Gulf of Mexico Fishery Management Council
Scientific and Statistical Committee
Review of SEDAR 33 Update: Gulf of Mexico Gag
January 10-11, 2017

Model Configuration

Meaghan Bryan (NMFS/SEFSC) presented an update assessment to the 2013 SEDAR 33 gag benchmark assessment. The update assessment used the same Stock Synthesis 3 model configuration as the benchmark assessment except that the landings and fishery-independent datasets were extended to add the years 2013-2015. However, there were adjustments to some of the datasets. Recreational landings for 1963-1980 were re-estimated following suggested SEDAR best practices, and revisions were made to the recreational landings between 1981 and 2015 due mainly to the recent adjustments to the Access Point Angler Intercept Survey. After 2010, there was an increase in the commercial sector in discards of legal size gag, probably due to implementation of the grouper IFQ program. Recreational discards also increased, probably due to shortened fishing seasons and reduced bag limits. Prior to 2010, it was assumed that all gag above the minimum size limit were kept.

Gag are protogynous hermaphrodite (female to male). The age at 50% female maturity is 3.5 years, and the age at 50% transition to male is 10.7 years. Natural mortality was modeled as a function of age using a Lorenzen curve with a maximum age of 31 years and an average natural mortality rate of M=0.1342.

As with SEDAR 33, the 2005 red tide event was modeled as if the red tide were a fishing fleet with selectivity the same for all age groups. Sensitivity runs were carried out for the red tide events in 2014 and 2015.

Model Outputs

The model outputs for the update assessment (continuity model) indicated that, while spawning stock biomass has been increasing in recent years, the increase is not as rapid as indicated by SEDAR 33 (Figure 4). The number of recruits in 2006-2007 was also estimated to be less in the update assessment compared to SEDAR 33. A retrospective analysis showed similar trends, i.e., as data for each year 2015-2012 was subsequently removed from the model and the model re-run, the spawning stock biomass and recruitment estimates increased.

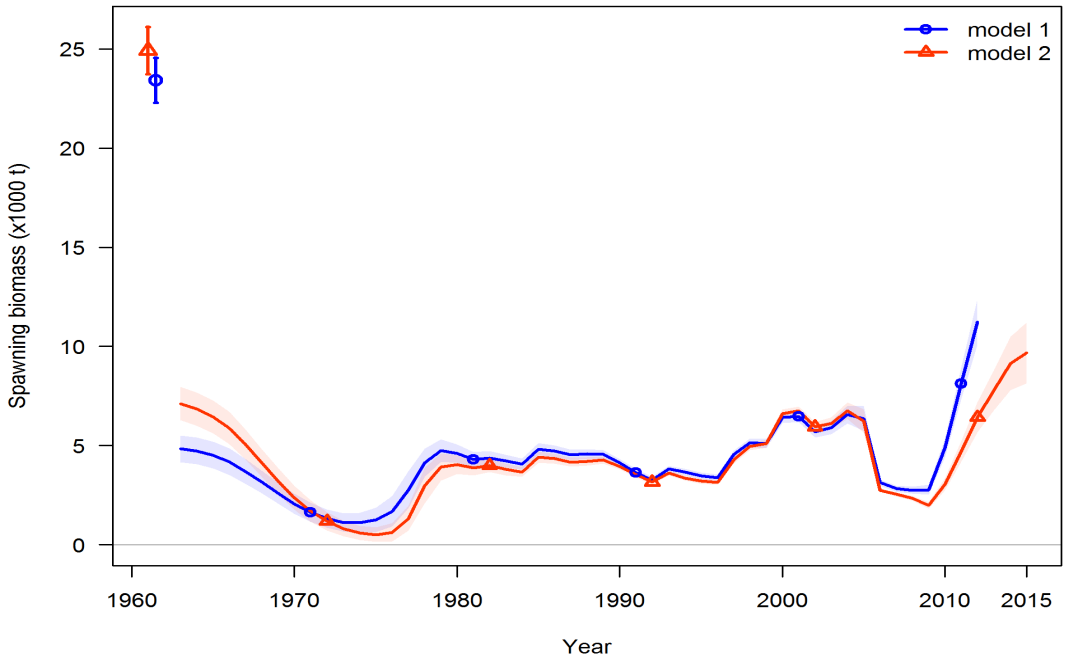

Figure 4. Spawning stock biomass estimates from SEDAR 33 (model 1) and the update assessment (model 2)

The red tide event in 2005 was reevaluated, and sensitivity runs conducted on the 2014, and 2015 red tide events. For the 2005 red tide event, the update assessment (continuity model) showed similar results to the SEDAR 33 analysis. However, when the effects of the 2005 red tide was combined 2014 or 2015, this number of dead discards was much higher (Table 2). This differs from the analysis conducted by FWRI following the SEDAR 33 assessment which concluded the 2014 red tide mortality was not substantial.

Table 2. Red tide sensitivity analysis

Model	Exploitation rate	Dead discards (1000s)
SEDAR 33	0.397	3405.69
Continuity	0.39	3216.48
Red tide 2005 and 2014	0.493, 0.564	5075.75, 4232.08
Red tide 2005 and 2015	0.425, 0.492	6718.35, 10366.1

The update assessment model outputs used to determine gag overfishing and overfished status are shown in Table 3. The fishing mortality rate that produces maximum yield-per-recruit (F_{MAX}) was used as a proxy for F_{MSY}. The current fishing mortality rate ($F_{CURRENT}$) was defined as the geometric mean of the fishing mortality rate for the most recent 3 years (2012-2015). As shown in Table 3, $F_{CURRENT}$ is well below the maximum fishing mortality threshold (MFMT) at just 41.6% of MFMT. **Therefore, the stock is not experiencing overfishing in the most recent 3 years (2013-2015).**

The current spawning stock biomass ($SSB_{CURRENT}$) was defined as the female biomass (in metric tons) in 2015. Table 3 shows that $SSB_{CURRENT}$ is above the minimum stock size threshold (MSST) at 156% of MSST. **Therefore, the stock is not overfished as of 2015**. In addition, $SSB_{CURRENT}$ is also above SSB_{MSY} (at 135% of SSB_{MSY}). Therefore, the stock is above the biomass level needed to obtain maximum sustainable yield on a continuing basis (assuming F_{MAX} is an appropriate proxy for F_{MSY})

Table 3. Stock status results from gag update assessment

		Model
		Continuity
Criteria	Definition	
Base M		0.134
Steepness		0.855
Virgin Recruitment	1000s	5030.8
SSB unfished	Metric tons	24908
F_{MSY} or proxy	F_{MAX}	0.1964
MFMT	F_{MAX}	0.1964
$F_{CURRENT}$	F (nyr-3)-nyr (geometric mean)	0.0817
$F_{CURRENT}$/MFMT		0.416
	Biomass criteria	
SSB_{MSY}	SSB at F_{MAX}	7171
MSST	(1-M)*SSB_{MSY}	6210.1
$SSB_{CURRENT}$	SSB2015	9688.07
$SSB_{CURRENT}$/MSST	SSB2015	1.56

OFL and ABC Projections

Following the presentation and discussion of the model results, the SSC passed the following motion to accept the assessment and the OFL yields shown below in Table 4.

> **Motion: That the SSC accept the continuity model as the best available science, and that the OFL yield streams resulting from the continuity model be accepted as shown in the table (Table 4), using the years 2017-2019.**

Motion passed 13-1 with 1 abstention.

The SSC felt that there was considerable uncertainty with the results of the gag update assessment for several reasons. Although the update assessment concurred with the SEDAR 33 results that the stock biomass was increasing, the strong retrospective pattern indicated previous management advice may have been optimistic. In addition, there is uncertainty about the level of discards in the private recreational fleet. In the continuity model, retention curves were used to account for private recreational discards. An alternative sensitivity model was run that assumed retention of gag in the recreational private fleet mirrored the retention of the headboat fleet. This simple change resulted in large changes in the model outputs, and would have indicated that the stock was overfished and experiencing overfishing. This indicated that the model is highly sensitive to its inputs.

Because of these uncertainties, the SSC felt that a conservative approach should be taken to setting ABC. Rather than use the ABC control rule's tier 1 spreadsheet to determine P*, the SSC asked the SEFSC for two alternative ABC yield stream for 2017-2019: 1) ABC at the lowest risk level authorized by the Council, P* = 0.30, and 2) ABC at the yield equal to 75% of F_{MAX}, which is consistent with the method previously used to set ABC following the SEDAR 33 assessment. The results for OFL and the two ABC yield streams are shown in Table 4:

Table 4. Projected Gag OFL and two alternative ABC yield streams, 2017-2019

Year	OFL at F_{MAX}	ABC at P* = 0.30	ABC at 0.75*F_{MAX}
2017	4.68 mp gw	4.28 mp gw	3.59 mp gw
2018	4.34 mp gw	3.99 mp gw	3.50 mp gw
2019	4.18 mp gw	3.86 mp gw	3.52 mp gw
Equilibrium	4.05 mp gw	3.81 mp gw	4.10 mp gw

For consistency with the previous method of setting ABC, the SSC selected the ABC yield stream based on 75% of F_{MAX}.

Motion: The SSC recommends to retain the alternative method to the ABC Control Rule, setting ABC at the yield stream at 75% of F_{MAX}, using the years 2017-2019.

Motion passed 14-0 with 3 abstentions.

For comparison, the previously recommend OFL for 2017 was 5.13 mp gw, and the previously ABC for 2017 was 4.46 mp gw. Because of concerns about the condition of the stock, the Council has maintained an ACL of 3.12 mp gw.