

**Gulf of Mexico Fishery Management Council
Standing and Special Mackerel SSC
Review of SEDAR 28 – Gulf of Mexico Spanish Mackerel
Tampa, Florida
March 27, 2013**

The agenda was adopted and the summary minutes of the July 26-27, 2011 Mackerel SSC meeting were approved as written.

SEDAR 28 Spanish Mackerel Benchmark Assessment

Nancie Cummings presented the Spanish mackerel benchmark assessment. As with the cobia assessment, she used an integrated statistical catch-at-age model, Stock Synthesis version 3.24h. Data inputs included commercial landings in pounds whole weight from 1926-2011, recreational landings in numbers of fish from 1950-2011, discard estimates in numbers of fish for the commercial, recreational and shrimp bycatch components, relative indices of abundance (shrimp bycatch relative to effort, recreational number caught per angler hour, pounds per trip from the FWC vertical line fish tickets, and SEAMAP trawl survey in number caught per trawl hour) length composition data from the commercial, recreational and SEAMAP catches, and conditional age-at-length data from the commercial and recreational components.

As with the recreational catch and effort estimates used with the cobia assessment, the data from the years 1950-1980 that came from the U.S Fish and Wildlife Service FHWAR survey was adjusted to remove a known reporting bias that results in overestimates of both the catch and effort estimates.

The base run used a Lorenzen natural mortality function based on a natural mortality rate of 0.38, and a model estimated stock-recruit steepness. Sensitivity runs were conducted with two alternative levels of natural mortality (0.27, 0.49), three levels of fixed steepness (0.7, 0.8, 0.9), an assumed 20% increase in discard mortality, data component weighting (within SS), and index inclusion. Additional sensitivity runs were conducted in response to CIE reviewer suggestions. All of the runs resulted in the stock being neither overfished nor experiencing overfishing, relative to an MSY proxy based on 30% SPR.

Due to difficulties that the model had in estimating the stock-recruit steepness value, the SSC concluded, as with the cobia assessment, that the Spanish mackerel assessment results should be based on the 30% MSY proxy rather than the actual estimate of MSY, and that the stock-recruit steepness value should be fixed rather than estimated by the model. The SSC's recommendations for additional analysis are as follows.

The SSC recommends that:

- **the MSY reference point used for the Spanish mackerel benchmark assessment be the 30% SPR proxy;**
- **the steepness value used for generating recruitment values for projections be fixed at 0.8;**

- **uncertainty be represented by combining PDFs constructed using the range of natural mortality values recommended by the assessment review panel (M=0.27, 0.38, and 0.49); and**
- **the weighting for the combined PDFs be the probabilities for each of the M values. For low and high, both probabilities are 29.6%, and for the base M, 40.8%.**

As with the cobia assessment, the analysts did not produce the probability distribution functions (PDF) needed for OFL and ABC recommendations because a number of questions remained on the use of certain parameters. Projections runs based on the above parameters need to be run before the SSC can recommend levels of OFL and ABC. In addition, since the SEDAR stock assessment report is not yet completed, the SSC is unable to either accept or reject the assessment. These determinations will be made at a future SSC meeting when the completed analysis is presented.

Although the SSC cannot yet provide recommendations for OFL and ABC, they were able to proceed through the ABC control rule Tier 1 spreadsheet to determine a level of P*, which will be applied to the PDF function to determine an ABC. The spreadsheet is described above, under the cobia assessment summary. The settings selected by the SSC for the Spanish mackerel Tier 1 spreadsheet were identical to the settings selected for cobia. As with cobia, they resulted in a P* of 0.434.

The following is from the Gulf Council SSC's May 2013 meeting.

SEDAR 28 Spanish Mackerel Benchmark Assessment Results

Dr. Tetzlaff presented the analysis and yield projection runs for Spanish mackerel based on the parameters specified by the SSC in March and a P* value of 0.434. However, projections were only provided for ABC, not OFL. In addition, the Review Panel report for the Spanish mackerel assessment was not yet available. Therefore, the SSC deferred taking any action until this information becomes available.

The following is from the Gulf Council SSC's August 2013 meeting.

SEDAR 28 Spanish Mackerel Benchmark Assessment Results

Dr. Luiz Barbieri summarized the SEDAR 28 Spanish mackerel review workshop report. This was the final item needed to complete the SEDAR report. The assessment itself was previously presented to the SSC. The Review Panel concluded that the data used in the assessment were generally sound and robust, were applied properly, and uncertainty in the data inputs was appropriately acknowledged. The current stock biomass level (as of 2011) was estimated to be well above the minimum stock size threshold ($SSB_{2011}/MSST = 3.06$), and therefore the stock is

not considered to be overfished. In addition, the current level of fishing mortality (the geometric mean of the 2009-2011 levels) is estimated to be below the maximum fishing mortality threshold ($F_{\text{current}}/\text{MFMT} = 0.38$), and therefore the stock is not considered to be experiencing overfishing. Updated benchmarks used in the yield projections report below produced slightly different estimates of SSB and F ($\text{SSB}_{2011}/\text{MSST} = 2.96$, and $F_{\text{current}}/\text{MFMT} = 0.40$) but still support the conclusion that the stock is neither overfished nor experiencing overfishing.

Dr. Nancie Cummings of the Southeast Fisheries Science Center reviewed an analysis of yield projections for the overfishing limit (OFL) and acceptable biological catch (ABC) calculated using bootstrap analysis. OFL was computed as the annual yield at a P^* of 0.50 applied to the yield at F_{MSY} probability density function (PDF), while ABC was determined at a P^* of 0.434 applied to the yield at F_{MSY} PDF. The difference between OFL and ABC represents a buffer for scientific uncertainty. The proxy for F_{MSY} was $F_{30\% \text{SPR}}$, and the steepness value of the spawner-recruit curve was 0.8. Three projection scenarios were run where the Lorenzen distribution of natural mortality for age 3+ fish was based on a mean natural mortality rate of $M = 0.38$ (base run), $M = 0.27$ (low M scenario), and $M = 0.49$ (high M scenario). An additional run was made where the PDFs resulting from the three M scenarios were combined into a weighted average, weighted 29.6% for low M, 40.8% for base M, and 29.6% for high M.

Projections were run from 2013 through 2019. In all scenarios, the resulting ABCs were above recent landings. However, the ABCs would drop down in subsequent years toward the equilibrium levels, except for the low M scenario (Figure 1 and Table 1). This is because the current biomass level is estimated to be well above B_{MSY} (except for the low M scenario). Consequently, catch levels above equilibrium ABC can occur, but will result in the stock being fished down to its equilibrium B_{MSY} level.



Figure 1. Spanish mackerel ABC yield projections at $P^* = 0.434$ under several scenarios of natural mortality.

Table 1. Spanish mackerel OFL and ABC yield projections for 2013-2019

MSRA Crit Definition		Base M (0.38)	High M (0.49)	Low M (0.27)	Weighted Average
OFL	Annual Yield @F30%SPR ($P^* 0.5$)				
	OFL 2013	14,396,226	22,663,584	9,171,256	15,057,615
	OFL 2014	12,897,078	18,122,049	9,568,089	13,624,606
	OFL 2015	12,059,320	16,093,790	9,986,968	12,742,754
	OFL 2016	11,530,209	15,101,707	10,339,709	12,235,690
	OFL 2017	11,133,375	14,660,782	10,604,265	11,949,088
	OFL 2018	10,824,727	14,285,995	10,846,774	11,882,949
	OFL 2019	10,670,403	13,999,393	11,023,144	11,838,857
ABC	Annual Yield@F30%SPR ($P^*=0.434$)				
	ABC 2013	14,175,763	22,288,797	9,016,932	14,285,995
	ABC 2014	12,720,708	17,857,493	9,413,765	12,830,940
	ABC 2015	11,816,810	15,719,003	9,788,552	12,059,320
	ABC 2016	11,309,746	14,704,874	10,119,246	11,728,625
	ABC 2017	10,912,913	14,263,948	10,405,848	11,574,301
	ABC 2018	10,604,265	13,911,208	10,626,311	11,464,070
	ABC 2019	10,471,987	13,668,699	10,802,681	11,486,116

A question was asked if the yield projections were in terms of total removals (retained plus discards) or retained catch only. Dr. Cummings clarified that the yields were for retained catch in pounds whole weight.

An SSC member asked if historical removals had been examined for signs of a shift in production toward higher productivity. Dr. Cummings affirmed that she had looked at the historical catches and exploitation rates. Exploitation rates had been higher in the 1960s to 1990s when overfishing was occurring, but had decreased since then.

Following discussion, the SSC passed the following motion.

Without opposition, the SSC accepts the SEDAR 28 Spanish mackerel Benchmark Assessment as the best available science and deems it suitable for management advice.

The SSC discussed which model run to use for projecting estimated OFL for future years. Table 1 shows that the buffer between OFL and ABC is relatively small, which may suggest that little scientific uncertainty is being captured in the assessment or projections. For this reason, a suggestion was made that yield stream recommendations for OFL and ABC be kept short term, i.e., no more than three years. It was further suggested that since the yield streams are declining toward equilibrium levels and there is no future Spanish mackerel assessment on the SEDAR schedule, the terminal year of the recommended yield streams be set at the equilibrium level. Another suggestion was made that the SSC not employ the ABC control rule to set ABC since resulting buffers were small.

The SEDAR stock assessment reported the equilibrium yields to be 6.942 mp for MSY, and 5.207 mp for OY. However, these were deterministic estimates for the base run and did not incorporate recruitment variability. Consequently, it was suggested that the estimates would need to be recalculated in light of the additional analysis that was conducted for this meeting, including the weighted average yield streams. Furthermore, it was noted that if the equilibrium MSY or OY was used for the terminal year of the ABC recommendations, it would result in a sudden large drop in ABC for that year. One SSC member recommended that if a short-term series of yields was recommended that ended with a relatively high ABC, then the SSC should be prepared to ask for projection updates in the future.

One SSC member stated that, given stock biomass is estimated to be much higher than equilibrium B_{MSY} , capturing uncertainty was not as much of an issue as it would be for less healthy stocks. However, in terms of management advice, this is an important issue since fishing at ABC would cause the stock to be fished down to equilibrium.

One SSC member suggested that the weighted average approach, which attempted to combine the results from three non-compatible runs, may have been the wrong approach to try and capture the plausible range of uncertainty. The weighted average combined results of model runs based on different non-compatible states of nature, which introduced additional unknowns that were not in the base model. If that is the case, it was suggested that the base model may provide more

plausible results. Other SSC members agreed, noting that the base results and weighted average results had the same central tendency, and the weighted average approach only broadened the variance around the probability distribution function by a small amount. It was suggested that, given the available data, the base model provided the best analysis of the dynamics of the stock. However, other SSC members disagreed, noting that the SSC had used weighted average results for the recent cobia and red snapper assessments. They also felt that the high M and low M model runs were not extreme and represented plausible alternatives to the base run

Given the above discussion, a majority of SSC members passed the following motion for OFL and ABC using the base model for management advice. In keeping with past practice, the values were rounded to three significant digits.

By a vote of 8 to 5, the SSC moves to define OFL for Spanish mackerel as the base model yield stream for the years 2013-2016.

2013: 14.4mp

2014: 12.9mp

2015: 12.1mp

2016: 11.5mp

The SSC discussed ABC and whether to set the terminal year of recommendations at the equilibrium yield level. Spanish mackerel landings in the Gulf since 2000 have ranged from 3.7 mp to 5.9 mp, but in prior years the landings had been much higher, as much as 13 to 14 mp including bycatch and shrimp trawl mortality. An audience member noted that those higher landings occurred when there was a gill net fishery. The gill net fishery no longer exists, and he felt that the hook and line fishery would not be able to catch those historical levels.

Given the small buffer between OFL and ABC, the SSC debated whether to strictly follow the results of the ABC control rule, or deviate from those results. One SSC member recommended that the ABC be set at some level below the calculated ABC yield stream in order to better account for scientific uncertainty. In response, another SSC member noted that when biomass is above B_{MSY} , if ABC were based on the yield at 75% of F_{MSY} , Restrepo et al. (1998) showed that the resulting yield would be 95% to 98% of MSY. Given that the Spanish mackerel biomass levels are estimated to be much higher than B_{MSY} , having ABC yields close to OFL is not unexpected. Other SSC members reiterated that scientific uncertainty was not being fully accounted for by the existing methods. Given that the stock is healthy and unlikely to undergo overfishing, having a small buffer was more acceptable to some SSC members. However, other members felt that the high ABCs could lead to a change in fishing and an increase in capitalization and landings. In this case, the high ABCs in the near-term projections would not be sustainable over the long term and would eventually lead to overfishing and a disruption to the fishery if ABC were later reduced as stock biomass was fished down.

Following the discussion regarding the ABC buffer, the SSC passed the following motion for an ABC yield stream using the base model and a probability of overfishing of $P^* = 0.434$ applied to the OFL PDF.

By a vote of 9 to 4, the SSC moves that the ABC for Spanish mackerel be defined by the base model yield stream for the years 2013-2016.

2013: 14.2mp

2014: 12.7mp

2015: 11.8mp

2016: 11.3mp

Although the SSC voted to set ABC according to its control rule and resulting P^* of 0.434 for years 2013 through 2016, the SSC felt that the Council should take into account the concerns raised regarding the OFL buffer and the equilibrium yield level when determining where to set ACL levels.