Steven Atran
Gulf of Mexico Fishery management Council – April 3, 2017

ABC Control Rule Options

ABC Control Rule Components

- Risk policy
- Control rule core
- Add-ons

Action 1 – Risk Policy

Risk Policy as Described by NS1 Guidelines (§ 600.310(f)(2)(i))

- Policy decision made by the Council, based on FMP objectives.
- Could be based on probability, but other appropriate methods can be used.
- Councils can consider the economic, social, and ecological trade-offs between being more or less risk averse.
- Cannot result in an ABC that exceeds the OFL.

Two Approaches to Risk Policy

- **P* - Probability based**
  - A probability of overfishing (P*) is applied to a probability distribution function (PDF)
  - P* does not account for all sources of uncertainty

- **Q* - Qualitative determination of relative risk**
  - A multiplier representing relative risk (Q*) is applied to the core ABC to determine a more or a less risk-averse ABC
  - Selection of Q* can be subjective – not scientific

Risk Policy – Alt. 1a - Tier 1 P* (Status Quo)

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

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
In this example
this can be char

Dimension	Dimension Wt	Tier No.	Tier Wt	Element Score	Element	Score it
Assessment Information	1	1	1	0.00	Quantitative, age-structured assessment that provides estimates of exploitation and biomass; includes MSY-derived benchmarks.	
				0.67	Quantitative, age-structured assessment provides estimates of either exploitation or biomass, but requires proxy reference points.	x
				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	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
				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.	
				1.0	Retrospective patterns have been described and are moderately significant.	
				2.0	Retrospective patterns *have not* been described *or* are large.	X
		3	0			
					NOT USED	
						z
		4	.333	0.0	Known environmental covariates are accounted for in the assessment.	x
				1.0	Known environmental covariates are **partially** accounted for in the assessment.	
				2.0	Known environmental covariates **are not** accounted for in the assessment.	

Risk Policy – Alt. 1b - Tier 1 Q*

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

Q* = 0.763

		$S_{hi}=$	3.998		
Maximum Risk	1.00	$a=$	0.000		
Minimum Risk	0.50	$b=$	0.1733735		

$$a = -\ln(1.00) \qquad b = -\frac{a + \ln(0.50)}{S_{hi}} \qquad S_{hi} = highest\ possible\ score$$

Element scores
In this example
this can be char

Dimension	Dimension Wt	Tier No.	Tier Wt	Element Score	Element	Score it
Assessment Information	1	1	1	0.00	Quantitative, age-structured assessment that provides estimates of exploitation and biomass; includes MSY-derived benchmarks.	
				0.67	Quantitative, age-structured assessment provides estimates of either exploitation or biomass, but requires proxy reference points.	x
				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	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
				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.	
				1.0	Retrospective patterns have been described and are moderately significant.	
				2.0	Retrospective patterns *have not* been described *or* are large.	X
		3	0			
					NOT USED	
						z
		4	.333	0.0	Known environmental covariates are accounted for in the assessment.	x
				1.0	Known environmental covariates are *partially* accounted for in the assessment.	
				2.0	Known environmental covariates *are not* accounted for in the assessment.	

GULF OF MEXICO Fishery Management Council

Tier 2 Status Quo for determining P*
Calculate a probability density distribution.
a. P* = 0.50
b. P* = 0.40
c. P* = 0.30 (default)

Tier 2 Status Quo for determining Q*
Multiply the base ABC control rule by the qualitative multiplier selected by the Council.
a. Q* = 85%
b. Q* = 75%
c. Q* = 65%

Risk Policy – Alt. 1a and 1b - Tiers 3a and 3b

Tier 3a: OFL = mean of landings + 2.0 * standard deviation
a. ABC = mean of the landings +1.5 * standard deviation
b. ABC = mean of the landings +1.0 * standard deviation (default)
c. ABC = mean of the landings +0.5 * standard deviation
d. ABC = mean of the landings

Tier 3b: OFL = mean of landings
a. ~~ABC = 100% of OFL~~ (previously rejected by SSC)
b. ABC = 85% of OFL
c. ABC = 75% of OFL (default)
d. ABC = 65% of OFL

Risk Policy – Alt. 2, Option 2a Bin Method for P*

P*=0.30
- **Overfished Stocks not meeting rebuilding schedule , no schedule established, or progress unknown**
- Gray triggerfish, Greater amberjack

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

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

GULF OF MEXICO Fishery Management Council

Risk Policy – Alt. 2, Option 2b
Option 2b: Bin Method for Q*

Q* =50%
- **Overfished Stocks not meeting rebuilding schedule , no schedule established, or progress unknown**
- Gray triggerfish, Greater amberjack

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

Q* = 95%
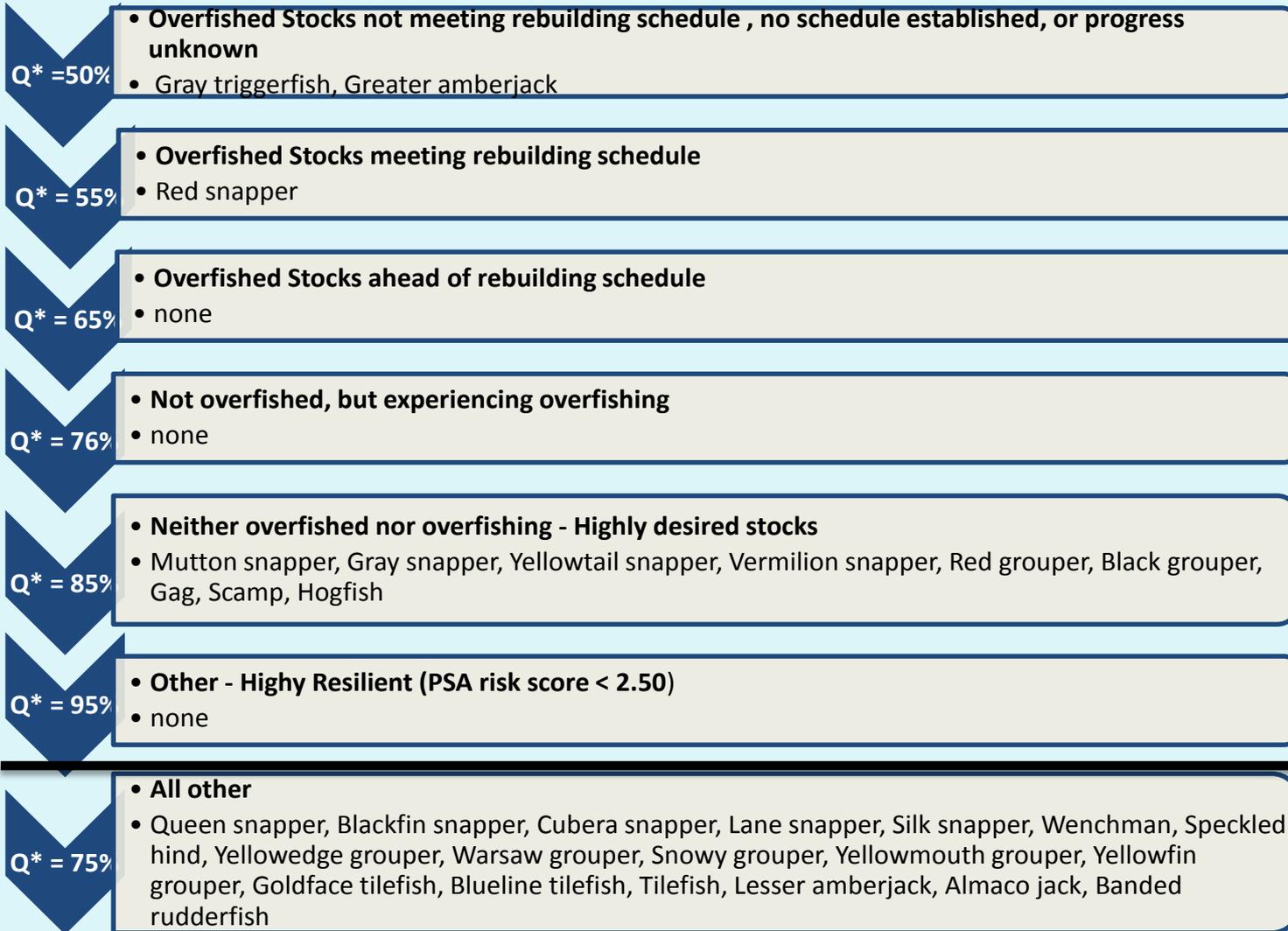- **Other - Highy Resilient (PSA risk score < 2.50)**
- none

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

GULF OF MEXICO Fishery Management Council

Risk Policy – Alternative 3 Ralston et al. (2011) Method*

* Recommended by SSC for further consideration in August 2014

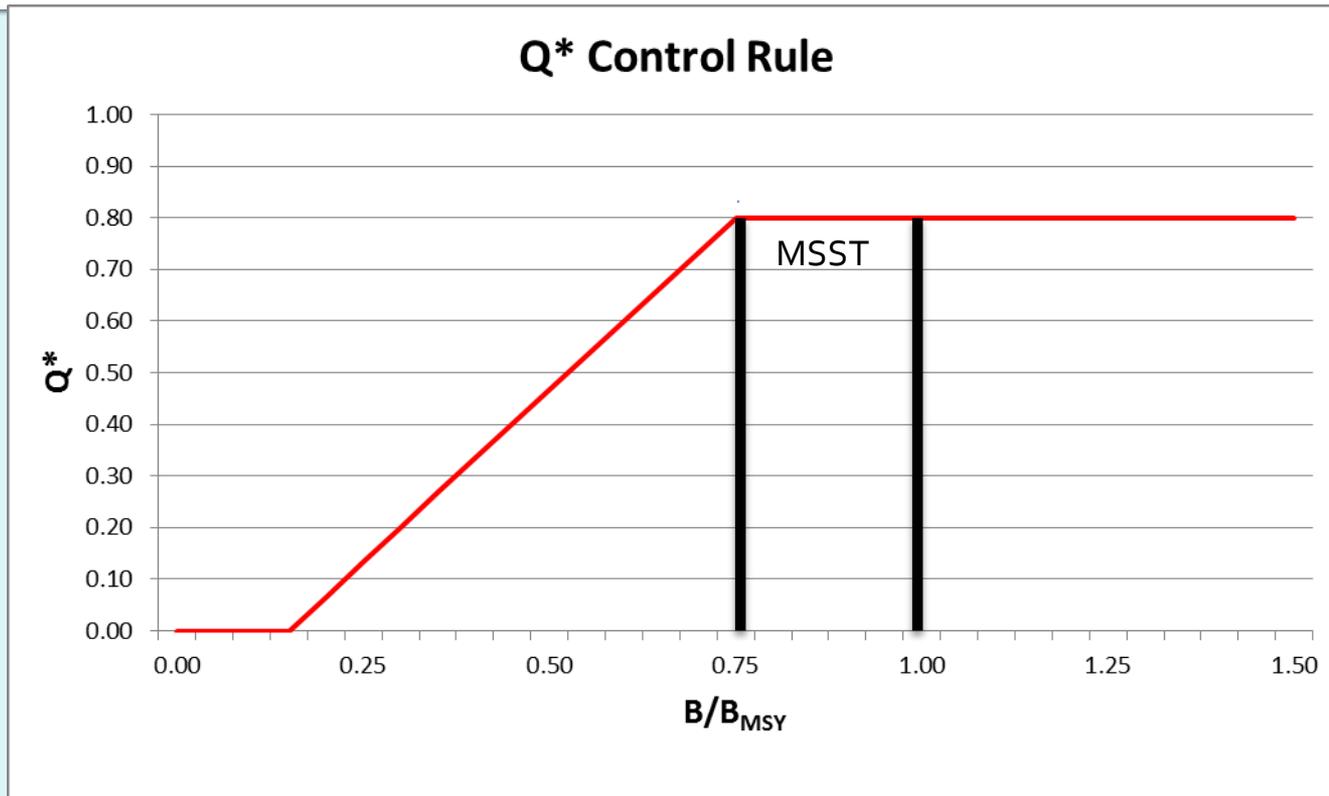| Stock category	Types of Information Utilized to Estimate OFL	P*	Coefficient of Variation Utilized to Estimate Buffer Between OFL and ABC
1	Catch, fishery independent surveys detailed life history age/length composition, standardized CPUE/effort	0.4	0.37
2	Catch, detailed life history age/length composition, 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

Risk Policy – Alternative 5
Fixed Risk Policy Parameter

- Option 4a: Use a fixed P* for all stocks
  - Example: P* = 0.40 applied to all PDFs

- Option 4b: Use a fixed Q* for all stocks
  - Example: Q* = 75%
    (ABC = 75% of OFL
    or yield at 75% of F_{MSY})*

- * Recommended by SSC for further consideration in August 2014

Risk Policy – Alternative 5 Based on PFMC Method

Q* Control Rule

Chart showing Q* on the y-axis (0.00 to 1.00) versus B/B$_{MSY}$ on the x-axis (0.00 to 1.50). The red line is flat at 0.00 until approximately B/B$_{MSY}$ = 0.15, then rises linearly to 0.80 at B/B$_{MSY}$ = 0.75, then remains flat at 0.80. Two vertical black lines at approximately 0.75 and 1.00, with MSST labeled.

If the biomass is above MSST, then M* = 0.8 (M*$_{MAX}$)

If the biomass is between 15% and 75% of B$_{MSY}$, then M* = (slope * (B-B$_{MIN}$))+M*$_{MIN}$

If the biomass is 15% or less of B$_{MSY}$, then M* = 0 (M*$_{MIN}$)

Action 2 – Base ABC Control Rule

- The base control rule is either:

  - The PDF to which the P* is applied, or

  - The function for determining OFL (or the yield at $F_{REBUILD}$)

Base Control Rule – Alt. 1

- No action. No guidance provided on the construction of a PDF.

Base Control Rule – Alt. 2

- Guidance for construction of PDF for Tier 1.
    - Option 2a. Use a fixed CV = 0.37
    - Option 2b. Use a fixed CV = average CV from all Gulf stock assessments
    - Option 2c. Use a pre-assigned CV for each stock (SSC will develop a table of stocks and assigned CV)
    - Option 2d. CV = the value determined by the risk policy
      (applicable to risk policy Alternative 3)

- For Tiers 2 and 3 under Risk policy 1a or 1b, ABC is as specified in the risk policy.

Base Control Rule – Alt. 3

- For Q* based risk policies, the base is the OFL or yield at $F_{REBUILD}$

$$ABC = Q* \text{ Base}$$

- For Tiers 2 and 3 under Risk policy 1a or 1b, ABC is as specified in the risk policy.

Add-ons – Actions 3.1 and 3.2 Carry-over of unharvested quota

- The actions in this section are for modifiers to the ABC that may not be used every time

  - Action 3.1 - Carryover provision
  - Action 3.2 – Adjustments to carry-over provision

Add-ons – Action 3.3
ABC Phase-in

- Alternative 1. No action.

- Alternative 2. Allow changes to ABC to be phased in over a period of not more than 3 years
  - ABC must stay at least 5% below OFL
  - Phase-in may only be used for stocks that are not in a rebuilding plan.

Add-ons – Action 3.4 Socioeconomic Adjustments

- Alternative 1. No action

- Alternative 2. Develop a process for adjusting ABC to account for socioeconomic considerations.
  - ABC may not exceed OFL
  - Process to be developed with the assistance of the SSC.