Amendment 41 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region

Analyses for SSC Review

October 3, 2016

Environmental Assessment Regulatory Impact Review Regulatory Flexibility Analysis Fishery Impact Statement

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Why is the South Atlantic Council considering action?

In 2012, the Comprehensive Annual Catch Limits (ACL) Amendment (SAFMC 2011) allocated the mutton snapper Acceptable Biological Catch (ABC) between the South Atlantic and Gulf of Mexico Councils based on the Florida Keys (Monroe County) jurisdictional boundary. The South Atlantic Council received 82% of the ABC and the Gulf Council received 18% of the ABC (established using 50% of average landings from 1990-2008 + 50% of average landings from 2006-2008). The following parameters (pounds whole weight; lbs ww) were implemented for mutton snapper in the South Atlantic through the Comprehensive ACL Amendment:

Parameter	Value
Overfishing Limit (OFL)	1,515,300
Acceptable Biological Catch (ABC)	926,600
Annual Catch Limit (ACL)	926,600
Commercial ACL	157,707
Recreational ACL	768,893
Recreational Annual Catch Target (ACT)	668,937

The current commercial ACL is 157,743 lbs ww and the recreational ACL is 768,857 lbs ww *(NOTE: The commercial allocation in the Comp ACL was 17.02% and the recreational allocation was 82.98%. However the ACLs that were implemented were calculated using this allocation to 6 decimal places instead of 2).*

In 2015, an update to the stock assessment for mutton snapper in the southeastern U.S. was conducted with data through 2013 (SEDAR 15A Update 2015). The South Atlantic Council needs to take action to implement biological benchmarks and fishing levels recommended by the latest stock assessment update (SEDAR 15A Update 2015). However, based on improvements to the modeling approach, the 2015 assessment estimated a smaller adult population compared to the 2008 assessment. Because of this finding the assessment recommends a lower ABC to maintain sustainable harvest. Consequently, the South Atlantic Council may modify existing management measures for mutton snapper to achieve the desired level of harvest.

Actions & alternatives proposed in Amendment 41

Amendment 41 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Snapper Grouper FMP) proposes the following 8 actions for mutton snapper in the South Atlantic Region:

1. **Specify maximum sustainable yield (MSY)**

   Currently: not specified

   Preferred Alternative 2. 912,500 pounds whole weight (lbs ww)

2. **Specify minimum stock size threshold (MSST)**

   Currently: not specified

   Preferred Alternative 3. MSST = 75% SSB_{MSY} = 3,486,900 lbs ww

3. **Revise annual catch limits (ACLs) and optimum yield (OY)** (see **Table S-1**)

   Currently: ACL = OY = ABC = 926,600 lbs ww
   Commercial ACL = 157,743 lbs ww
   Recreational ACL = 768,857 lbs ww

   Preferred Sub-alternative 2a. ACL = OY = ABC = 129,150 fish for 2017.
   Commercial ACL = 100,015 lbs ww (for 2017)
   Recreational ACL = 116,127 fish (for 2017)

4. **Revise the recreational annual catch target (ACT)**

   Currently: ACT = recreational ACL*(1-PSE) or ACL*0.5, whichever is greater = 668,906 lbs ww

   Preferred Sub-alternative 2b. ACT =85% recreational ACL = 98,708 fish

5. **Modify the minimum size limit**

   Currently: minimum size limit = 16 inches total length (TL)

   Preferred Alternative 3. 18 inches TL

6. **Designate the "spawning months" for regulatory purposes**

   Currently: commercial restrictions apply in May-June:10 fish/person/day or 10 fish/person/trip, whichever is more restrictive. There are no additional restrictions for the recreational sector during May-June.

   Preferred Sub-alternative 2a. For regulatory purposes, designate April-June as "spawning months". The remainder of the year would be the "regular season."

7. Modify the recreational bag limit

Currently: 10 fish/person/day, included in the 10-snapper aggregate bag limit.

Preferred Sub-alternative 4c. Retain mutton snapper within the recreational 10 snapper aggregate bag limit in the South Atlantic, but specify bag limit of 5 fish/person/day within the aggregate bag limit year round.

8. Modify the commercial trip and possession limit

Currently: Commercial restrictions apply May through June - *10 fish/person/day or 10 fish/person/trip, whichever is more restrictive.*

Preferred Sub-alternative 2c. Establish a commercial trip limit of 500 pounds for mutton snapper during the "regular season" (i.e., non-spawning months) in the South Atlantic.

Preferred Sub-alternative 3f. Specify a commercial ~~trip~~ possession limit for mutton snapper during the "spawning months" in the South Atlantic of 5 fish/person/day.

Acceptable biological catch for mutton snapper

An update to the stock assessment for mutton snapper in the southeastern U.S. (SEDAR 15A Update 2015) was conducted in 2015 with data through 2013. The Scientific and Statistical Committee (SSC) reviewed the results at their April 28-30, 2015 meeting and made the following fishing level recommendations for mutton snapper in the South Atlantic and Gulf of Mexico:

Mutton Snapper recommendations from SEDAR 15A Update (2015). ABC to be specified based on landings projections in numbers of fish.

Criteria	Deterministic	Probabilistic
Overfished evaluation	Not overfished: $SSB/SSB_{F30\%}$=1.13	
Overfishing evaluation	Not overfishing: $F/F_{30\%SPR}$=0.65	
MFMT ($F_{30\%SPR}$)	0.18	
$SSB_{30\%SPR}$ (lbs females)	4,649,200	
MSST (lbs females)	4,137,700	
Y at $F_{30\%SPR}$ (MSY proxy, lbs)	912,500	
Y at $F_{40\%SPR}$ (lbs)	874,000	
ABC Control Rule Adjustment		20%
P-Star		30%

	OFL RECOMMENDATIONS					
Year	Landings (lbs)	Discards (lbs)	Catch (lbs)	Landings (numbers)	Discards (numbers)	Catch (numbers)
2017	751,711	55,962	807,673	164,150	29,660	193,810
2018	793,823	56,994	850,817	173,656	30,071	203,727
2019	835,318	58,170	893,488	180,716	30,430	211,146
2020	850,077	58,857	908,934	184,868	30,780	215,648

	ABC RECOMMENDATIONS (P* = 0.03)					
Year	Landings (lbs)	Discards (lbs)	Catch (lbs)	Landings (numbers)	Discards (numbers)	Catch (numbers)
2017	717,200	53,700	770,900	157,500	28,400	185,900
2018	746,800	53,900	800,700	164,500	28,300	192,800
2019	774,400	54,400	828,800	169,300	28,300	197,600
2020	798,300	54,500	852,800	172,700	28,300	201,000

Purpose for Actions

The *purpose* of this amendment is to update the acceptable biological catch, annual catch limit, maximum sustainable yield, minimum stock size threshold, optimum yield, and revise management measures for the mutton snapper component of the snapper grouper fishery based on the results of the most recent stock assessment.

Need for Actions

The *need* for the amendment is to base mutton snapper management measures on the best scientific information available in order to achieve and maintain optimum yield and to prevent overfishing while minimizing, to the extent practicable, adverse social and economic effects.

Recreational Data Analysis of Management Alternatives

Dr. Mike Errigo, SAFMC Staff

INTRODUCTION

Amendment 41 to the Snapper Grouper FMP contains actions to address the 2015 update assessment for Mutton Snapper conducted by the FL Fish and Wildlife Commission (FWC). The South Atlantic Fishery Management Council (SAFMC) is proposing actions to update the stock biological reference points and the catch level recommendations for Mutton Snapper in response to the FL FWC update assessment. The update assessment predicted a drop in the Acceptable Biological Catch (ABC) of the stock from what was estimated in the previous benchmark; therefore the SAFMC is also considering changes to the management measures for Mutton Snapper in its jurisdiction.

This document describes the analyses conducted of the potential effects of the proposed recreational management measures on recreational harvest of Mutton Snapper in the South Atlantic (SA). Recreational management measure alternatives include adjustments to the timing of the spawning season, recreational bag limit, and recreational size limit for Mutton Snapper.

DATA

Trip level data was used from the Marine Recreational Information Program (MRIP) and the Southeast Regional Headboat Survey (SRHS) to conduct the analyses. The years 2010 to 2014 were included. All analyses were conducted using numbers of fish, since the SAFMC has specified the new recreational ACL will be in numbers rather than in weight. The analyses described here deal with landings data, which is defined as fish that are kept by the angler. The MRIP program defines landings as consisting of types A and B1 fish, which are described below.

MRIP

The MRIP data includes both private recreational trips and charter trips. These data were for trips intercepted by MRIP interviewers, which is only a small portion of the total Mutton Snapper trips (~0.22%). Data were available at the trip level and included number of fish observed (by the interviewer, type A), number of fish killed but not observed (type B1), number of fish discarded (type B2), the number of anglers on board, the date of the intercept, the kind of day (weekend vs. weekday), the length of each fish, and the expansion factor used to expand the landings and discards of each trip up to the total landings and discards for the entire South Atlantic based on the estimated fishing effort. For kind of day, holidays were included as weekends. During the time period used in this analysis, the landings attributed to MRIP make up approximately 88.5% of the total recreational Mutton Snapper landings in the SA.

Since Mutton Snapper is part of the Aggregate Snapper bag limit, an analysis was conducted to look at what proportion of trips was reaching the aggregate bag limit. From 2010 to 2014, only 3 trips were intercepted in the SA that reached the Aggregate Snapper bag limit. On those trips, the dominant species in the landings was Yellowtail Snapper. On average, there were about 9 Yellowtail Snapper for every Mutton Snapper on those 3 trips. Since so few trips reached the

Aggregate Snapper bag limit, and since the SAFMC is only considering reductions in the number of Mutton Snapper that can be retained in the Aggregate Snapper bag limit, the analysis was conducted using only the landings data of Mutton Snapper. This assumption was carried through to the SRHS data.

As mentioned above, data from 2010 to 2014 were used to perform the analysis. Figure 1 shows the MRIP landings for each of the years included in the analysis, which range from ~48,000 fish to ~140,000 fish. The average landings across the years for each month were used to predict potential reductions due to changes in management measures (Figure 2). The size composition of the MRIP landings shows that a large proportion of the landed fish are at or below the current 16 inch minimum size in most years and for areas north of the FL Keys (Figure 3Figure 4).

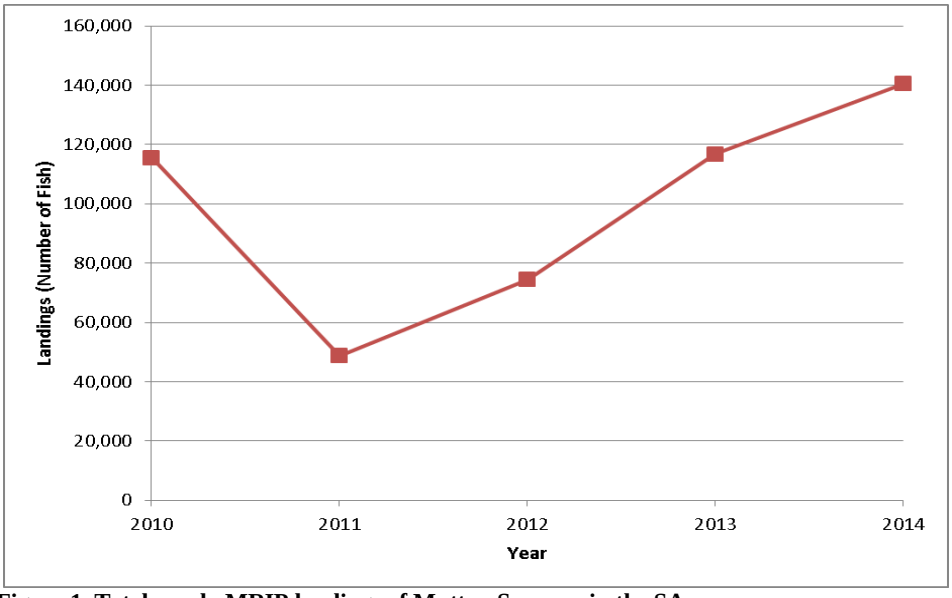

Figure 1. Total yearly MRIP landings of Mutton Snapper in the SA.

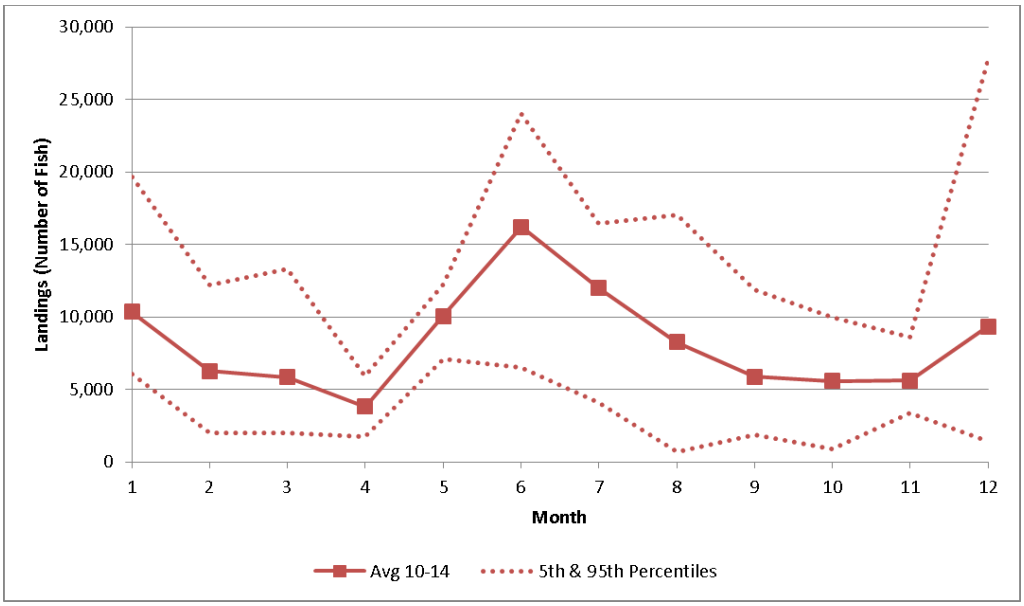

Figure 2. Monthly MRIP landings of Mutton Snapper in the SA averaged from 2010 to 2014, with 5th and 95th percentile lines.

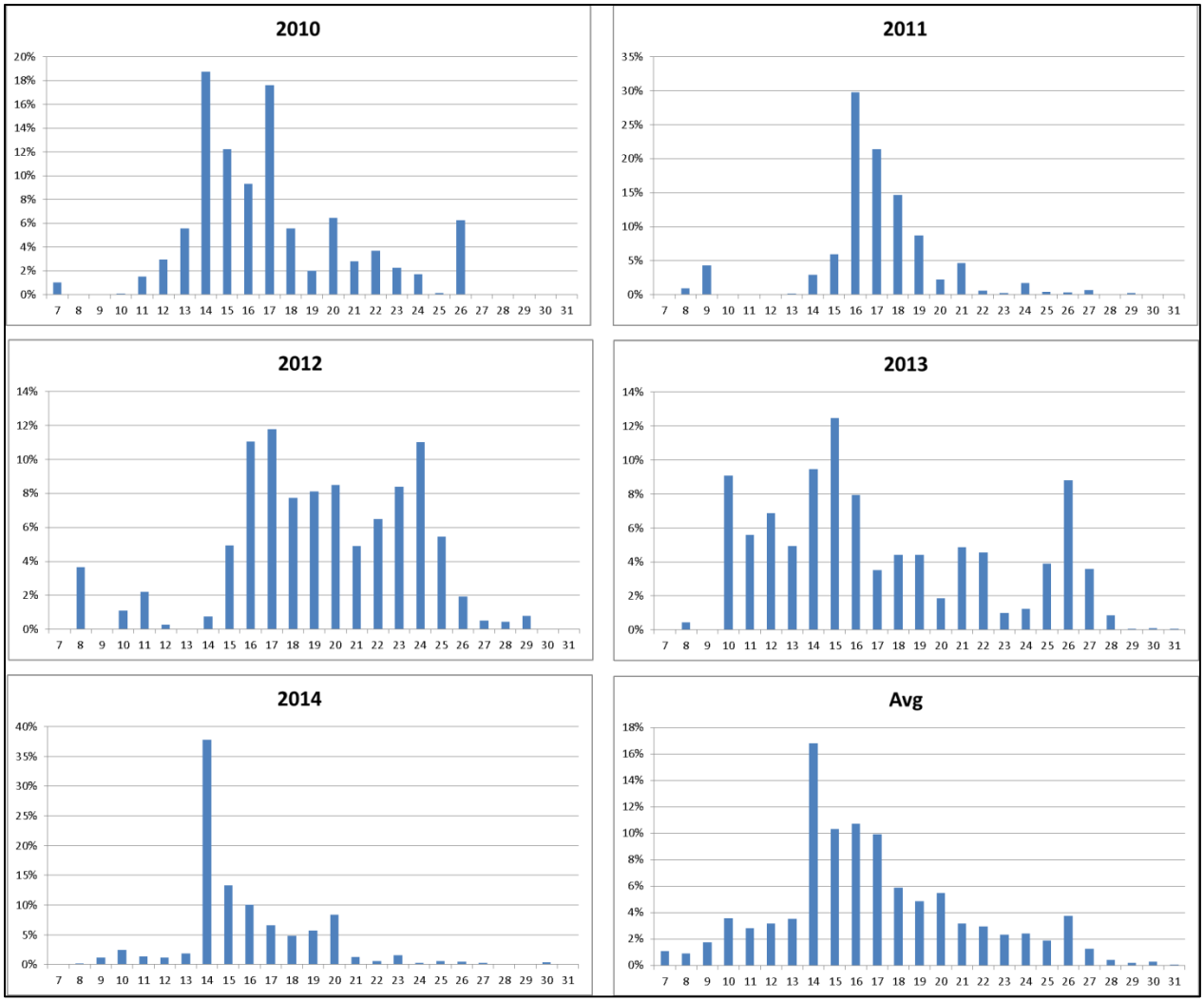

Figure 3. Size composition of the MRIP landings by year.

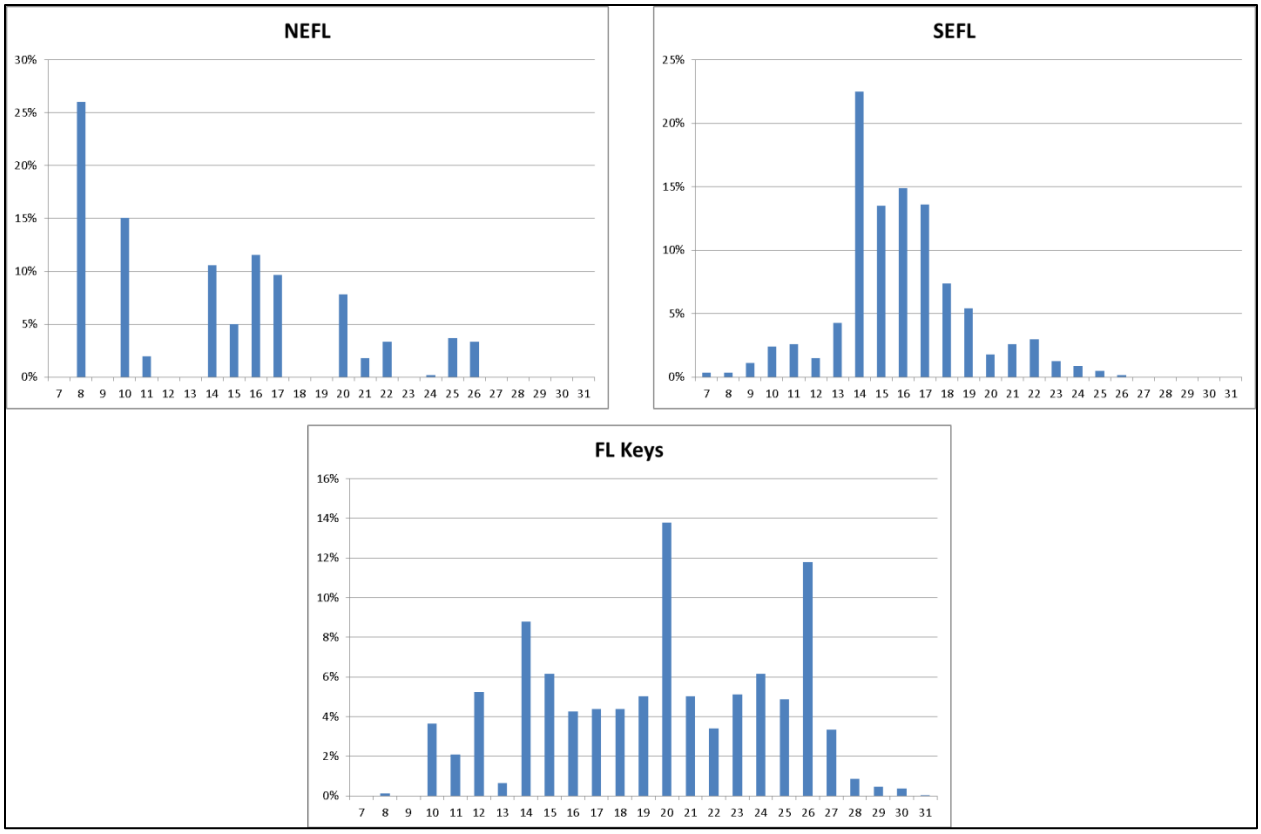

Figure 4. Size composition of the MRIP landings by area (corresponding to the HB areas).

SRHS

The headboat (HB) data was also available at the trip level and were obtained from logbook data. The logbook data were corrected for misreporting using correction factors provided by SRHS staff. These data also included number of fish kept, number of fish discarded, number of anglers on board, and the date of the trip. These data did not include the kind of day, but they did include the type of trip (since headboats can take multiday trips, which allows them to retain a separate bag limit for each day they are out).

Figure 5 shows the HB landings for each of the years included in the analysis, which range from ~9,000 fish to ~17,000 fish. Figure 6 shows the average landings across the years for each month, which were used to predict potential reductions due to changes in management measures and the timing of the Spawning Season.

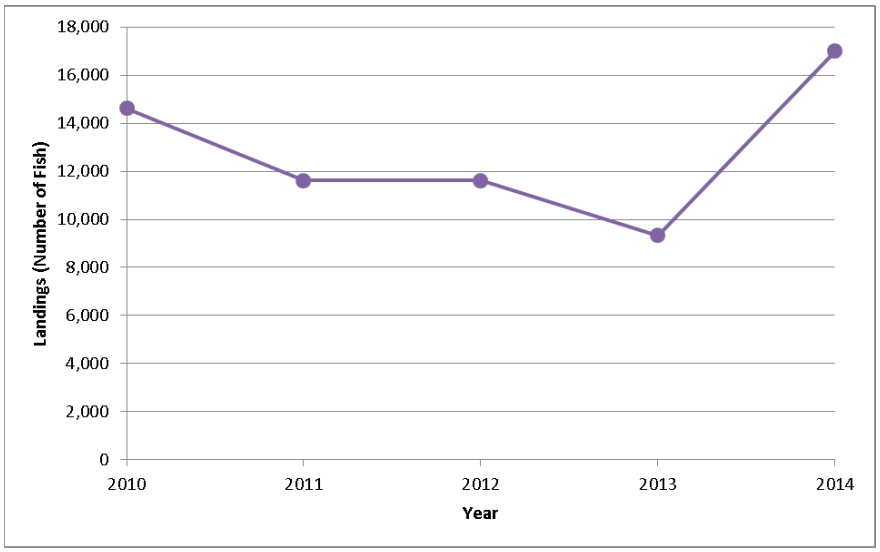

Figure 5. Total yearly HB landings of Mutton Snapper in the SA.

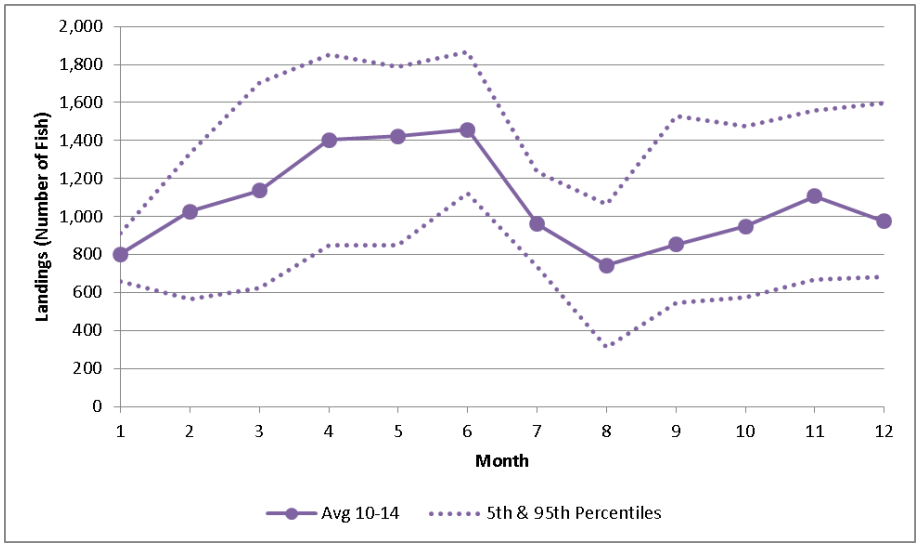

Figure 6. Monthly HB landings of Mutton Snapper in the SA averaged from 2010 to 2014, with 5th and 95th percentile lines.

SIZE LIMIT

Table 1 shows the size limit alternatives being considered for Mutton Snapper. In order to perform this analysis, the landings for each trip were first adjusted based on the proposed size limit of interest. For the status quo of 16 inches, no adjustment was made. All the other proposed size limit alternatives resulted in either a decrease in the trip landings or no adjustment for an individual trip.

The methods for adjusting the MRIP data versus the HB data were different, due to the nature of the data available. The HB data have a "typical" length frequency distribution based on the sampling design, which was calculated for each of 4 areas (NEFL, SEFL, FL Keys, Dry

Tortugas) and by year (Figure 8Figure 9Figure 10). These areas were used because the size composition of the landings differed between these areas (Figure 9). In contrast, MRIP generates length frequencies for each intercepted trip, which can then be expanded to the entire landings. Therefore, the number of fish below a given minimum size limit can be directly determined for each intercepted MRIP trip, rather than applying a general length frequency distribution as is typically done.

Table 1. Mutton Snapper minimum size limit alternatives being considered in Snapper Grouper Amendment 41. TL refers to total length, Alt.1 (No Action) is what is currently in place.

Alternative	Size Limit
Alt. 1 (No Action)	16 inches TL
Alt. 2	17 inches TL
Alt. 3	18 inches TL
Alt. 4	19 inches TL
Alt. 5	20 inches TL

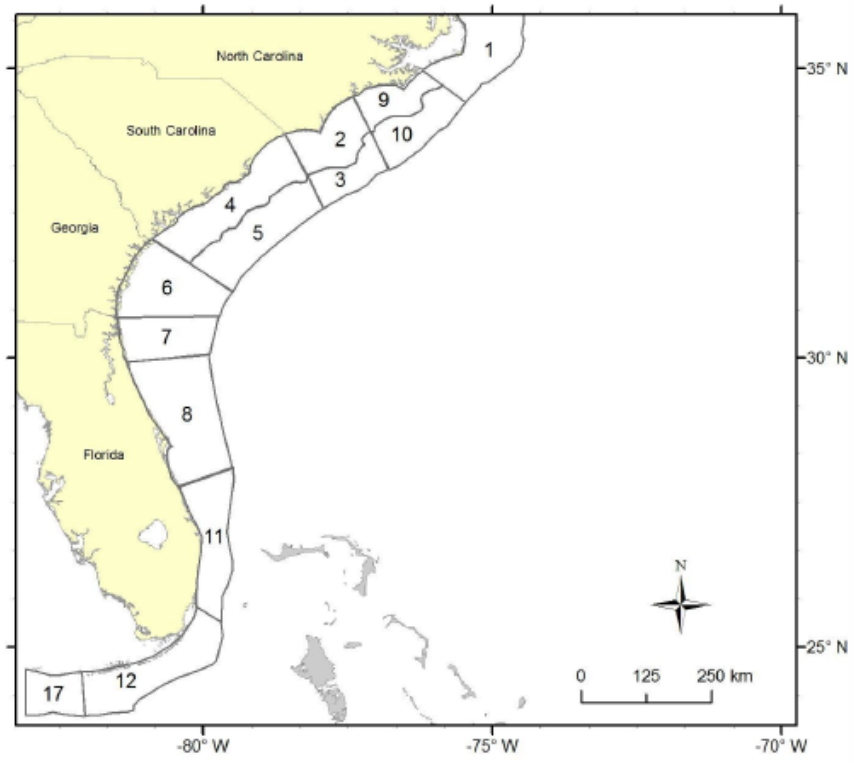

Figure 7. South Atlantic Headboat fishing areas.

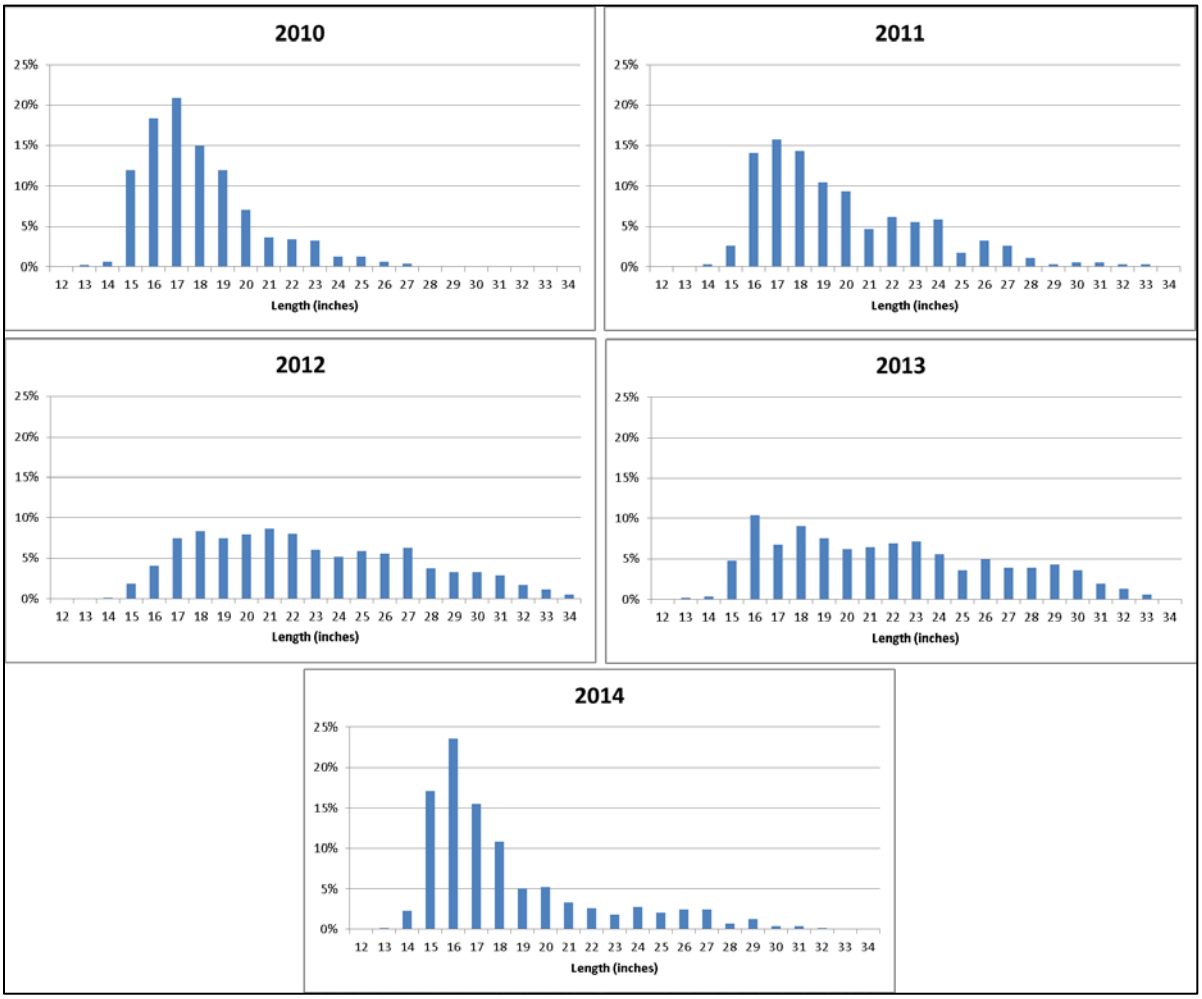

Figure 8. Size composition of the Headboat landings by year.

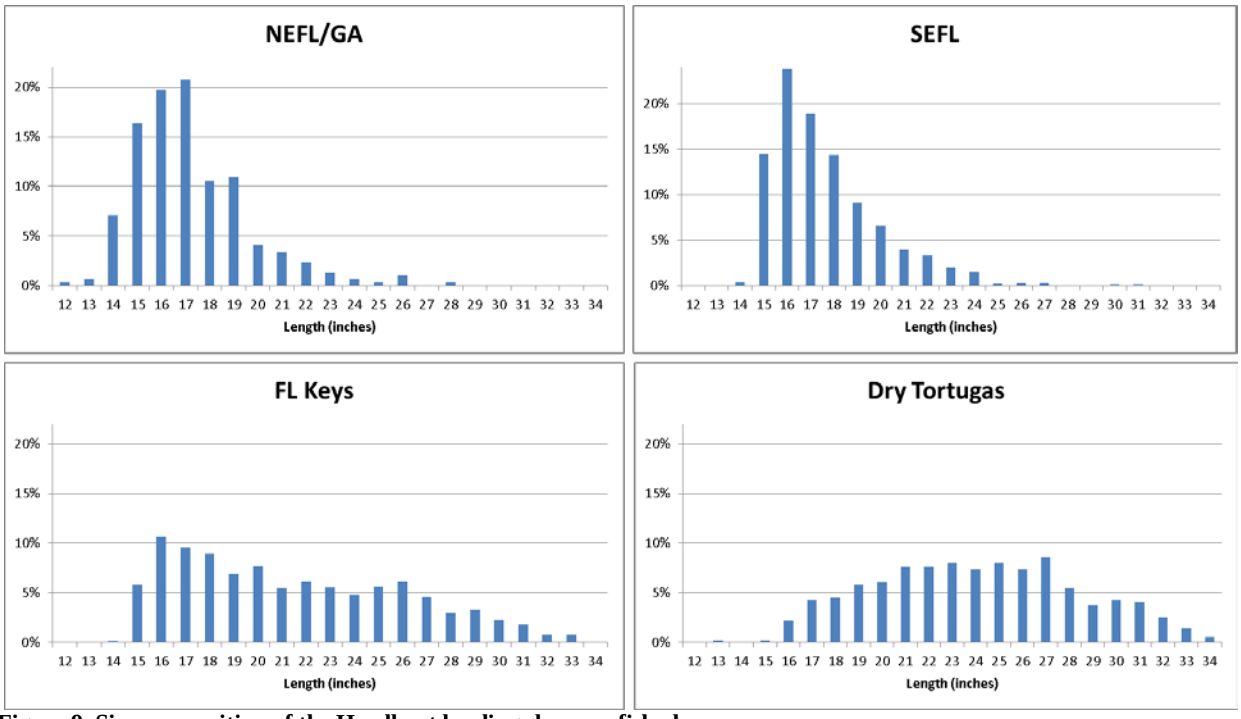

Figure 9. Size composition of the Headboat landings by area fished.

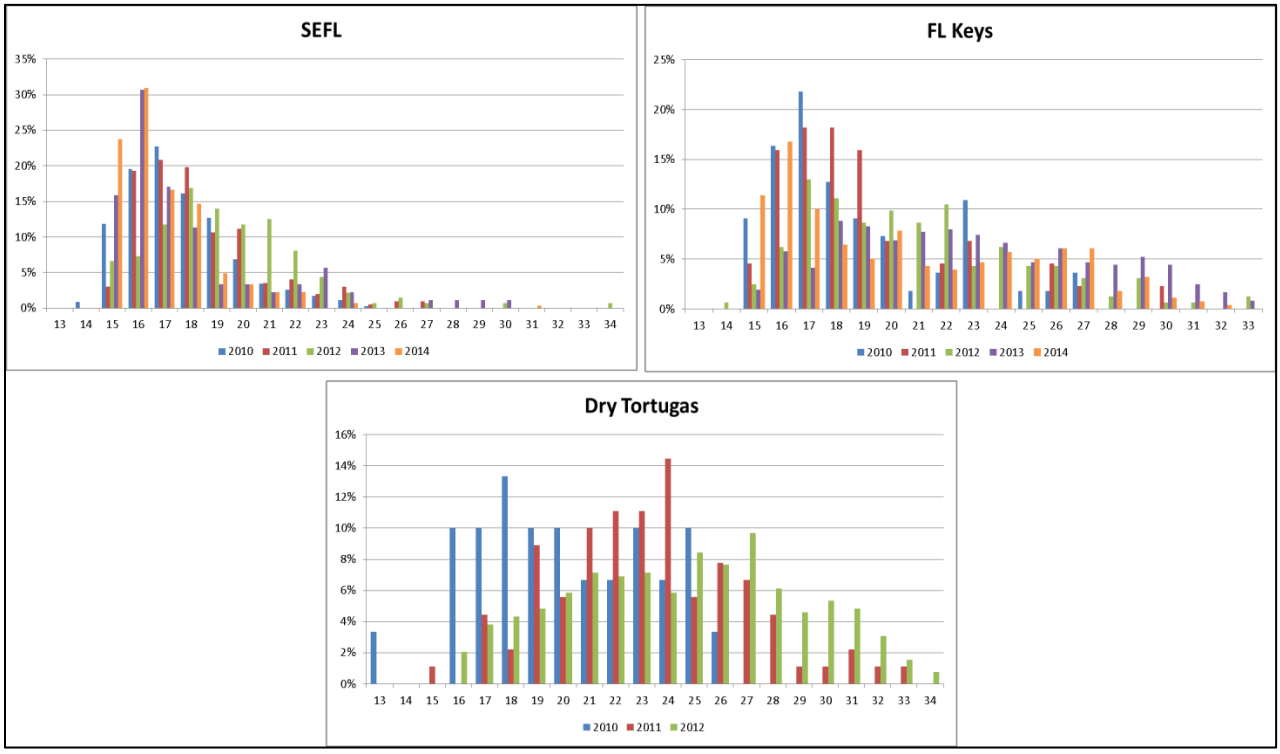

Figure 10. Headboat size composition by year within fishing areas.

SIZE LIMIT RESULTS

Below are the estimated recreational landings of Mutton Snapper under each of the proposed size limit alternatives in Amendment 41 (Table 2). The analysis of the size limit alternatives shows that any increase in the size limit will cause at least a 65% reduction in estimated landings in 2017, even if no other management measures are taken. This estimate assumes that fisher behavior will not change after these new management measures take effect. For example, number of trips will not increase and trip length will not increase.

Table 2. Estimated recreational Mutton Snapper landings and percent reduction from status quo landings for alternative size limits proposed in Amendment 41. All size limits are in inches total length.

Alternative	Size Limit (inches)	Est. Landings (numbers of fish)	% Reduction
Status Quo	16	111,966	-
Alt. 2	17	56,284	49.7%
Alt. 3 (Preferred)	**18**	**50,597**	**54.8%**
Alt. 4	19	46,907	58.1%
Alt. 5	20	44,173	60.5%

SPAWNING SEASON AND BAG LIMIT

Once all the trip landings have been adjusted for the proposed size limit alternative to be analyzed, the analysis then considers modifications to the bag limit both within the spawning season and during the rest of the year. The timing of the spawning season must be chosen here before the bag limit analysis can proceed, since there are alternatives that specify different bag limits during the spawning season than the rest of the year.

Next, the bag limit alternatives are chosen for the spawning season and the rest of the year. The landings for each trip are then adjusted based on the bag limit alternative chosen and the month the trip occurred in. If the trip happened within the chosen spawning season, the landings from that trip are compared to the bag limit alternative for the spawning season; otherwise the comparison is made to the bag limit alternative for the rest of the year. If the landings on a trip were below the bag limit alternative, then they were not adjusted. If the landings were above the bag limit alternative, then they were set equal to the bag limit.

Finally, the MRIP adjusted landings per trip needed to be expanded for the recreational effort and corrected for site selection probability in order to get the landings estimates. This was done using a two-step process per trip. First, the landings, which had already been adjusted for the chosen size limit alternative, were multiplied by a correction factor, which corrected for site selection probability. Then, the landings were multiplied by the effort expansion factor. The effort expansion factors are provided by MRIP per trip. The correction factor is calculated by dividing the corrected landings (landings that have already been corrected for site selection probability) by the uncorrected landings (actual number of fish landed), which are both provided by MRIP. Once the MRIP landings have been expanded for effort and corrected for site selection probability, all landings were summed across months to produce the estimate of landings for

each combination of alternatives for each year. The average across 2010-2014 was reported, along with the 5th and 95th percentiles.

CLOSURE DATE PROJECTIONS

Daily landings rates needed to be estimated in order to predict when a closure might occur under each combination of management alternatives and each of the ACL alternatives. The MRIP data include kind of day as one of the data elements, referring to whether the day was a weekday or weekend. Weekends included Saturday, Sunday, and holidays. Kind of day was used to calculate the proportion of the landings within each month, averaged across 2010-2014, attributable to weekdays versus weekends. Month was used for two reasons. The first was because of spawning season alternatives crossing Waves. The second is due to the difference in the proportion of the landings attributable to weekdays versus weekends in different months. For example, in March 56% of the landings happened on weekdays whereas in April only 25% of the landings happened on weekdays and both of those months occur in Wave 2. The HB data did not include kind of day information; therefore it was calculated based on the date of the trip. The daily landings rate is calculated separately for HB and MRIP data, and then combined to get the total landings rate for the kind of day in a given month.

The distribution of weekdays, weekends, and holidays from 2017 was used to project the closure dates. For each month in 2017, the number of weekdays and weekend days was calculated. To get the daily landings for each day within a month, the estimated monthly landings for the chosen combination of management alternatives was multiplied by the proportion of the landings for that month attributable to either weekends or weekdays (depending on which day is being looked at) and then divided by the total number of that kind of day within that month. The cumulative daily landings were compared to each ACL alternative and if it exceeded any of the ACL alternatives, the season was closed for that ACL scenario.

ASSUMPTIONS & UNCERTAINTIES

The analyses conducted here utilized recreational data from two disparate sources and attempted to use these data to predict what might happen to landings in a future year under management conditions which are not currently in place. Therefore, several key assumptions had to be made to allow this analysis to proceed.

1. Fishermen behavior will remain the same as it was during 2010-2014 (the years in the analysis).
    - This is not always the case. Anglers could very well increase their effort to catch more 17 inch fish, but predicting this behavior is very difficult to do in a scientifically rigorous manner. Therefore, this analysis assumes that fisher behavior will remain constant in 2017. One piece of evidence that does suggest this pattern may hold is that the current landings per angler at 16 inches and 10 fish per person bag limit is approximately 0.44 fish per person on trips that caught Mutton Snapper, on average.
    - A scenario was run looking at the case where the size limit was only 75% effective, due to changes in fisherman behavior, increases in effort, etc., to investigate the effect of this assumption on the analysis. At 75% effectiveness,

there were still no management measure combinations, under any of the three ACL alternatives, which resulted in an early closure.

2. Selectivity is knife-edge for all sizes limits above the current 16 inches.
    - Meaning all fish below the proposed minimum size limits were removed from the landings. However, there is typically some degree of miscalculation or error on the part of the angler and some undersized fish do make it into the landings. Also, B1 fish in the MRIP program (which could be dead discards) are counted as landings. This adds some uncertainty into the analysis, making the analysis a bit conservative.
3. For headboats, it was assumed that all anglers on a trip were fishing on a communal bag limit rather than individual bag limits, as was done for charter boats.
    - This assumption was considered to be realistic by industry representatives.

Besides the assumptions that had to be made, there were also many sources of uncertainty associated with the data. The MRIP data is survey data, so only a small portion of the total trips is sampled. MRIP samples ~0.22% of the total Mutton Snapper trips and makes up 88.5% of the landings. The Headboat landings data is a census; however the length information is a survey where only 5.6% of the trips are sampled.

Another large source of uncertainty is simply what is known as the year effect. This could refer to the economic climate being more or less conducive to fishing, weather conditions being more or less favorable, temperature patterns being more or less favorable to fish occurrence or migration patterns, or just a different set of trips being intercepted by MRIP. Multiple years were used in the analysis in an attempt to mitigate the year effect. Therefore, the results depict the average conditions (for 2010 to 2014) with confidence intervals around those averages.
In 2013, MRIP implemented a significant change to the Access Point Angler Intercept Survey (APAIS). It is unclear what affect this change has had on estimated landings as compared to years prior to the implementation of the new survey design. In order to investigate a possible bias in landings trends by year and month, the landings were pulled for 2010-2012 (before implementation of the new APAIS survey design) and compared to landings from 2013-2014 (after implementation of the new APAIS survey design). By year, the average across years falls within the 95% confidence intervals (CI) for most years, except 2011 (Figure 11). However, there is no trend separating the 2010-2012 years from the 2013-2014 years. When looked at by month, each of the time block average landings values by month falls within the 95% CI of the other time block except for December (Figure 12). In December, 2013-2014 has much higher landings than those from 2010-2012, on average.

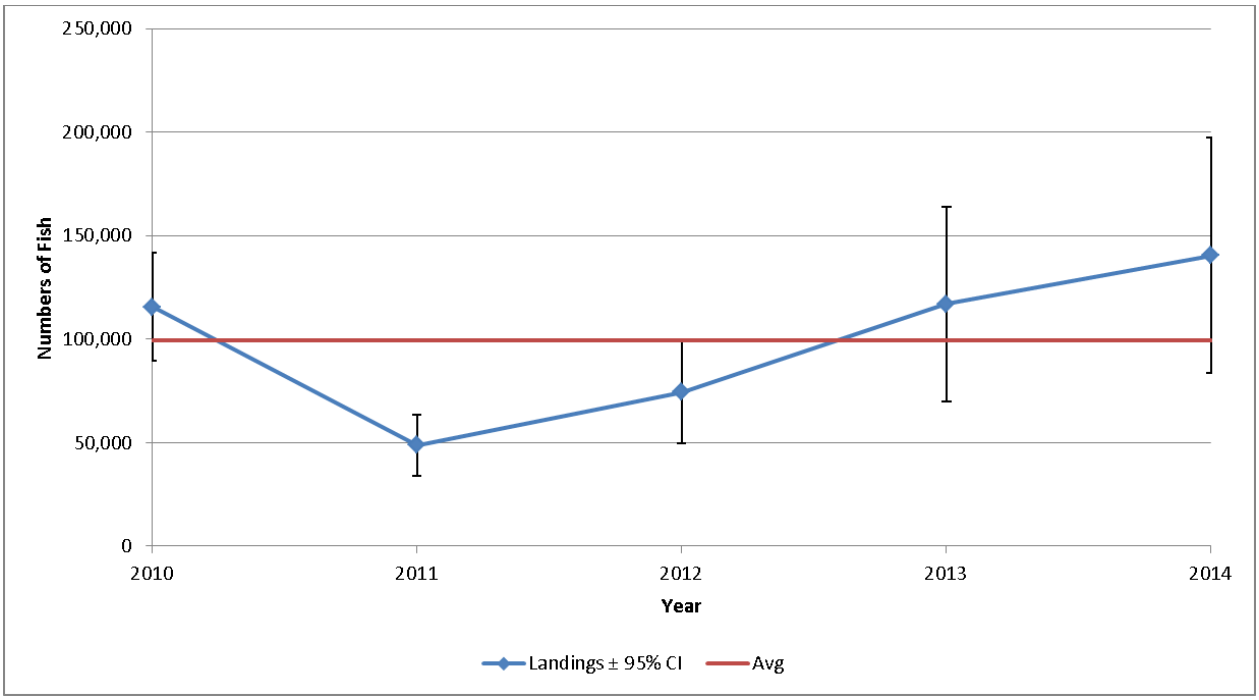

Figure 11. MRIP landings of Mutton Snapper by year with 95% CI and average across 2010-2014.

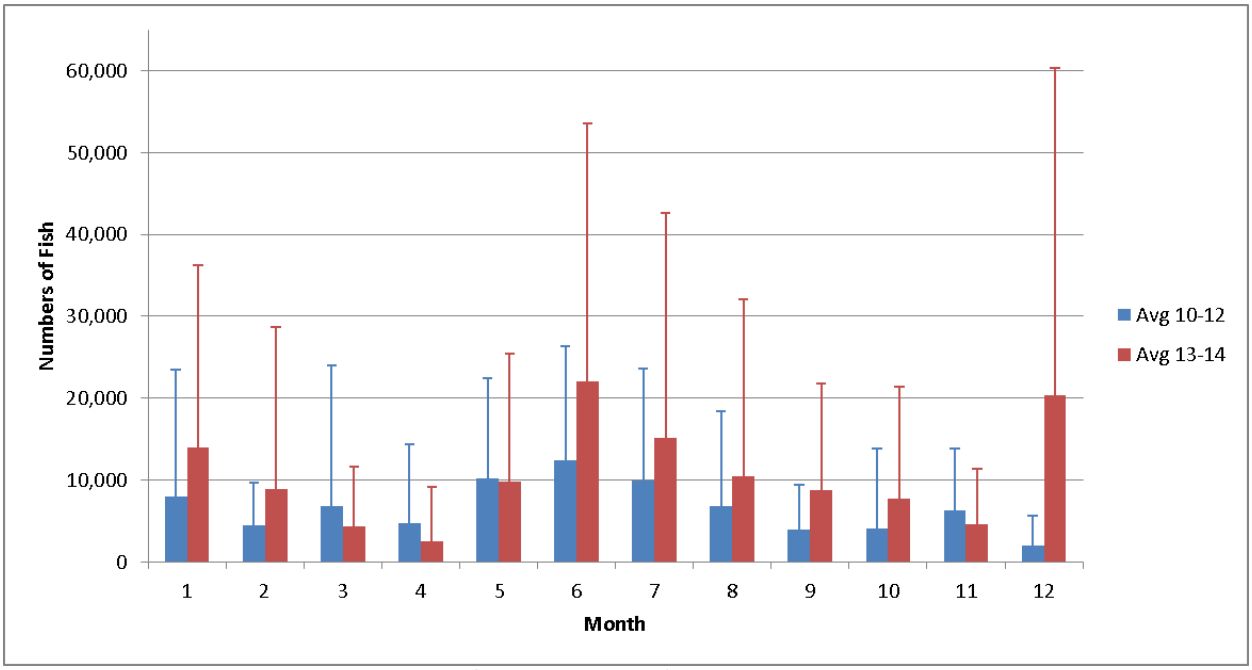

Figure 12. Average monthly MRIP landings of Mutton Snapper for 2010-2012 and 2013-2014 with 95% CI.

RESULTS

According to the analysis, the size limit has the largest impact on the estimated recreational landings of Mutton Snapper in the SA. At the status quo of 16 inches, under the most restrictive year round bag limit of 2 fish per person per day, the average reduction in landings is only estimated to be 3.6%. Even under the most restrictive set of management alternatives (spawning

season from April to July, no retention during the spawning season, and 4 fish per person during the rest of the year) at 16 inches the reduction is at 42.3%. In contrast, by going to a 17 inch size limit and keeping the bag limit at 10 fish per person within the Snapper Aggregate year round, the reduction in landings is 49.7%.

Closures are only predicted to occur for ACL alternatives 2b and 2c (95%ABC and 90%ABC, respectively). The earliest predicted closure dates (for the status quo scenario) are Dec 27 for 2b and Dec 9 for 2c. There are no closures predicted for any of the size limit alternatives above the status quo of 16 inches. However, it should be noted that this analysis was only looking at the 2017 fishing year and not beyond that. Changes in the minimum size can have population effects that change the availability of certain size classes over time. For instance, if the size limit was set at 17 inches (holding all other regulations the same as they are currently), the 2017 landings will drop to around 50% of what they would have been at 16 inches, on average. However, over time, more fish will grow into the 17 inch size class and become available to the fishery, causing landings to increase from year to year (all other regulations and conditions being equal). It's possible the landings could eventually get back to the level where they are now, in numbers, just with a larger average weight. Therefore, the relative impacts of the bag limit alternatives may be of interest for future years.

Table 3 shows a comparison of the management alternatives between size limits. Once a size limit is chosen above the 16 inch status quo, the estimated landings drop significantly, as well as the overall variability in the landings due to different bag limit and spawning season alternatives. At 16 inches, the only management measure that has a significant impact on estimated landings (>15%) is when there is no retention for Mutton Snapper during the spawning season. Every other combination of management measures at 16 inches has a less than 4% reduction in landings.

Table 3. Results from the Amendment 41 analysis of recreational Mutton Snapper data, summarized by size limit alternatives. Avg. Est. Landings are the estimated landings averaged across all scenarios at a given size limit. 5th and 95th Percentile are the 5th and 95th percentiles of estimated landings averaged across all scenarios at a given size limit. Std. Dev. is the standard deviation in the estimated landings across all scenarios at a given size limit.

Size Limit	Avg. Est. Landings	5th Percentile	95th Percentile	Std. Dev.
16	103,553	69,787	111,283	14,777
17	51,593	34,502	55,849	7,929
18	**49,782**	**47,905**	**50,571**	**931**
19	46,242	44,698	46,898	759
20	40,567	27,038	43,779	6,204

Commercial Data Analysis of Management Alternatives

Dr. Michael Larkin, SERO Staff

NOTE: Analyses of the effects of the proposed minimum size limit increase on the commercial sector are pending.

Action 8 of Amendment 41 is proposing modifications to the mutton snapper commercial possession limit during the spawning months and implementation of a trip limit during the remainder of the year (non-spawning months). The spawning and non-spawning months for mutton snapper are considered in Action 6. The rationale behind these modifications is concern regarding mutton snapper harvest during the spawning season. Currently, commercial harvest is restricted during May and June to 10 fish per person per day or 10 fish per person per trip, whichever is more restrictive.

Commercial logbook data (accessed September 3, 2015) from the Southeast Fisheries Science Center (SEFSC) was explored to determine the harvest of mutton snapper per trip. The most recent years of complete data (2012-2014) had 4,551 trips that harvested mutton snapper in the South Atlantic. South Atlantic commercial trips that harvested mutton snapper were explored during May and June and outside those months (Figure 1).

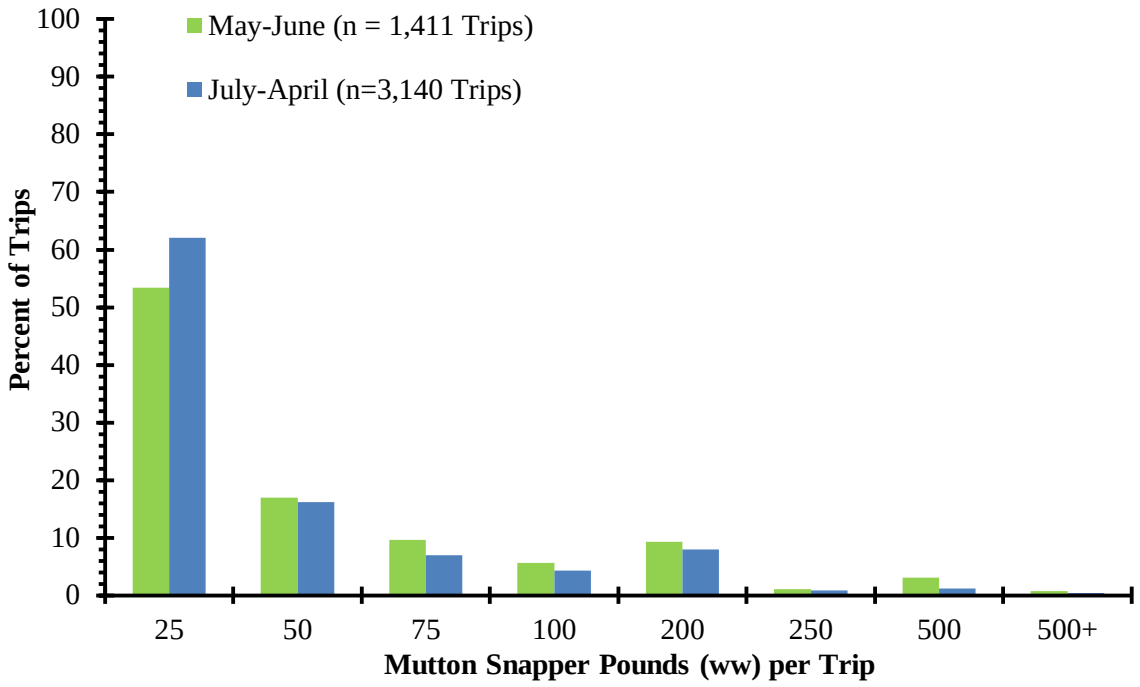

Figure 1. Distribution of the mutton snapper harvested per trip (lbs ww) in the South Atlantic region from the commercial logbook dataset from 2012 to 2014. Restrictions on commercial harvest are currently in place during May and June only.

Trip Limit Analysis

Preferred Alternative 2 of Action 8 considers implementing a trip limit during the 'regular season'. The months that constitute the 'regular season' are proposed in Action 6 (the preferred alternative would establish April-June as the "spawning months" and March-July as the "regular season"). **Preferred Alternative 2** proposes trip limits of 300, 400, and 500 pounds whole weight (lbs ww) during the "regular season". The SEFSC logbook data were analyzed by imposing the proposed trip limits under **Preferred Alternative 2** only during the 'regular season'. For example, a trip in the 'regular season' that harvested 500 lb ww of mutton snapper was reduced to just 500 lbs to examine the proposed 500 lbs ww trip limit under **Preferred Sub-alternative 2c**, while landings during the proposed "spawning months" under Action 5 were not reduced. The reduced landings from the imposed trip limit were compared to the total annual unmodified landings to estimate the percent reduction in landings (**Table 1**).

Table 1. Percent decreases in total landings for various commercial trip limits proposed under **Preferred Alternative 2**. Data from the commercial logbook, 2012 to 2014.

Regular Season	Trip Limit		
	300 lbs ww	400 lbs ww	500 lbs ww
July - April	-6.0%	-4.6%	**-3.7%**
July - March	**-5.9%**	**-4.5%**	**-3.7%**
August - March	-4.1%	-3.0%	**-2.3%**
August - April	-4.2%	-3.0%	**-2.3%**

The commercial logbook data provides landings in pounds; however, the current commercial harvest restriction during May and June is specified in numbers of fish. **Preferred Alternative 3** proposes commercial possession limits in numbers of fish. To conduct the analysis, landings in pounds were converted to numbers of fish by dividing the harvest by the average weight of mutton snapper harvested commercially. Average weight was determined to be 7.68 lbs ww in the commercial sector in the most recent stock assessment (SEDAR 15A update 2015). **Preferred Alternative 3** proposes commercial trip limits in numbers of fish in two ways: per person per day, and per vessel per day. **Figure 2** provides the percentage of trips distribution of the total numbers of mutton snapper harvested both per person per day (**Figure 2A**) and per vessel per day (**Figure 2B**) during May-June from 2012 through 2014.

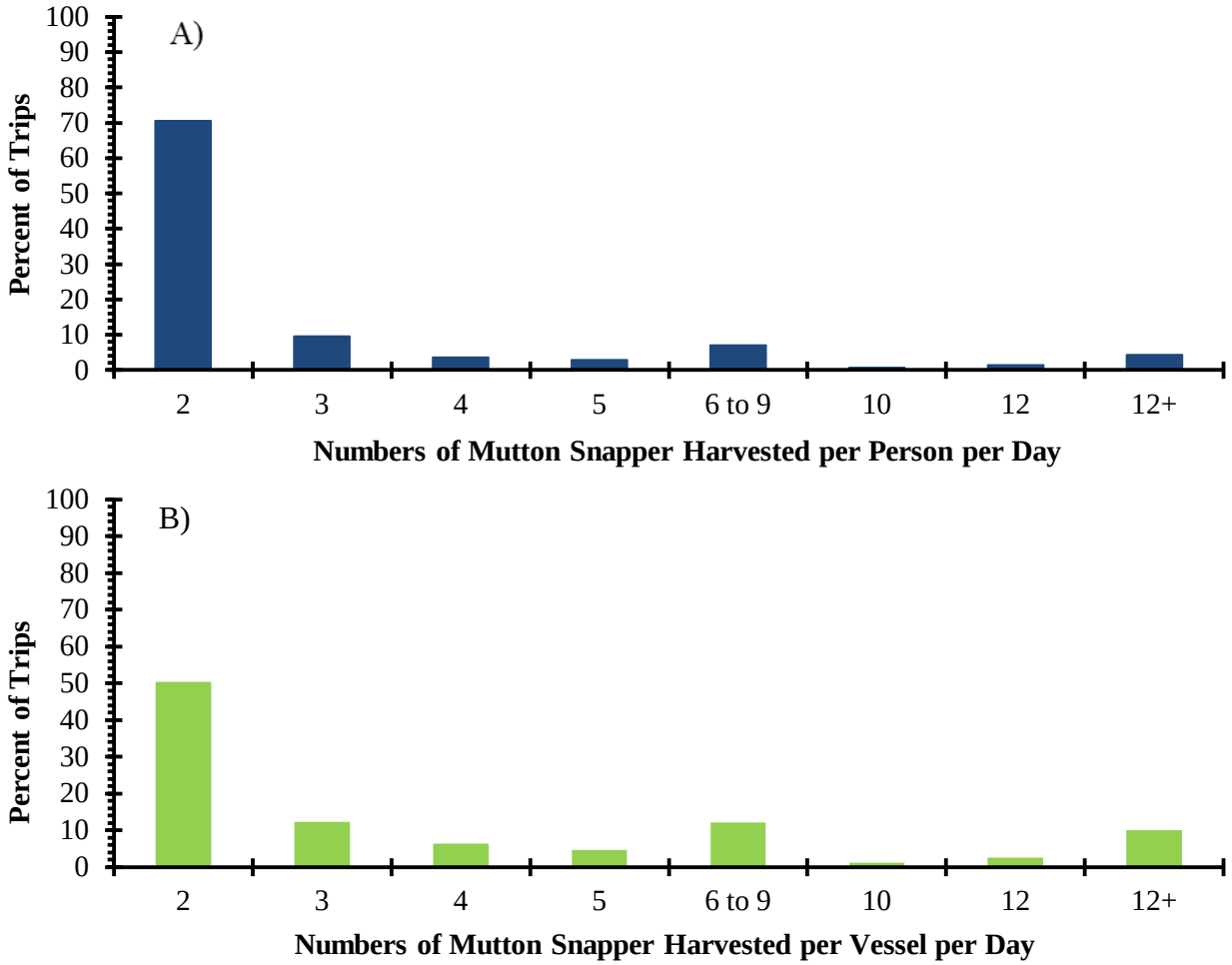

Figure 2. Distribution of the total number of mutton snapper harvested per person per day (A) and numbers of mutton snapper harvested per vessel per day (B) in the South Atlantic region during May and June. Data from the commercial logbook, 2012 to 2014 (n = 1,411 trips).

As mentioned previously, **Alternative 1 (No Action)** specifies a commercial trip limit of 10 fish per person per day or 10 fish per person per trip, whichever is more restrictive. There is the potential, however, for vessels to intentionally carry additional people on commercial trips during May and June to maximize harvest of mutton snapper. **Figure 2A** which shows the distribution of total number of mutton snapper harvested per person per day and indicates that 5.8% of the trips that took place during May and June from 2012 through 2014 exceed the current 10 fish per person per day limit.

Sub-alternatives under **Preferred Alternative 3** propose per person possession limits, per vessel limits, and no retention during the spawning months (defined under Action 6 as April-June). The per-person trip limits were analyzed by dividing the total catch by the total number of people, including the captain, on a commercial trip. The per-vessel trip limit analysis focused on trip level data per day. This was analyzed by dividing the catch per trip by the number of days reported in the commercial logbook. An examination of the commercial logbook data from 2012 through 2014 revealed that 70% (n = 989 trips) of the mutton snapper commercial fishing trips during May and June are one-day trips.

Each of the proposed trip limits under **Preferred Alternative 3** were analyzed for each proposed "spawning months" sub-alternative under Action 6. Percent reductions in commercial landings were calculated for the proposed trip limits of 0, 2, 3 and 5 mutton snapper per person per day by reducing trips that exceeded the proposed trip limit to match the trip limit being considered. For example, to analyze the reduced trip limit of 3 fish/person/day a trip that reported harvest of 9 mutton snapper/person/ day was reduced to 3 mutton snapper/person/day. Landings outside the proposed "spawning months" were not modified. The reduced total annual landings were then compared against the total annual landings to determine the percent reduction in landings from the reduced trip limit.

Implementing a trip limit of 10 to 12 mutton snapper per vessel inside the spawning season would decrease landings because the current 10 fish trip limit is per person. Therefore, under the current trip limit **(Alternative 1)** a one-day trip with two people can harvest 20 mutton snapper; however, under the **Sub-alternatives 3c** and **3d** a one day trip can only harvest 10 or 12 mutton snapper, respectively, regardless of the number of people are on the boat. Percent reductions in commercial landings were calculated for the proposed vessel limits of 10 and 12 mutton snapper per vessel per day by reducing trips that exceeded the proposed trip limit to match the trip limit being considered. For example, to analyze the trip limit of 10 mutton snapper/vessel/day a trip that reported harvest of 15 mutton snapper/vessel/ day was reduced to 10 mutton snapper/person/day. This vessel limit analysis only modified trips inside the spawning season. Trips outside the spawning season were not modified. Then the decreased total annual landings were compared against the total annual landings to determine the percent decrease in total landings from the vessel trip limit. **Table 2** provided the percent decrease in landings for the various commercial trip limits proposed in **Preferred Alternative 3**.

Table 2. Percent decrease in landings for various commercial trip limits proposed in Alternative 3 of Action 7 in Amendment 41. The estimates came from mutton snapper commercial logbook data from 2012 to 2014, and the reductions were calculated for changes to the trip limit inside the spawning season.

Spawning Season	Possession Limit					
	No Retention	2 fish/ person/day	3 fish/ person/day	5 fish/ person/day	10 fish/ vessel/day	12 fish/ vessel/day
May-June	-35.8%	-20.0%	-16.3%	**-8.6%**	-4.1%	-2.8%
April-June	**-41.7%**	**-23.5%**	**-19.3%**	**-13.6%**	**-5.0%**	**-3.5%**
April-July	-52.6%	-29.6%	-24.2%	**-17.1%**	-6.9%	-5.1%
May-July	-46.6%	-29.6%	-21.3%	**-14.9%**	-6.0%	-4.5%

This analysis attempted to predict realistic changes to the landings from the various trip limit options presented in the amendment. Uncertainty exists in these projections, as economic conditions, weather events, changes in catch-per-unit effort, fisher response to management regulations, and a variety of other factors may cause departures from this assumption. The bounds of this uncertainty are not captured by the model as currently configured; as such, it should be used with caution as a 'best guess' for future dynamics. In addition to the aforementioned sources of uncertainty, the modeled reductions associated with management measures assume that past performance in the fishery is a good predictor of future dynamics. An attempt was made to constrain the range of data considered to recent years to reduce the unreliability of this assumption.

References

SEDAR 15A. 2015. Stock Assessment of Mutton Snapper (*Lutjanus analis*) of the U.S. South Atlantic and Gulf of Mexico through 2013. Southeast Data, Assessment and Review. North Charleston, South Carolina. http://www.sefsc.noaa.gov/sedar/.