among stocks, or stock-specific P* values. *Note: in the example here, a default P* = 0.4 is used given this is the mid-point of the Council's probability of overfishing range of 0.3 to 0.5.*
2. An assessment is performed to estimate OFL based on reliable available data.
3. The table below is utilized to determine the appropriate CV to estimate the PDF of OFL, which is normally distributed with mean = OFL and CV determined from the table.

Table utilized to select coefficient of variation of OFL PDF:

Stock category	Types of Information Utilized to Estimate OFL	P*	☐Coefficient of Variation Utilized to Estimate Buffer Between OFL and ABC
1	Catch, fishery independent surveys detailed life history age/length composition, standardized CPUE/effort	0.4	0.37
2	Catch, detailed life history age/length composition, standardized CPUE/effort	0.4	0.58
3	Catch, detailed life history [age/length composition or indices of abundance]	0.4	0.81
4	Catch, basic life history, qualitative indicators of stock status (OFL set as a multiple of average catch)	0.4	1.49
5	Insufficient info.	0.4	2.64

Note: If the SSC concludes that important structural uncertainties have not been adequately addressed, such as might be caused by a significant environmental perturbation or a large portion

of a stock's distribution or landings are not being accounted for in the data or model, then the CV utilized to compute the buffer between OFL and ABC may be increased to reflect this type of scientific uncertainty. This method is modified from the method described in Ralston et al. (2011).
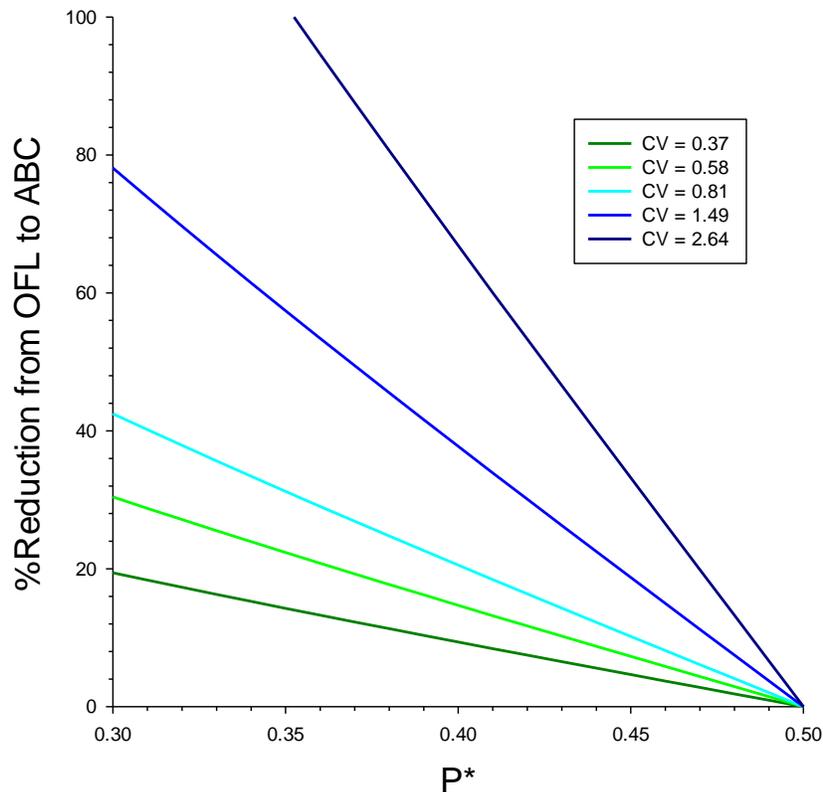

Figure 2.1.3 Percent reduction from OFL to ABC under various CV and P* levels **the Martell and Froese (2012) method.**

Alternative 4 uses a fixed risk policy value for all stocks, either P* (**Option 4a**) or Q* (**Option 4b**). This is one of two methods that the SSC recommended at its August 2014 meeting for further consideration by the Council. A value for either P* or Q* would be selected at the time this method is adopted, and would thereafter be applied to all stocks. For example:

- Under **Option 4a**, P* = 0.40 might be selected as the fixed value. A PDF for each stock where ABC is being set would be constructed, and a P* = 0.40 would be applied to that PDF to determine ABC.
- Under **Option 4b**, Q* = 0.75 might be selected as the fixed value. For each stock where ABC is being set, an OFL would be determined, and ABC would equal 75% of OFL.

The above examples are for illustration only. The Council would select whichever fixed P* or Q* it chooses.

Advantages and disadvantages of **Alternative 4** are as follows;

Pros:
-Simplest approach
-Can be applied to both data-rich and data-poor stocks
-Uncertainty is implied, no need to explicitly and arbitrarily describe
-Often results in a larger OFL-ABC buffer initially (could be either a pro or con) but ABC approaches OFL as the stock biomass increases above SSB_{MSY}
-Results in a larger SSB at equilibrium.
-Can be used to combine scientific uncertainty (ABC) and management uncertainty (ACL/ACT) into a single approach

Cons:
-Uses the same formula as for optimum yield (OY). No differentiation between limit (ABC) and target (OY) values, but this can be solved by the approach indicated above
-Mixes scientific advice with management policy

Alternative 5 uses a method similar to the Pacific Fishery Management Council. It is a graphical based method (Figure 2.1.4). The risk policy value (P* or Q*) is at a high (least conservative) value as long as the stock biomass is above the minimum stock size threshold (MSST), indicating a relatively small buffer between OFL and ABC. If the stock biomass drops below MSST, the risk policy value is reduced along a declining slope, becoming more conservative (resulting in a larger ABC buffer) with lower biomass levels. If the biomass drops to some minimum level, the risk policy value drops to zero, indicating an ABC = 0. In the other direction, the buffer becomes smaller as the stock recovers to MSST and above. In the example shown in Figure 2.1.4, the buffer is always at least 20% below OFL, and the ABC drops to zero if the biomass drops to 15% of its MSY level. These parameters can be adjusted, and the method can be applied to either P* (**Option 5a**) or Q* (**Option 5b**).

Advantages and disadvantages of **Alternative 5** are as follows;

Pros:
-Risk policy level can vary with stock status
-The only method that allows setting ABC = 0 at a certain point

Cons:
-Requires that stock be assessed using a method that can determine biomass level relative to biomass at maximum sustainable yield (B_{MSY}).
-Does not account for model uncertainty.
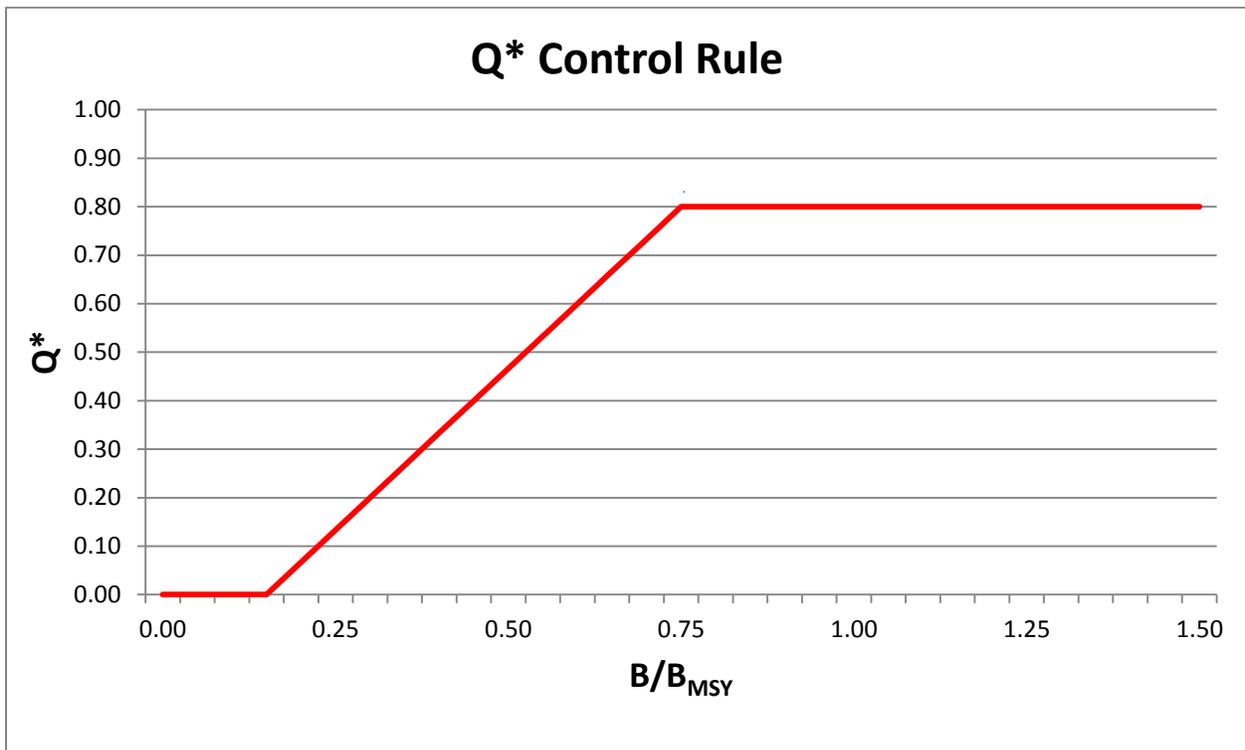
Figure 2.1.4. Q* control rule based on PFMC method.

In this example, MSST = 0.75*OFL, and the minimum Biomass where fishing is allowed is 0.15*OFL. The multiplier will always be 0.80 or smaller.

- − If the biomass is above MSST, then $Q^* = 0.8$
- − If the biomass is between 15% and 75% of B_{MSY}, then then
  $Q^* = (slope * (B-B_{MIN}))+Q^*_{MIN}$
- − If the biomass is 15% or less of B_{MSY}, then $Q^* = 0$
- − Q^*_{MIN} and Q^*_{MAX} can be adjusted

2.2 Action 2 – Base ABC Control Rule

If a P* risk policy is used, it is necessary to construct a PDF and apply the P* to the PDF to determine ABC. Guidance for construction of the PDF is as follows:

Alternative 1. No Action. Do not provide guidance in the construction of a PDF.

Alternative 2. Construct a PDF using an externally derived estimate of standard deviation, also known as sigma (σ).
> **Option 2a**. $\sigma = 0.37$ for all stocks
> **Option 2b**. $\sigma =$ the average standard deviation for all Gulf stock assessments as calculated by the SEFSC
> **Option 2c**. $\sigma =$ fixed values pre-assigned by stock (SSC will develop a table of stocks and assigned σs)
> **Option 2d**. $\sigma =$ the value determined by the risk policy (where applicable)

Alternative 3. If a Q* risk policy is used, the base ABC control rule is the OFL or the yield at F_{MSY}. For rebuilding stocks, the base is the yield at $F_{REBUILD}$. ABC = base yield * Q*. For example, if the multiplier from Action 1 is 0.75, the ABC = yield at 0.75 * F_{MSY} (or proxy).

Discussion:

The selection of the ABC control rule base is straightforward. If a risk policy is selected in Action 1 that utilizes P* (probability of overfishing), then that P* is applied to a PDF (Figure 2.1.5) to determine the ABC.

The ABC is dependent not only on the P* value, but also on the shape of the PDF curve, which can change depending on which variables are selected to vary in Monte Carlo simulations. The purpose of this action is to determine whether to establish guidance on the construction of PDFs.

Under **Alternative 1**, there is no formal guidance for constructing PDFs. Construction of a PDF is left to the judgement of the SSC and SEFSC (or other appropriate analytical agency). The current method used to construct the PDF curve usually relies on varying only the input for the natural mortality rate. This can result in a small σ that captures only a small portion of the total scientific uncertainty, resulting in a shallow PDF curve which varies little from the OFL value except at extreme P* values.

Alternative 2 establishes guidance on the construction of PDFs by specifying how σ is selected. **Option 2a** uses an external σ of 0.37 for all stocks. Using an external σ value allows a PDF to be constructed even if there is no stock assessment with an estimate of MSY or its proxy. This value came from the Pacific Council, which calculated an average σ for all of its stock assessments. This is a time consuming effort that may be difficult to replicate for Gulf stocks. The SSC suggested that, given the large number of stocks from which the Pacific $\sigma = 0.37$ value was determined, it is likely that this is a universal value that can be applied to all stocks. However, this theory has not been evaluated.
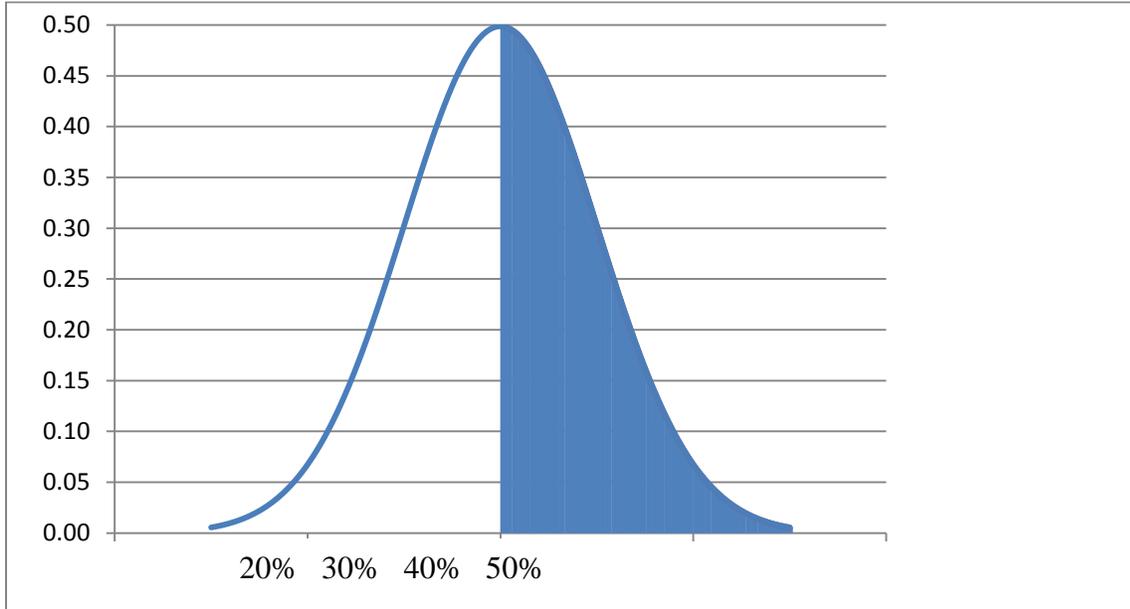
Figure 2.1.5. A hypothetical PDF. X-axis is the P*. Y-axis would be the ABC.

Alternative 2, **Option 2b** uses a fixed value for σ that is derived by the SEFSC from evaluating Gulf stocks. This is similar to **Option 2a**, except that the σ value which would be generated is specific to Gulf stocks. As discussed above, this is a time consuming effort, and may require that many older stock assessments be re-run in order to generate the appropriate values. If this option is selected, the SEFSC would need to determine the feasibility given the number and type of past assessments conducted for the Gulf.

Alternative 2, **Option 2c** would have the SSC assign σ values on a stock by stock basis using the best judgement of the SSC and SEFSC. If this option is selected, the resulting table of σ values should be included in this amendment before it is finalized.

Alternative 2, **Option 2d** is only applicable if a risk policy is selected in Action 1 that includes selection of σ. This would apply only to Alternative 3 in Action 1, which uses a method based on Ralston et al. (2011).

Alternative 3 would be used if a qualitative multiplier (Q*) risk policy method is used. No options are necessary for **Alternative 3** because of the simplicity of the ABC control rule base when using this risk policy. The Q* would be a value between 0 and 1. The OFL, or the rebuilding yield for a rebuilding stock, would be multiplied by the Q* to determine the ABC.

2.3   Action 3 – Add-ons to the ABC Control Rule

These are adjustments to the ABC determined in Action 2. They could be multiplier values or additions/subtractions to/from the ABC.

2.3.1 Action 3.1 – Establishment of a Carry-Over Provision to Harvest Uncaught Quota in the Gulf of Mexico (Gulf)

Alternative 1: No Action.

Alternative 2: Allow carryover of any uncaught quota from a previous fishing year for stocks in the Reef Fish, Red Drum, CMP, Spiny Lobster, Shrimp, and Coral and Coral Reefs FMPs. Any quota not harvested upon the closure of a fishery because the ACL or ACT was projected to be met will be considered for carry-over to the following fishing year. Quota carried over will be added to the ACL for the next year, up to the current ABC. The ACT and quota, if applicable, will be adjusted appropriately (i.e., if there was leftover quota in 2017, the carry-over of unharvested quota would be applied in 2018).

Alternative 3: Modify the ABC Control Rule to establish a carry-over provision for uncaught quota from a previous fishing year for stocks in the Reef Fish, Red Drum, CMP, Spiny Lobster, Shrimp, and Coral and Coral Reefs FMPs. Any quota determined to have not been harvested upon the closure of a fishery because the ACL or ACT was projected to be met will be considered for carry-over to the following fishing year. Quota carried over will be added to the following year's ABC, up to some percentage of the OFL, to prevent overfishing (Options 3a – 3c). The ACL, ACT and quota, if applicable, will be adjusted appropriately. Remaining quota may only be carried over to the individual fishing component(s) (commercial or recreational; recreational for-hire, and/or private recreational) from which the remaining quota originally went unharvested in the previous fishing year.
> **Option 3a**: New ABC may not exceed 95% of OFL
> **Option 3b**: New ABC may not exceed 90% of OFL
> **Option 3c**: New ABC may not exceed 85% of OFL

Discussion:

Alternative 1 would not establish a carry-over provision for uncaught quota from a previous fishing year. The ABC and sector ACLs prescribed for a given fishing year will remain in effect unless otherwise modified by the Council. **Alternative 1** would likely be more beneficial to the timely completion of a rebuilding plan (where applicable) in years where an ACL underage exists, as opposed to carrying the foregone yield from that fishing year over to a subsequent fishing year.

Alternative 2 would allow carry-over of uncaught quota in the Reef Fish, Red Drum, CMP, Spiny Lobster, Shrimp, and Coral FMPs for those stocks with an ACL below the ABC, or with an ACT or quota below the ABC (harvest of red drum is not currently allowed in federal waters, but could be in the future). The Magnuson-Stevens Act does not allow the ACL to exceed the

ABC; therefore, a stock with an ACL = ABC cannot have a carryover without increasing the ABC for the next year. However, if landings are below the ABC because the ACL is less than the ABC, or an ACT or quota is used, then underages can be carried over, so long as the ACL for the next year does not exceed the ABC. Because **Alternative 2** does not require a recommendation from the SSC, it can be implemented more quickly than a carry-over method which requires input from the SSC.

Alternative 3 would modify the ABC Control Rule to establish a carry-over provision for uncaught quota from a previous fishing year for stocks in in the Reef Fish, Red Drum, CMP, Spiny Lobster, Shrimp, and Coral FMPs (harvest of red drum is not currently allowed in federal waters, but could be in the future). A carry-over would only be considered for those species with an accepted quantitative stock assessment from which projections for OFL and ABC are based. Further, the carry-over would only be applied in the event that the previous fishing year for a species was closed due to the ACL being projected to be met, after which the preliminary landings data for that fishing year indicate that some amount of allowable harvest was not caught. Limiting the circumstances under which a carry-over can be applied helps to reduce the probability of overfishing the stock in a carry-over year (a year when a carry-over is applied). This protection is especially necessary for stocks which may be under a rebuilding plan.

Any quota remaining after the conclusion of a fishing year would be considered for carry-over to the next fishing year only, and only to the individual fishing component(s) (commercial, recreational for-hire, and/or private recreational) from which the remaining quota went unharvested. For example, if a certain amount of quota went unharvested in a given fishing year from the commercial sector's ACL, then that unharvested quota (however adjusted) could be carried over to the commercial sector's ACL in the subsequent fishing year. A fishing sector or, where applicable, sector component, is only eligible to receive a carry-over from its own unharvested quota, regardless of whether another component within a sector met its quota. Options for fixing the revised ABC for a given fishing year (the original ABC plus the amount of quota to be carried over) are presented in **Options 3a – 3c**. Fixing a buffer between the ABC and OFL in years when quota is carried over will decrease the probability of overfishing in carry-over years.

If a carry-over provision is implemented, in accordance with the NS1 guidelines the Council should evaluate the appropriateness of applying the carry-over provision for stocks that are overfished and/or rebuilding, as the overriding goal for such stocks is to rebuild them in as short a time as possible. If the combined sector landings *exceed* the sector ACL, there will be no carry-over, even if one sector component did not harvest its quota for that fishing year. Concurrently, if the combined sector landings *did not exceed* the sector ACL, then the sector component(s) which did not harvest its (their) quota for that fishing year may have a carry-over not to exceed the difference between the projected landings and the sector ACL for the following fishing year. Any such carry-over will be allocated proportionate to the foregone yield by sector component.

2.3.2 Action 3.2 – Adjustments for a Carry-Over Provision to Harvest Uncaught Quota in the Gulf

Alternative 1: No Action. Do not establish adjustment parameters for a carry-over provision to harvest uncaught quota in the Gulf. The ABC and ACL levels prescribed for a given year will remain in effect unless otherwise modified by the Council. Any amount of quota to be carried over and applied to the following fishing year would be applied in full.

Alternative 2: Reduce the amount of quota to be carried over from a previous fishing year to the following fishing year by the mean natural mortality rate of the subject species as used in the most recent accepted quantitative stock assessment.

Alternative 3: Reduce the amount of quota to be carried over from a previous fishing year to the following fishing year by an amount which accounts for management uncertainty.
>   **Option 3a:** Reduce the amount of quota to be carried over by 5%
>   **Option 3b:** Reduce the amount of quota to be carried over by 10%
>   **Option 3c:** Reduce the amount of quota to be carried over by 15%

Alternative 4: The Council's SSC will determine the appropriate adjustment (if any) to the ABC for the following fishing year. The Council will then determine the appropriate ACLs and ACTs (if used for management) to set harvest levels for the eligible fishery components.

Discussion:

Action 3-2 provides for elective adjustments to any quota which is eligible to be carried over to the following fishing year. The updated NS1 guidelines recommend corrections for factors such as natural mortality, and for other parameters as appropriate. Action 3-2 provides the Council with the opportunity to make such adjustments to any quota eligible to be carried over from one fishing season to the following fishing season.

Alternative 1 would not establish adjustment parameters for a carry-over provision, and any amount of quota to be carried over to the following fishing year would be applied in full. For example, if 100,000 lbs is available to be carried over from the 2017 fishing year to the 2018 fishing year, then all 100,000 lbs would be carried over. This alternative does not account for natural mortality, episodic mortality events, or other sources of variance which might affect the amount of quota which can be carried over without adversely affecting a given stock or, if applicable, that stock's rebuilding plan.

Alternative 2 would reduce the amount of quota to be carried over from the previous fishing year to the following fishing year by the mean natural mortality rate of the subject species as used in the most recent accepted quantitative stock assessment. For example: if a species has a mean natural mortality rate of 11%, and 100,000 lbs of quota is eligible to be carried over to a particular fishing sector, then the final amount to be carried over to that sector would be 89,000 lbs (100,000 lbs minus 11%, or 11,000 lbs). An adjustment for natural mortality is recommended under the revised NS1 guidelines; not making this adjustment may necessitate a record of why it was not being applied.

Alternative 3 would reduce the amount of quota to be carried over from the previous fishing year to the following fishing year by an amount which accounts for management uncertainty. Options for this adjustment include 5% (**Option 3a**), 10% (**Option 3b**), and 15% (**Option 3c**). This adjustment would be based on factors not necessarily related to biological uncertainty. Reasons to make such an adjustment to the carry-over may include uncertainty in catch data (proportional standard error), changes to the regulatory environment, a recent increasing trend in fishing effort, or other factors.

Alternative 4 would task the Council's SSC with determining the appropriate adjustment (if any) to the quota to be carried over for the following fishing year. The SSC would review appropriate data for the species in question, and would make a revised ABC recommendation for the following fishing year only. The SSC would also supply the Council with a justification of its recommendation, outlining the reason for any adjustments to the amount originally eligible to be carried over. The Council would then determine the appropriate ACLs and ACTs (if used for management) to set harvest levels for the eligible fishery components.

2.3.3 Action 3.3 – Three Year Phase-in of Changes to ABC

Alternative 1: No Action – Do not provide for a phase-in of changes to an ABC.

Alternative 2: Changes to an ABC may be implemented gradually over a period not to exceed three years, except that ABC cannot exceed OFL in any year. If under this phase-in ABC would exceed OFL or come within less than 5% of OFL in any year, reduce the ABC from the linear phase-in so that it is 5% below OFL in any year. This phase-in may only be applied to stocks that are not in a rebuilding plan.

<u>Discussion</u>

The revised NS1 guidelines state that large changes in catch limits due to new scientific information about the status of the stock can have negative short-term effects on a fishing industry. To help stabilize catch levels as stock assessments are updated, a Council may choose to develop a control rule that phases in changes to ABC over a period of time, not to exceed years, as long as overfishing is prevented each year (i.e., the phased-in catch level cannot exceed the OFL in any year) (Figure 2.3.2.1).

If such a provision is allowed, the NS1 guidelines state that the Council must articulate within its FMP when the phase-in and/or carry-over provisions of the control rule can and cannot be used. Also, Councils should evaluate the appropriateness of phase-in provisions for stocks that are overfished and/or rebuilding, as the overriding goal for such stocks is to rebuild them in as short a time as possible.

Alternative 1 does not implement any provision for a phase-in. Changes to an ABC must adhere to the ABCs recommended by the SSC for each year. For stocks that are not overfished or undergoing overfishing, changes in ABC are likely to be relatively small from year to year, negating the need for a phase-in. However, changes in information about the biology of the stock (e.g., changes in recruitment, growth rates, and natural mortality rates) could result in larger changes in an ABC.

Alternative 2 allows an ABC phase-in of up to three years, but only for stocks that are neither overfished nor undergoing overfishing. ABC cannot exceed the OFL, so in years where this would occur under the phase-in, or where the buffer between OFL and ABC would be less than 5%, the phase-in ABC would be adjusted so that it is 5% below the OFL. An SSC member noted in January 2017 that the original ABC yield streams recommended by the SSC assume that the ABC level of catch will be taken. In a declining ABC yield stream, the phase-in will result in adjusted ABCs during the phase-in period that are higher than the SSC projections. Consequently, the increased ABCs during the phase-in period will lead to reduced ABCs from original projections in subsequent years. This would be more consequential for stocks that are rebuilding than for stocks that are not overfished; as such, **Alternative 2** does not allow the phase-in to be used for stocks that are rebuilding.
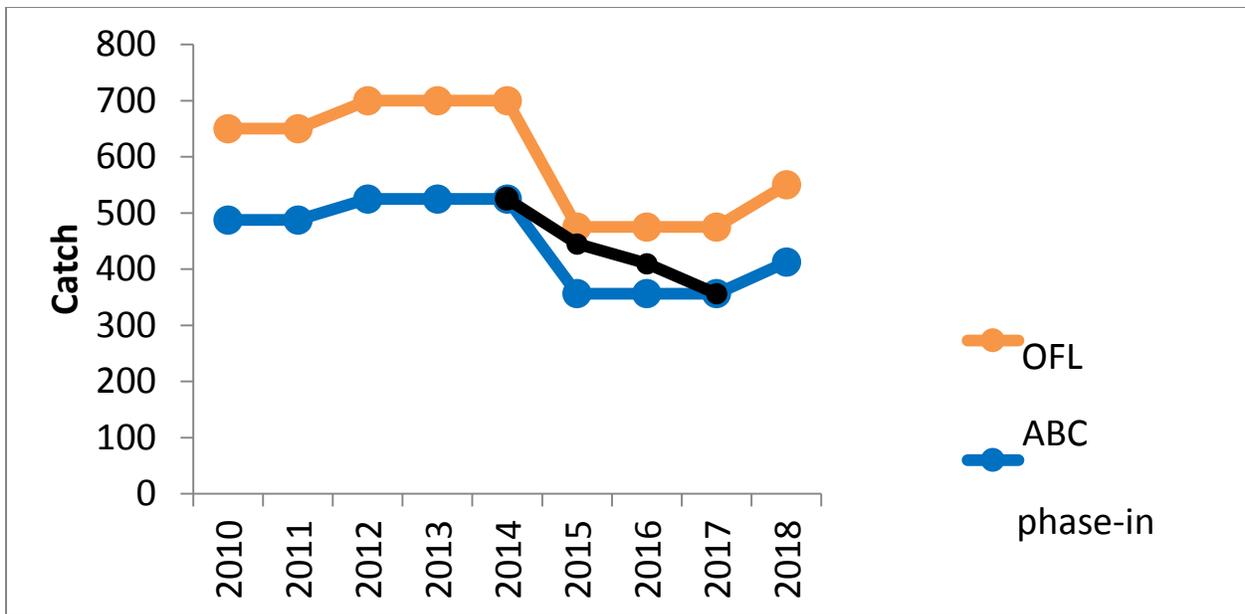
Figure 2.3.3.1. 3-year ABC phase-in control rule

2.3.4 Action 3.4 – Socioeconomic Adjustments to the ABC

Alternative 1: No Action – Do not modify the ABC control rule to account for socioeconomic considerations.

Alternative 2. Develop a process for adjusting ABC to account for socioeconomic considerations. Any adjustment to the ABC may not exceed the OFL.
Note: Such process, and how that process will adjust the ABC, will be developed with the assistance of the SSC.

Discussion:

The revised NS1 guidelines state that economic, social, or ecological trade-offs could be evaluated when determining the risk policy for an ABC control rule. However, the guidelines also state that ACL (or ACT) could be set lower than the ABC to account for ecological, economic, and social factors (e.g., needs of forage fish, promoting stability, addressing market conditions, etc.).

Social factors listed in the NS1 guidelines that could be considered include, but are not limited to:
  – Enjoyment gained from recreational fishing;
  – Avoidance of gear conflicts and resulting disputes;
  – Preservation of a way of life for fishermen and their families; and
  – Dependence of local communities on a fishery (e.g., involvement in fisheries and ability to adapt to change)

Economic factors listed in the NS1 guidelines that could be considered include, but are not limited to:
  – Prudent consideration of the risk of overharvesting when a stock's size or reproductive potential is uncertain;
  – Satisfaction of consumer and recreational needs;
  – Encouragement of domestic and export markets for U.S. harvested fish;
  – The value of fisheries;
  – The level of capitalization;
  – The decrease in cost per unit of catch afforded by an increase in stock size;
  – The attendant increase in catch per unit of effort;
  – Alternate employment opportunities; and
  – Economic contribution to fishing communities, coastal areas, affected states, and the nation

Alternative 1 would not adjust the ABC to account for social or economic considerations. This would not prevent such considerations from being taken into account when setting an ACL or ACT. Furthermore, some of the risk policy alternatives in Action 1 (specifically, Action 1, Alternative 2) may already include some socioeconomic considerations when selecting P* or Q*.

Alternative 2 would develop a process to adjust ABC based on socioeconomic considerations, provided that any such adjustment may not exceed OFL. If the Council chooses to consider this alternative further, a process for socioeconomic adjustments to ABC will be developed by Council staff with the assistance of the SSC.

2.4 Action 4 – Modify the Framework Procedures for the Gulf Council FMPs

Alternative 1. No Action. Do not adjust the framework procedures.

Alternative 2. Modify the closed framework procedures for the Reef Fish FMP and the Coastal Migratory Pelagics (CMP) FMP to allow the Regional Administrator (RA) to adjust the annual catch limit (ACL), annual catch target (ACT), and quota for a stock (as selected in Action 3) to account for carryover of unused ACL. The amount of the ACL adjustment will be determined by the ABC control rule (as modified in Action 2). See highlighted sections below.

Closed Framework:

Consistent with existing requirements in the FMP and implementing regulations, the RA is authorized to conduct the following framework actions through appropriate notification in the Federal Register:

1. Close or adjust harvest of any sector of the fishery for a species, sub-species, or species group that has a quota or sub-quota at such time as projected to be necessary to prevent the sector from exceeding its sector-quota for the remainder of the fishing year or sub-quota season;
2. Reopen any sector of the fishery that had been prematurely closed;
3. Implement an in-season AM for a sector that has reached or is projected to reach, or is approaching or is projected to approach its ACL, or implement a post-season AM for a sector that exceeded its ACL in the current year.
4. Adjust the ACL, ACT, and quota for a species, sub-species, species group, sector, or component of a sector to account for carryover of unused ACL, as determined by the ABC control rule.

Alternative 3. Modify the abbreviated framework procedures for the Reef Fish, Coastal Migratory Pelagics, Red Drum, Coral and Coral Reefs, Spiny Lobster and Shrimp FMPs to allow specification of an ABC recommended by the SSC based on results of a new stock assessment and using the ABC control rule. See highlighted sections below.

Abbreviated documentation process:

Regulatory changes that may be categorized as routine or insignificant may be proposed in the form of a letter or memo from the Council to the Regional Administrator containing the proposed action, and the relevant biological, social and economic information to support the action. If multiple actions are proposed, a finding that the actions are also routine or insignificant must also be included. If the Regional Administrator concurs with the determination and approves the proposed action, the action will be implemented through publication of appropriate notification in the Federal Register. Actions that may be viewed as routine or insignificant include, among others:

xiii. Specification of ABC, MSY, OY, and associated management parameters (such as overfished and overfishing definitions) where new values are calculated based on previously approved specifications,

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Alternative 4. Revise the framework procedures for the Reef Fish, Coastal Migratory Pelagics, Red Drum, Coral and Coral Reefs, Spiny Lobster and Shrimp FMPs to have consistent terminology and format, and to include changes to the standard framework procedure for the Red Drum, Coral and Coral Reef, and Spiny Lobster FMPs to include accountability measures. See highlighted sections below for additions to the Red Drum and Coral and Coral Reef FMPs.

Standard documentation process:

Regulatory changes that do not qualify as a routine or insignificant may be proposed in the form of a framework document with supporting analyses. Non routine or significant actions that may be implemented under a framework action include:

vi. Implementation or changes to in-season accountability measures
1. Closure and closure procedures
2. Trip limit implementation or change
3. Designation of an existing limited access privilege program as the accountability measure for species in the IFQ program
4. Implementation of gear restrictions

vii. Implementation or changes to post-season accountability measures
5. Adjustment of season length
6. Implementation of closed seasons/time periods
7. Adjustment or implementation of bag, trip, or possession limit
8. Reduction of the ACL/ACT to account for the previous year overage
9. Revoking a scheduled increase in the ACL/ACT if the ACL was exceeded in the previous year
10. Implementation of gear restrictions
11. Reporting and monitoring requirements

Note: The Council may choose Alternatives 2, 3 and 4 as preferred alternatives.

CHAPTER 3. REFERENCES

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APPENDIX A: GENERIC FRAMEWORK PROCEDURE

Generic Framework Procedure
As Approved by the Gulf Council – August 2011
And Modified by Amendment 38 – March 2013

This framework procedure applies to the Gulf of Mexico Fishery Management Council's Red Drum, Reef Fish, Shrimp, and Coral and Coral Reefs Fishery Management Plans. It replaces any previous framework procedure for setting catch limits or total allowable catch.

This framework procedure provides standardized procedures for implementing management changes pursuant to the provisions of the above Fishery Management Plans. There are two basic processes, the open framework process and the closed framework process. Open frameworks are further divided into abbreviated or standard documentation processes. Open frameworks address issues where there is more policy discretion in selecting among various management options developed to address an identified management issue, such as changing a size limit to reduce harvest. Closed frameworks address much more specific factual circumstances, where the FMP and implementing regulations identify specific action to be taken in the event of specific facts occurring, such as closing a sector of a fishery after their quota has been harvested.

Open Framework:

1. Situations under which this framework procedure may be used to implement management changes include the following:

   a. A new stock assessment resulting in changes to the overfishing limit, acceptable biological catch, or other associated management parameters.

      In such instances the Council may, as part of a proposed framework action, propose an annual catch limit (ACL) or series of ACLs and optionally an annual catch target (ACT) or series of ACTs, as well as any corresponding adjustments to MSY, OY, and related management parameters.

   b. New information or circumstances.

      The Council will, as part of a proposed framework action, identify the new information and provide rationale as to why this new information indicates that management measures should be changed.

   c. Changes are required to comply with applicable law such as MSA, ESA, MMPA, or are required as a result of a court order.

      In such instances the Regional Administrator will notify the Council in writing of the issue and that action is required. If there is a legal deadline for taking action, the deadline will be included in the notification.

2. Open framework actions may be implemented in either of two ways, abbreviated documentation, or standard documentation process.

    a. **Abbreviated documentation process.** Regulatory changes that may be categorized as a routine or insignificant may be proposed in the form of a letter or memo from the Council to the Regional Administrator containing the proposed action, and the relevant biological, social and economic information to support the action. If multiple actions are proposed, a finding that the actions are also routine or insignificant must also be included. If the Regional Administrator concurs with the determination and approves the proposed action, the action will be implemented through publication of appropriate notification in the Federal Register. Actions that may be viewed as routine or insignificant include, among others:

        i. Reporting and monitoring requirements,

        ii. Permitting requirements,

        iii. Gear marking requirements,

        iv. Vessel marking requirements,

        v. Restrictions relating to maintaining fish in a specific condition (whole condition, filleting, use as bait, etc.),

        vi. Bag and possession limit changes of not more than 1 fish,

        vii. Size limit changes of not more than 10% of the prior size limit,

        viii. Vessel trip limit changes of not more than 10% of the prior trip limit,

        ix. Closed seasons of not more than 10% of the overall open fishing season,

        x. Species complex composition, including species subject to limited access privilege program (LAPP) management, requiring new share specification,

        xi. Restricted areas (seasonal or year-round) affecting no more than a total of 100 square nautical miles,

        xii. Respecification of ACL, ACT or quotas that had been previously approved as part of a series of ACLs, ACTs or quotas,

        xiii. Specification of MSY, OY, and associated management parameters (such as overfished and overfishing definitions) where new values are calculated based on previously approved specifications,

xiv. Gear restrictions, except those that result significant changes in the fishery, such as complete prohibitions on gear types,

xv. Quota changes of not more than 10%, or retention of portion of an annual quota in anticipation of future regulatory changes during the same fishing year.

b. **Standard documentation process.** Regulatory changes that do not qualify as a routine or insignificant may be proposed in the form of a framework document with supporting analyses. Non routine or significant actions that may be implemented under a framework action include:

i. Specification of ACTs or sector ACTs, and modifications to ACL/ACT control rule,

ii. Specification of ABC and ABC control rules,

iii. Rebuilding plans and revisions to approved rebuilding plans,

iv. The addition of new species to existing limited access privilege programs (LAPP),

v. Changes specified in section 4(a) that exceed the established thresholds.

vi. Implementation or changes to in-season accountability measures
12. Closure and closure procedures
13. Trip limit implementation or change
14. Designation of an existing limited access privilege program as the accountability measure for species in the IFQ program
15. Implementation of gear restrictions

vii. Implementation or changes to post-season accountability measures
16. Adjustment of season length
17. Implementation of closed seasons/time periods
18. Adjustment or implementation of bag, trip, or possession limit
19. Reduction of the ACL/ACT to account for the previous year overage
20. Revoking a scheduled increase in the ACL/ACT if the ACL was exceeded in the previous year
21. Implementation of gear restrictions
22. Reporting and monitoring requirements

3. The Council will initiate the open framework process to inform the public of the issues and develop potential alternatives to address the issues. The framework process will include the development of documentation and public discussion during at least one council meeting.

4. Prior to taking final action on the proposed framework action, the Council may convene its advisory committees and panels, as appropriate, to provide recommendations on the proposed actions.
5. For all framework actions, the Council will provide the letter, memo, or the completed framework document along with proposed regulations to the Regional Administrator in a timely manner following final action by the Council.
6. For all framework action requests, the Regional Administrator will review the Council's recommendations and supporting information and notify the Council of the determinations, in accordance with the MSA[1] and other applicable law.

Closed Framework:

1. Consistent with existing requirements in the FMP and implementing regulations, the Regional Administrator is authorized to conduct the following framework actions through appropriate notification in the Federal Register:

    a. Close or adjust harvest any sector of the fishery for a species, sub-species, or species group that has a quota or sub-quota at such time as projected to be necessary to prevent the sector from exceeding its sector-quota for the remainder of the fishing year or sub-quota season,

    b. Reopen any sector of the fishery that had been prematurely closed,

    c. Implement accountability measures, either in-season or post-season.

Footnote 1:
SEC. 304. ACTION BY THE SECRETARY 16 U.S.C. 1854
(a) REVIEW OF PLANS.—
(1) Upon transmittal by the Council to the Secretary of a fishery management plan or plan amendment, the Secretary shall—
    (A) immediately commence a review of the plan or amendment to determine whether it is consistent with the national standards, the other provisions of this Act, and any other applicable law; and
    (B) immediately publish in the Federal Register a notice stating that the plan or amendment is available and that written information, views, or comments of interested persons on the plan or amendment may be submitted to the Secretary during the 60-day period beginning on the date the notice is published.
(2) In undertaking the review required under paragraph (1), the Secretary shall—
    (A) take into account the information, views, and comments received from interested persons;
    (B) consult with the Secretary of State with respect to foreign fishing; and
    (C) consult with the Secretary of the department in which the Coast Guard is operating with respect to enforcement at sea and to fishery access adjustments referred to in section 303(a)(6).

(3) The Secretary shall approve, disapprove, or partially approve a plan or amendment within 30 days of the end of the comment period under paragraph (1) by written notice to the Council. A notice of disapproval or partial approval shall specify—

        (A) the applicable law with which the plan or amendment is inconsistent;

        (B) the nature of such inconsistencies; and

        (C) recommendations concerning the actions that could be taken by the Council to conform such plan or amendment to the requirements of applicable law. If the Secretary does not notify a Council within 30 days of the end of the comment period of the approval, disapproval, or partial approval of a plan or amendment, then such plan or amendment shall take effect as if approved.

(4) If the Secretary disapproves or partially approves a plan or amendment, the Council may submit a revised plan or amendment to the Secretary for review under this subsection.

(5) For purposes of this subsection and subsection (b), the term "immediately" means on or before the 5th day after the day on which a Council transmits to the Secretary a fishery management plan, plan amendment, or proposed regulation that the Council characterizes as final.

(b) REVIEW OF REGULATIONS.—

(1) Upon transmittal by the Council to the Secretary of proposed regulations prepared under section 303(c), the Secretary shall immediately initiate an evaluation of the proposed regulations to determine whether they are consistent with the fishery management plan, plan amendment, this Act and other applicable law. Within 15 days of initiating such evaluation the Secretary shall make a determination and—

        (A) if that determination is affirmative, the Secretary shall publish such regulations in the Federal Register, with such technical changes as may be necessary for clarity and an explanation of those changes, for a public comment period of 15 to 60 days; or

        (B) if that determination is negative, the Secretary shall notify the Council in writing of the inconsistencies and provide recommendations on revisions that would make the proposed regulations consistent with the fishery management plan, plan amendment, this Act, and other applicable law.

(2) Upon receiving a notification under paragraph (1)(B), the Council may revise the proposed regulations and submit them to the Secretary for reevaluation under paragraph (1).