Impacts of proposed alternatives in South Atlantic Regulatory Amendment 27: Commercial Visioning Blueprint

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Introduction

The South Atlantic Fishery Management Council (Council) manages Snapper-Grouper stocks in federal waters from the Florida Keys to the Virginia/North Carolina border. In Vision Blueprint Commercial Regulatory Amendment 27 for the Snapper Grouper Fishery of the South Atlantic Region (Reg-27), the Council has proposed modifications of commercial regulations such as fishing seasons, trip limits, seasonal closures, and size limits for species in the snapper grouper fishery. These proposed management measures are intended to lengthen commercial fishing seasons, minimize discard mortality, to improve compliance, and aid in enforcement of regulations in the South Atlantic region. This document evaluates the impacts of proposed alternatives in Reg-27 and provides analytical support for the Council's decision-making process.

Methods & Results

Action 1. Establish a commercial split season for blueline tilefish

- **Alternative 1 (No Action)**. The commercial fishing year for blueline tilefish in the South Atlantic EEZ is from January 1 to December 31.
- **Alternative 2.** Specify two commercial fishing seasons for blueline tilefish. Allocate the blueline tilefish commercial ACL into two quotas: 40% to the period January 1 through June 30 and 60% to the period July 1 through December 31. Any remaining quota from Season One would transfer to Season Two. Any remaining quota from Season Two would not be carried forward.
    - **Sub-alternative 2a.** Season 1 trip limit = 100 pounds lbs gw, Season 2 trip limit = 300 pounds lbs gw.
    - **Sub-alternative 2b.** Season 1 trip limit = 150 pounds lbs gw, Season 2 trip limit = 300 pounds lbs gw.
- **Alternative 3.** Modify the commercial trip limit for blueline tilefish:
    - **Sub-alternative 3a**. 100 lbs gw from January 1 through April 30 and 300 lbs gw from May 1 through December 31
    - **Sub-alternative 3b**. 150 lbs gw from January 1 through April 30 and 300 lbs gw from May 1 through December 31

- **Sub-alternative 3c**. 100 lbs gw from January 1 through April 30 and 400 lbs gw from May 1 through December 31
- **Sub-alternative 3d.** 100 lbs gw from January 1 through June 30 and 300 lbs gw from July 1 through December 31.

Average monthly commercial landings for blueline tilefish by state from 2004-2013 are provided in **Figure 1**. The percentage of annual blueline tilefish landings from each state from 2002-2016 is provided in **Figure 2**. Due to recent quota closures (**Table 1**), data were not available from recent years to inform Season 2 landings. The Council may want to consider moving this action to blueline tilefish amendment (Amendment 38) given the pending completion in June 2018 of the SEDAR 50 stock assessment, which may provide updated stock status and ABC recommendations. Also, blueline tilefish management has been very dynamic over the past few years, with many regulatory changes including a prohibition of harvest beyond 240 fathoms in 2011. The input data available for forecasting future landings have consequently been affected, which has implications for the reliability of analyses. In general, the most recent year is probably the best available predictor of future trends.

Trip limit impacts were simulated by modifying and re-summarizing landings from commercial logbook trip records (SEFSC commercial logbook data, accessed April 2017). Total monthly landings 2006-2016 were compared between modified (500, 400, 300, 250, 200, 150, and 100-lb gw trip limit) and unmodified trip records. Monthly scalars were applied to projected landings data for the alternatives listed above. Monthly trip limit scalars on projected catches were determined using the last three fully open years without a trip limit in place within this range (**Table 2**). All trip limit scalars were based on a 300-lb trip limit baseline, with landings from Mar 2015-June 2016 scaled up from the 100-lb trip limit that was in place at that time.

To predict baseline 2018 landings for Alternative 1, monthly commercial landings data for 1997-2016 was obtained from the NOAA Southeast Fisheries Science Center (SEFSC) annual catch limit (ACL) commercial database (accessed May 2017). Input data was evaluated from 1997 onward because species identification has improved through time. Landings under a back-calculated 300-lb trip limit were converted to daily catch rates by month, which considered the number of open days during months with quota closures or seasonal restrictions on harvest. Two projection models were developed: (1) based on the last three years of data (2014-2016; "Last 3"), and (2) a seasonal auto-regressive integrated moving average (SARIMA) model. For the first model, the mean and standard deviation of the last three years of data were used to generate monthly mean and 95% confidence interval projection estimates for daily catch rates, which were subsequently expanded into estimates of monthly landings by multiplying by the number of days in each month. Commercial discards were estimated by month using the SEFSC Commercial Logbook and Supplemental Discard Logbook (accessed May 2017) to develop a

discard rate in numbers of fish per unit effort, by species, gear, and region, and expand that rate to the total effort in the fishery by gear and region.

A second projection was developed by fitting SARIMA models to the data (Box et al. 2013). In a SARIMA(p,d,q)x(P,D,Q) model, the autoregressive component (p) represents the lingering effects of previous observations, the integrated component (d) represents temporal trends, and the moving average component (q) represents lingering effects of previous random shocks (or error). The SARIMA models were implemented using Proc ARIMA in SAS version 9.2 (SAS Institute). Following Farmer & Froeschke (2015), all possible combinations of single-difference SARIMA models for landings per day by wave were considered (**Table S-1**). A single-difference SARIMA model only considers a maximum of one differencing term in the annual and one differencing term in the seasonal component. Differencing terms considered were annual and monthly. All SARIMA models were fit using conditional least squares. Stationarity tests were used to guide differencing selection. Final SARIMA model selection was guided by the examination of autocorrelations, inverse autocorrelations, partial autocorrelations, cross-correlations, residual diagnostics, and AIC. The Last 3 approach is a simple average and highly sensitive to recent trends. The SARIMA approach is more statistically robust, with the final model selected with the combination of seasonal and interannual trends that best fits the data. The SARIMA model approach is sensitive to recent trends, captures long term trends, and has been shown to provide superior fits to catch trends as compared to recent year's data approaches (Farmer & Froeschke 2015).

The final selected model was a ARIMA(1,0,0)X(0,1,1)s with R^2=0.53 (**Figure 3**). Projected mean and 95% confidence intervals for daily catch rates were expanded into estimates of monthly landings by multiplying by the number of days in each month. Peak blueline tilefish landings were projected for August, followed by July (**Figure 4**). Projections using the Last 3 model anticipated 50% of the ACL would be reached in April (95% CI: Mar-June). SARIMA projections estimated 50% of the ACL would be reached in May (95% CI: Jan-Dec). Projected season lengths under Alternatives 1-3 are provided in **Table 3**. Due to recent dynamic changes in the fishery and challenges accounting for the imposition of a 300-lb trip limit in July 2016, there is substantial uncertainty in these projections. Expanded estimates of commercial discards for blueline tilefish from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017) are provided in **Figure S-1**.

Action 2. Establish a commercial split season for snowy grouper

- **Alternative 1 (No Action)**. The commercial fishing year for snowy grouper in the South Atlantic federal waters is from January 1 to December 31.
- **Alternative 2**. Specify two commercial fishing seasons for snowy grouper. Allocate the snowy grouper commercial ACL into two quotas: 60% to the period January 1 through June 30 and 40% to the period July 1 through December 31. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward.
- **Alternative 3**. Specify two commercial fishing seasons for snowy grouper. Allocate the snowy grouper commercial ACL into two quotas: 70% to the period January 1 through June 30 and 30% to the period July 1 through December 31. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward.

Average monthly commercial landings for snowy grouper are provided by state 2002-2005 and 2007-2011 in **Figure 5**. The years 2006 and 2012-2016 were excluded due to closures. The percentage of annual snowy grouper landings from each state from 2002-2016 is provided in **Figure 6**. Similar to blueline tilefish (see Action 1, above), commercial landings data were converted to daily catch rates within months for 1997-2016. There have been several recent quota closures for snowy grouper (**Table 4**). Two projection models were fit to the data: (1) mean catch rates 2014-2016 ("Last 3") and (2) a SARIMA model. In the Last 3 model, the ratio of Sept to Oct-Dec landings 2010-2012 was used to generate extrapolated catch estimates for Oct-Dec due to quota closures in the 2014-2016 period. No data adjustments were made for the change in trip limit from 100 lbs to 200 lbs in Aug 2015. For the SARIMA model, a covariate was introduced for the trip limits of 2500 lbs (1994-Sept 2006), 275 lbs (Oct 2006-Dec 2006), 175 lbs (2007), 100 lbs (2008-July 2015), and 200 lbs (Aug 2015-on). Based on commercial logbook self-reported catch records, some trips with harvest above the status quo trip limit was identified in each year 2010-2015. The final selected SARIMA model was ARIMA(0,1,1)X(0,1,1)s with R^2=0.85 (**Figure 7**).

The numerous changes in trip limits and other regulations for snowy grouper likely make recent data a poor predictor of future trends. Under Alternative 1 (No Action), the ACL is anticipated to be met by Sept (95% CI: June-No Closure) or Mar (95% CI: Feb-Nov) by the Last 3 and SARIMA models, respectively (**Figure 8**). The Last 3 model predicts 50% of the ACL will be achieved by May (95% CI: Apr-Sept); the SARIMA model predicts 50% of the ACL will be met by Feb (95% CI: Jan-July). The broad confidence intervals for these predictions and the recent changes in the trip limit indicate high uncertainty in these predictions and they should be interpreted with caution.

Projected season lengths under Alternatives 1-3 are provided in **Table 5**. Expanded estimates of commercial discards for snowy grouper from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017) are provided in **Figure S-3**. Snowy grouper are landed in every state, with the majority of vessels landing snowy grouper operating out of Florida (**Figure S-10**). Note this analysis was performed at the state level, so vessels landing in multiple states would be counted for each state.

Action 3. Establish a commercial split season for greater amberjack

- **Alternative 1 (No Action)**. The commercial fishing year for greater amberjack in the South Atlantic exclusive economic zone is from March 1 to the end of February. During April each year, no person may sell or purchase greater amberjack harvested from the South Atlantic exclusive economic zone, and the harvest and possession limit is one per person per day or one per person per trip, whichever is more restrictive. The commercial trip limit in March and from May through the end of February each fishing year is 1,200 pounds whole weight.
- **Alternative 2**. Specify two commercial fishing seasons for greater amberjack. Allocate the commercial ACL for greater amberjack into two quotas: 50% to the period March 1 through August 31 and 50% to the period September 1 through the end of February. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward. During April, no person may sell or purchase a greater amberjack harvested from the South Atlantic exclusive economic zone.
    - **Sub-alternative 2a.** Season 1 trip limit = 1,200 pounds lbs ww, Season 2 trip limit = 1,000 pounds lbs ww. Season 2 would include a trip limit step-down to 750 pounds lbs ww when 75% of the ACL is met or projected to be met.
    - **Sub-alternative 2b.** Season 1 trip limit = 1,200 pounds lbs ww, Season 2 trip limit = 1,000 pounds lbs ww. Season 2 would include a trip limit step-down to 500 pounds lbs ww when 75% of the ACL is met or projected to be met.
    - **Sub-alternative 2c.** Trip limit equals 1,000 pounds whole weight in both seasons. A trip limit reduction to 500 pounds whole weight would occur in each season once 75% of the seasonal quota is met or projected to be met. A trip limit reduction would not occur in Season 1 if 75% of the season's quota is met or is projected to be met on July 31. A trip limit reduction would not occur in Season 2 unless 75% of the season's quota is met or is projected to be met on January 1.
- **Alternative 3**. Specify two commercial fishing seasons for greater amberjack. Allocate the commercial ACL for greater amberjack into two quotas: 60% to the period March 1 through August 31 and 40% to the period September 1 through the end of February. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward. Commercial harvest would still be prohibited annually in April.
    - **Sub-alternative 3a.** Season 1 trip limit equals 1,200 pounds whole weight, Season 2 trip limit equals 1,000 pounds whole weight. Season 2 would include a trip limit reduction to 750 pounds whole weight when 75% of the ACL is met or projected to be met. A trip limit reduction would not occur in Season 2 unless75% of the season's quota is met or is projected to be met on January 1.

- **Sub-alternative 3b.** Season 1 trip limit equals 1,200 pounds whole weight, Season 2 trip limit equals 1,000 pounds whole weight. Season 2 would include a trip limit reduction to 500 pounds whole weight when 75% of the ACL is met or projected to be met. A trip limit reduction would not occur in Season 2 unless75% of the season's quota is met or is projected to be met on January 1.
- **Sub-alternative 3c.** Trip limit equals 1,000 pounds whole weight in both seasons. A trip limit reduction to 500 pounds whole weight would occur in each season once 75% of the ACL is met or projected to be met. A trip limit reduction would not occur in Season 1 if 75% of the season's quota is met or is projected to be met on July 31. A trip limit reduction would not occur in Season 2 unless 75% of the season's quota is met or is projected to be met on January 1.

Average monthly commercial landings for greater amberjack by state from 2005-2015 are provided in **Figure 9**. The percentage of annual greater amberjack landings from each state from 2012-2016 is provided in **Figure 10**. State landings of greater amberjack were restricted to the most recent five years of data due to high proportions of unclassified amberjacks prior to 2012. Even after 2012, some unclassified amberjacks (greater amberjack, lesser amberjacks, banded rudderfish, and almaco jack) were present in North Carolina landings. North Carolina's seafood dealers began using species-specific codes for greater amberjack in 2011, but it was not until 2015 that unclassified amberjack was completely removed as an option for all dealers. It was difficult to this evaluate alternative given the unspecified percentages. Similar to blueline tilefish (see Action 1, above), commercial landings data were converted to daily catch rates within months for 1997-2016. There have been several recent quota closures for greater amberjack (**Table 6**). Two projection models were fit to the data: (1) mean catch rates 2014-2016 ("Last 3") and (2) a SARIMA model. The final selected SARIMA model was a ARIMA(1,1,0)X(0,1,1)s with R^2=0.86 (**Figure 11**).

Under Alternative 1 (No Action), the ACL is anticipated to be met by Nov (95% CI: Sept-No Closure) or July (95% CI: Feb-No Closure) by the Last 3 and SARIMA models, respectively (**Figure 12**). The Last 3 model predicts 50% of the ACL will be achieved by June (95% CI: May-July); the SARIMA model predicts 50% of the ACL will be met by May (95% CI: Mar-Not Met). The broad confidence intervals indicate high uncertainty and these predictions should be interpreted with caution. Trip limit reductions are provided in **Table 7**. Estimated closure dates for the various alternatives are provided in **Table 8**.

Expanded estimates of commercial discards for greater amberjack from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017) are provided in **Figure S-4**.

Action 4. Establish a commercial split season for red porgy

- **Alternative 1 (No Action)**. The commercial fishing year for red porgy in the South Atlantic federal waters is from January 1 to December 31. During January, February, March, and April, the seasonal harvest limit of red porgy in or from South Atlantic federal waters is three per person per day or three per person per trip, whichever is more restrictive. From May 1 through December 31, the trip limit is 120 fish.
- **Alternative 2**. Maintain the annual January 1 to April 30 seasonal harvest limit for red porgy.
    - **Sub-Alternative 2a.** Allocate the directed commercial red porgy ACL into two quotas: 50% to the period January 1 through June 30 and 50% to the period July 1 through December 31. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward.
    - **Sub-alternative 2b.** Allocate the directed commercial red porgy ACL into two quotas: XX% to the period January 1 through _____ and YY% to the period ____ through December 31. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward.
- **Alternative 3**. Remove the annual January 1 to April 30 seasonal harvest limit for red porgy.
    - **Sub-Alternative 3a.** Allocate the directed commercial red porgy ACL into two quotas: 50% to the period January 1 through June 30 and 50% to the period July 1 through December 31. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward.
    - **Sub-Alternative 3b.** Allocate the directed commercial red porgy ACL into two quotas: XX% to the period January 1 through _____ and YY% to the period ____ through December 31. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward.

Average monthly commercial landings for red porgy by state from 2005-2012 and 2014-2016 are provided in **Figure 13**. The year 2013 was excluded due to a closure. The percentage of annual red porgy landings from each state from 2002-2016 is provided in **Figure 14**. It was difficult to this evaluate alternative given the unspecified percentages. Similar to blueline tilefish (see Action 1, above), commercial landings data were converted to daily catch rates within months for 1997-2016. There has only been one recent quota closure for red porgy (**Table 9**). Two projection models were fit to the data: (1) mean catch rates 2014-2016 ("Last 3") and (2) a SARIMA model. For the Last 3 model, landings in the event of a Jan-Apr opening of the fishery were extrapolated from mean 2014-2016 May landings using the mean ratio of May landings to Jan-Apr landings 1986-1999 (the final year the fishery was open Jan-Apr). Final SARIMA model selection was guided by the examination of autocorrelations, inverse autocorrelations, partial autocorrelations, cross-correlations, residual diagnostics, and AIC. In the SARIMA

Comment [NAF1]: Analysis not yet updated.

Alternative 1 (No Action). The commercial fishing year for red porgy in the South Atlantic exclusive economic zone is from January 1 to December 31. During January 1 through April 30 each year, no person may sell or purchase red porgy harvested from the South Atlantic exclusive economic zone, and the harvest and possession limit is three per person per day or three per person per trip, whichever is more restrictive. From May 1 through December 31 each year, the trip limit for red porgy is 120 fish.

Alternative 2. Specify two commercial fishing seasons for red porgy. Allocate the commercial red porgy ACL into two quotas: 30% to the period January 1 through April 30 and 70% to the period May 1 through December 31. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward. Remove the sale and purchase prohibition during January 1 to April 30 each year. Retain the commercial trip limit of 120 fish from May 1 through December 31 and specify a commercial trip limit from January 1 through April 30 of:

Sub-alternative 2a. 30 fish
Sub-alternative 2b. 45 fish
Sub-alternative 2c. 60 fish

Alternative 3. Specify two commercial fishing seasons for red porgy. Allocate the commercial red porgy ACL into two quotas: 50% to the period January 1 through April 30 and 50% to the period May 1 through December 31. Any remaining quota from Season 1 would transfer to Season 2. Any remaining quota from Season 2 would not be carried forward. Remove the sale and purchase prohibition during January 1 to April 30 each year. Retain the commercial trip limit of 120 fish from May 1 through December 31 and specify a commercial trip limit from January 1 through April 30 of:

Sub-alternative 3a. 30 fish
Sub-alternative 3b. 45 fish
Sub-alternative 3c. 60 fish
~~**Sub-alternative 3c.** 120~~ fish

Alternative 4. Remove the harvest and possession restrictions, and sale and purchase prohibition for red porgy from the South Atlantic during January 1 to April 30 each year. Specify a commercial trip limit of 120 fish from January 1 through December 31.

model, Jan-Apr catch rates were left blank 2000-present, allowing the model to freely estimate these parameters from the input time series. The final selected model was a ARIMA(1,1,0)X(0,1,1)s with R^2=0.89 (**Figure 15**).

With a Jan-Apr closure, 50% of the ACL is projected to be caught by August (95% CI: July-Sept) or Sept (95% CI: June-No Closure) by the Last 3 and SARIMA models, respectively (**Figure 16: left**). Between Jan-June 30, 38,247 lb ww (95% CI: 23,862-52,632 lb ww) to 24,646 lb ww (95% CI: 0-111,485 lb ww) is projected to be caught by the Last 3 and SARIMA models, respectively.

Without a Jan-Apr closure, 50% of the ACL is projected to be caught by May (95% CI: Apr-July) or July (95% CI: Feb-Dec 31) by the Last 3 and SARIMA models, respectively (**Figure 16: right**). Between Jan-June 30, 110,456 lb (95% CI: 63,041-157,871 lb ww) to 60,393 lb ww (95% CI: 0-294,705 lb ww) is projected to be caught by the Last 3 and SARIMA models, respectively. The wide confidence intervals for these projections indicate the substantial uncertainty in the predictions, especially for the impacts of removing the Jan-Apr closure, which has been in place since 2000.

Expanded estimates of commercial discards for red porgy from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017) are provided in **Figure S-2**.

Action 5. Modify the commercial trip limit for vermilion snapper in the second season

- **Alternative 1 (No Action)**. The commercial fishing year for vermilion snapper in the South Atlantic exclusive economic zone is from January 1 to December 31. The commercial annual catch limit is split into two quotas: 50% to the period January 1 through June 30 and 50% to the period July 1 through December 31. Any remaining quota from Season 1 transfers to Season 2. Any remaining quota from Season 2 is not carried forward. The commercial trip limit for vermilion snapper in the South Atlantic exclusive economic zone is 1,000 pounds gutted weight. For both seasons, when 75% of the vermilion snapper seasonal quota is met or is projected to be met, the trip limit is reduced to 500 pounds gutted weight.
- **Alternative 2**. Retain the commercial trip limit and trip limit reduction in Season 1 (January 1 through June 30). For Season 2 (July 1 through December 31), modify the commercial trip limit to 750 pounds gutted weight and retain the trip limit reduction to 500 pounds gutted weight when 75% of the season's quota is met or projected to be met. Any remaining quota from Season 1 transfers to Season 2. Any remaining quota from Season 2 is not carried forward.
- **Alternative 3**. Retain the commercial trip limit and trip limit reduction in Season 1 (January 1 through June 30). For Season 2 (July 1 through December 31), modify the commercial trip limit to 500 pounds gutted weight and remove the trip limit reduction. Any remaining quota from Season 1 transfers to Season 2. Any remaining quota from Season 2 is not carried forward.
- **Alternative 4.** Modify the commercial trip limits for both seasons (January 1 through June 30; July 1 through December 31) to 750 pounds gutted weight and remove the trip limit reduction in Season 2. Any remaining quota from Season 1 transfers to Season 2. Any remaining quota from Season 2 is not carried forward.

Similar to blueline tilefish (see Action 1, above), commercial landings data were converted to daily catch rates within months for 1997-2016. There have been several recent quota closures for vermilion snapper (**Table 10**). Two projection models were fit to the data: (1) mean catch rates 2014-2016 ("Last 3") and (2) a SARIMA model. For vermilion snapper, models with differencing on the monthly term predicted population collapses; as such, model selection was restricted to annual differencing models. The final selected model was a ARIMA(1,0,0)X(0,1,1)s with R^2=0.88 (**Figure 17**). Trip limit impacts were simulated by modifying and re-summarizing landings from commercial logbook trip records (SEFSC commercial logbook data, accessed April 2017). Total monthly landings 2006-2016 were compared between modified (750 and 500 lb gw trip limit) and unmodified trip records. Monthly scalars were applied to projected landings data for the alternatives listed above. Monthly trip limit scalars on projected catches were determined using the last three fully open years (**Table 11**).

Daily catches were projected for Season 1 and Season 2 using projected monthly catch rates. Cumulative landings were tracked and trip limits were applied to scale monthly catch rates when 75% of the ACL was met. For Season 1, the ACL is anticipated to be met by Mar (95% CI: Mar-Apr) or Apr (95% CI: Feb-June) by the Last 3 and SARIMA models, respectively. Projected trip limit reduction dates and closure dates for Season 2 are provided in **Table 12**. Last 3 and SARIMA model projections were relatively consistent, indicating fairly high confidence in projected closure dates (**Figure 18**).

Expanded estimates of commercial discards for vermilion snapper from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017) are provided in **Figure S-5**.

Action 6. Implement a commercial trip limit for the Other Jacks Complex

- **Alternative 1 (No Action)**. There is no commercial trip limit for the Other Jacks Complex (lesser amberjack, almaco jack, and banded rudderfish).
- **Alternative 2**. Establish a commercial trip limit for the Other Jacks Complex.
    - **Sub-alternative 2a.** 500 pounds gutted weight with a trip limit reduction to 250 pounds gutted weight once 75% of the annual catch limit is met or projected to be met.
    - **Sub-alternative 2b.** 400 lbs gutted weight with a trip limit reduction to 200 pounds gutted weight once 75% of the annual catch limit is met or projected to be met.
    - **Sub-alternative 2c.** 300 lbs gutted weight with a trip limit reduction to 150 pounds gutted weight once 75% of the annual catch limit is met or projected to be met.
- **Alternative 3**. Establish a commercial trip limit for the Other Jacks Complex.
    - **Sub-alternative 3a.** 500 lbs gw
    - **Sub-alternative 3b.** 400 lbs gw
    - **Sub-alternative 3c.** 300 lbs gw

Similar to blueline tilefish (see Action 1, above), commercial landings data were converted to daily catch rates within months for 1997-2016. There have been several recent quota closures for the Jacks complex (**Table 13**). Two projection models were fit to the data: (1) mean catch rates 2014-2016 ("Last 3") and (2) a SARIMA model. For the Last 3 model, projected catch rates for Sept-Dec were based on the mean ratio of August to Sept-Dec landings from the last three completely open fishing years during those months (2009-2011) applied to mean August 2014-2016 catch rates. The final selected SARIMA model was a ARIMA(0,0,1)X(0,1,1)s with R^2=0.79 (**Figure 19**). Projections were developed for the Jacks complex, with Alternative 3 almaco jack landings partitioned using the mean monthly ratio of almaco jack to Jacks complex landings from the most recent three fishing years (**Figure 20**).

Trip limit impacts were simulated by modifying and re-summarizing landings from commercial logbook trip records (SEFSC commercial logbook data, accessed April 2017). Total monthly landings 2006-2016 were compared between modified (500, 400, and 300 lb ww trip limit) and unmodified trip records. Monthly scalars were applied to projected landings data for the alternatives listed above. Monthly trip limit scalars on projected catches were determined using the last three fully open years (**Table 14**). Daily catches were estimated using projected monthly catch rates. Cumulative landings were tracked under different trip limit alternatives.

Under Alternative 1 (No Action), the ACL is anticipated to be met by July (95% CI: June-Dec) or June (95% CI: Apr-No Closure) by the Last 3 and SARIMA models, respectively (**Figure 21**). Although the predictions from the Last 3 model and SARIMA model are similar, the broad

confidence intervals for these predictions suggest some uncertainty in these predictions and they should be interpreted with caution. **Table 15** provides the projected mean and 95% confidence limits for quota closure dates under the various Action 6 alternatives. Note that the stepdown when 75% of the ACL is met does not provide substantial increases in season length.

Expanded estimates of commercial discards for the Jacks complex from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017) are provided in **Figure S-6**.

Action 7. Implement a minimum size limit for almaco jack for the commercial sector

- **Alternative 1 (No Action).** There is no commercial minimum size limit specified for almaco jack.
- **Alternative 2.** Specify a minimum size limit for almaco jack for the commercial sector:
  - **Sub -alternative 2a.** 20 inches fork length
  - **Sub-alternative 2b.** 22 inches fork length
  - **Sub-alternative 2c.** 24 inches fork length
  - **Sub-alternative 2d.** 26 inches fork length

The South Atlantic Fishery Management Council does not currently specify a commercial minimum size limit for harvested almaco jack. To evaluate the effects of establishing a minimum size limit, commercial catch data collected by the Southeast Fisheries Science Center's (SEFSC) Trip Intercept Program (TIP) were used to determine the proposed impact. Almaco jacks harvested by the commercial sector in the South Atlantic from the most recent three years available were used in the analyses.

TIP recorded 3,587 almaco jacks harvested in the South Atlantic from 2014 – 2016 with all lengths converted to inches fork length (FL). The size limit analysis estimated the percent decrease of harvest in whole weight for each of the four proposed size limits if implemented during this time, thus the weight of each fish was required. When whole weight data was available it was used, and gutted weights were converted using the SEFSC conversion factor of 1.04. When weight data was unavailable, it was estimated from length using the almaco jack weight-length equation defined in SEDAR 49 (2016).

Figure 22 provides the commercial sector almaco jack length distribution in 2-inch increments from 2014 – 2016. Approximately, 37% of the almaco jacks harvested are below the shortest minimum size limit being proposed in **Sub-alternative 2a** of 20 inches FL. Implementing the largest proposed minimum size limit (26 inches FL in **Sub-alternative 2d)** would reduce the number of almaco jacks harvested by 65%. Each 2-inch size bin between 20 and 26 inches FL would reduce the number of almaco jacks harvested between 8.8% and 10%.

Decreases in landings in whole weight were calculated for minimum size limits (MSL) at 2-inch intervals between 20 – 26 inches FL as follows:

Percent reduction = $((C – (G+R)) /C$, where:

C = *catch in pounds*

G = *weight of fish that are greater than or equal to the MSL*

R = release mortality multiplied against the fish that are less than the MSL being considered

Data were pooled for the most recent three years of complete data (2014 – 2016) with the assumption that recent weights will likely reflect future weights harvested in the fishery. All of the weights used in the analysis are in pounds whole weight. A release mortality estimate of 5% was incorporated into the analysis from SEDAR 49 (2016). A decrease in harvest weight ranged between 10.9 and 32.5% for each of the minimum size limits proposed (**Table 16)**. Any of the proposed size limits would likely slow the harvest rate of almaco jack. The slower harvest rates could lengthen the current commercial seasons for the Jacks Complex, which closed in June, July, or August from 2012 – 2016, because almaco jacks comprise the majority of Jacks Complex landings (**Figure 20**). Establishing a minimum size limit would likely result in increased discarding of under sized almaco jacks, but a low discard mortality rate (<10%) was supported by fishers at SEDAR 49 (2016). Fishers cited the shallower depth of capture and general hardiness of almaco jacks compare to other jack species as support for a very low discard mortality rate. Even with a low discard mortality rate between 0 and 10%, it is possible some smaller individuals could be used as bait to target other species. The reliability of this analysis is dependent upon the accuracy of the underlying data and input assumptions. This analysis assumes that the commercial harvest of almaco jacks from 2014 – 2016 will reflect the size distribution of almaco commercial harvest in the future.

Action 8. Modify the seasonal prohibition on commercial harvest and possession of shallow-water groupers

- **Alternative 1 (No Action).** During January through April, no person may sell or purchase a gag, black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, yellowfin grouper, graysby, or coney harvested from or possessed in the South Atlantic exclusive economic zone.
- **Alternative 2.** Maintain seasonal prohibition on sale and purchase of shallow-water groupers annually from January 1 to April 30 north of 28 degrees North latitude. Prohibit sale and purchase of shallow-water grouper species (gag, scamp, red grouper, yellowfin grouper, yellowmouth grouper, red hind, rock hind, graysby, and coney) (excluding black grouper) south of 28° North latitude (approximately off Palm Bay, Florida):
    - **Sub-alternative 2a.** January – March (three months)
    - **Sub-alternative 2b.** February – March (two months)
    - **Sub-alternative 2c.** February – April (three months)
    - **Sub-alternative 2d.** February – May (four months)
- **Alternative 3.** Maintain seasonal prohibition on sale and purchase of shallow-water groupers annually from January 1 to April 30 north of 28 degrees North latitude. Prohibit sale and purchase of black grouper in the exclusive economic zone south of 28 degrees North Latitude:
    - **Sub-alternative 4a.** January – March (three months)
    - **Sub-alternative 4b.** January
    - **Sub-alternative 4c.** February
    - **Sub-alternative 4d.** March
- **Alternative 4.** Exclude gag from the prohibition on sale and purchase of shallow-water groupers annually from April 1 through April 30. Specify a trip limit for gag during April:
    - **Sub-alternative 3a.** 100 pounds gutted weight
    - **Sub-alternative 3b.** 200 pounds gutted weight
    - **Sub-alternative 3c.** 300 pounds gutted weight
- **Alternative 5.** Maintain seasonal prohibition on sale and purchase of shallow-water groupers annually from January 1 to April 30 in the exclusive economic zone off Georgia and east Florida. Prohibit sale and purchase of red grouper in the exclusive economic zone off North Carolina and South Carolina
    - **Sub-alternative 5a.** January – May (five months)
    - **Sub-alternative 5b.** February – May (four months)
    - **Sub-alternative 5c.** March – June (four months)

Alternative 2 was difficult to evaluate as the months were not specified. Also of note is that the most recent black grouper stock assessment data workshop noted issues with species ID between

gag and black grouper off South Florida. This could have implications for analyses. All landings are assumed to be correctly identified to species in these analyses. It is very challenging to make meaningful predictions of the amount of harvest that will be realized with the removal/modification of the shallow-water grouper closure due to the duration it has been in place. Confidentiality concerns prohibit the disclosure of a time series of landings for the various species considered in the action. Mean 2014-2016 and projected monthly landings of shallow-water grouper species are provided in **Figure 23**.

This analysis required backfilling landings for the Jan-Apr closed time period. The months of Mar-Apr were closed to gag and black grouper were closed by Amendment 9 in 1999. The months of Jan-Apr were closed to all shallow-water grouper were closed by Amendment 16 in mid-2009. Estimates of landings that would be realized during openings in the Jan-Apr time period are based on the mean ratios from the last three completely open fishing years, for all shallow-water grouper stocks, for those months. For Jan-Feb, the mean ratio of Jan-Feb to May 2007-2009 landings was applied. For Mar-Apr, the mean ratio of Mar-Apr to May 1996-1998 landings was applied. Landings in the Jan-Apr period are projected to be relatively high (between 40-80% of May landings); however, this analytical approach does not account for the potential redistribution of peak effort to May following the implementation of the Mar-Apr closure in 1999, nor does it account for potential declines in catch rates in the May-Dec period if the fishery opened earlier in the calendar year. Thus, it is likely the projected landings presented in Figure 22 are an upper bound for what might be caught if the closure months were modified. If the Council moves forward with this action following their December meeting, additional analysis may be provided to attempt to quantify uncertainty and directly address the impacts of the proposed alternatives.

Expanded estimates of commercial discards for shallow-water grouper from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017) are provided in **Figure S-7**.

Action 9. Remove the commercial minimum size limits for deep-water species

- **Alternative 1 (No Action)**. The commercial minimum size limit for queen snapper, silk snapper, and blackfin snapper in the South Atlantic EEZ is 12 inches total length (TL).
- **Alternative 2**. Remove the 12-inch TL commercial minimum size limit for queen snapper, silk snapper, and blackfin snapper in South Atlantic federal waters.

The current commercial size limit of 12 inches TL for queen snapper, silk snapper, and blackfin snapper was established in Amendment 9 (1998). It was difficult to determine the effects of Alternative 2 due to the lack of commercial discard data available. The only discard data available for the years 2014-2016 was from the SEFSC Supplemental Discard Logbook Program. The discard logbook database (accessed May 2017) contains self-reported discard reports from a 20 percent sub-sample (by region and gear fished) of all commercial vessels with federal fishing permits. From 2014-2016, only two trips reported discards for silk snapper and no discards were reported for queen snapper and blackfin snapper (**Table 17**). None of the three species were reported as kept for bait. For the only trips with reported discards for any of the three species, five silk snapper were discarded alive due to the local or federal size limit forbidding it. Barotrauma likely results in high fishing mortality of discards due to the relatively deep depth of capture for these species. Expanding the observed discard rates to the fishery as a whole is non-informative due to low reported encounters in recent years (**Figure S-8**). Available data suggests minimal changes in discard or harvest rates would be expected under Alternative 2. The reliability of this analysis is dependent upon the accuracy of the underlying data and input assumptions.

Action 10. Decrease the commercial minimum size limit for gray triggerfish off the east coast of Florida

- **Alternative 1 (No Action)**. The commercial minimum size limit for gray triggerfish in the South Atlantic federal waters off the east coast of Florida is 14 inches fork length (FL). The commercial minimum size limit for gray triggerfish in the federal waters off Georgia, South Carolina, and North Carolina is 12 inches FL.
- **Alternative 2**. Decrease the commercial minimum size limit for gray triggerfish in the federal waters off the east coast of Florida to 12 inches FL.

NOTE: Consider an alternative that would increase the MSL from 12 to 14 inches off GA, SC and NC. The Gulf Council is considering increasing the MSL to 15 inches as Gulf gray trigger is undergoing overfishing.

The South Atlantic Fishery Management Council recently modified the gray triggerfish minimum size limit for the commercial sector in federal waters off the east coast of Florida in Amendment 29, effective July 1, 2015. This amendment raised the minimum size limit in federal waters off the east coast of Florida from 12 inches total length (TL) to 14 inches FL. To evaluate the effects of lowering the current minimum size limit, commercial catch data collected by the Southeast Fisheries Science Center's (SEFSC) Trip Intercept Program (TIP) prior to the current rule were used to determine the proposed impact. Only gray triggerfish harvested from January 2014 through June 2015 by the commercial sector in federal waters off east Florida were used in the analyses.

TIP recorded 2,616 gray triggerfish for this area and time period after eliminating a small number of outliers (FL < 4 inches). All lengths were converted to inches FL using standard conversion factors and equations used in SEDAR 41 (2016). The size limit analysis estimated the percent increase in whole weight if the current 14-inch FL size limit was reduced during this time, thus the weight of each fish was required. When whole weight data was available it was used, and gutted weights were converted using the SEFSC conversion factor of 1.04. When weight data was unavailable, it was estimated from length using the gray triggerfish weight-length equations defined in SEDAR 41 (2016).

Figure 24 provides the commercial sector gray triggerfish length distribution in 1-inch increments from January 2014 to June 2015. The majority of the gray triggerfish harvested were

above the current minimum size limit of 14 inches FL. Lowering the current size limit to 12 inches FL (Alternative 2) would result in approximately 20% additional gray triggerfish available for harvest. This is consistent with recent analyses from Amendment 29 that reported between 11% and 26% of the mean monthly landings were less than 14 inches FL in the South Atlantic from 2007-2012. Alternative 2 would also likely reduce discards when the season was open, but may increase harvest rates, possibly shortening the commercial fishing seasons. Quota closures have been implemented for gray triggerfish every year since 2012.

Increases in landings in weight were calculated for minimum size limits (MSL) at 1-inch intervals between 12-14 inches FL as follows:

Percent increase = $(C + G + RU) / (C + RC)$, where:

C = catch in pounds with a MSL of 14-inch FL
G = weight of fish that are less than the MSL of 14-inch FL and greater than or equal to the reduced MSL
RU = release mortality multiplied against the fish that less than the reduced MSL and greater than the 12-inch MSL being considered
RC = release mortality multiplied against the fish that less than the 14-inch FL MSL and greater than the 12-inch MSL being considered

Percent increases associated with MSL were normalized to a 0% increase at the commercial status quo size limit of 14 inches FL in Alternative 1. Data were pooled for the time with the assumption that recent lengths will likely reflect future lengths harvested in the fishery. All of the weights used in the analysis are in pounds whole weight. Release mortality was incorporated into the analysis, and the mid-range discard mortality of 12.5% following SEDAR 41 (2016) was used.

Similar to the length distribution, lowering the size limit to 12 inches FL would likely increase the rate of fish harvested, thus increasing the landings and shortening the current commercial seasons (**Table 18**). The reliability of this analysis is dependent upon the accuracy of the underlying data and input assumptions. This analysis assumes that the commercial harvest of gray triggerfish size distribution from January 2014 to June 2015 will reflect the size distribution of gray triggerfish commercial harvest in the future.

References

SEDAR 41. 2016. SEDAR 41 – South Atlantic Gray Triggerfish Assessment Report. SEDAR, North Charleston, SC. 428 pp. http://sedarweb.org/sedar-41.

SEDAR 49. 2016. SEDAR 49 – Gulf of Mexico Data-limited Species. SEDAR, North Charleston, SC. 618 pp. http://sedarweb.org/sedar-49.

Table 1. Blueline tilefish recent landings and quota closures.

Fishing Year	Current Landings	ACL	%ACL	Closure Date
2017	85,629	87,521	97.84	7/18/17; Reopened 10/24/17-11/1/17
2016	101,043	87,521	115.45	6/1/16; reopened 7/13/16, closed 8/30/16
2015	78,802	17,841	441.69	4/7/2015
2014	143,942	112,207	128.28	6/23/2014
2013	309,411	376,469	82.19	
2012	378,667	343,869	110.12	9/8/2012

Source: SERO ACL Monitoring Webpage.

Table 2. Projected blueline tilefish commercial trip limit scalars, by month, based on most recent three years without a quota closure.

Month	500-lb	400-lb	300-lb	250-lb	200-lb	150-lb	100-lb	Years
1	130%	116%	100%	90%	79%	66%	51%	2013-2015
2	125%	113%	100%	92%	82%	70%	56%	2013-2015
3	138%	120%	100%	89%	76%	63%	48%	2012*-2014
4	137%	120%	100%	89%	78%	65%	51%	2012*-2014
5	139%	120%	100%	89%	78%	65%	52%	2012-2014
6	139%	120%	100%	90%	79%	67%	53%	2012*-2014
7	146%	123%	100%	88%	75%	62%	47%	2011-2013
8	146%	124%	100%	87%	74%	60%	45%	2011-2013
9	151%	126%	100%	87%	73%	58%	42%	2010, 2011, 2013
10	149%	125%	100%	87%	73%	58%	43%	2010, 2011*, 2013*
11	149%	125%	100%	87%	73%	58%	43%	2010*, 2011*, 2013*
12	148%	125%	100%	87%	73%	59%	44%	2010*, 2011*, 2013*

*Some months aggregated to achieve sample size of n>30.

Table 3. Projected mean and 95% lower and upper (L95, U95) confidence limits quota closure dates for blueline tilefish under different alternatives proposed for Action 1. Blanks denote no projected quota closure.

		Mean 2014-2016			SARIMA		
Alternative	**Season**	**L95**	**MEAN**	**U95**	**L95**	**MEAN**	**U95**
Alt 1	Jan-Dec		7-Jul	22-Apr		13-Jul	2-May
Alt 2a	Jan-June		12-Jun	28-Mar		25-Jun	7-Apr
	July-Dec		11-Aug	27-Jul		9-Aug	30-Jul
Alt 2b	Jan-June		14-May	20-Mar		25-May	19-Mar
	July-Dec		11-Aug	27-Jul		9-Aug	30-Jul
Alt 3a	Jan-Dec		30-Aug	16-Jun		18-Sep	14-Jun
Alt 3b	Jan-Dec		30-Aug	4-Jun		18-Sep	30-May
Alt 3c	Jan-Dec		20-Jul	9-Jun		18-Jul	5-Jun
Alt 3d	Jan-Dec		8-Aug	6-Jul		8-Aug	8-Jul

Table 4. Snowy grouper recent landings and quota closures.

Year	Landings	ACL	Units	%ACL	Closure
2017	136,375	135,380	gw	100.73	6/22/17
2016	46,615	125,760	gw	116.58	6/14/2016
2015	125777	115451	gw	108.94	9/22/2015
2014	92101	82900	gw	111.1	7/25/2014
2013	79479	82900	gw	95.87	8/10/2013
2012	89048	82900	gw	107.42	12/19/2012
2011	37338	82900	gw	45.04	
2010	86693	82900	gw	104.58	
2009	75614	82900	gw	91.21	
2008	72774	84000	gw	86.64	
2007	111994	118000	gw	94.91	
2006	213813	151000	gw	141.6	10/23/2006
2005	206638	344508	gw	59.98	
2004	220958	344508	gw	64.14	

Source: SERO ACL Monitoring Webpage.

Table 5. Projected mean and 95% lower and upper (L95, U95) confidence limits quota closure dates for snowy grouper under different alternatives proposed for Action 2. Blanks denote no projected quota closure.

Alternative	Season	L95	MEAN	U95	L95	MEAN	U95
Alt 1	Jan-Dec		21-Sep	1-Jul	8-Nov	19-Mar	14-Feb
Alt 2	Jan-June		21-Jun	8-May		18-Feb	27-Jan
	July-Dec		26-Sep	27-Sep	8-Nov	28-Jul	15-Jul
Alt 3	Jan-June			21-May		25-Feb	31-Jan
	July-Dec		21-Sep	14-Sep	8-Nov	21-Jul	11-Jul

Table 6. Greater amberjack recent landings and quota closures.

Fishing Year	Total Landings	ACL	Units	ACL	Closure Date
March 1, 2017 – February 28, 2018	795,862	769,388	gw	103.44	10/18/17; April 1-30 SEASONAL CLOSURE
March 1, 2016 – February 28, 2017	748,950	769,388	gw	97.34	10/4/2016
March 1, 2015 - Feb 28, 2016	757,881	769,388	gw	98.5	1/21/2016
May 1, 2014 - Feb 28, 2015	594,624	769,388	gw	77.29	
May 1, 2013 - April 30, 2014	842,234	800,163	ww	105.26	
May 1, 2012 - April 30, 2013	826,018	800,163	ww	103.23	
May 1, 2011 - April 30, 2012	1,032,080	1,169,931	gw	88.22	
May 1, 2010 - April 30, 2011	857,839	1,169,931	gw	73.32	
May 1, 2009 - April 30, 2010	837,077	1,169,931	gw	71.55	
May 1, 2008 - April 30, 2009	648,247	1,169,931	gw	55.41	
May 1, 2007 - April 30, 2008	542,438	1,169,931	gw	46.36	

Source: SERO ACL Monitoring Webpage.

Table 7. Projected greater amberjack commercial trip limit scalars, by month, based on most recent three years without a quota closure.

Month	1200-lb	1000-lb	750-lb	600-lb	500-lb	350-lb	200-lb	Years
1	98.4	94.4	86.3	78.5	72.3	59.8	42.1	2013-2015
2	97.1	92.8	83.7	75.8	69.1	56.2	38.6	2013-2015
3	98.3	91.3	77.7	67.4	59.6	46.0	30.0	2014-2016
4	97.7	90.9	77.9	67.9	60.2	46.8	30.7	(2014-2016)*
5	97.4	90.6	78.0	68.2	60.6	47.3	31.2	2014-2016
6	99.1	94.2	84.6	76.3	69.5	57.2	40.4	2014-2016
7	99.2	95.3	87.1	79.6	73.0	60.7	44.0	2014-2016
8	99.3	95.1	84.6	75.8	68.7	55.8	39.0	2014-2016
9	98.8	93.9	84.7	76.8	70.1	57.4	40.3	2014-2016
10	98.9	94.3	83.9	75.0	67.8	54.7	37.3	2013-2015
11	95.0	89.1	77.2	67.6	60.4	47.5	31.7	2013-2015
12	98.1	92.1	79.0	68.3	60.2	46.6	30.8	2013-2015

*Some months aggregated to achieve sample size of n>30.

Table 8. Projected greater amberjack commercial closure dates under proposed alternatives. Note blank denotes no closure.

		MEAN 2014-2016			SARIMA		
Alternative	**Season**	**L95**	**MEAN**	**U95**	**L95**	**MEAN**	**U95**
Alt 1	Mar-Feb		8-Nov	29-Sep		27-Jul	21-May
Alt 2a	Mar-Aug	7-Jul	10-Jun	28-May		17-May	28-Mar
	Sept-Feb					21-Dec	6-Oct
Alt 2b	Mar-Aug	7-Jul	10-Jun	28-May		17-May	28-Mar
	Sept-Feb					31-Dec	8-Oct
Alt 2c	Mar-Aug	9-Aug	5-Jul	15-Jun		27-May	3-May
	Sept-Feb					30-Dec	8-Oct
Alt 3a	Mar-Aug	3-Apr	10-Mar	7-Mar	15-Mar	14-Mar	12-Mar
	Sept-Feb		13-Sep	7-Sep	17-Sep	16-Sep	14-Sep
Alt 3b	Mar-Aug	3-Apr	10-Mar	7-Mar	15-Mar	14-Mar	12-Mar
	Sept-Feb		13-Sep	7-Sep	17-Sep	16-Sep	14-Sep
Alt 3c	Mar-Aug	5-Apr	11-Mar	8-Mar	16-Mar	15-Mar	13-Mar
	Sept-Feb		13-Sep	8-Sep	19-Sep	17-Sep	15-Sep

Table 9. Red porgy recent landings and quota closures.

Year	Landings	ACL	Units	%ACL	Closure
2016	120,104	164,000	ww	73.23	
2015	146,056	164,000	ww	89.06	
2014	155,546	154,500	ww	100.68	
2013	163,337	153,000	gw	106.76	12/02/13
2012	155,743	190,050	gw	81.95	
2011	195,215	190,050	gw	102.72	
2010	152,743	190,050	gw	80.37	
2009	158,219	190,050	gw	83.25	
2008	165,365	127,000	gw	130.21	
2007	136,382	127,000	gw	107.39	
2006	80,293	127,000	gw	63.22	
2005	46,844	None	gw		
2004	47,848	None	gw		

Source: SERO ACL Monitoring Webpage.

Table 10. Vermilion snapper recent landings and quota closures.

Fishing Year	Landings	ACL	Units	ACL	Trip Limit	Closure
January 1 -June 30, 2017	410,786	431,460	ww	95.21	3/22/2017	5/17/17
July 1 - Dec 31, 2017	465,567	431,460		102.90	10/2/17	10/17/17
January 1 - June 30, 2016	429,774	431,460	ww	99.61	3/2/2016	3/29/2016
July 1 - Dec 31, 2016	425,014	432,305		98.31	8/28/2016	10/11/16; reopened 12/14-12/15/16
Jan 1 - June 30, 2015	435,435	438,260	gw	99.69	3/2/2015	4/15/2015
July 1 - Dec 31, 2015	457,259	438,260		104.3	9/10/2015	9/22/2015
Jan 1 - June 30, 2014	454,084	446,080		101.8	3/11/2014	4/19/2014
July 1 - Dec 31, 2014	437,523	446,080		98.08	8/23/2014	9/12/2014
Jan 1 - June 30, 2013	304,432	466,480		65.26		2/13/2013
July 1 - Dec 31, 2013	623,347	613,278		101.6		12/2/2013
Jan 1 - June 30, 2012	400,787	315,523		127		2/29/2012
July 1 - Dec 31, 2012	504,525	302,523		166.8		9/28/2012
Jan 1 - June 30, 2011	333,001	315,523		105.5		3/10/11; Re-opened 5/1/11-5/8/11
July 1 - Dec 31, 2011	591,067	302,523		195.4		9/30/2011
Jan 1 - June 30, 2010	360,065	315,523		114.1		3/19/2010
July 1 - Dec 31, 2010	524,797	302,523		173.5		10/6/2010
Jan 1 - June 30, 2009	425,665	315,523		134.9		
July 1 - Dec 31, 2009	409,858	302,523		135.5		9/18/2009
Jan 1 - Dec 31, 2008	1,112,224	1,100,000		101.1		
	981,369	1,100,000		89.22		
	772,496	1,100,000		70.23		
	1,029,081	None				
	1,017,889	None				

Source: SERO ACL Monitoring Webpage.

Table 11. Projected vermilion snapper commercial trip limit scalars, by month, based on most recent three years without a quota closure.

Limit	Month	Scalar	Based on:
750	1	85%	2014-2016
750	2	86%	2014-2016
750	3	89%	2007-2009
750	4	89%	2007-2009
750	5	91%	2007-2009
750	6	92%	2007-2009
750	7	88%	2014-2016
750	8	85%	2012-2013, 2015
750	9	87%	2008, 2010, 2013
750	10	88%	2006-2008
750	11	89%	2006-2008
750	12	90%	2006-2008
500	1	62%	2014-2016
500	2	65%	2014-2016
500	3	73%	2007-2009
500	4	72%	2007-2009
500	5	76%	2007-2009
500	6	78%	2007-2009
500	7	68%	2014-2016
500	8	64%	2012-2013, 2015
500	9	66%	2008, 2010, 2013
500	10	71%	2006-2008
500	11	70%	2006-2008
500	12	73%	2006-2008

Table 12. Projected mean and 95% lower and upper (L95, U95) confidence limits trip limit reduction and quota closure dates for vermilion snapper under different alternatives proposed for Action 5.

	TRIP LIMIT REDUCED					
	Last 3 Years			**SARIMA**		
Alternative	L95_Last3	**Last3**	U95_Last3	L95_SARIMA	**SARIMA**	U95_SARIMA
1	18-Sep	**25-Aug**	13-Aug	4-Oct	**22-Aug**	4-Aug
2	28-Sep	**1-Sep**	18-Aug	18-Oct	**30-Aug**	9-Aug
3	n/a					
4	n/a					
	FISHERY CLOSED					
	Last 3 Years			**SARIMA**		
Alternative	L95_Last3	**Last3**	U95_Last3	L95_SARIMA	**SARIMA**	U95_SARIMA
1	25-Oct	**16-Sep**	30-Aug		**15-Sep**	23-Aug
2	8-Nov	**23-Sep**	4-Sep		**23-Sep**	28-Aug
3	12-Dec	**11-Oct**	17-Sep		**10-Oct**	9-Sep
4	29-Oct	**18-Sep**	31-Aug		**17-Sep**	23-Aug

Table 13. Jacks complex recent landings and quota closures.

Fishing Year	Current Landings	ACL	Units	ACL	Closure Date
2017	183,300	189,422	ww	96.77	8/4/17
2016	206,726	189,422	ww	109.14	8/9/2016
2015	235,969	189,422	ww	124.57	6/23/2015
2014	212,474	189,422	ww	112.17	7/15/2014
2013	201,398	189,422	ww	106.32	6/18/2013
2012	333,561	193,999	ww	171.94	7/2/2012

Source: SERO ACL Monitoring Webpage.

Table 14. Projected Jacks complex commercial trip limit scalars, by month, based on most recent three years without a quota closure.

Trip Limit (gw)	1	2	3	4	5	6	7	8	9	10	11	12
500	95%	93%	92%	59%	86%	71%	83%	87%	79%	83%	83%	85%
400	94%	90%	89%	53%	80%	66%	78%	82%	75%	78%	78%	80%
300	91%	86%	84%	45%	71%	58%	71%	75%	69%	71%	71%	71%
250	88%	82%	80%	41%	65%	53%	67%	70%	65%	67%	66%	66%
200	84%	78%	75%	36%	58%	47%	61%	65%	60%	62%	60%	58%
150	77%	70%	67%	30%	49%	39%	53%	58%	53%	54%	52%	49%
Years Used:	2014-2016	2014-2016	2014-2016	2014-2016	2014-2016	2012, 2014, 2016	2010, 2011, 2016	2009, 2010, 2011	2009, 2010, 2011	2009, 2010, 2011	2009, 2010, 2011	2009, 2010, 2011

Source: SEFSC Commercial Logbook (Nov 2017).

Note: Trip limit scalars relative to total pounds (whole weight) landed on trip, as projections and ACL are in whole weight.

Table 15. Projected mean and 95% lower and upper (L95, U95) confidence limits for quota closure dates for Jacks complex under different alternatives proposed for Action 6.

	Overage Date					
	Last 3 Years			SARIMA		
Alt	**L95**	**Mean**	**U95**	**L95**	**Mean**	**U95**
1	14-Dec	3-Jul	5-Jun		12-Jun	24-Apr
2a		12-Aug	7-Jul		25-Jul	18-May
2b		13-Aug	6-Jul		23-Jul	15-May
2c		3-Sep	16-Jul		11-Aug	22-May
3a		1-Aug	30-Jun		14-Jul	11-May
3b		13-Aug	6-Jul		23-Jul	15-May
3c		3-Sep	16-Jul		11-Aug	22-May

Table 16. The estimated percent decrease in whole weight of commercial almaco jack landings at 2-inch intervals between 20 – 26 inches FL. The decreases were generated with TIP data from 2014 – 2016 from a sample of 3,587 fish.

Alternative	Minimum Size Limit (inches FL)	Percent Decrease in Harvest (lbs wwt)
2a	20	10.9%
2b	22	16.5%
2c	24	24.1%
2d	26	32.5%

Table 17. The number of self-reported discards reported to the coastal logbook program from 2014-2016 for the South Atlantic for queen, silk, and blackfin snapper.

Species	Number Discarded	Discard Condition	Discard Reason
Queen Snapper	0	———	———
Silk Snapper	5	All Alive	Size Limit
Blackfin Snapper	0	———	———

Table 18. The estimated percent increase in whole weight of commercial gray triggerfish landings at 1-inch intervals between 12-14 inches FL. The increases were generated with TIP data from January 2014 to June 2015 from a sample of 2,616 fish.

Minimum Size Limit (inches FL)	Percent Increase in Harvest (lbs wwt)
12	19.7%
13	12.5%
14	0.0%

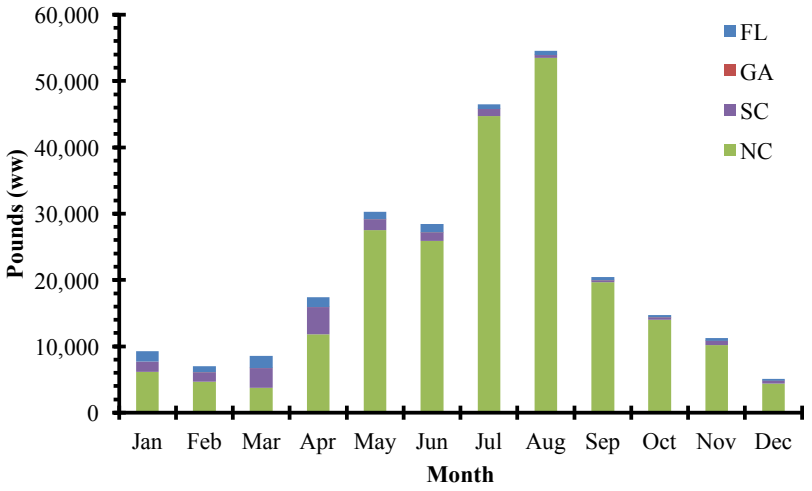


Figure 1. The average monthly South Atlantic blueline tilefish landings by state from 2004-2013 in pounds whole weight. The years 2014-2016 were excluded due to closures. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

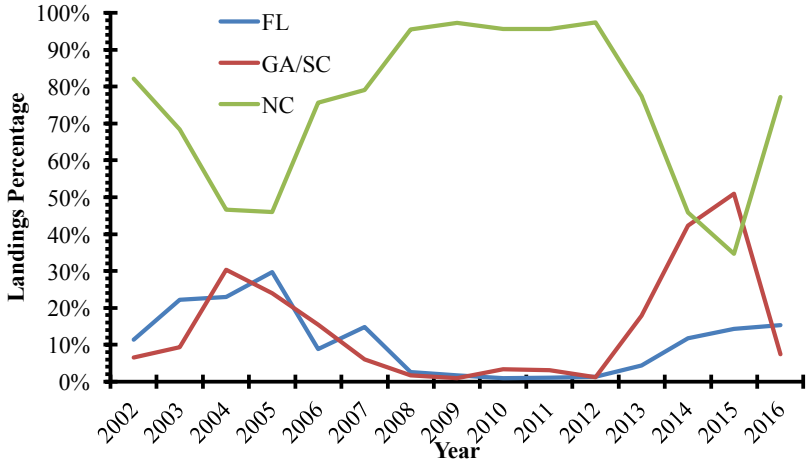


Figure 2. The percentage of annual South Atlantic blueline tilefish landings by state from 2002-2016. Georgia and South Carolina were combined due to confidentiality concerns. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

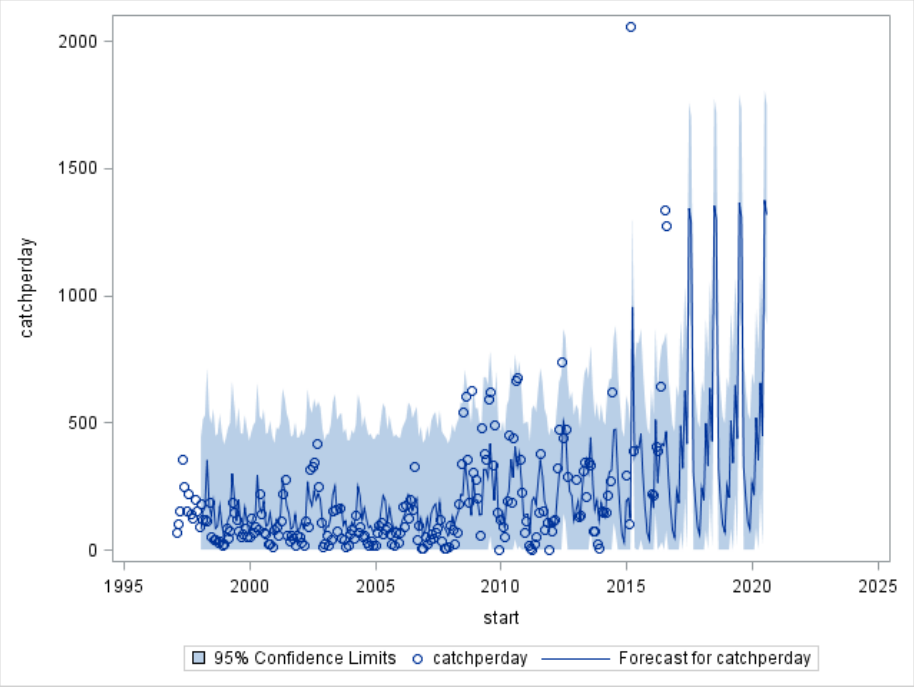


Figure 3. Final SARIMA model fit for blueline tilefish monthly commercial landings (lb ww) per open day.

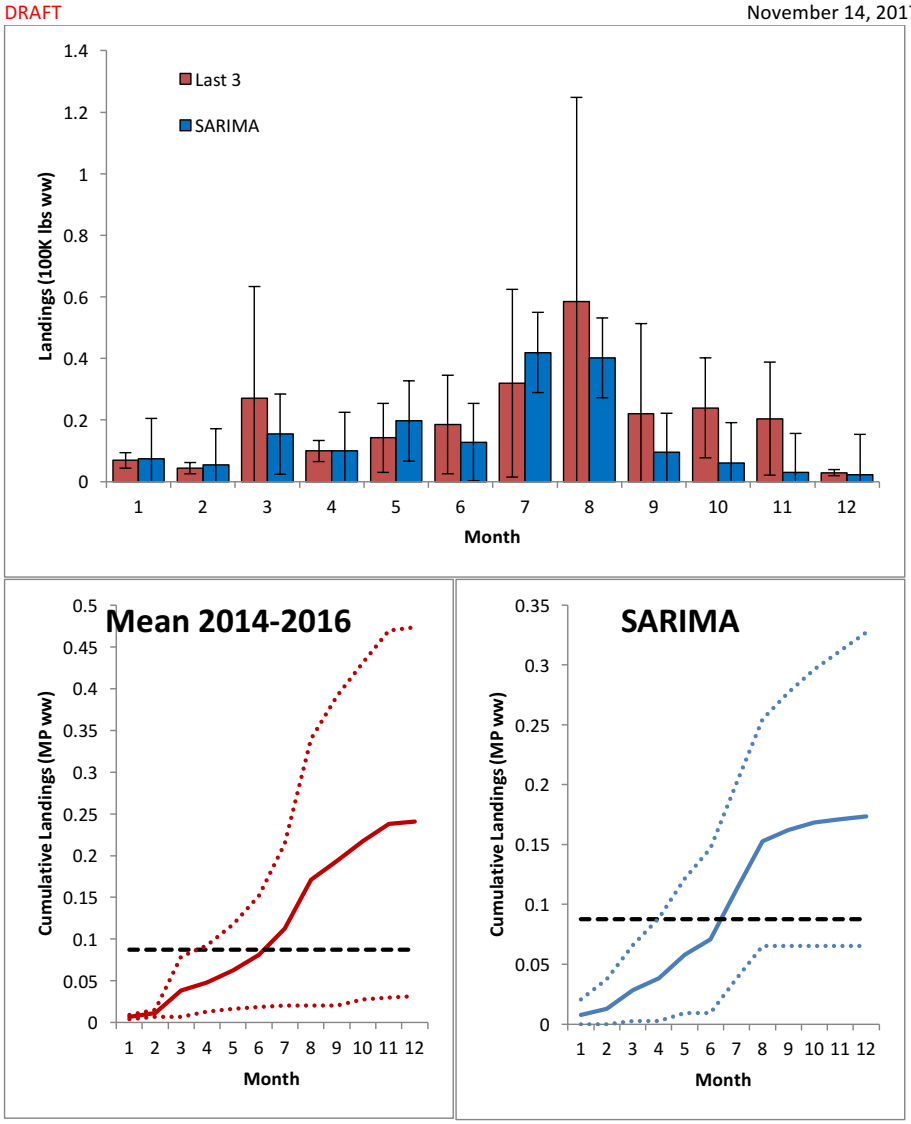


Figure 4. Blueline tilefish projected commercial landings (MP: million pounds, whole weight) by month (top) and mean (solid line) and 95% confidence limits (dotted lines) estimates for

cumulative landings relative to ACL (bottom) for two projection models: Mean of last 3 years (2014-2016) and SARIMA.

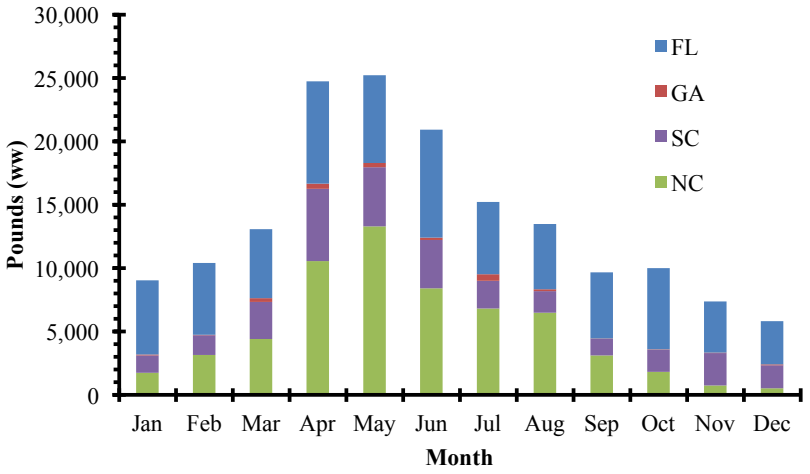


Figure 5. The average monthly South Atlantic snowy grouper landings by state from 2002-2005 and 2007-2011 in pounds whole weight. The years 2006 and 2012-2016 were excluded due to closures. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

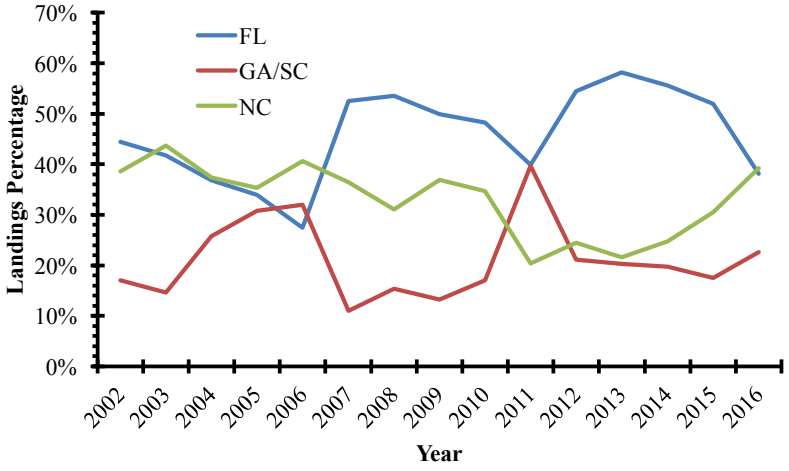


Figure 6. The percentage of annual South Atlantic snowy grouper landings by state from 2002-2016. Georgia and South Carolina were combined due to confidentiality concerns. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

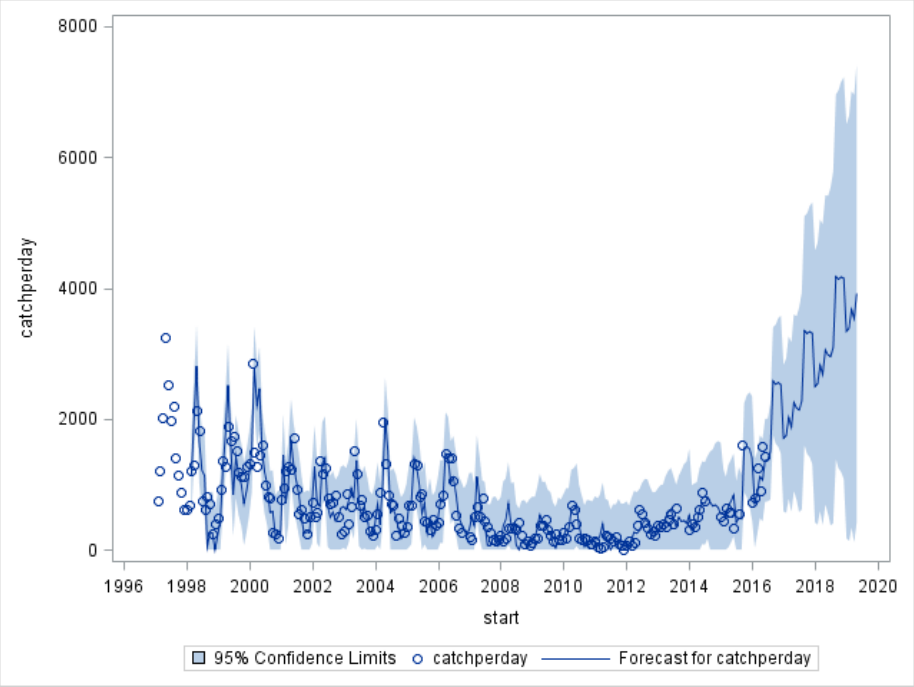
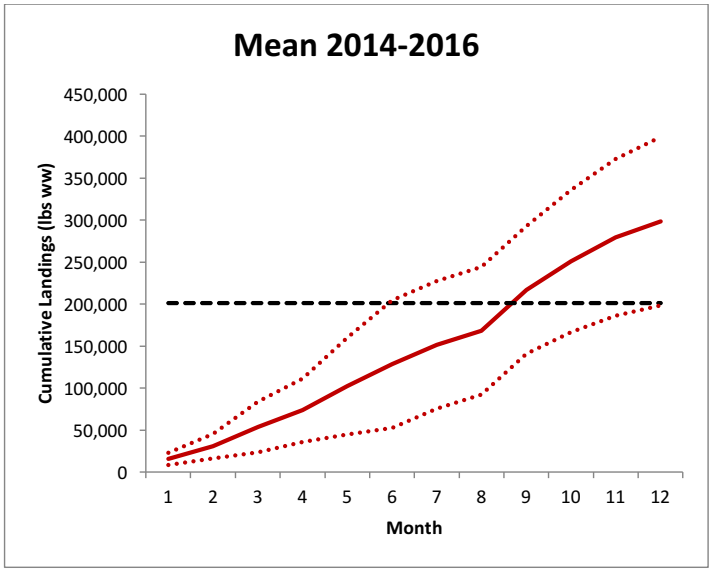


Figure 7. Final SARIMA model fit for snowy grouper monthly commercial landings (lb ww) per open day.


Mean 2014-2016
Cumulative Landings (lbs ww)
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
1 2 3 4 5 6 7 8 9 10 11 12
Month

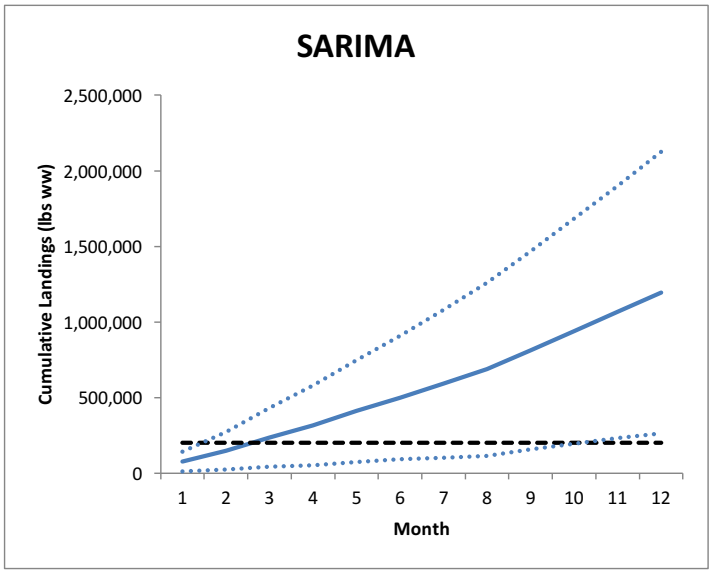

SARIMA
Cumulative Landings (lbs ww)
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1 2 3 4 5 6 7 8 9 10 11 12
Month

Figure 8. Mean (solid line) and 95% confidence limits (dotted lines) for Snowy grouper projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

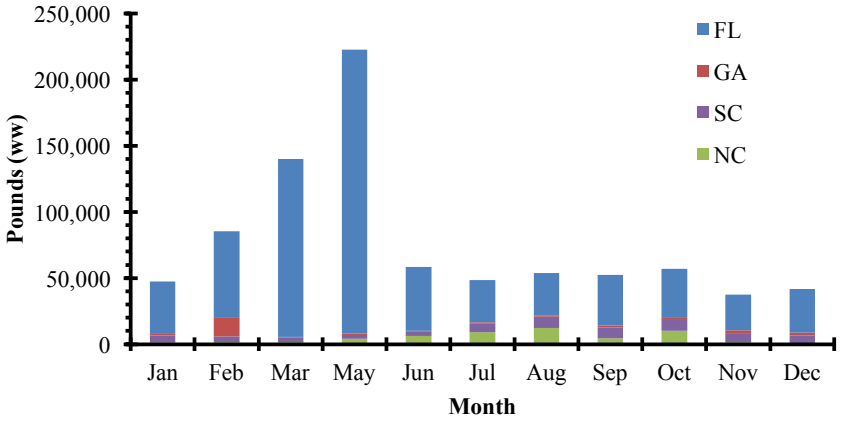


Figure 9. The average monthly South Atlantic greater amberjack landings by state from 2005-2015 in pounds whole weight. Data from the month of April was not available due to the seasonal closure in place since 1999. The year 2016 was excluded due to a closure. Source: Southeast Fisheries Science Center commercial (10/5/2017) ACL dataset.

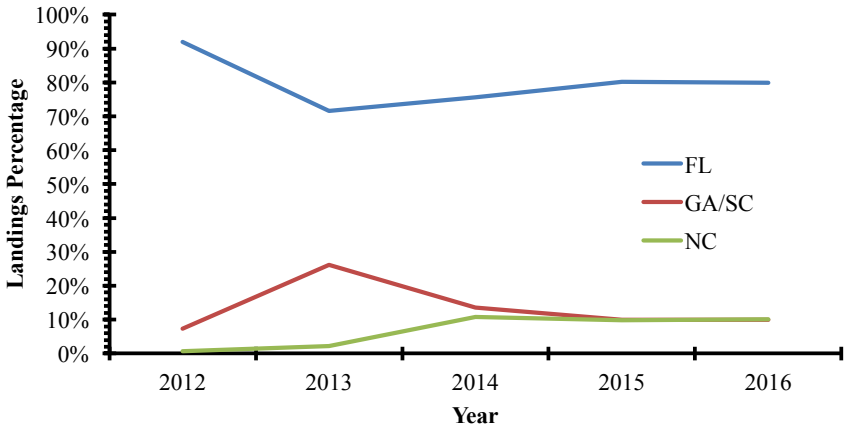


Figure 10. The percentage of annual South Atlantic greater amberjack landings by state from 2012-2016. Georgia and South Carolina were combined due to confidentiality concerns. North Carolina's seafood dealers began using a species-specific code for greater amberjack in 2011, but it was not until 2015 that unclassified amberjacks was completely removed as an option. Source: Southeast Fisheries Science Center commercial (10/5/2017) ACL dataset.

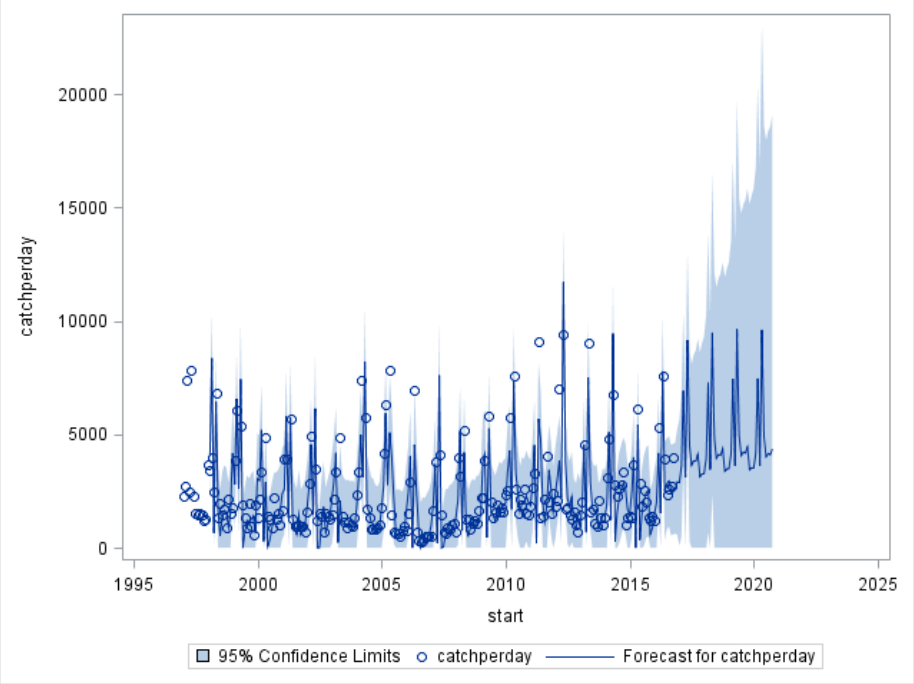
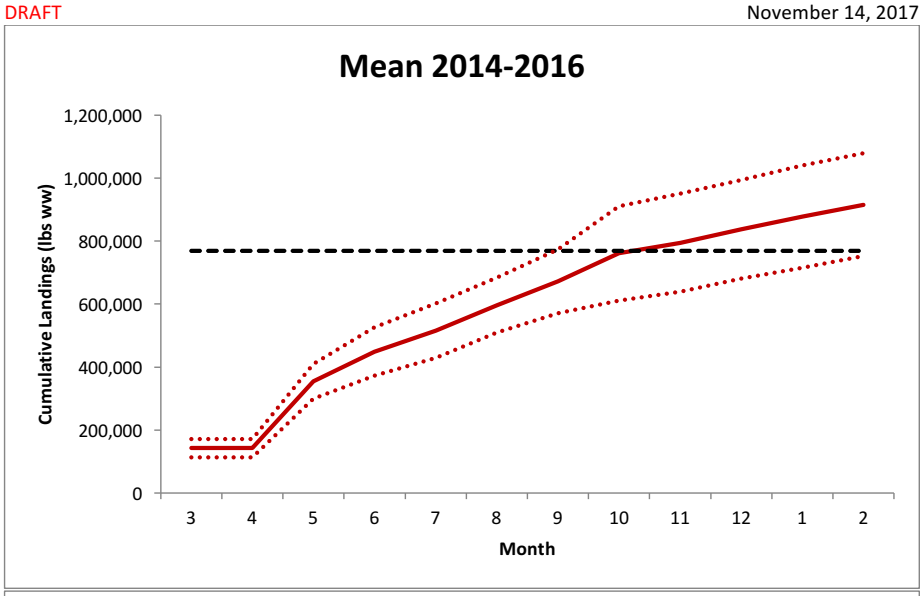


Figure 11. Final SARIMA model fit for greater amberjack monthly commercial landings (lb ww) per open day.


Mean 2014-2016
Cumulative Landings (lbs ww)
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
3
4
5
6
7
8
9
10
11
12
1
2
Month

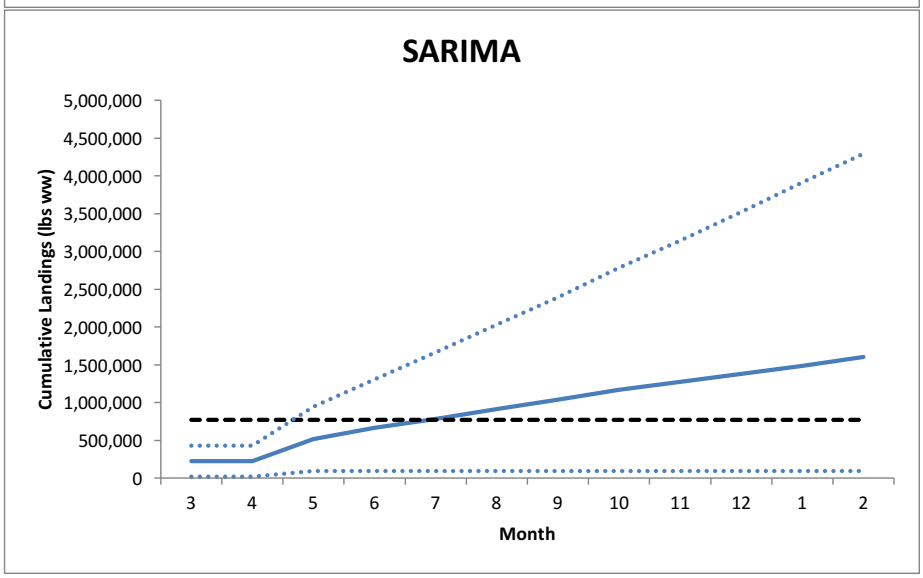

SARIMA
Cumulative Landings (lbs ww)
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
3
4
5
6
7
8
9
10
11
12
1
2
Month

Figure 12. Mean (solid line) and 95% confidence limits (dotted lines) for Greater amberjack projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

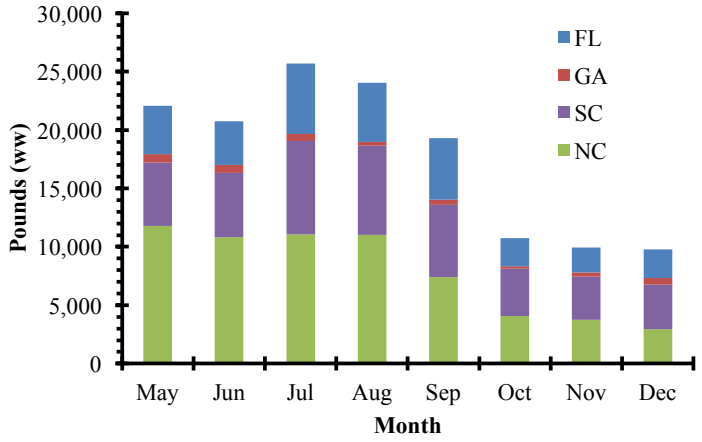


Figure 13. The average monthly South Atlantic red porgy landings by state from 2005-2012 and 2014-2016 in pounds whole weight. The year 2013 was excluded due to a closure. Data from the months of January to April was not available due to the seasonal closure in place since 2000. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

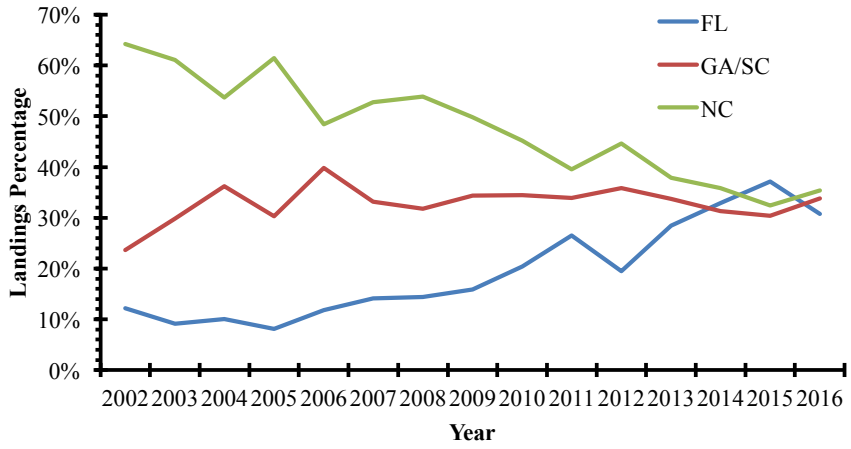


Figure 14. The percentage of annual South Atlantic red porgy landings by state from 2002-2016. Georgia and South Carolina were combined due to confidentiality concerns. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

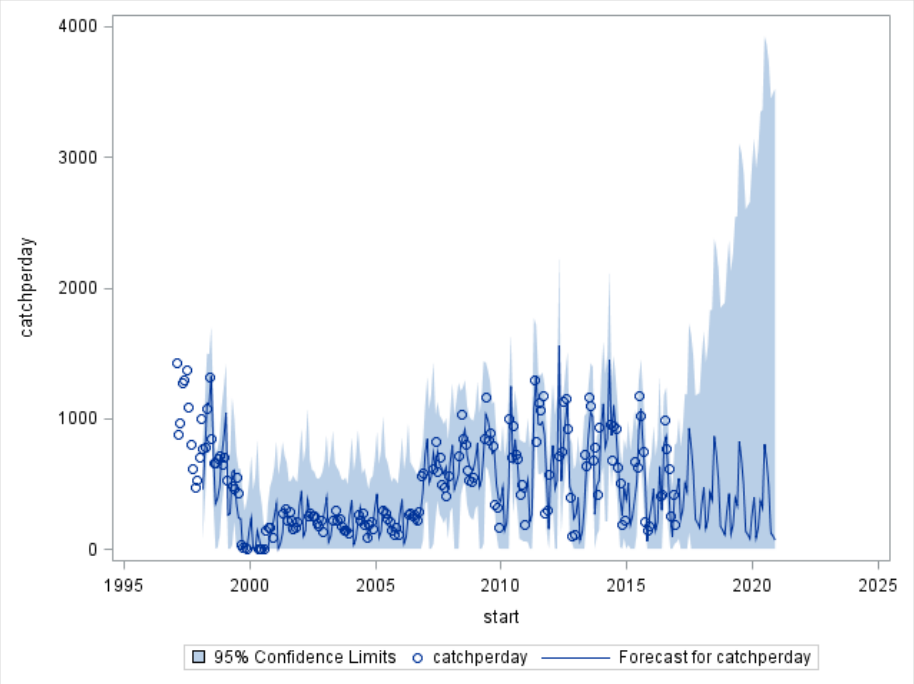


Figure 15. Final SARIMA model fit for red porgy monthly commercial landings (lb ww) per open day.

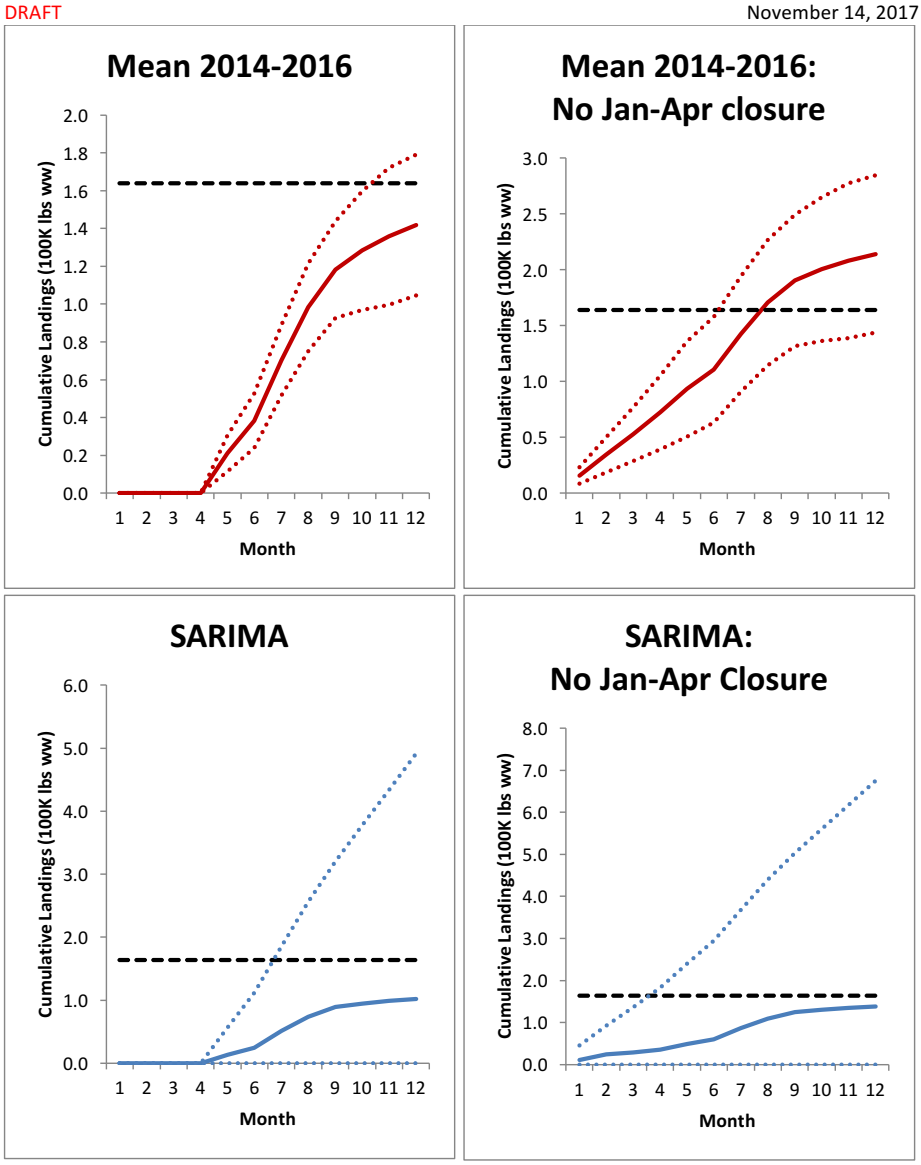

Mean 2014-2016
Cumulative Landings (100K lbs ww)
Month
Mean 2014-2016:
No Jan-Apr closure
Cumulative Landings (100K lbs ww)
Month
SARIMA
Cumulative Landings (100K lbs ww)
Month
SARIMA:
No Jan-Apr Closure
Cumulative Landings (100K lbs ww)
Month

Figure 16. Mean (solid line) and 95% confidence limits (dotted lines) for Red porgy projected cumulative landings relative to ACL, with and without Jan-Apr closure, for two projection models: Mean of last 3 years (2014-2016) and SARIMA.

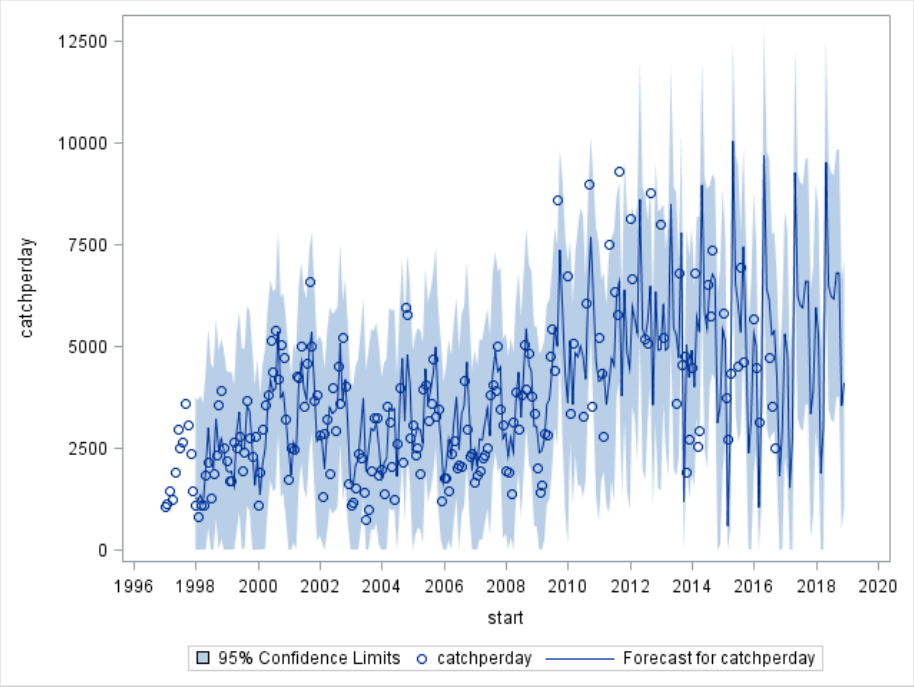


Figure 17. Final SARIMA model fit for vermilion snapper monthly commercial landings (lb ww) per open day.

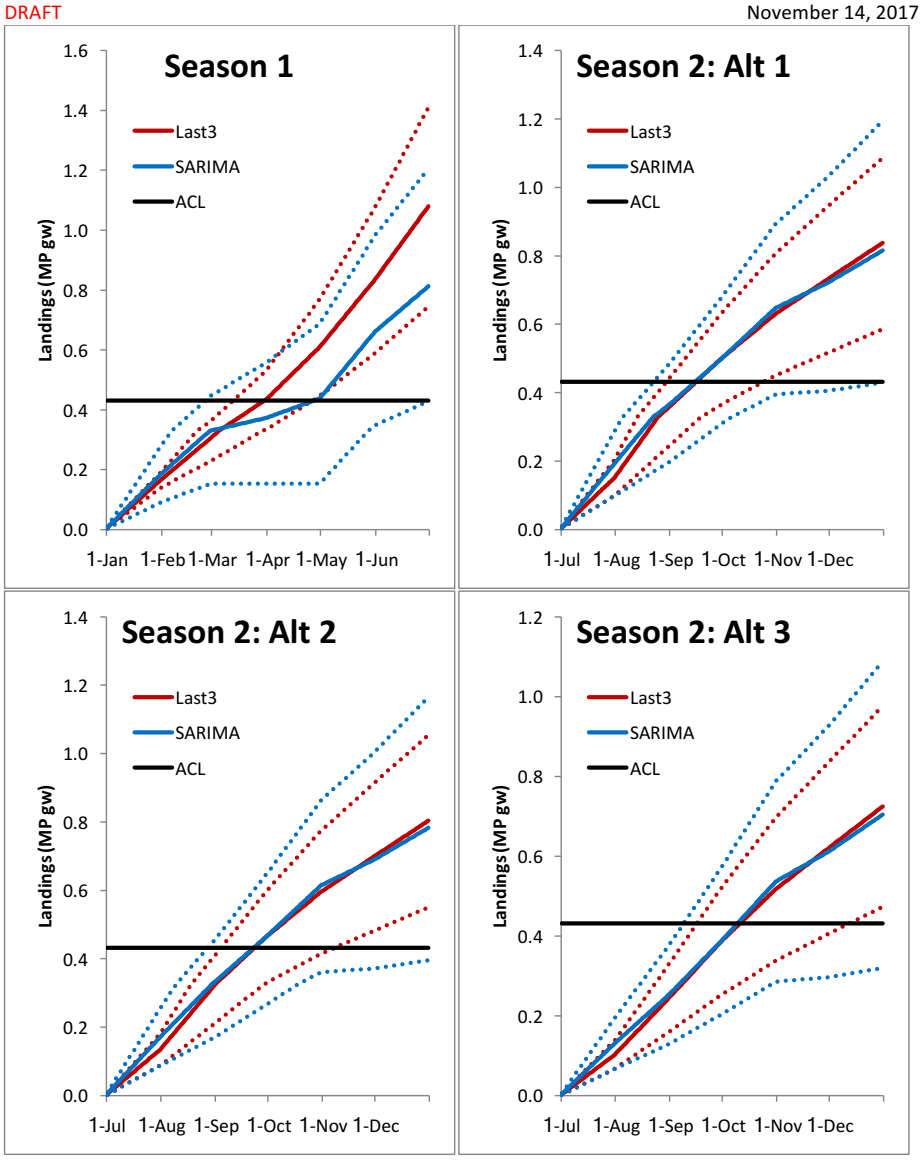

Season 1
Last3
SARIMA
ACL
Landings (MP gw)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1-Jan 1-Feb 1-Mar 1-Apr 1-May 1-Jun
Season 2: Alt 1
Last3
SARIMA
ACL
Landings (MP gw)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1-Jul 1-Aug 1-Sep 1-Oct 1-Nov 1-Dec
Season 2: Alt 2
Last3
SARIMA
ACL
Landings (MP gw)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1-Jul 1-Aug 1-Sep 1-Oct 1-Nov 1-Dec
Season 2: Alt 3
Last3
SARIMA
ACL
Landings (MP gw)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1-Jul 1-Aug 1-Sep 1-Oct 1-Nov 1-Dec

Figure 18. Mean (solid line) and 95% confidence limits (dotted lines) for vermilion snapper projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

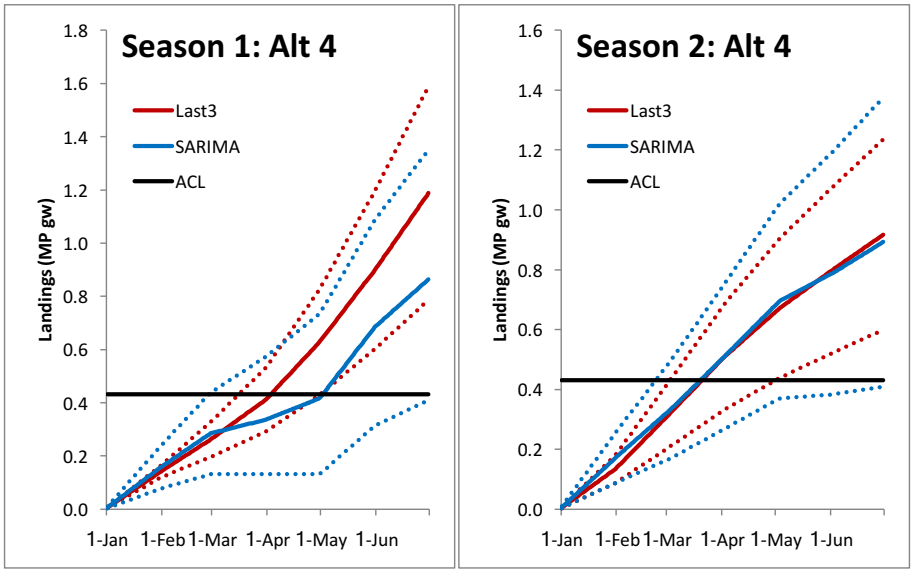


Figure 18 (con't).

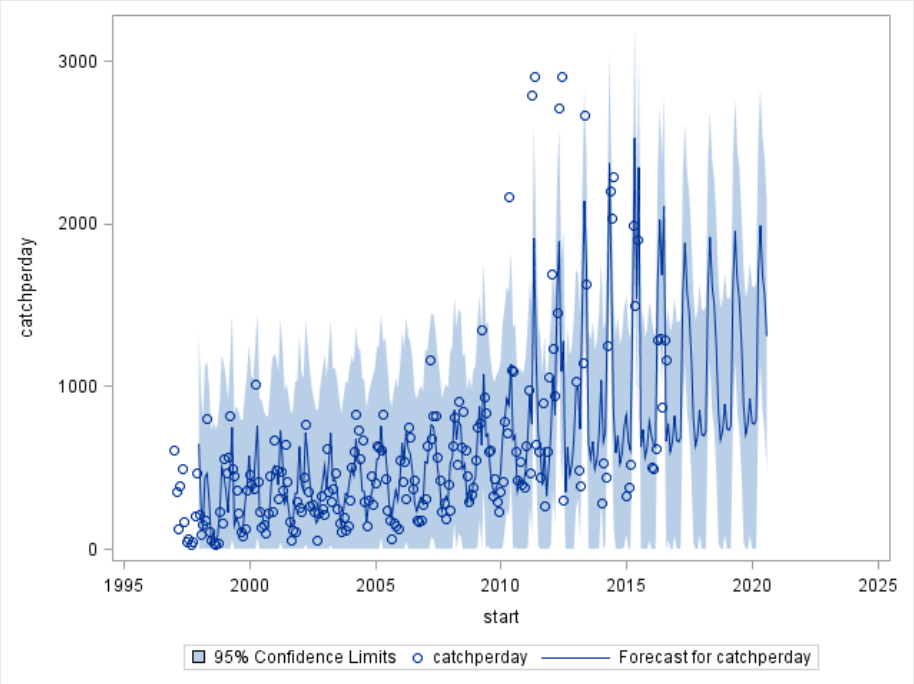


Figure 19. Final SARIMA model fit for Jacks complex monthly commercial landings (lb ww) per open day.

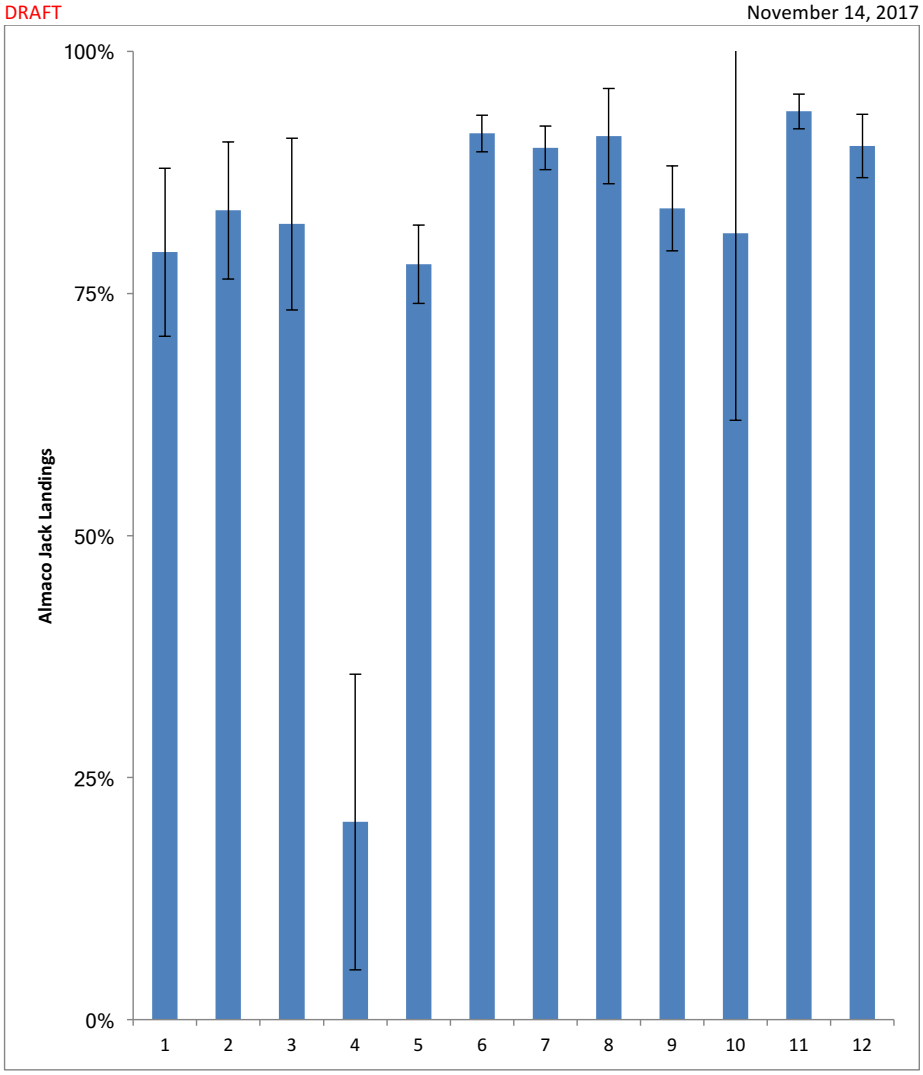


Figure 20. Monthly ratio of almaco jack to Jacks complex commercial landings from the most recent three completely open fishing years. Error bars denote standard deviation.

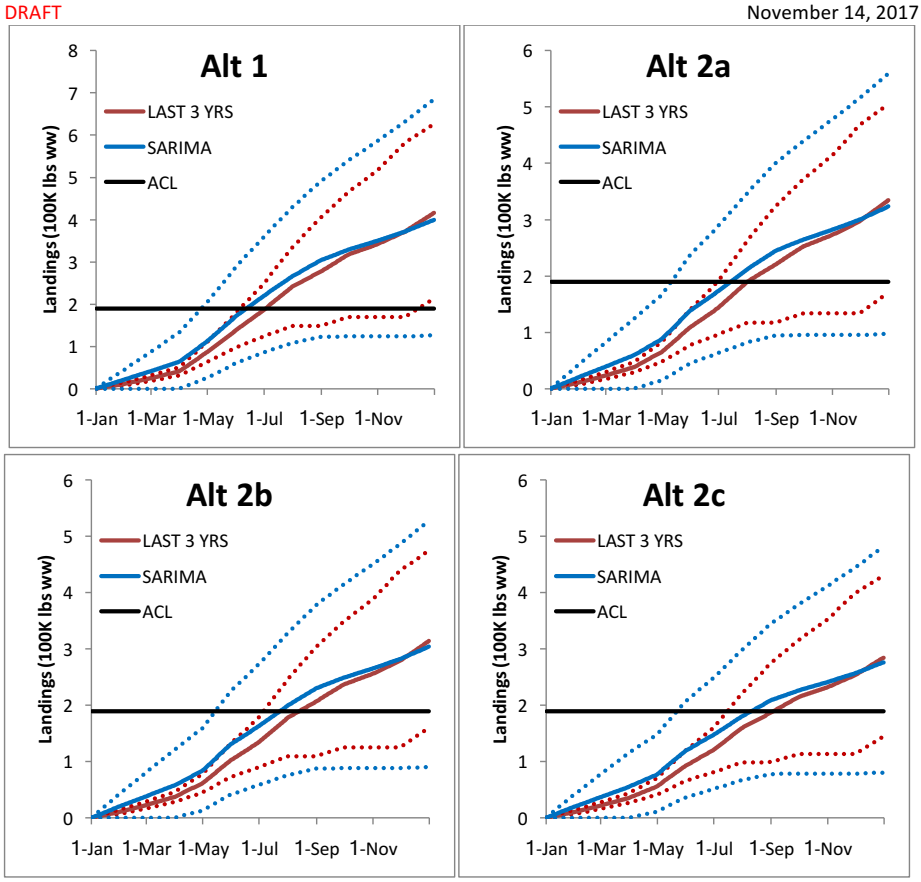


Figure 21. Mean (solid line) and 95% confidence limits (dotted lines) for Jacks complex projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

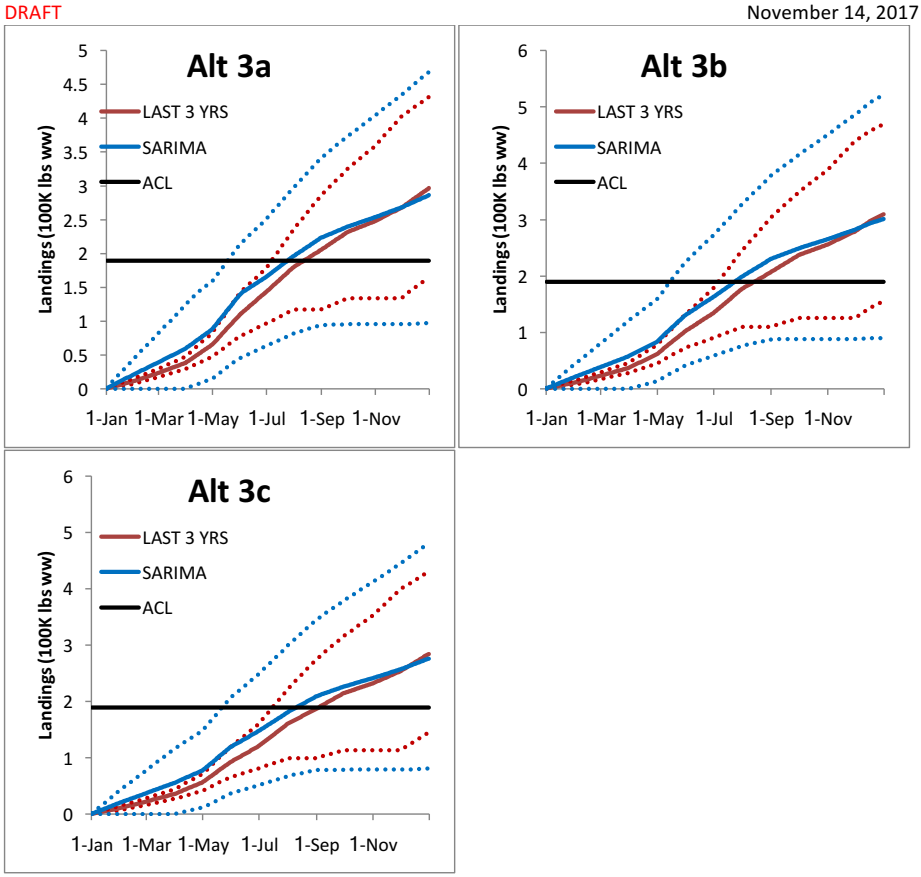


Figure 21 (con't). Mean (solid line) and 95% confidence limits (dotted lines) for Jacks complex projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

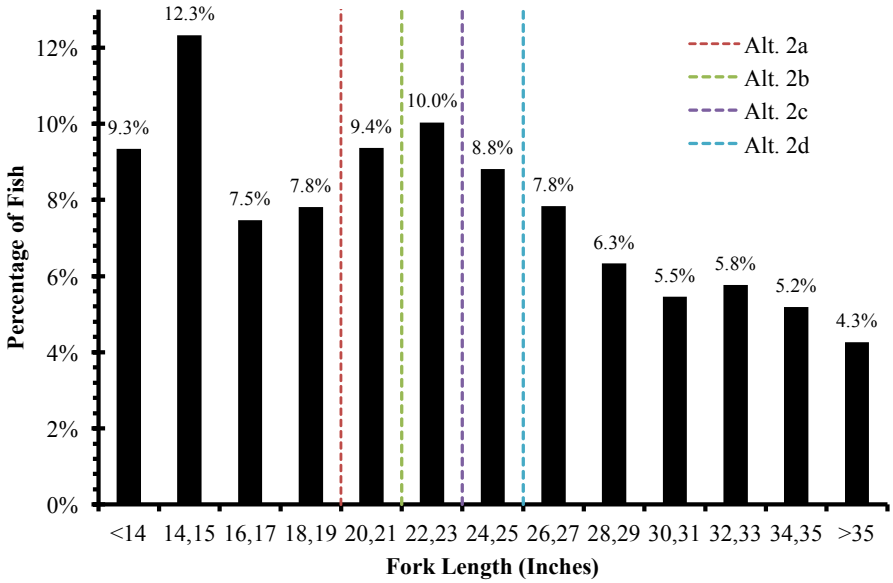


Figure 22. The length distribution of almaco jacks harvested in the South Atlantic from commercial TIP (n=3,587) data from 2014 – 2016. The dashed lines denote the commercial minimum size limit proposed in each alternative.

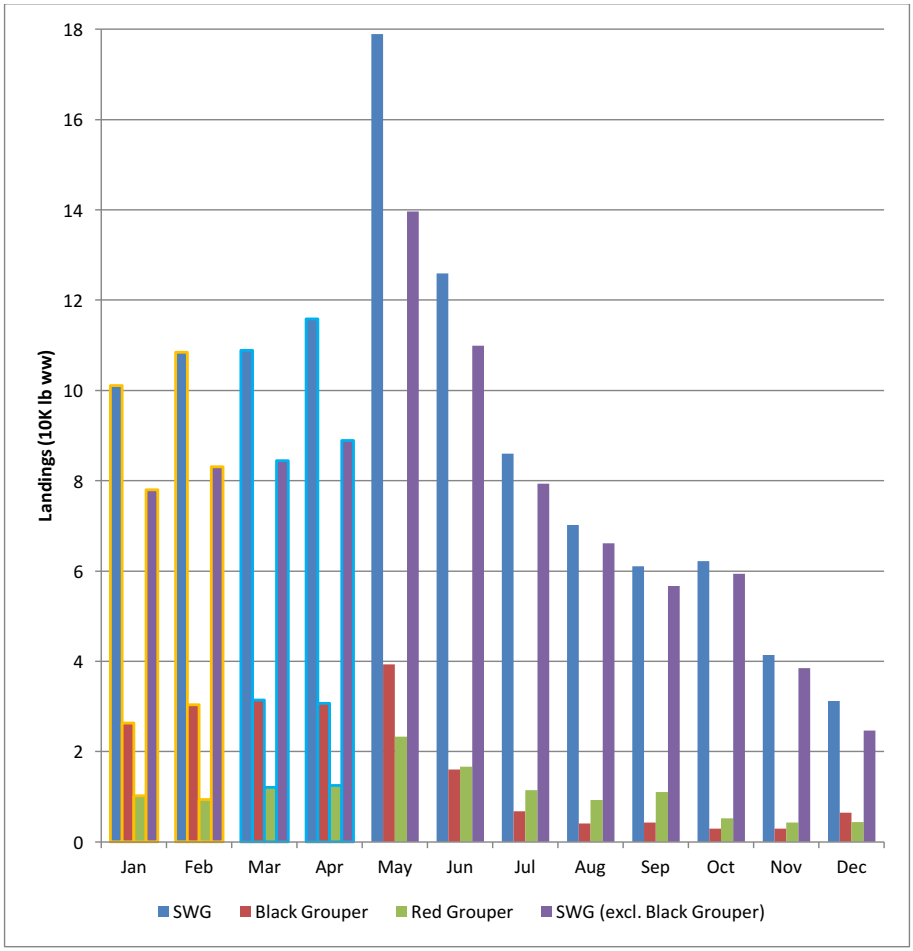


Figure 23. Mean 2014-2016 (no outline) and projected (outlines) monthly commercial landings for shallow water grouper (SWG: gag, black grouper, scamp, red grouper, yellowfin grouper, yellowmouth grouper, red hind, rock hind, graysby, and coney), black grouper, red grouper, and SWG excluding black grouper. Orange outlines denote expansions using mean ratio of Jan-Feb to May 2007-2009 landings; blue outlines denote expansions using mean ratio of Mar-Apr to May 1996-1998 landings.

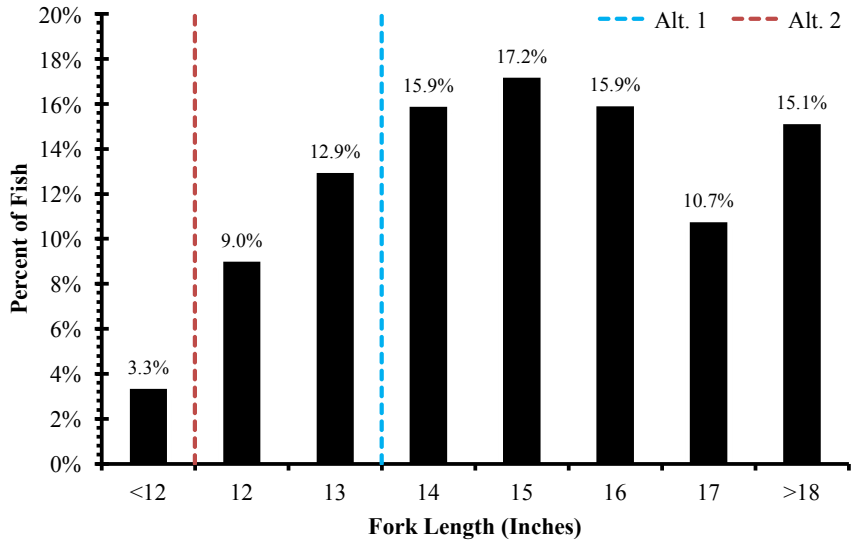


Figure 24. The length distribution of gray triggerfish captured in federal waters off east Florida generated from commercial TIP (n=2,616) data from January 2014 to June 2015. The dashed lines denote the commercial minimum size limit proposed in each alternative.

SUPPLEMENTAL TABLES AND FIGURES

Table S-1. Seasonal (*s*) autoregressive integrated moving average (SARIMA) (*p*,*d*,*q*)x(*P*,*D*,*Q*)s model combinations evaluated, where the autoregressive component (*p*) represents the lingering effects of previous observations, the integrated component (*d*) represents temporal trends, the moving average component (*q*) represents lingering effects of previous random shocks (or error), and s denotes the seasonal time step. As recreational landings are primarily collected in 2-month waves, *s* was set to 6. A "1" denotes an active component in the model.

ARIMA(*p*,*d*,*q*)X(*P*,*D*,*Q*)s Model
ARIMA(0,1,1)X(0,1,1)*s*
ARIMA(1,0,0)X(0,1,1)*s*
ARIMA(0,0,1)X(0,1,1)*s*
ARIMA(0,1,1)X(1,1,0)*s*
ARIMA(1,0,0)X(1,1,0)*s*
ARIMA(0,0,1)X(1,1,0)*s*
ARIMA(1,1,0)X(0,1,1)*s*
ARIMA(1,1,0)X(1,1,0)*s*

Table S-2. Mean monthly estimates of discards (numbers of fish) from all South Atlantic commercial trips (2014-2016) based on self-reported discard rates (SEFSC Supplemental Discard Logbook, accessed May 2017) expanded to overall South Atlantic commercial fishing effort (SEFSC Commercial Logbook, accessed May 2017), aggregated across all gears. Note that SEDAR has found this approach consistently underestimates discarded fish relative to observer data in the Gulf of Mexico, and the 95% confidence limits for many of these expanded estimates overlap zero, indicating substantial uncertainty in the data (see **Figures S1-9**).

Month	Blueline Tilefish	Red Porgy	Snowy Grouper	Greater Amberjack	Vermilion Snapper	Jacks	SWG	DWS	Gray Triggerfish
1	3.36	4301.28	21.79	252.35	1473.76	51.45	477.41	0.00	473.48
2	5.46	4400.48	9.69	201.91	1555.67	47.70	492.18	0.00	509.79
3	12.17	5008.66	31.40	194.86	1802.61	69.51	699.54	3.90	272.92
4	1564.03	2868.43	37.91	146.88	1129.58	15.29	479.09	0.00	134.62
5	811.20	2068.36	63.34	524.34	5131.96	65.40	1711.23	0.00	4242.74
6	313.83	1054.46	103.30	578.14	3532.59	132.38	696.81	0.00	2145.66
7	115.53	1428.28	106.24	338.61	2435.49	596.83	1236.36	0.00	2730.68
8	899.71	1498.00	19.76	369.51	2394.22	1183.32	1748.28	0.00	1985.43
9	1260.22	924.08	13.41	312.48	1972.90	751.37	1554.68	0.00	2419.15
10	14.98	251.32	1.70	368.43	2529.10	738.61	1392.88	0.00	1799.98
11	3.15	70.92	23.75	94.12	2123.60	149.76	1370.58	0.00	812.42
12	0.00	112.81	1.57	72.31	1838.30	247.58	656.46	0.00	609.86

SWG: Shallow-water grouper (gag, black grouper, scamp, red grouper, yellowfin grouper, yellowmouth grouper, red hind, rock hind, graysby, and coney), DWS: Deep-water snapper (blackfin, queen, silk snapper), Jacks: lesser amberjack, almaco jack, banded rudderfish.

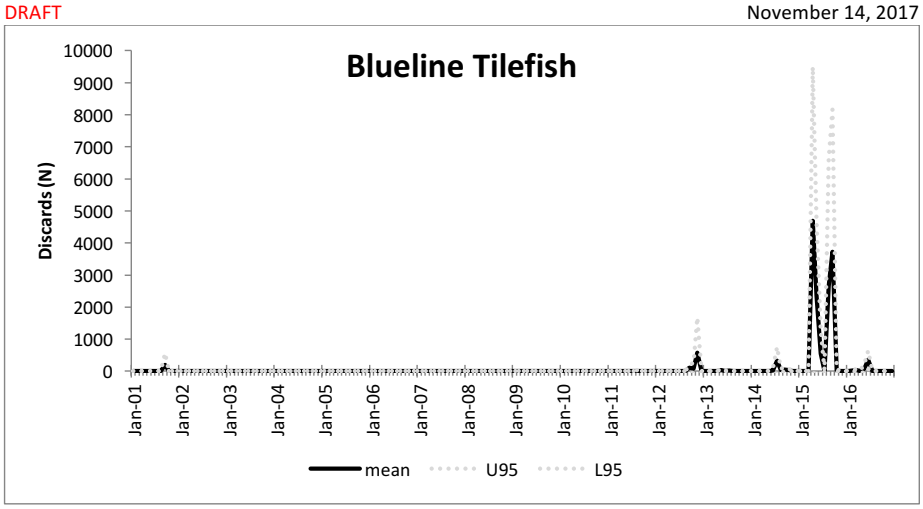


Figure S-1. Blueline tilefish expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

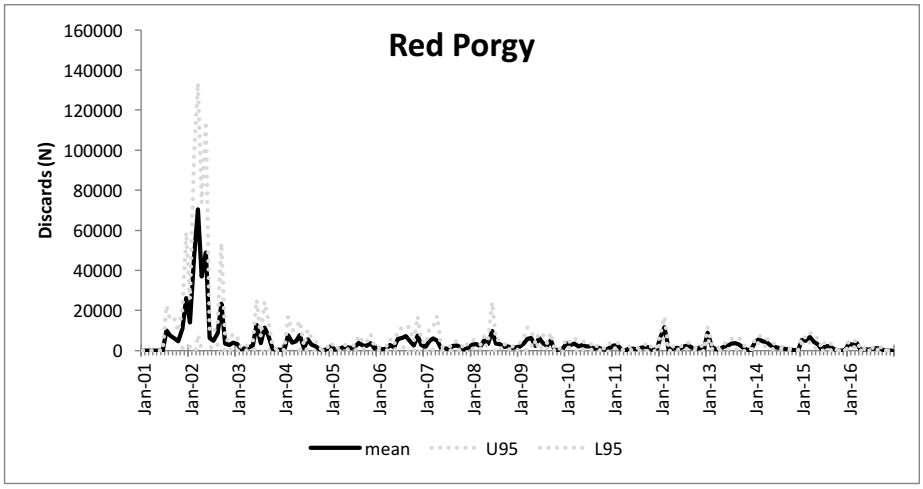


Figure S-2. Red porgy expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

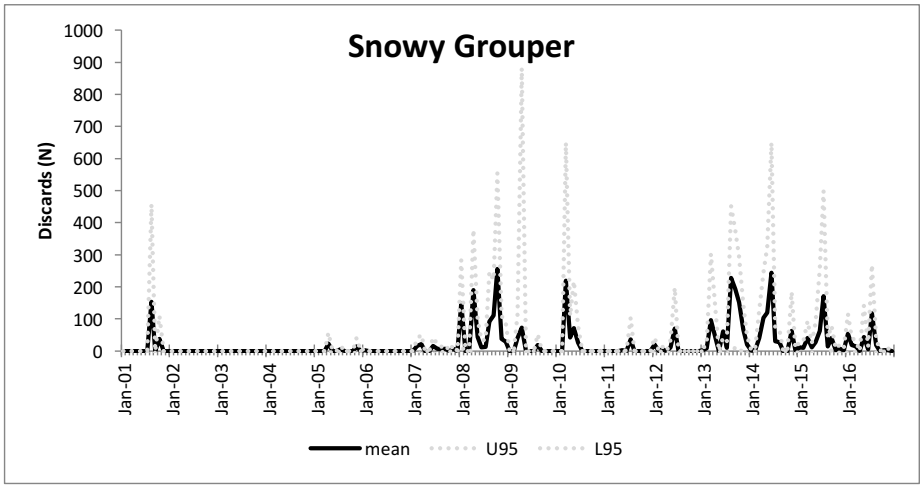


Figure S-3. Snowy grouper expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

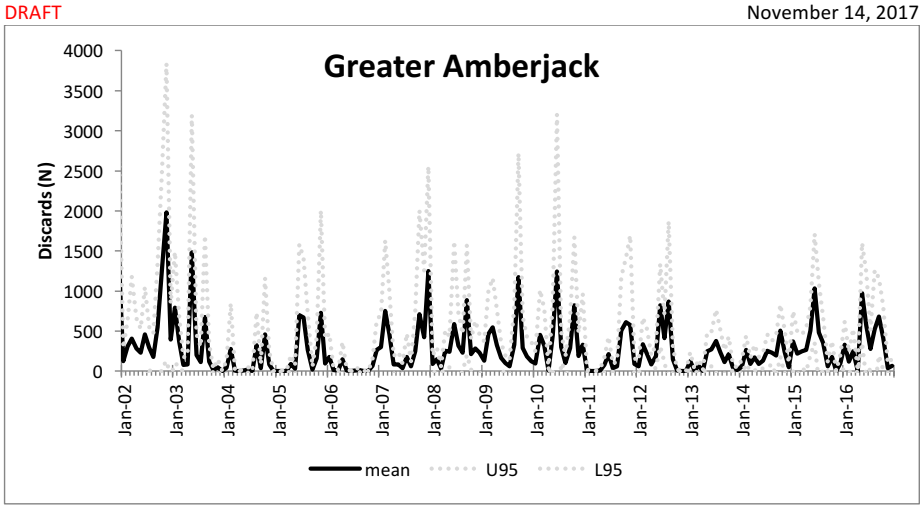


Figure S-4. Greater amberjack expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

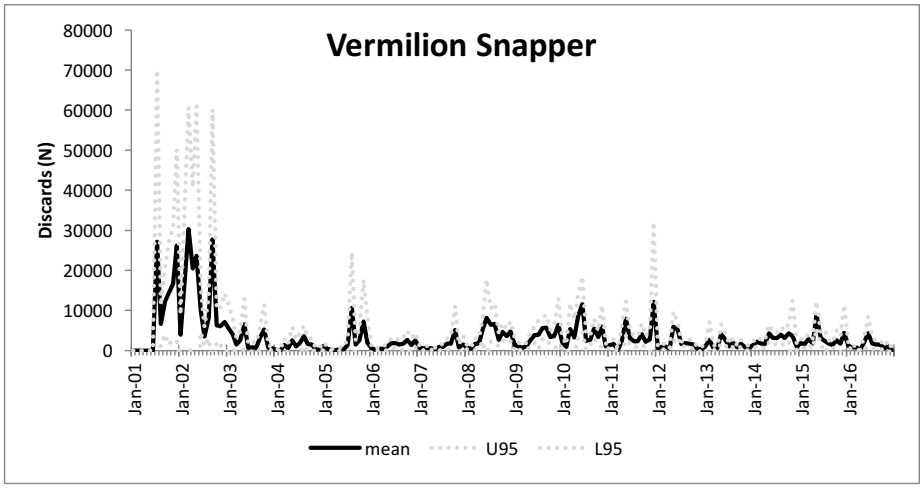


Figure S-5. Vermilion snapper expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

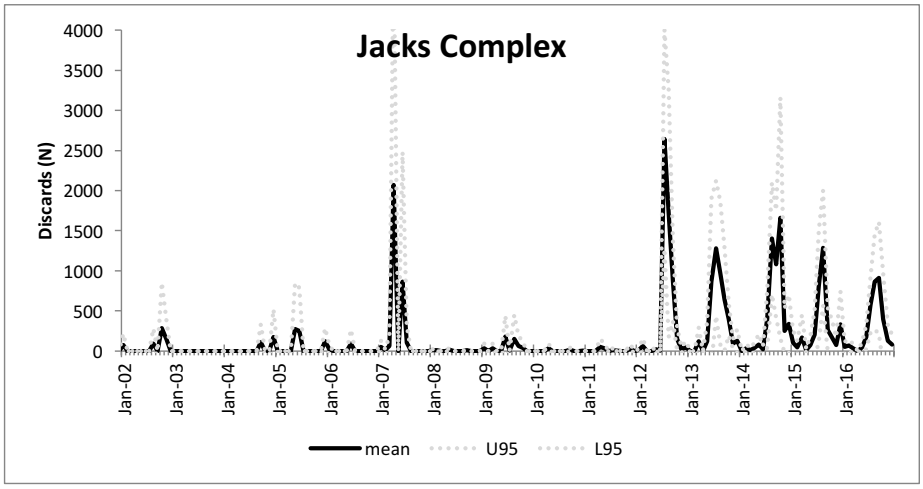


Figure S-6. Jacks complex (lesser amberjack, banded rudderfish, almaco jack) expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

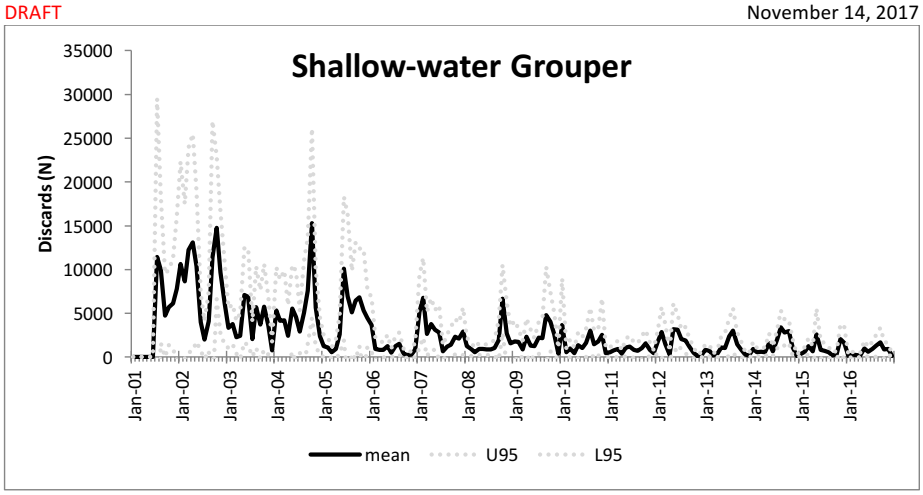


Figure S-7. Shallow-water grouper (gag, black grouper, scamp, red grouper, yellowfin grouper, yellowmouth grouper, red hind, rock hind, graysby, and coney) expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

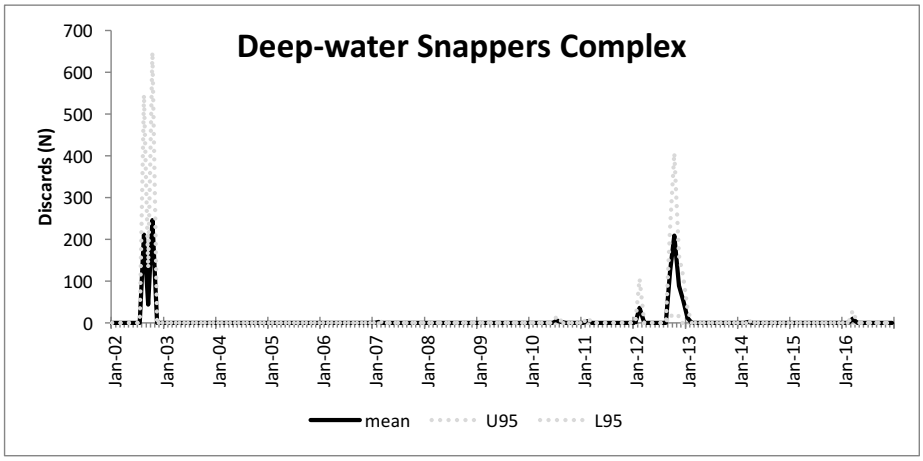


Figure S-8. Deep-water snapper (queen snapper, silk snapper, blackfin snapper) expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental

Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

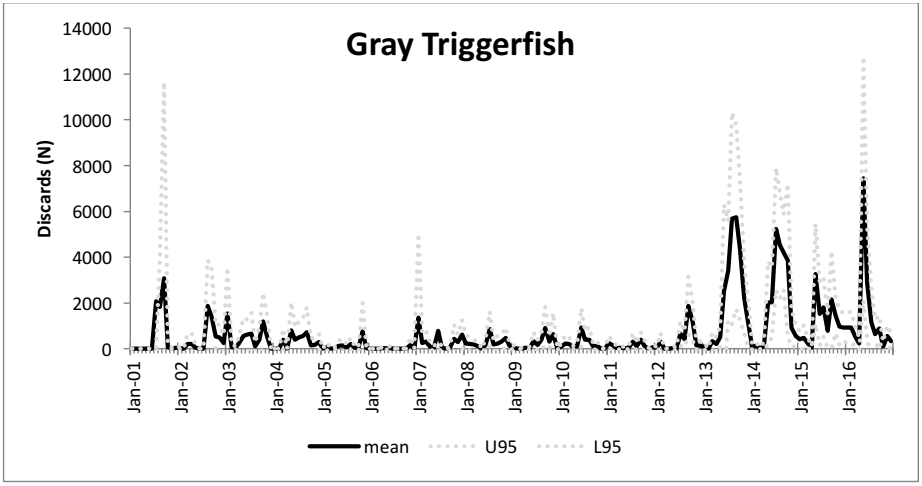


Figure S-9. Gray triggerfish expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate. Note an outlier was removed for trolling gear in Nov 2006.

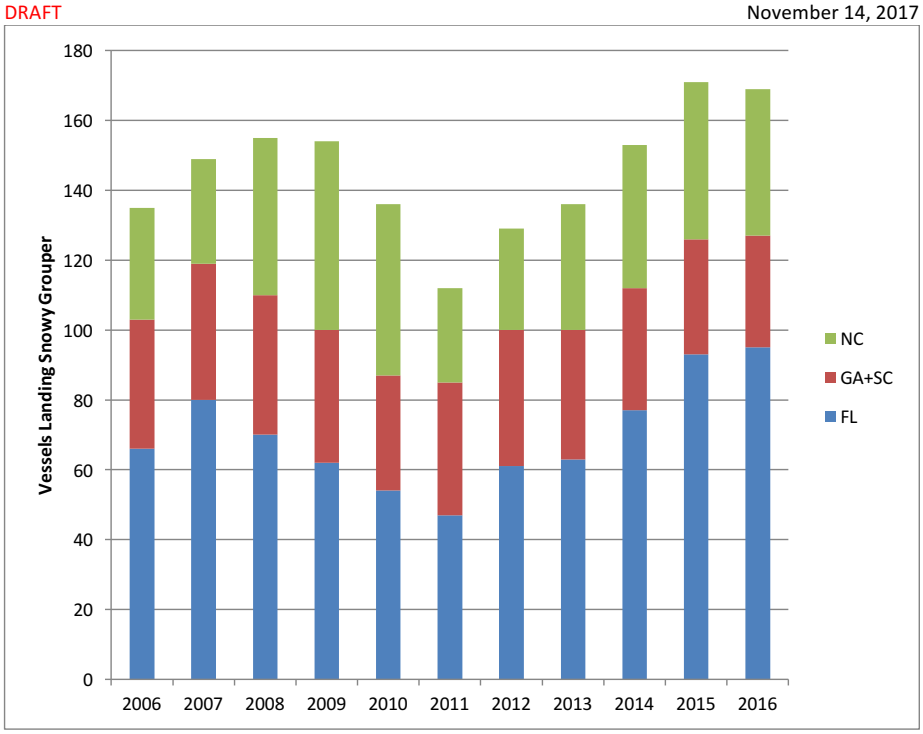


Figure S-10. Number of vessels reporting landings of snowy grouper, by state and year. Note that Georgia and South Carolina have been aggregated to protect confidentiality.