SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

SCIENTIFIC AND STATISTICAL COMMITTEE

SSC Meeting Report

May 7, 2018

Meeting via webinar

VERSION
FINAL

CONTENTS

Documents:

Attachment 1. Impacts of proposed alternatives in Reg Am 27
Attachment 2. Reg Am 27 Working Draft
Attachment 3. Farmer & Froeschke Forecasting Rec Fisheries for Mgmt
Attachment 4. Landings Trends from Reg Am 27

1. INTRODUCTION

1.1. Documents

Agenda

1.2. Action

- Introductions
- Review and Approve Agenda

2. REVIEW OF THE SARIMA MODEL

2.1. Documents

Attachment 1. Impacts of proposed alternatives in Reg Am 27
Attachment 2. Reg Am 27 Working Draft
Attachment 3. Farmer & Froeschke Forecasting Rec Fisheries for Mgmt
Attachment 4. Landings Trends from Reg Am 27

2.2. Overview

At their October 2017 meeting, the SSC reviewed Snapper Grouper Regulatory Amendment 27 (Attachment 2), the Commercial Visioning Amendment. The Committee was asked to review the use of two different modelling techniques used to conduct the same analyses. A new modelling technique for forecasting fishery landings using a Seasonal Autoregressive Integrated Moving Average (SARIMA, Attachment 3) model and the traditional approach of using the previous 3-year average. The SARIMA model was used to predict catch rates of fisheries on a monthly time scale using historical data, whereas the 3-year average method used only the most recent 3 years of data, for estimating impacts of proposed management alternatives (Attachments 1 and 2). Each method gave very different results for some of the actions and alternatives. The conclusions of the Committee are below.

- ***The complexity of the SARIMA model makes it less favorable as a management tool.***
- ***The last 3 years of data are likely more representative of the current fishery than using the entire data series.***

However, the analyst who performed the SARIMA analysis was unavailable to answer questions of the Committee and the SSC also gave constructive feedback for testing and improving on the analysis.

In February 2018, the SEP met and also reviewed the use of the SARIMA model for forecasting fisheries landings and for management advice. The SEP had a diverging opinion on the use of the SARIMA model in Regulatory Amendment 27. The conclusions of the SEP are below.

Regarding the appropriateness of the two models and methodologies used to predict landings under various scenarios, the SEP agreed that, in principle, the SARIMA method was superior to the "Last 3 Years" averaging method; however, the SEP recommends that the council be presented with results from both models, as both models have pros and cons. The "Last 3 Years" model is less complicated and easier to understand, but it puts perhaps too much weight on data from recent years at the expense of neglecting longer-run effects due to changes in year class abundance or environmental or policy shocks or cycles. The SARIMA model is more complicated but probably gives a better picture of the uncertainty involved in predicting landings through better modeling of the error term that incorporates the effects of factors left out of the model. Over time, as data availability and quality improve, the performance of the SARIMA model should improve relative to the "Last 3 Years" model.

After this meeting, a retrospective analysis was conducted, using 2016 data, to determine which method more accurately predicted the catch rates of the fishery in the following year. The results indicated that each method performed better under different circumstances (Attachments 2 and 4). Attachment 4 is provided to help the Committee distinguish why one method may have performed better than the other in a particular circumstance.

The SSC and SEP are now meeting jointly via webinar to attempt to resolve the diverging opinions arrived at by the two groups.

2.3. Public Comment

2.4. Action

- Review and comment on the use and uncertainties of the two methods used in Actions 1-6 of Reg Amendment 27 to analyze the effects of the alternatives.
    - Is one methodology more appropriate for use in these analyses?
        - *Relative to Reg Amendment 27 only:*
            - *In a new analysis presented during the webinar, the analyst generated predictions of closure dates in 2017 with both models and compared them with the actual timing of quota closures under current regulations. For Regulatory Amendment 27, he recommended using the model for each species that most closely predicted actual closure dates in 2017.*
            - *Based on the justifications given by the analyst, the SSC agrees with the recommended use of both the SARIMA and the Last 3 Years, depending on the retrospective performance analysis done for each Action in Reg Amendment 27.*

- *The recommended model usage is as follows:*
  1. *Action 1: Last 3 Years*
     - *When tested against actual closure dates for 2017, the predictions of closure dates for blueline tilefish were very close with both models, suggesting relatively robust estimates for closure dates for the various alternatives. The SSC recommends the use of the Last 3 Years model.*
  2. *Action 2: Last 3 Years*
     - *Predictions of closure dates for snowy grouper were much earlier with the SARIMA model than with the Last 3 Years model. The SARIMA model interprets the higher observed catch rates in 2016 and 2017 as a rapid acceleration in fishing pressure, whereas the prediction of the Last 3 Years model is more consistent with observations of recent fishing pressure and the increasing ACL. The SSC agrees with Dr. Farmer's recommendation to use the Last 3 Years model.*
  3. *Action 3: Last 3 Years*
     - *Predictions of closure dates for greater amberjack generally were earlier with the SARIMA model because it predicted an increase in catch per day, whereas there was no trend in aggregate landings over the previous 3 years. The SSC agrees with Dr. Farmer's recommendation to use the Last 3 Years model.*
  4. *Action 4: SARIMA*
     - *Predictions of closure dates for red porgy differed substantially for the two models. The Last 3 Years model predicted closures even though landings from 2015 through 2017 were below the commercial ACL. The SARIMA model did not predict closures as it reflected the downward trend in landings and catch per day as predicted by SARIMA. The SSC agrees with Dr. Farmer's recommendation to use the SARIMA model.*
  5. *Action 5: SARIMA*
     - *Based on Dr. Farmer's retrospective analysis, the SARIMA model more closely estimated actual landings in 2017, but it is noted that both models overestimated the 2017 landings. Thus, the predicted quota closure dates may be conservative. The SSC agrees with Dr. Farmer's recommendation to use the SARIMA model.*

- *General recommendations for using SARIMA:*
  - *Suggest looking at including co-occurring targeted species that are associated with the incidentally caught species in this analysis.*

- *To determine which (or both) of the two models (SARIMA and Last 3) is best to use for forecasting fishery catch rates and closure dates, a decision framework needs to be developed in advance for making such a decision.*
- *Clear criteria for how to decide on which method to use is critical for stakeholder buy-in.*
- *To clarify, these analyses are only used for Council management actions within amendments, not for annual analyses to look at in-season or post-season accountability measures.*
- *Due to how sensitive the SARIMA seems to be to recent trends, it will take careful consideration by the analyst when deciding when to use this tool.*
- *Suggest retrospective analysis of fitting SARIMA and Last 3 Years model to many types of fisheries under different conditions (stable fisheries, management changes, etc.).*

- Does either of these approaches provide clearer management advice to the Council?
  - *The SSC recommends SARIMA become one of the tools used to analyze catch data and that it be explored as one of the possible models for use when predicting future catch rates and providing management advice.*
- Are there differences in relative risk or uncertainty between the two methods?
  - *SARIMA more susceptible to recent trends in fisheries data than the Last 3 Years model.*
    - *This can either increase or decrease the risk of uncertainty between these two approaches.*
  - *Volatility clustering may help to reduce sensitivity of SARIMA to recent fishery volatility.*
- Are there cases where one method may be superior to the other in providing management advice? If so, why and can the appropriate model be determined a priori?
  - *The choice of model depends on whether trends in the last 2-3 years of data are present and if those trends are real or not.*
  - *The SARIMA will forecast a fishery's behavior more accurately if that fishery is relatively stable through time.*
  - *The Last 3 Years performs better under conditions of recent change (such as management changes) or recent hyper-stability that differs from the long-term trend.*
  - *One caveat about the predictive ability of the models is that neither model includes causative or behavioral variables. However, changes in*

regulations cause changes in fishing behavior, and for this reason could result in landings that deviate from historical averages, patterns or trends.

3. OTHER BUSINESS

- *There was no other business to come before the Committee.*

4. REPORT AND RECOMMENDATIONS REVIEW

The Committee is provided an opportunity to review its report and final recommendations.

Due to the timing of this meeting, a preliminary report on the Committee's recommendations will be provided by the Chair at the June 2018 SAFMC meeting. The Final SSC report will be available for the Council at the September 2018 Council meeting.

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