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: 60% to the period January 1 through June 30 and 40% 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 = 300 pounds lbs gw, Season 2 trip limit = 100 pounds lbs gw.
    - **Sub-alternative 2c.** Season 1 trip limit = XX pounds lbs gw, Season 2 trip limit = XX pounds lbs gw.
- **Alternative 3**. Specify two commercial fishing seasons for blueline tilefish. Allocate the blueline tilefish commercial 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 4.** Modify the commercial trip for blueline tilefish:
  - **Sub-alternative 4a**. 100 lbs gw from January 1 through April 30 and 300 lbs gw from May 1 through December 31
  - **Sub-alternative 4b**. 150 lbs gw from January 1 through April 30 and 300 lbs gw from May 1 through December 31
  - **Sub-alternative 4c**. 100 lbs gw from January 1 through April 30 and 400 lbs gw from May 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**. It was difficult to evaluate alternative given the unspecified percentages. 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 SEDAR50 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 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 1-4 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: 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 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**. 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 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 recent changes in trip limits and other regulations for snowy grouper likely make past 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**).

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 federal waters is from March 1 to the end of February. During April, commercial harvest is limited to one per person per day or one per person per trip, whichever is more restrictive.
- **Alternative 2**. Specify two commercial fishing seasons for greater amberjack. Allocate the commercial ACL for greater amberjack into two quotas: XX% to the period March 1 through August 31 and XX% 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 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.** Season 1 trip limit = XX pounds lbs ww, Season 2 trip limit = XX pounds lbs ww.
    - **Sub-alternative 2d.** Season 1 trip limit = XX pounds lbs ww, Season 2 trip limit = XX pounds lbs ww.
- **Alternative 3**. Specify two commercial fishing seasons for greater amberjack. Allocate the commercial ACL for greater amberjack into two quotas: XX% to the period March 1 through _____ and YY% to the period _____ 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.

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 2002-2016 is provided in **Figure 10**. 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**).

Comment [NAF1]: We will update this figures once we get corrected data from SEFSC

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**.

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 8**). 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 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 trip limit for vermilion snapper in the South Atlantic federal waters is 1,000 pounds gutted weight (lbs gw) and the commercial ACL is split equally between two six-month seasons. When 75% of the vermilion snapper seasonal quota is met or is projected to be met, the trip limit is reduced to 500 lbs gw. Any remaining quota from Season 1 transfers to Season 2. Any remaining quota from Season 2 is not carried forward.
- **Alternative 2**. Implement a 750 lbs gw vermilion snapper commercial trip limit for the second season (July 1 through December 31). The commercial trip limit is reduced to 500 lbs gw when 75% of the second season quota is met or is projected to be met.
- **Alternative 3**. Remove the step-down to 500 lbs gw when 75% of the seasonal quota is met or projected to be met, and implement a 500 lbs gw vermilion snapper commercial trip limit for the second season (July 1 through December 31).
- **Alternative 4.** Change the commercial trip limits for both seasons (January 1 through June 30; July 1 through December 31) to 750 lbs gw and remove the season 2 trip limit step-down when 75% of the seasonal quota is met or projected to be met.

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 9**). 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 10**).

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 11**. 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 whole weight (lbs ww)
  - **Sub-alternative 2b.** 400 lbs ww
  - **Sub-alternative 2c.** 300 lbs ww
- **Alternative 3**. Establish a commercial trip limit for almaco jack.
  - **Sub-alternative 3a.** 500 lbs ww
  - **Sub-alternative 3b.** 400 lbs ww
  - **Sub-alternative 3c.** 300 lbs ww

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 12**). 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 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 13**). 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**). **Table 14** provides the projected mean and 95% confidence limits for quota closure dates under the various Action 6 alternatives. 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.

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

- **Alternative 1 (No Action).** Commercial harvest and possession of shallow-water groupers (gag, black grouper, scamp, red grouper, yellowfin grouper, yellowmouth grouper, red hind, rock hind, graysby, and coney) is prohibited annually in the South Atlantic Exclusive Economic Zone from January 1 through April 30.
- **Alternative 2.** Maintain seasonal prohibition on commercial harvest of shallow-water groupers annually from January 1 to April 30 north of 28 degrees North latitude. Prohibit commercial harvest and possession of shallow-water grouper species (excluding black grouper) south of 28° North latitude (approximately off Palm Bay, Florida):
    - **Sub-alternative 2a.** January – March (3 months)
    - **Sub-alternative 2b.** February – March (2 months)
    - **Sub-alternative 2c.** February – April (3 months)
    - **Sub-alternative 2d.** February – May (4 months)
- **Alternative 3.** Maintain seasonal prohibition on commercial harvest of shallow-water groupers annually from January 1 to 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 4.** Maintain seasonal prohibition on commercial harvest of shallow-water groupers annually from January 1 to April 30 north of 28 degrees North latitude. Prohibit commercial harvest and possession of black grouper in the Exclusive Economic Zone south of 28 degrees North Latitude:
    - **Sub-alternative 3a.** January – March (3 months)
    - **Sub-alternative 3b.** January
    - **Sub-alternative 3c.** February
    - **Sub-alternative 3d.** March
- **Alternative 5.** Maintain seasonal prohibition on commercial harvest of shallow-water groupers annually from January 1 to April 30 in the Exclusive Economic Zone off Georgia and east Florida. Prohibit commercial harvest and possession of red grouper in the Exclusive Economic Zone off North Carolina and South Carolina:
    - **Sub-alternative 4a.** January – May (5 months)
    - **Sub-alternative 4b.** February – May (4 months)
    - **Sub-alternative 4c.** March – June (4 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 22**.

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 September 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 8. 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 15**). 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 9. 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 23 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 16**). 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.

Table 1. Blueline tilefish recent landings and quota closures.

Fishing Year	Current Landings	ACL	%ACL	Closure Date
2017	35,464	87,521	40.52	
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. Gray shading denotes alternatives that were not evaluated due to missing details in the proposed action.

		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			18-May			16-May
	July-Dec		8-Aug	18-Jul		8-Aug	20-Jul
Alt 2b	Jan-June		10-May	19-Mar		23-May	19-Mar
	July-Dec		24-Aug	4-Aug		27-Aug	12-Aug
Alt 2c	Jan-June						
	July-Dec						
Alt 3	Jan-Dec						
Alt 4a	Jan-Dec		30-Jul	16-Jun		27-Jul	14-Jun
Alt 4b	Jan-Dec		24-Jul	4-Jun		23-Jul	30-May
Alt 4c	Jan-Dec		20-Jul	9-Jun		18-Jul	5-Jun

Table 4. Snowy grouper recent landings and quota closures.

Year	Landings	ACL	Units	%ACL	Closure
2017	70,394	135,380	gw	24.34	
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. Gray shading denotes alternatives that were not evaluated due to missing details in the proposed action.

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-?						
	?-Dec						

Table 6. Greater amberjack recent landings and quota closures.

Fishing Year	Total Landings	ACL	Units	ACL	Closure Date
March 1, 2017 – February 28, 2018	187,007	769,388	gw	24.31	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. Red porgy recent landings and quota closures.

Year	Landings	ACL	Units	%ACL	Closure
2016	115,235	164,000	ww	70.27	
2015	134,185	164,000	ww	81.82	
2014	142,406	154,500	ww	92.17	
2013	155,967	153,000	gw	101.94	12/02/13
2012	155,346	190,050	gw	81.74	
2011	195,049	190,050	gw	102.63	
2010	152,743	190,050	gw	80.37	
2009	158,221	190,050	gw	83.25	
2008	165,461	127,000	gw	130.28	
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 9. Vermilion snapper recent landings and quota closures.

Fishing Year	Landings	ACL	Units	ACL	Trip Limit	Closure
January 1 -June 30, 2017	350,609	431,460	ww	81.26	3/22/2017	
July 1 - Dec 31, 2017	0	431,460		0		
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 10. 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 11. 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 12. Jacks complex recent landings and quota closures.

Fishing Year	Current Landings	ACL	Units	ACL	Closure Date
2017	78,956	189,422	ww	41.68	
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 13. Projected Jacks complex and almaco jack commercial trip limit scalars, by month, based on most recent three years without a quota closure.

Trip Limit	Month	Jacks	Almaco	Years
500	1	99%	99%	2014-2016
500	2	96%	97%	2014-2016
500	3	95%	96%	2014-2016
500	4	60%	90%	2014-2016
500	5	89%	93%	2014-2016
500	6	73%	73%	2012, 2014, 2016
500	7	85%	85%	2010, 2011, 2016
500	8	89%	89%	2009, 2010, 2011
500	9	81%	90%	2009, 2010, 2011
500	10	85%	88%	2009, 2010, 2011
500	11	85%	85%	2009, 2010, 2011
500	12	88%	88%	2009, 2010, 2011
400	1	98%	97%	2014-2016
400	2	93%	95%	2014-2016
400	3	91%	93%	2014-2016
400	4	54%	85%	2014-2016
400	5	83%	87%	2014-2016
400	6	68%	68%	2012, 2014, 2016
400	7	80%	80%	2010, 2011, 2016
400	8	84%	85%	2009, 2010, 2011
400	9	77%	87%	2009, 2010, 2011
400	10	80%	83%	2009, 2010, 2011
400	11	80%	80%	2009, 2010, 2011
400	12	82%	82%	2009, 2010, 2011
300	1	94%	95%	2014-2016
300	2	89%	91%	2014-2016
300	3	86%	89%	2014-2016
300	4	46%	79%	2014-2016
300	5	73%	78%	2014-2016
300	6	59%	60%	2012, 2014, 2016
300	7	73%	72%	2010, 2011, 2016
300	8	77%	78%	2009, 2010, 2011
300	9	71%	82%	2009, 2010, 2011
300	10	73%	78%	2009, 2010, 2011
300	11	73%	73%	2009, 2010, 2011
300	12	73%	74%	2009, 2010, 2011

Table 14. 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		28-Jul	26-Jun		9-Jul	8-May
2b		8-Aug	3-Jul		19-Jul	12-May
2c		29-Aug	13-Jul		5-Aug	20-May
3a	28-Dec	14-Jul	11-Jun		21-Jun	26-Apr
3b		27-Jul	20-Jun		5-Jul	29-Apr
3c		27-Jul	20-Jun		5-Jul	29-Apr

Table 15. 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 16. 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
12	19.7
13	12.5
14	0.0

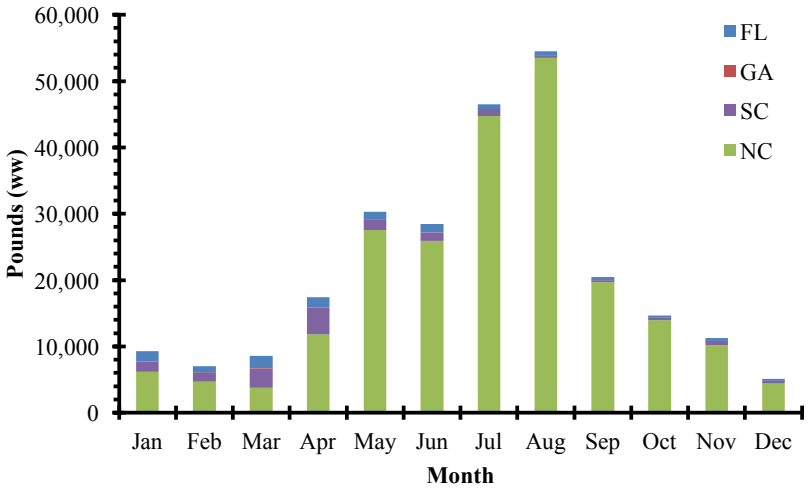

Figure 1. The average monthly South Atlantic blueline tilefish landings by state from 2004-2013 in pounds whole weight. The years 2014-2016 were excluded due to closures. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

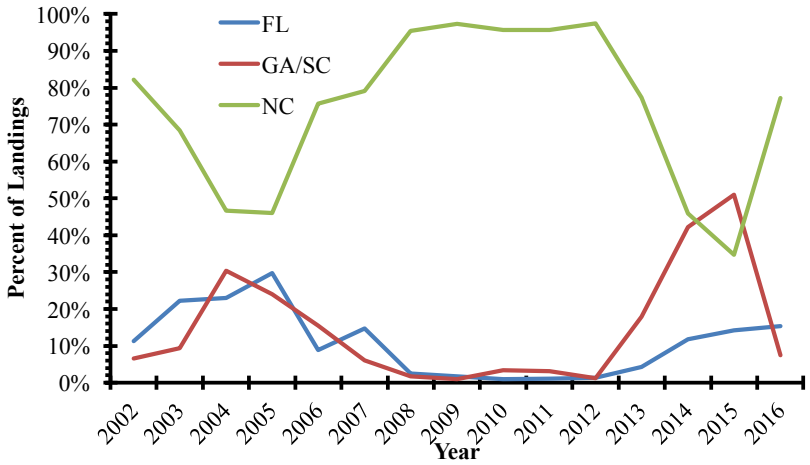

Figure 2. The percentage of annual South Atlantic blueline tilefish landings by state from 2002-2016. Georgia and South Carolina were combined due to confidentiality concerns. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

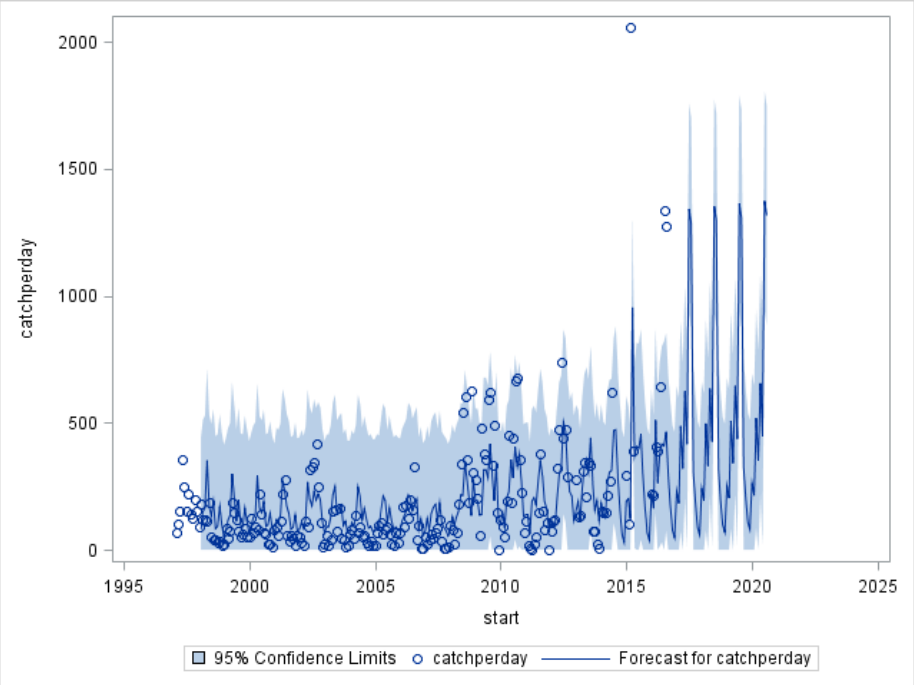

Figure 3. Final SARIMA model fit for blueline tilefish monthly commercial landings (lb ww) per open day.

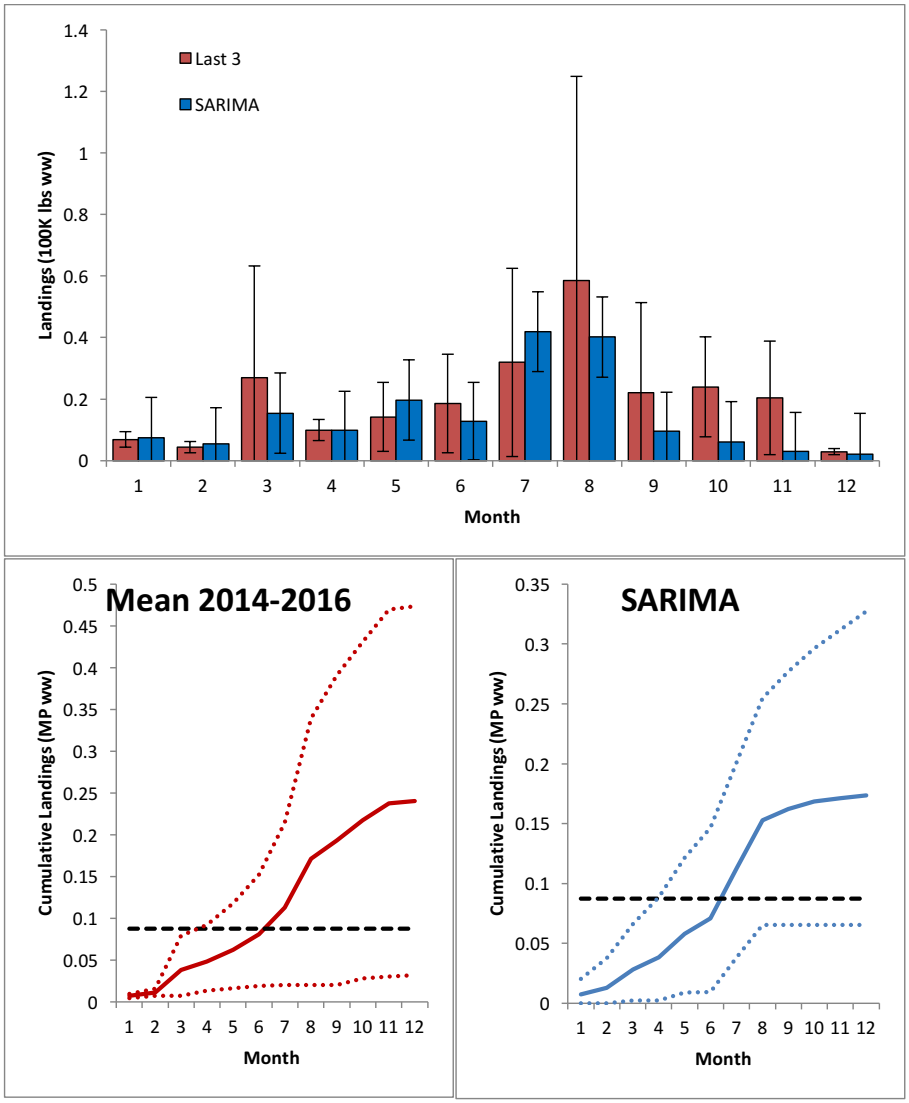

Figure 4. Blueline tilefish projected commercial landings (MP: million pounds, whole weight) by month (top) and mean (solid line) and 95% confidence limits (dotted lines) estimates for cumulative landings relative to ACL (bottom) for two projection models: Mean of last 3 years (2014-2016) and SARIMA.

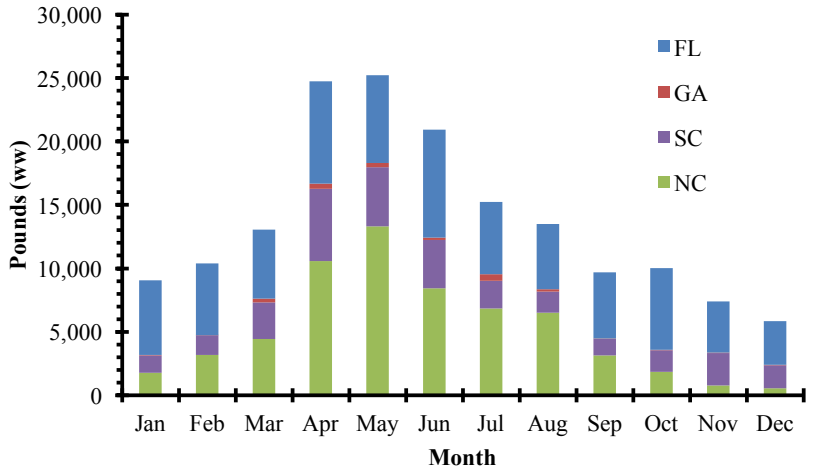

Figure 5. The average monthly South Atlantic snowy grouper landings by state from 2002-2005 and 2007-2011 in pounds whole weight. The years 2006 and 2012-2016 were excluded due to closures. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

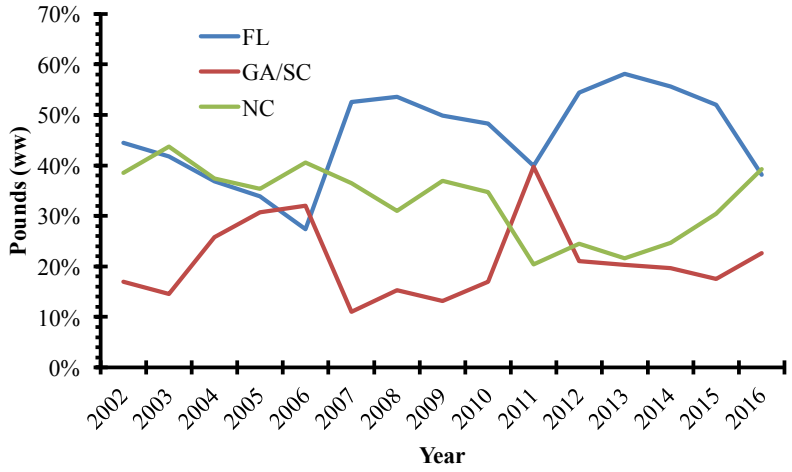

Figure 6. The percentage of annual South Atlantic snowy grouper landings by state from 2002-2016. Georgia and South Carolina were combined due to confidentiality concerns. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

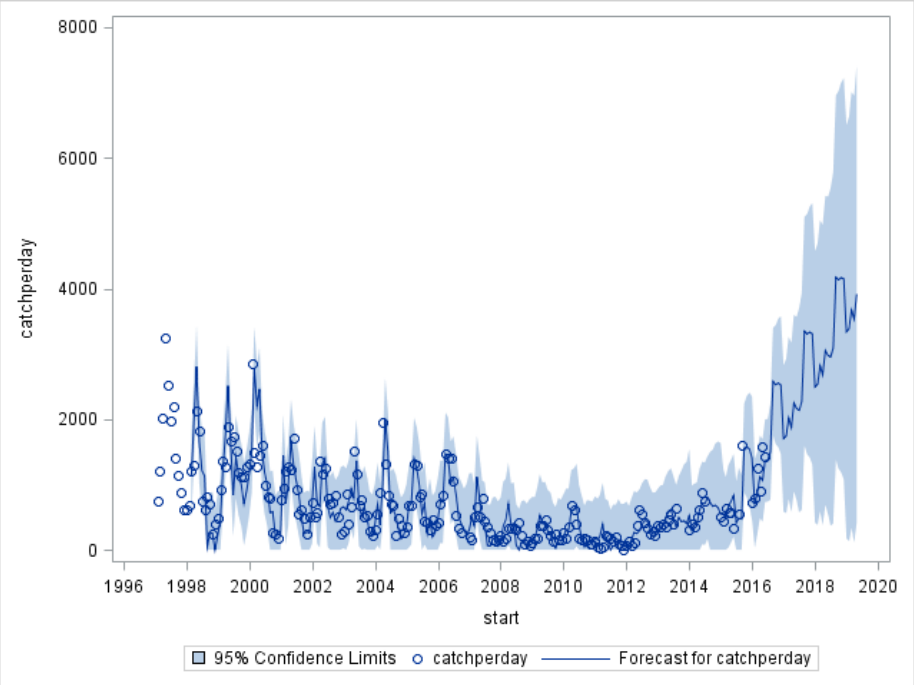

Figure 7. Final SARIMA model fit for snowy grouper monthly commercial landings (lb ww) per open day.

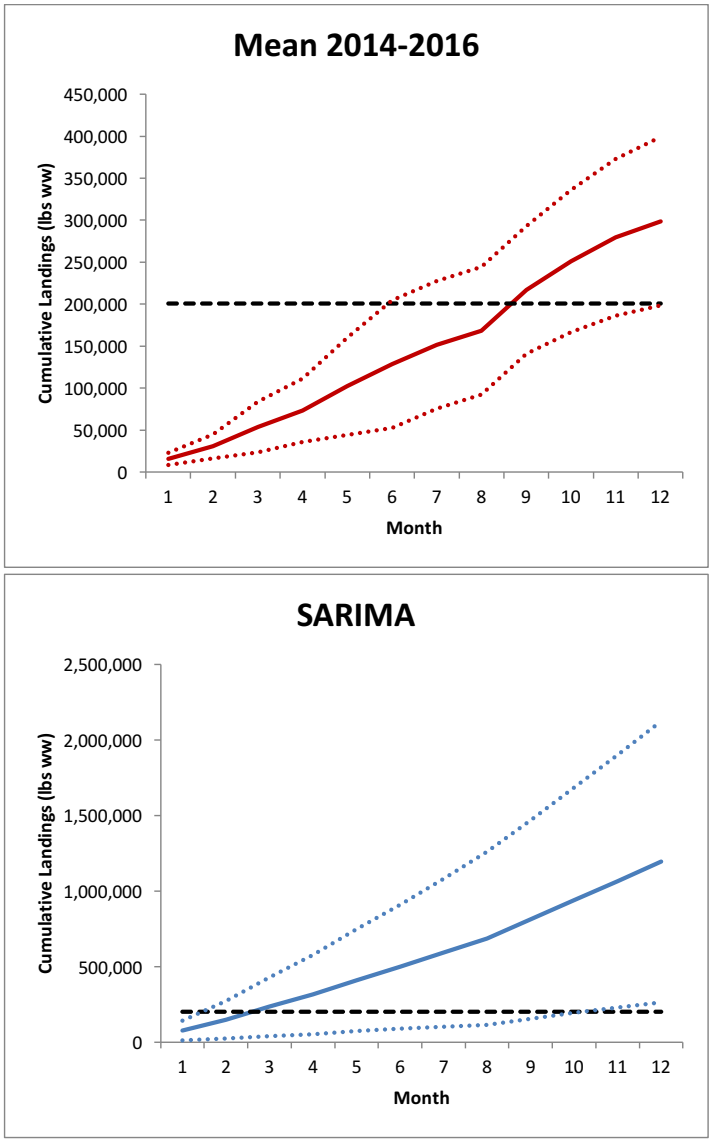

Figure 8. Mean (solid line) and 95% confidence limits (dotted lines) for Snowy grouper projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

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?. The year 2016 was excluded due to a closure.

Figure 10. The percentage of annual South Atlantic greater amberjack landings by state from 2002-2016. Georgia and South Carolina were combined due to confidentiality concerns.

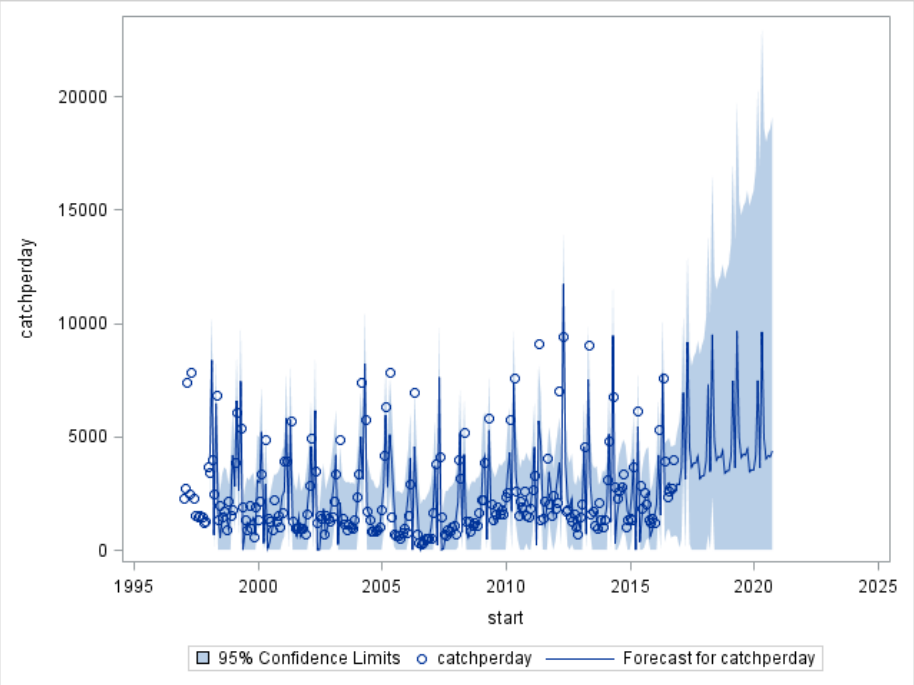

Figure 11. Final SARIMA model fit for greater amberjack monthly commercial landings (lb ww) per open day.

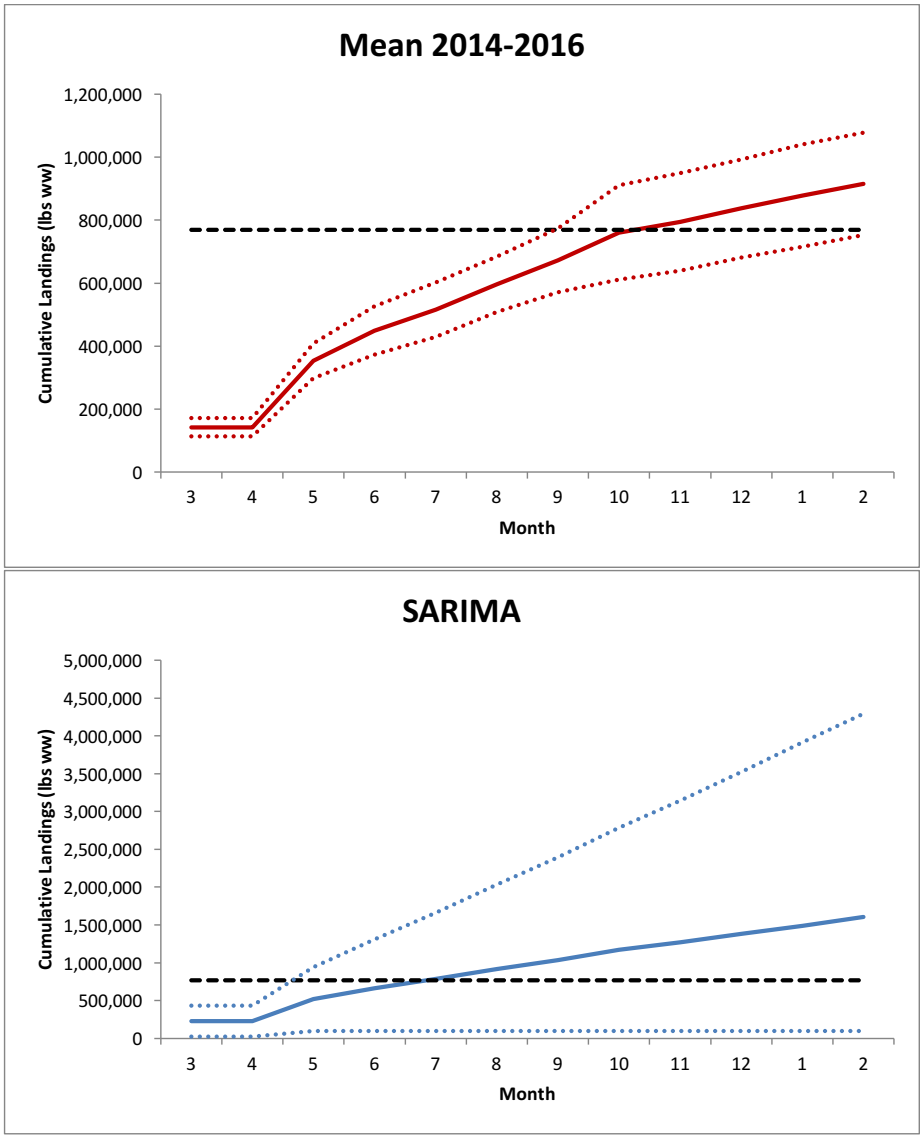

Figure 12. Mean (solid line) and 95% confidence limits (dotted lines) for Greater amberjack projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

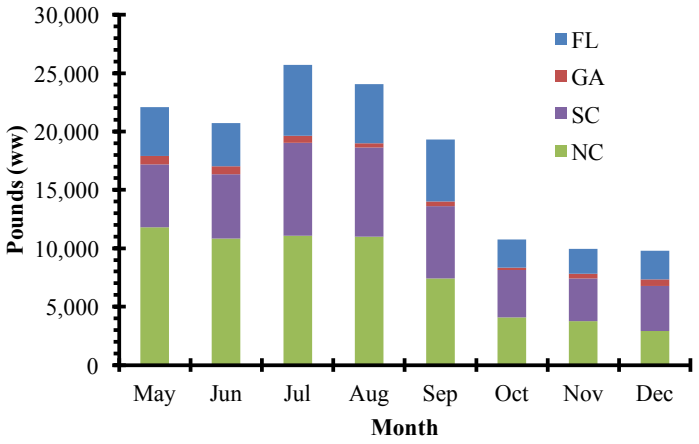

Figure 13. The average monthly South Atlantic red porgy landings by state from 2005-2012 and 2014-2016 in pounds whole weight. The year 2013 was excluded due to a closure. Data from the months of January to April was not available due to the seasonal closure in place since 2000. Source: Southeast Fisheries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

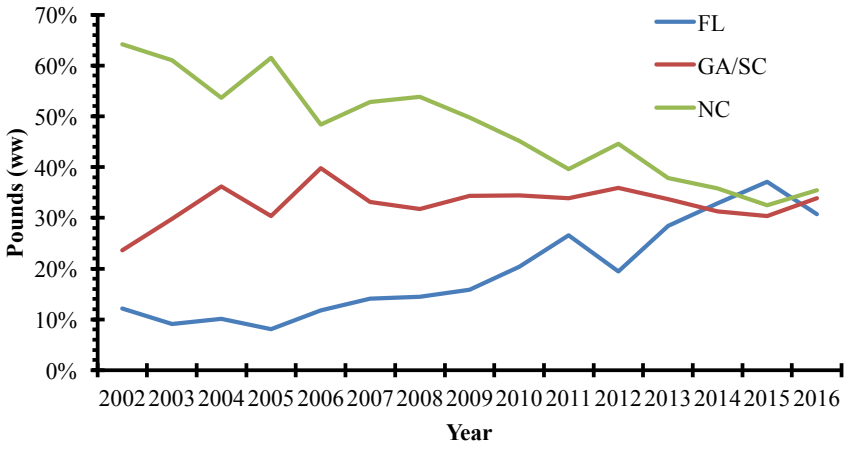

Figure 14. The percentage of annual South Atlantic red porgy landings by state from 2002-2016. Georgia and South Carolina were combined due to confidentiality concerns. Source: Southeast Fisheries Science Center commercial (5/2/2017) ACL dataset.

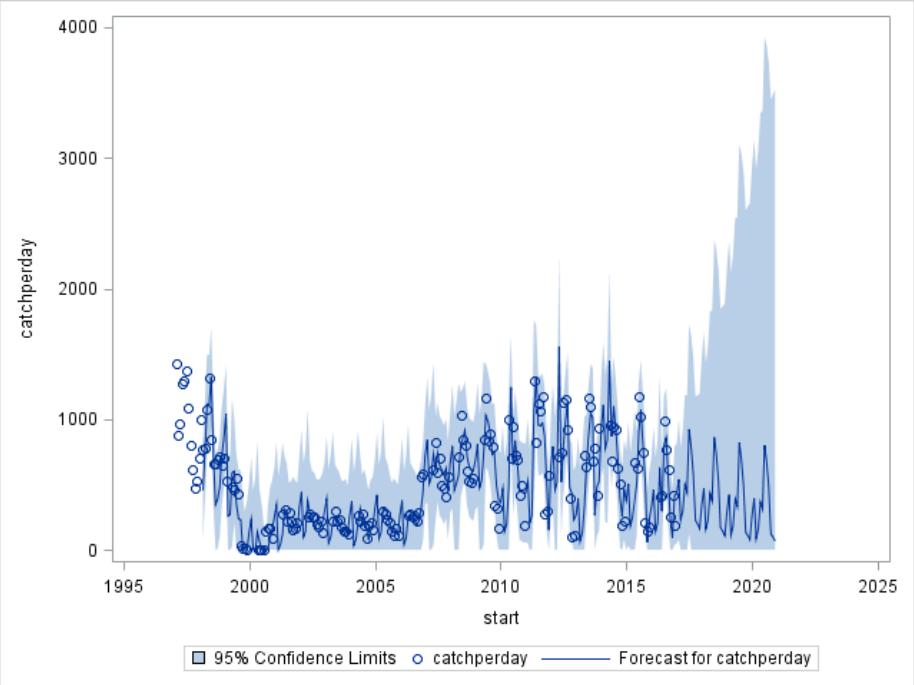

Figure 15. Final SARIMA model fit for red porgy monthly commercial landings (lb ww) per open day.

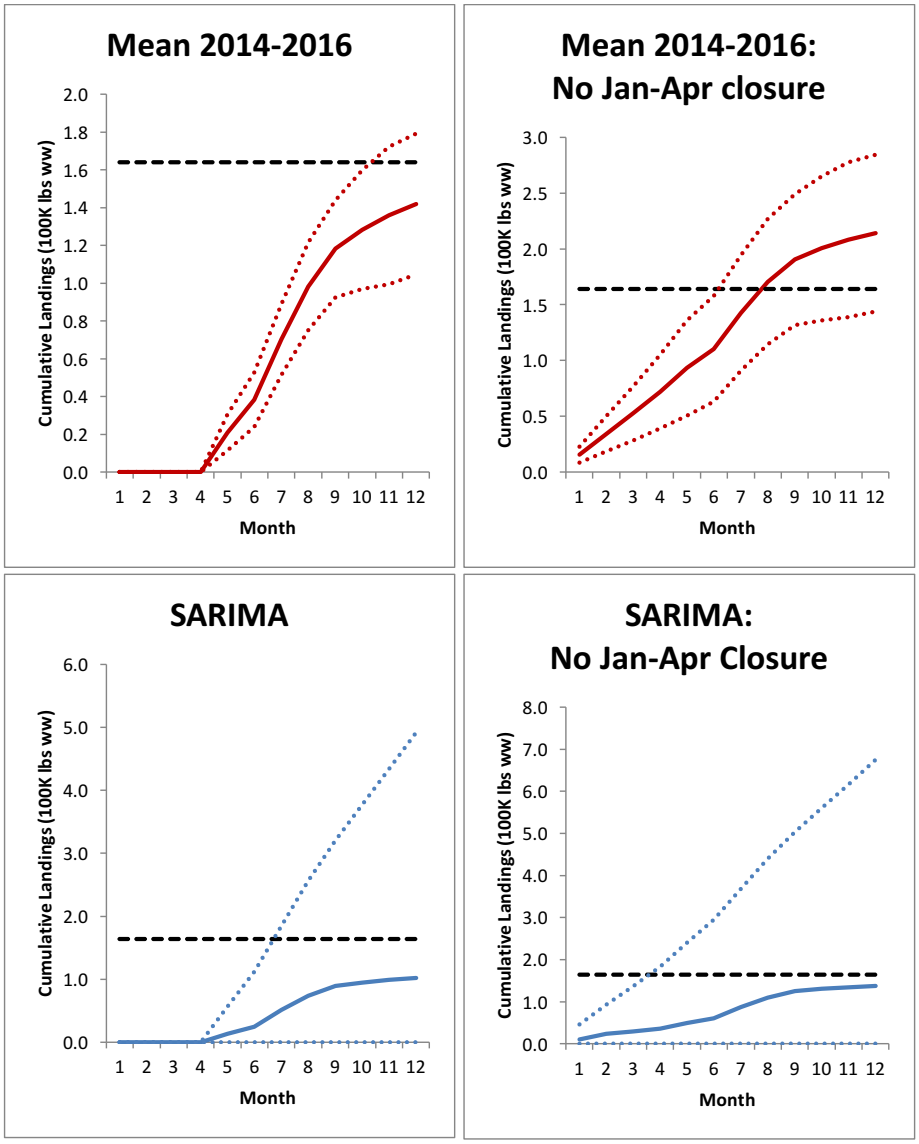

Figure 16. Mean (solid line) and 95% confidence limits (dotted lines) for Red porgy projected cumulative landings relative to ACL, with and without Jan-Apr closure, for two projection models: Mean of last 3 years (2014-2016) and SARIMA.

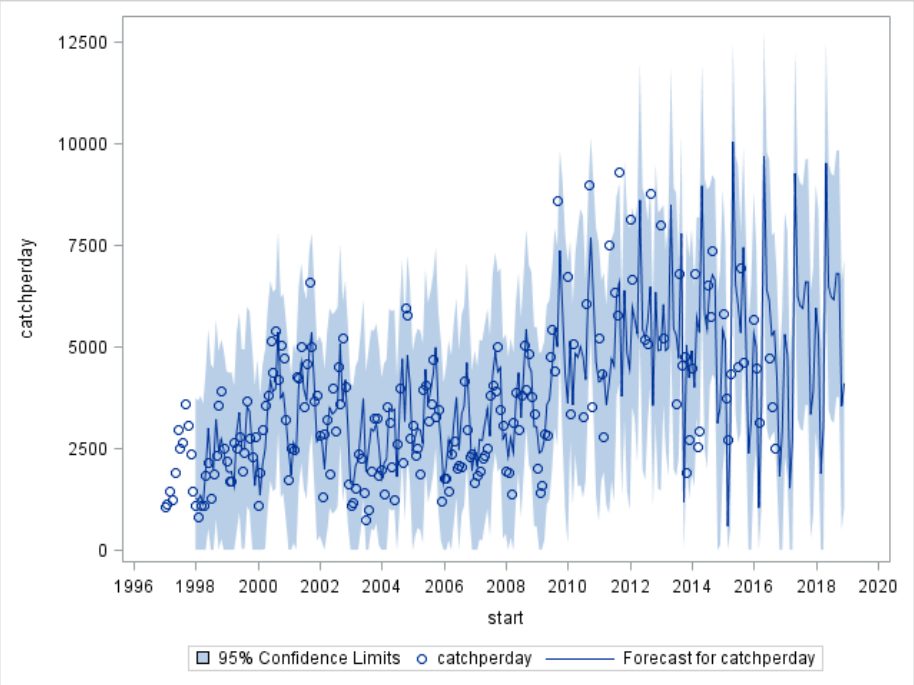

Figure 17. Final SARIMA model fit for vermilion snapper monthly commercial landings (lb ww) per open day.

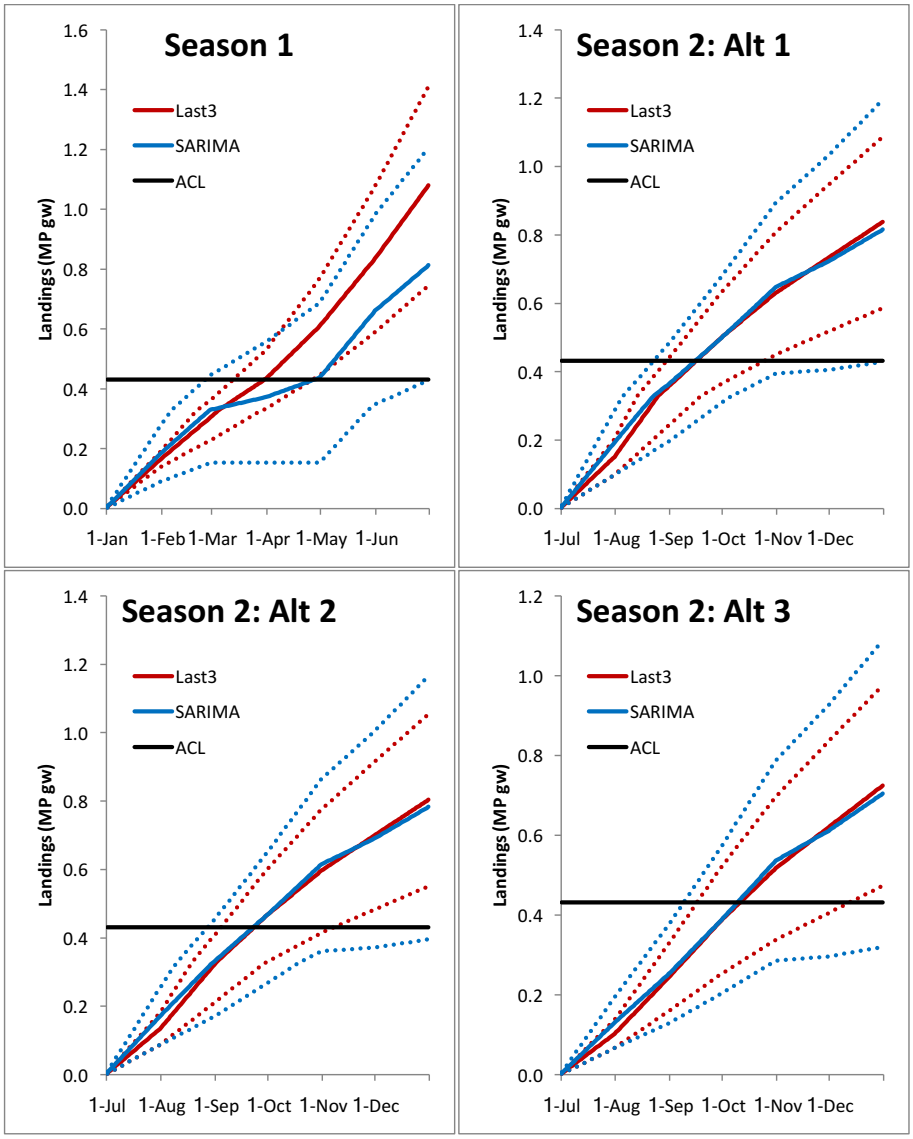

Figure 18. Mean (solid line) and 95% confidence limits (dotted lines) for vermilion snapper projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

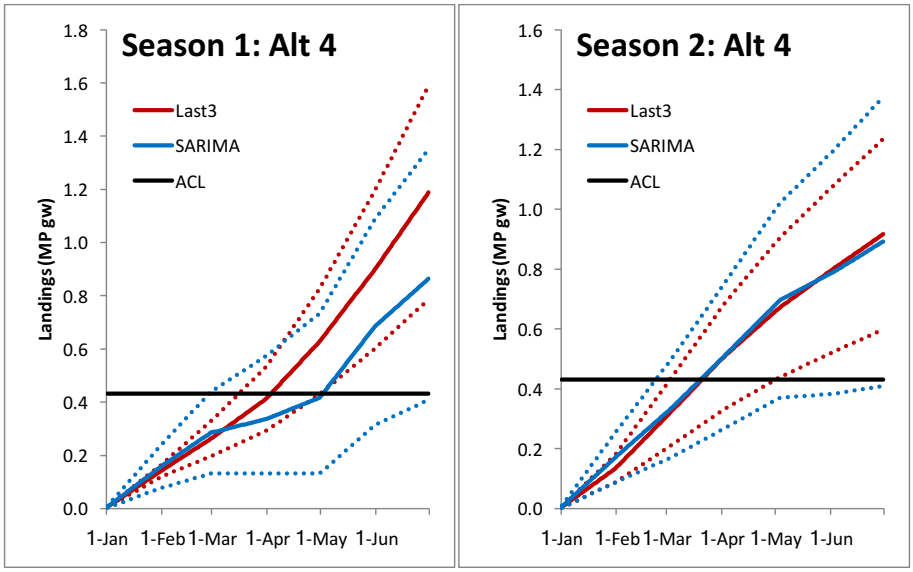

Figure 18 (con't).

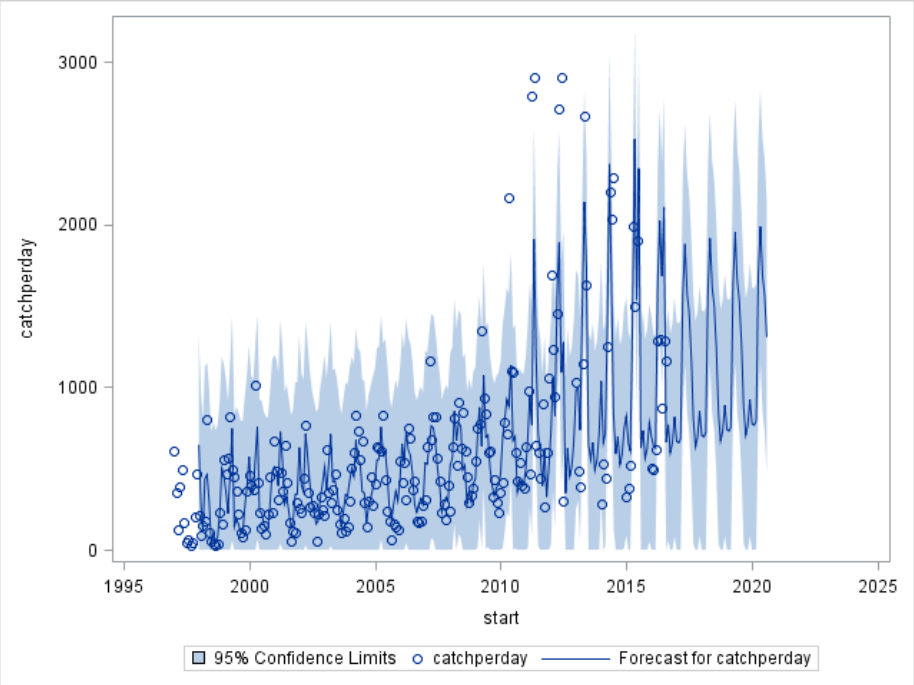

Figure 19. Final SARIMA model fit for Jacks complex monthly commercial landings (lb ww) per open day.

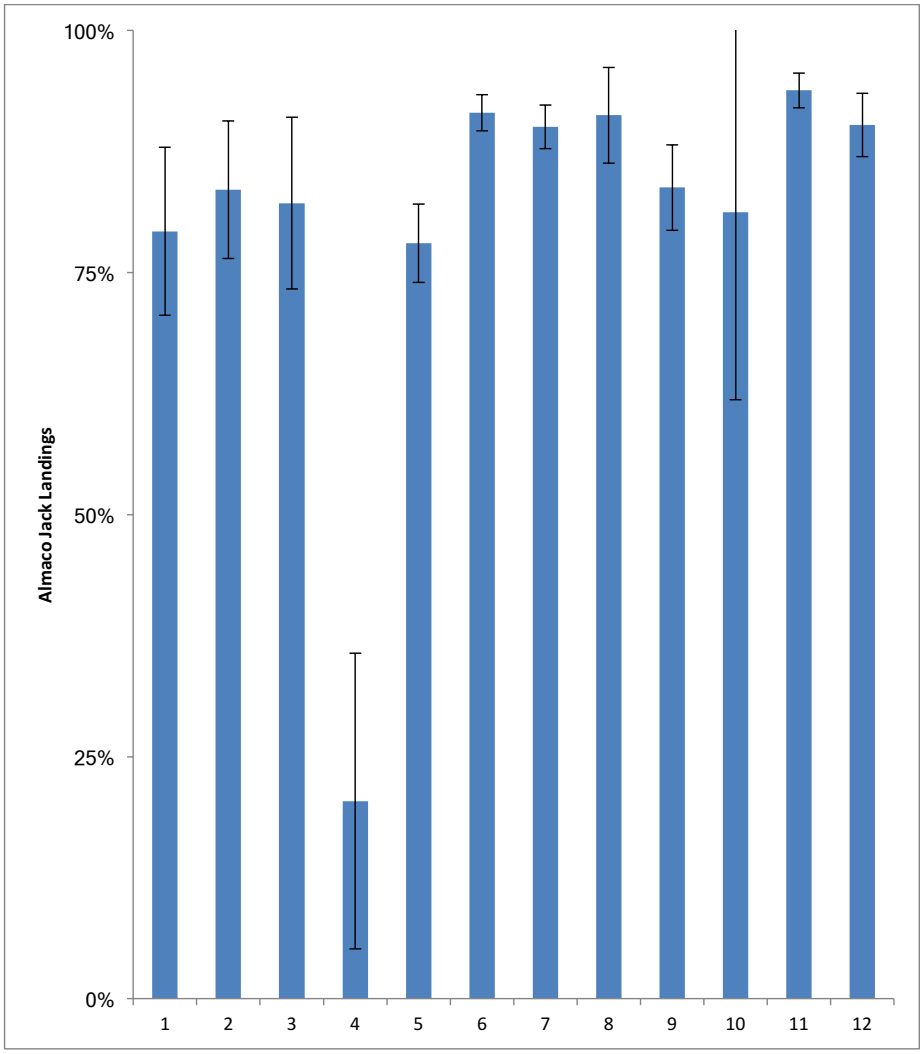

Figure 20. Monthly ratio of almaco jack to Jacks complex commercial landings from the most recent three completely open fishing years. Error bars denote standard deviation.

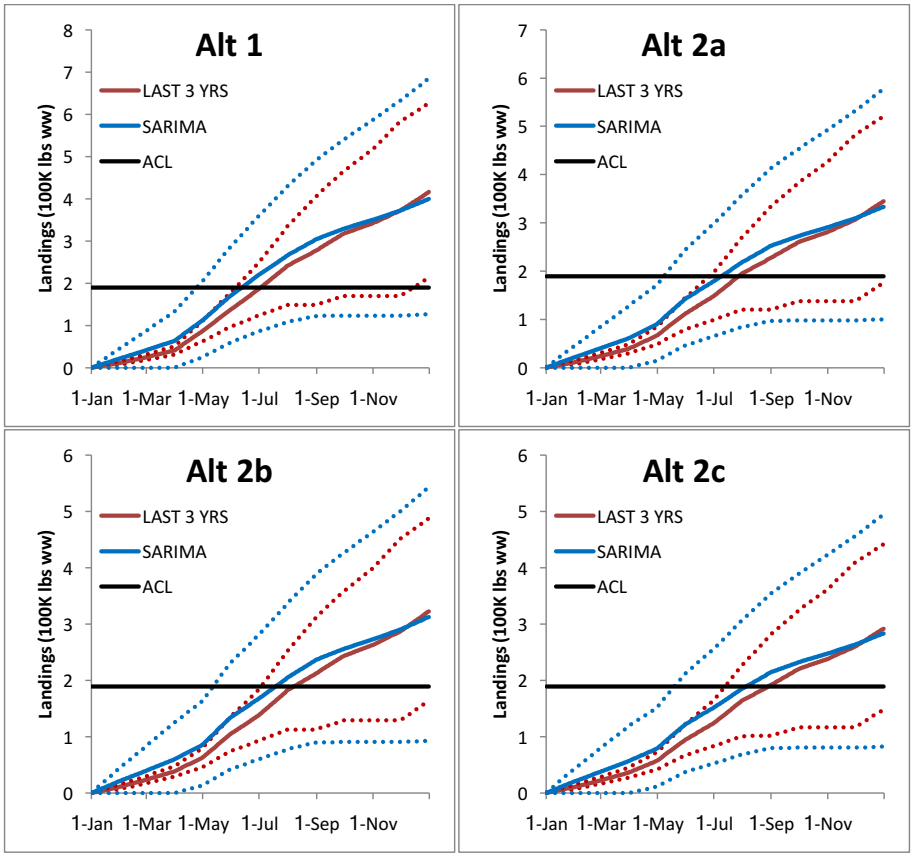

Figure 21. Mean (solid line) and 95% confidence limits (dotted lines) for Jacks complex projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

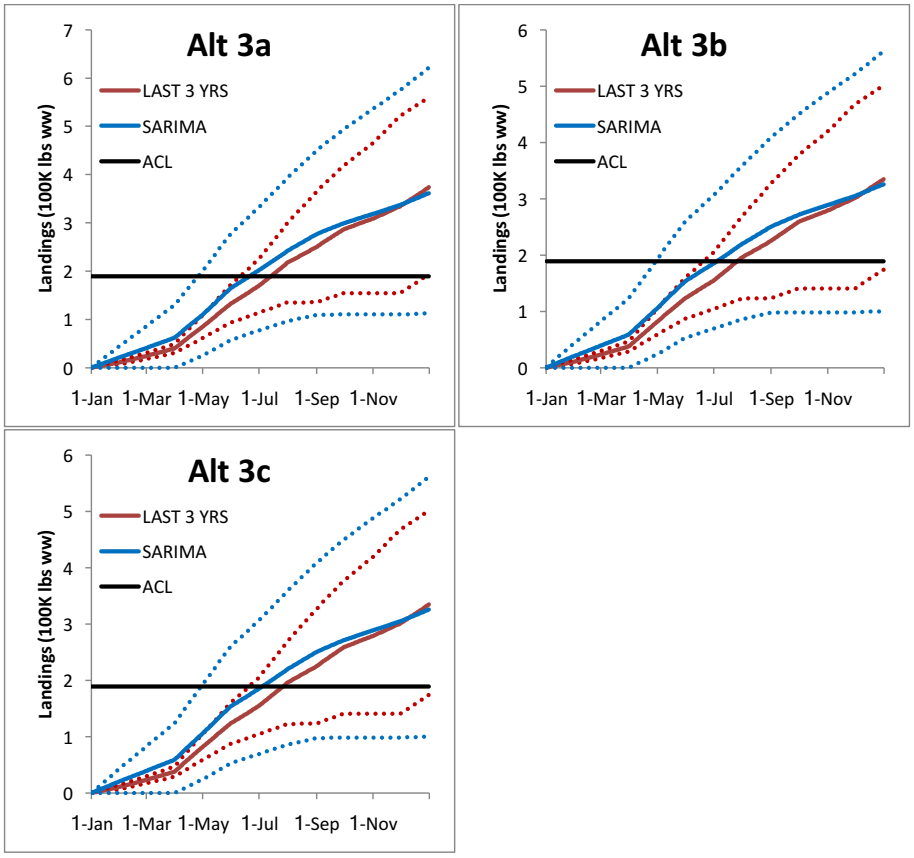

Figure 21 (con't). Mean (solid line) and 95% confidence limits (dotted lines) for Jacks complex projected cumulative landings relative to ACL under two projection models: Mean of last 3 years (2014-2016) and SARIMA.

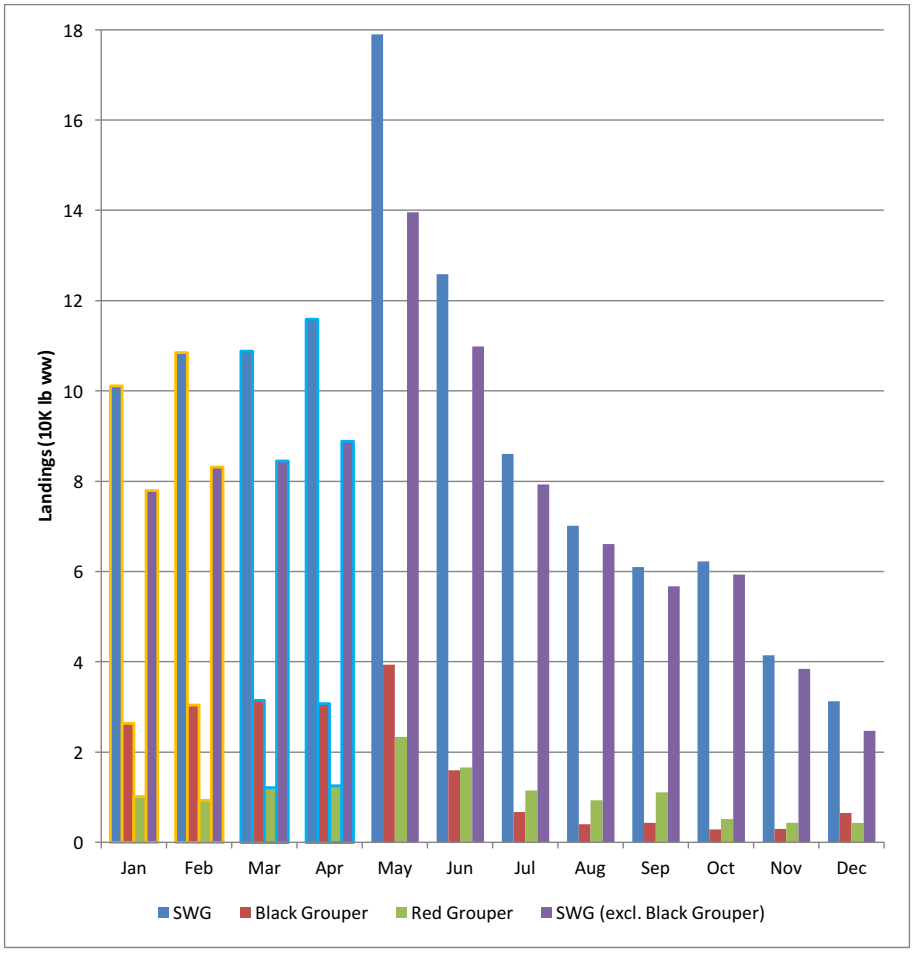

Figure 22. Mean 2014-2016 (no outline) and projected (outlines) monthly commercial landings for shallow water grouper (SWG: gag, black grouper, scamp, red grouper, yellowfin grouper, yellowmouth grouper, red hind, rock hind, graysby, and coney), black grouper, red grouper, and SWG excluding black grouper. 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.

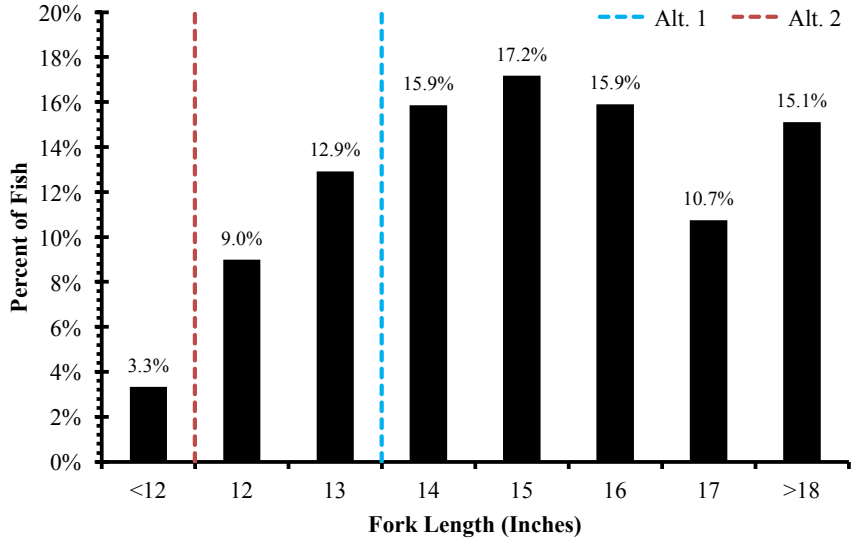

Figure 23. The length distribution of gray triggerfish captured in federal waters off east Florida generated from commercial TIP (n=2,616) data from January 2014 to June 2015. The dashed lines denote the commercial minimum size limit proposed in each alternative.

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.

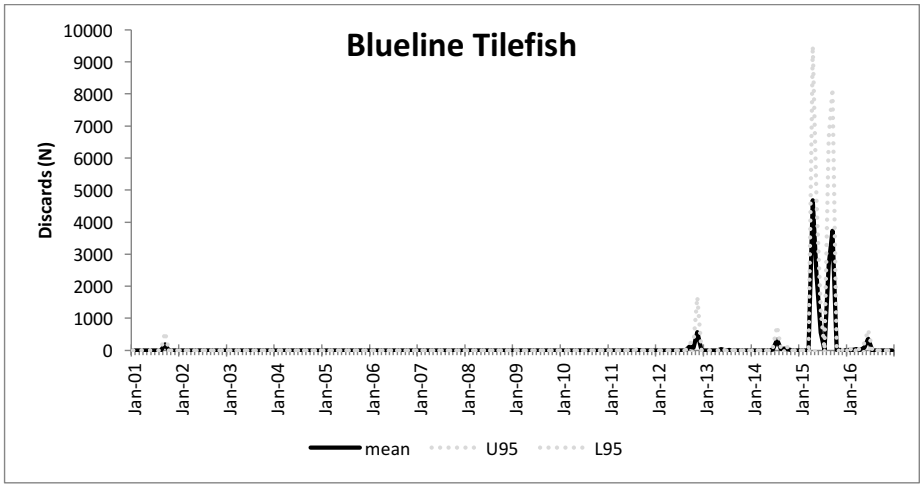

Figure S-1. Blueline tilefish expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

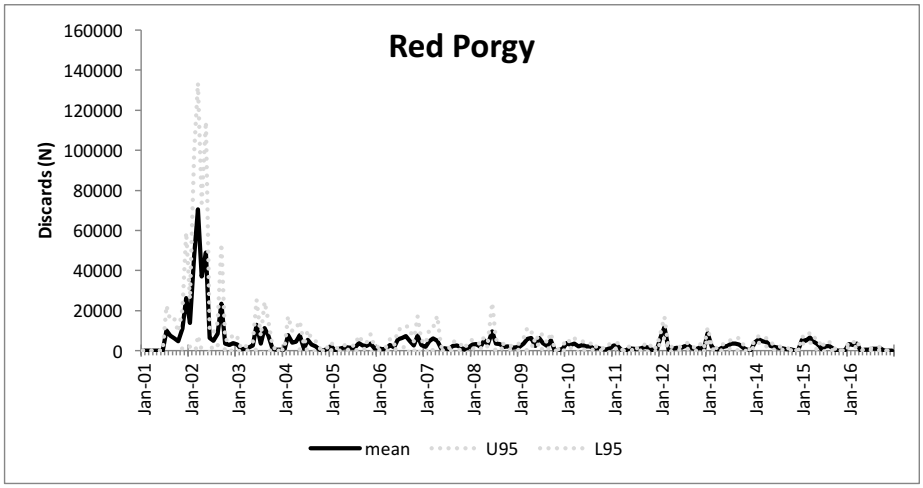

Figure S-2. Red porgy expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

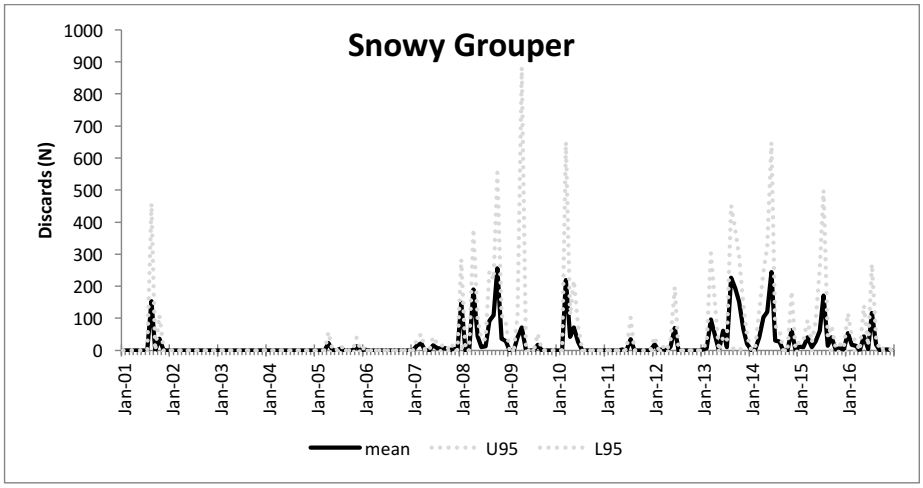

Figure S-3. Snowy grouper expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

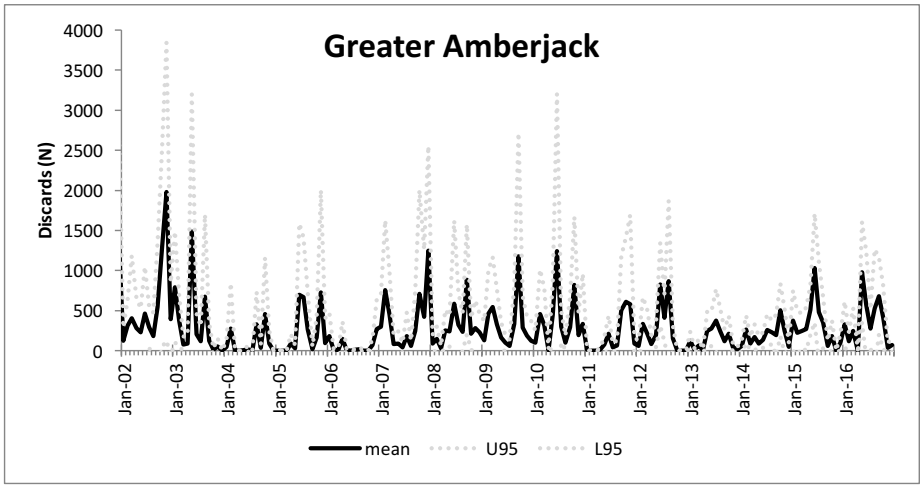

Figure S-4. Greater amberjack expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

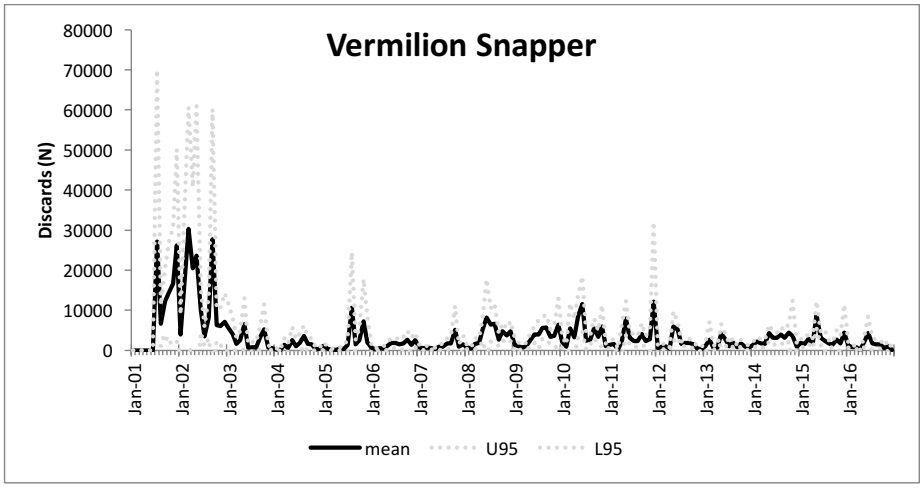

Figure S-5. Vermilion snapper expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

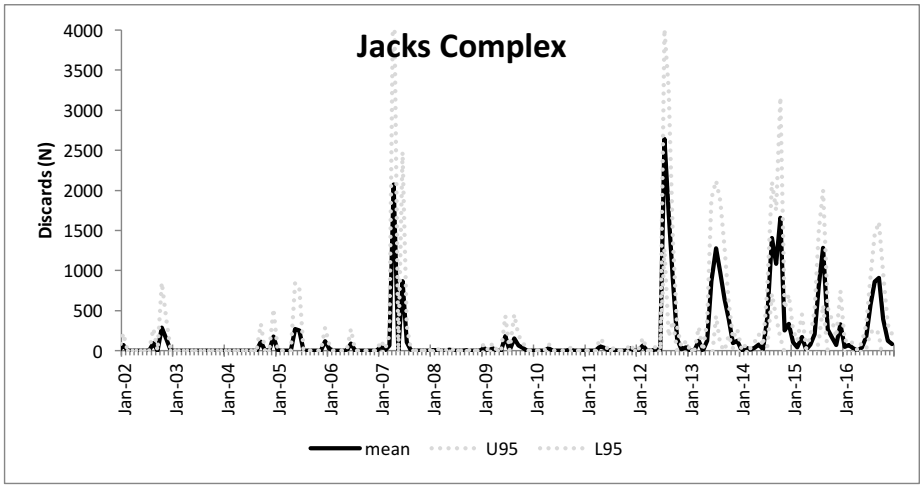

Figure S-6. Jacks complex (lesser amberjack, banded rudderfish, almaco jack) expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

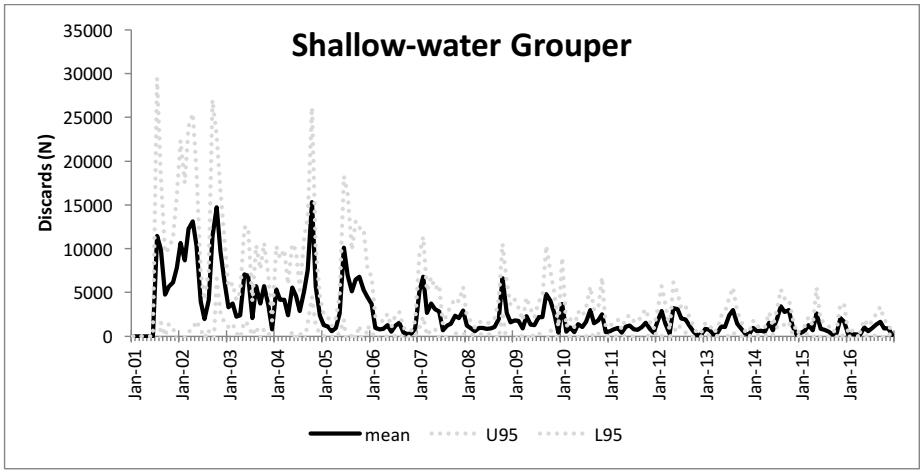

Figure S-7. Shallow-water grouper (gag, black grouper, scamp, red grouper, yellowfin grouper, yellowmouth grouper, red hind, rock hind, graysby, and coney) expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black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

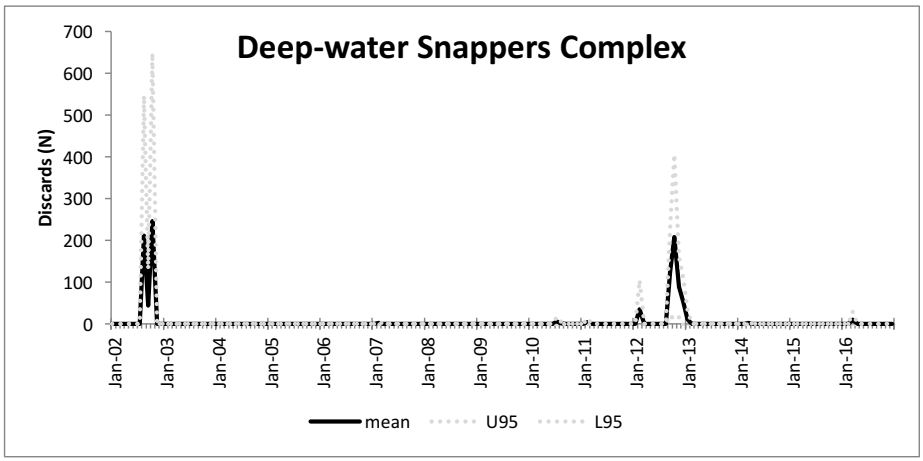

Figure S-8. Deep-water snapper (queen snapper, silk snapper, blackfin snapper) expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate.

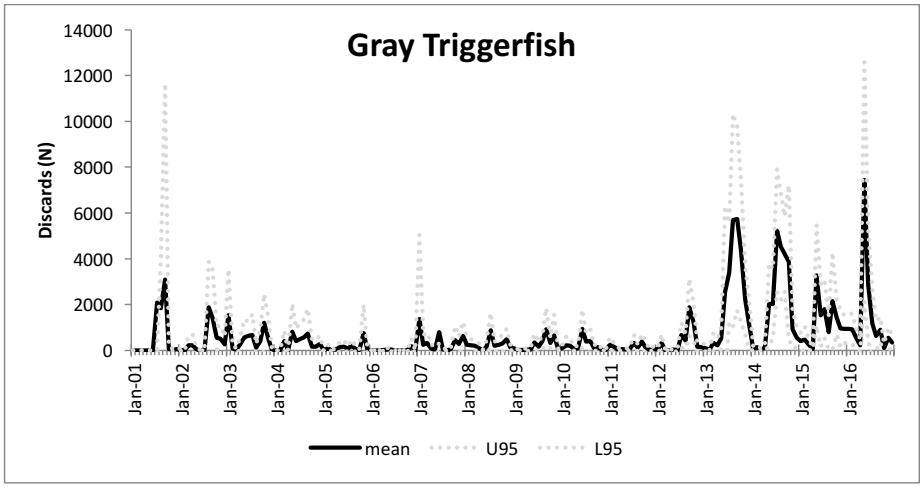

Figure S-9. Gray triggerfish expanded monthly commercial discard estimates (numbers of fish) from the SEFSC Supplemental Commercial Discard Logbook (accessed May 2017). Black line denotes mean, dotted lines denote 95% confidence limits for estimate. Note an outlier was removed for trolling gear in Nov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

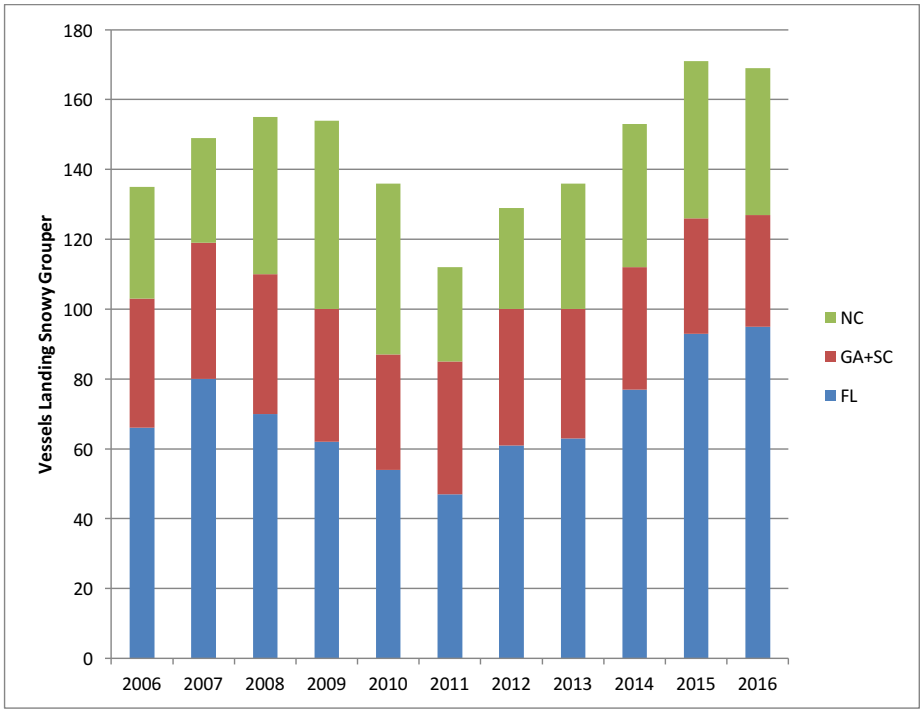

Figure S-10. Number of vessels reporting landings of snowy grouper, by state and year. Note that Georgia and South Carolina have been aggregated to protect confidentiality.