Gulf of Mexico Fishery Management Council
Standing and Special Reef Fish SSC Meeting Summary
Review of SEDAR 19 – Black Grouper
March 24, 2010
Tampa, Florida

SEDAR 19 Black Grouper Assessment

Following a discussion of the draft ABC Control Rule developed by the Standing SSC and ABC Control Rule Working Group, Bob Muller presented the SEDAR 19 black grouper stock assessment. Studies have found no genetic differences between black grouper from Florida, Belize or Campeche Banks (although fish from Bermuda are genetically different) and therefore concluded that there is a single black grouper stock in southeast U.S. waters. Average natural mortality was set at M = 0.136 based on Hoenig's equation and a maximum age of T_{Max} = 33 years. However, age-specific natural mortality rates were calculated using Lorenzen (2005) equation and scaled such that the rates for ages 3-33 years averaged 0.136 per year. Multiple von Bertalanffy growth curves were generated by gear type and periods between management changes. Discard mortality was estimated at 20% for all hook and line vertical gear, and at 30% for longline gear. For all of these parameters, sensitivity runs were conducted using higher and lower values. Five indices of abundance were used, four fishery dependent (NMFS commercial hook and line, NMFS commercial longline, MRFSS, and headboat survey) and one fishery independent (FWC visual survey of age-1 fish). ASAP2, an age-structures assessment program, was used for the model runs although a surplus production model (ASPIC) was also run for comparison. A proxy for F_{MSY} was used ($F_{30\% SPR}$) as specified in the 1999 Generic Sustainable Fisheries Act Amendment.

50% of black grouper females are mature at 6.5 years old and 856 mm (33.7 inches) TL based on fish collected in the Florida Keys during January-March and omitting stage 7 (resting) fish. The smallest mature female was 508 mm (20 inches) TL and the youngest was three years old. Spawning biomass includes males.

Results of the base model run found that the stock was neither overfished nor undergoing overfishing The fishing mortality in 2008 was at half the overfishing limit ($F_{2008}/F_{30\% SPR}$ = 0.50), and the spawning stock biomass level was 40% above the maximum sustainable yield level ($SSB_{2008}/SSB_{F30\% SPR}$ = 1.40). Nearly all of the sensitivity runs also found the stock to be neither overfished nor undergoing overfishing.

Following the presentation, Dr. Muller addressed several questions. In response to a question about the possibility of outside recruitment, he noted that such a situation would tend to produce a higher steepness value for the spawner recruit curve. An SSC member expressed concern about the low sample sizes used to compute the separate von Bertalanffy growth curves. Another SSC member noted that black grouper is not an abundant species and that the data was sparse. Dr, Muller responded that while sample sizes may have been low, the data was of good quality. The goodness-of-fit parameter of root mean square error (RMSE) was consistent across all model fits to the indices of abundance. A question was asked as to

why an $F_{30\% SPR}$ proxy was used instead of the actual estimate of F_{MSY}. Dr. Muller responded that the actual estimate depended upon the spawner-recruit relationship, but the relationship for black grouper was weak. In addition, the use of $F_{30\% SPR}$ gave more consistent results across all model permutations than F_{MSY}. A question was asked whether the stock could be split into a south Atlantic component and Gulf of Mexico component for management purposes. Dr. Muller explained that, because of movements of fish at different life stages and the lack of genetic differentiation, there was no separation, and he suggested that the stock not be split.

Following the presentation and discussion, the SSC passed the following motion:

> **The SSC recommends by unanimous voice vote that the black grouper stock assessment be accepted as the best available science.**

ABC Control Rule Case Study Using Black Grouper

The SSC decided to apply the draft ABC Control Rule for determining an acceptable level of scientific risk to black grouper as a case study. For the Assessment Information dimension and tier, the SSC agreed that the assessment was in level 2 since it used proxy reference points instead of MSY based reference points. Under the Characterization of Uncertainty dimension, for the first tier (Level of Uncertainty in the Overfishing Limit Probability Distribution Function), the SSC agreed that level 3 should be assigned because, due to the sparse data, full uncertainty has not been carried forward into the projections. For the second tier ("Within Model" retrospective patterns), the SSC agreed that level 1 should be applied because of the unusually good fits when retrospective analyses was applied. For the third tier (Level of Significance of Historical Retrospective Patterns), there was some disagreement. Historical retrospective patterns were not examined because there was no historical data to do the examination. Some SSC members felt that the tier should be removed for this analyses because there were in fact no historical data to analyze, while other members felt that the lowest most conservative level 3 (2 points) should be assigned because the there was no analyses done regardless of the reason. After discussion, it was decided to assign level 3 to this tier. Tier 4 (environmental covariates) generated a similar discussion. Some SSC members felt that the highest level 1 (0 points) should be assigned on the basis that there were no unaccounted for environmental covariates because there were no known environmental covariates to begin with. Other SSC members felt that not having examined any environmental covariates represented an increased level of uncertainty and that the lowest level 3 (2 points) should be assigned. After discussion, it was decided that since the lowest level did not include the specification, “or has not been examined” (which was in the lowest level for the previous tier), that level 1 should be assigned.

Once the decision table was filled out as discussed above, it produced a result that $P^* = 0.33$ or a 33% probability that ABC exceeds the true overfishing limit is the appropriate level of risk for this stock.

The next question was how far into the future to project ABCs. The P* approach was only designed to examine probability levels for one year out. Uncertainty increases with increasing

years of projections, but that analyses using the P* approach (i.e., P** and P***) is still being developed. The SSC decided to provide ABC projections for five years.

> **By unanimous voice vote, the SSC recommends that a five-year [yield] stream from 2011-2015, to include landings and dead discards in whole weight, be the ABC for black grouper, for a P* of 0.33 (From Table A3.3.4.16 in the 2010 Black Grouper Assessment).**

The SSC noted that the National Standard 1 Guidelines state that both landed and discard mortality must be accounted for when setting catch levels. However, management actions are generally based on achieving landed catch. Steven Atran stated that the landed catch ABCs take into account the discard mortality, but it is assumed that discard mortality will continue to occur in the same proportions used in the assessment. The SSC decided to provide ABCs to the Council as landings, discards, and total (landings plus discards).

Note: Table A3.3.4.16 provided projections for P* = 0.30 and 0.40, but not 0.33. Bob Muller ran a supplemental P* run after the meeting to provide the ABC levels at P* = 0.33, which are shown below. The values for OFL are taken from Table A3.3.4.17 for a fishing mortality rate of $F=F_{30\% SPR}$. Values are in pounds whole weight.

	OFL		
Year	**Landings**	**Discards**	**Total**
2011	695,007	123,952	818,959
2012	652,810	127,396	780,206
2013	627,552	130,213	757,765
2014	619,665	130,237	749,902
2015	615,801	130,207	746,008

	ABC		
Year	**Landings**	**Discards**	**Total**
2011	523,000	126,761	649,761
2012	522,543	132,399	654,942
2013	545,595	130,978	676,574
2014	558,711	130,314	689,025
2015	564,737	130,018	694,755

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

P* = 0.33

S_{hi} = 4

Maximum Risk 0.45 a= 0.799

Minimum Risk 0.15 b= 0.2746531

$$a = -ln(0.45) \qquad b = -\frac{a + ln(0.15)}{S_{hi}} \qquad S_{hi} = highest\ possible\ score$$

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

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.		0.33	0.33	0.33
				0.33	Quantitative, age-structured assessment provides estimates of either exploitation or biomass, but requires proxy reference points.	X			
				1.00	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	.25	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.		1.33	0.3325	0.83
				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.				
				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.	X			
				2.0	The OFL provided by the assessment ***DOES NOT*** include uncertainty in important inputs and parameters.				
		2	.25	0.0	"Within Model" retrospective patterns have been described, and are not significant.	X	0.0	0	
				1.0	"Within Model" retrospective patterns have been described and are moderately significant.				
				2.0	"Within Model" retrospective patterns ***have not*** been described ***or*** are large.				
		3	.25	0.0	Historical retrospective patterns (examination of past performance of models on the same species) have been examined and are not signficant.		2.0	0.5	
				1.0	Historical retrospective patterns (examination of past performance of models on the same species) have been examined and are moderate.				
				2.0	Historical retrospective patterns (examination of past performance of models on the same species) have been examined and are large ***or*** have not been examined	z			
		4	.25	0.0	Known environmental covariates are accounted for in the assessment.	X	0.0	0	
				1.0	Known environmental covariates are **partially** accounted for in the assessment.				
				2.0	Known environmental covariates ***are not*** accounted for in the assessment.				