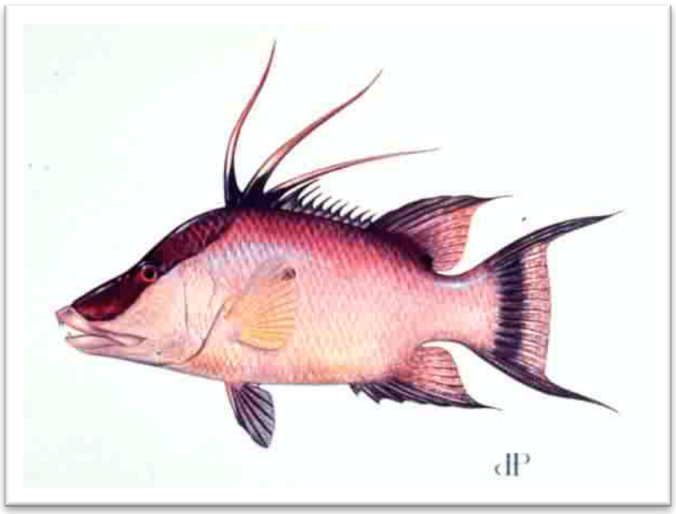


Amendment 37
to the Fishery Management Plan
for the Snapper Grouper Fishery
of the South Atlantic Region

DECISION DOCUMENT

September 2015
(revised 9/8/15)

Revisions:

- Clarified language for preferred sub-alternative under Action 1
- Correction in description of location of Shark Point in Action 1
- Added discussion of methodology to specify ACLs in numbers vs. pounds under Action 4
- Added discussion addressing the need for additional projections and how this affects timing of amendment development under Action 5
- Hogfish size distribution figures correctly placed under Action 8 (under Action 9 in previous version)

Introduction

The Florida Fish and Wildlife Conservation Commission completed a stock assessment for hogfish in 2014. The South Atlantic Fishery Management Council's (South Atlantic Council) Scientific and Statistical Committee (SSC) reviewed the assessment and provided fishing level recommendations in October 2014, and the South Atlantic Council received the SSC's recommendations at their December 2014 meeting. Based on genetic evidence, the SSC supported treating hogfish in the South Atlantic as two stocks: Georgia-North Carolina (GA-NC) and East Florida-Florida Keys (FLK/EFL). Fishing level recommendations were provided for each stock. The SSC recommended that catch level recommendations for the GA-NC stock be developed using the Only Reliable Catch Stocks (ORCS) approach, as outlined in Level 4 of the South Atlantic Council's acceptable biological catch (ABC) control rule. **The ABC for the GA-NC stock, as recommended by the SSC, is 28,161 pounds whole weight.** Amendment 37 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Amendment 37) specifies status determination criteria, annual catch limits, and management measures for the GA-NC stock.

For the FLK/EFL stock, the SSC considered the benchmark assessment to represent the best available science and recommended it for use in management. The Southeast Fisheries Science Center concurred with this determination. **The assessment results indicate the FLK/EFL stock is undergoing overfishing and is overfished.** The SSC applied the ABC Control Rule and recommended a P* of 27.5%, and a $P_{REBUILD}$ of 72.5% for that stock. Amendment 37 specifies status determination criteria and ACLs for the FLK/EFL stock, a plan to end overfishing and rebuild hogfish in south Florida, and management measures to attain the desired level of harvest.

Genetic data suggest there is a third stock for hogfish in the eastern Gulf of Mexico. There is a need to specify the boundary between the FLK/EFL stock, managed by the South Atlantic Council, and the Gulf of Mexico stock, managed by the Gulf of Mexico Fishery Management Council. This demarcation needs to not only clearly delineate the stock boundary but should also enhance enforcement of regulations for hogfish in each Council's jurisdiction as well as allow for proper tracking of hogfish annual catch limits (ACLs) for each stock. Amendment 37 provides options for specifying the boundary line between the FLK/EFL and Gulf of Mexico hogfish stocks.

Purpose and Need

Purpose for Actions

The *purpose* of this amendment is to modify the management unit for hogfish, specify fishing levels based on the South Atlantic Fishery Management Council's Scientific and Statistical Committee recommendations for the Georgia-North Carolina and Florida Keys/East Florida stocks of hogfish, and modify or establish management measures. For the Florida Keys/East Florida stock of hogfish, this amendment would establish a rebuilding plan to increase hogfish biomass to sustainable levels within a specified time period based on results of the recent stock assessment conducted with data through 2012.

Need for Actions

The *need* for this amendment is to align the management boundaries for hogfish with the best available science (i.e., genetic information), and end overfishing and rebuild the ~~FLK/EFL~~ Florida Keys/East Florida stock of hogfish while minimizing, to the extent practicable, adverse social and economic effects.

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED EDITS TO THE PURPOSE AND NEED STATEMENTS

OPTION 2. DO NOT ACCEPT THE IPT'S SUGEGSTED EDITS TO THE PURPOSE AND NEED STATEMENT (COMMITTEE TO MODIFY AS NEEDED AND APPROVE).

OTHERS?

Actions and Alternatives

Action 1. Modify the Fishery Management Unit for hogfish

Alternative 1 (No action). Do not establish separate stocks of hogfish in the South Atlantic. There is a Gulf of Mexico stock and South Atlantic stock of hogfish separated at the jurisdictional boundary between the South Atlantic Fishery Management Council and the Gulf of Mexico Fishery Management Council:
The boundary coincides with the line of demarcation between the Atlantic Ocean and the Gulf of Mexico, which begins at the intersection of the outer boundary of the EEZ, as specified in the Magnuson-Stevens Act, and 83°00′ W. long., proceeds northward along that meridian to 24°35′ N. lat., (near the Dry Tortugas Islands), thence eastward along that parallel, through Rebecca Shoal and the Quicksand Shoal, to the Marquesas Keys, and then through the Florida Keys to the mainland at the eastern end of Florida Bay, the line so running that the narrow waters within the Dry Tortugas Islands, the Marquesas Keys and the Florida Keys, and between the Florida Keys and the mainland, are within the Gulf of Mexico.

Preferred Alternative 2. Modify the snapper grouper fishery management unit (FMU) to specify two separate stocks of hogfish: (1) a Georgia through North Carolina (GA-NC) stock from the Georgia/Florida state boundary to the North Carolina/Virginia state boundary, and (2) a Florida Keys/East Florida (FLK/EFL) stock from the Florida/Georgia state boundary south to:

Sub-alternative 2a. The South Atlantic/Gulf of Mexico Council boundary.

Sub-alternative 2b. The Monroe/Collier County line.

Preferred Sub-alternative 2c. Line due west of Shark Point on Florida's southwest coast (25°23' N lat.).

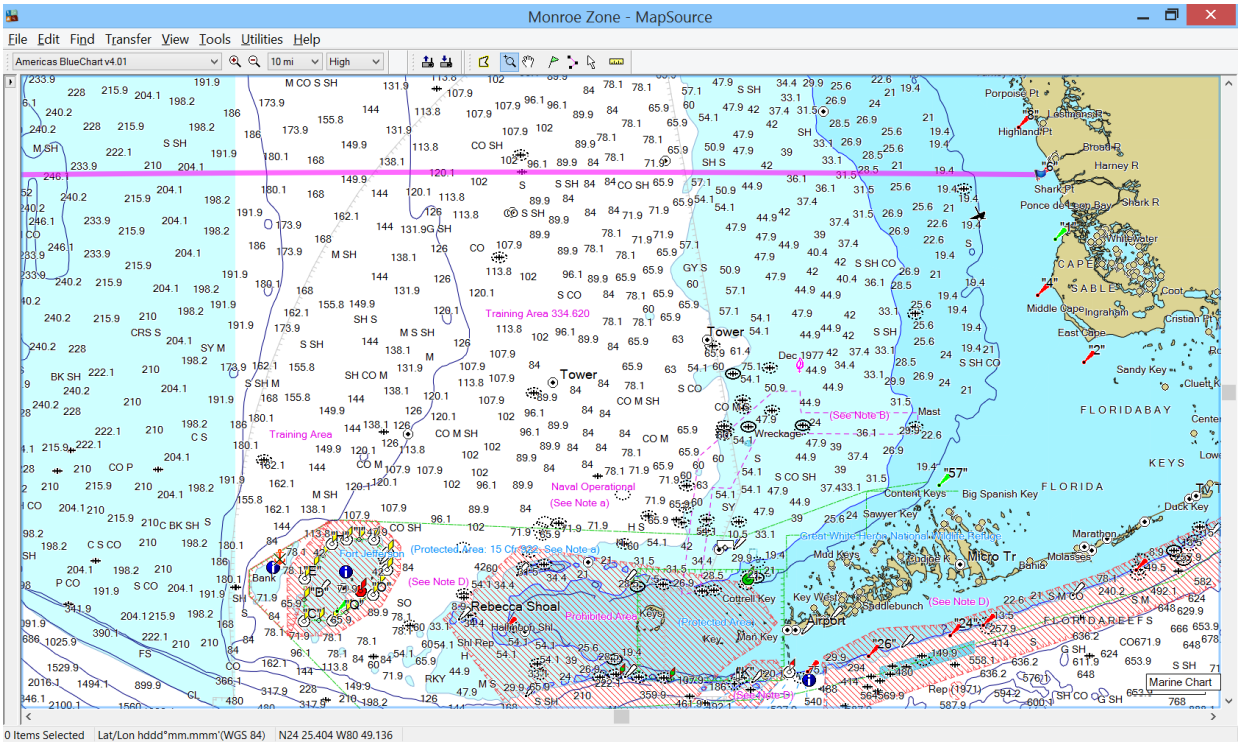


Figure 1. Proposed **Sub-alternative 2c** boundary due west of Shark Point on Florida's west coast (25°23' N lat.).

Discussion

Alternative 1 (No Action) would make no changes to specify separate stocks of hogfish within the snapper grouper fishery management unit (FMU) and would, therefore, fail to recognize the latest scientific information on those stocks. **Alternative 2** would specify the boundaries for the GA-NC stock of hogfish and the sub-alternatives would define the boundary between the FLK/EFL stock of hogfish managed by the South Atlantic Fishery Management Council (South Atlantic Council), and the Gulf of Mexico stock managed by the Gulf of Mexico Fishery Management Council (Gulf Council). **Sub-alternative 2a** would use the jurisdictional boundary between the South Atlantic and Gulf Councils but would not fit the biological demarcation of the two stocks so that a portion of the FLK/EFL stock would remain within the Gulf Council's jurisdiction. **Sub-alternative 2b** uses the Monroe/Collier County line to differentiate the two stocks. This boundary would result in a better fit to the areas in which the two stocks are contained, but there could be negative law enforcement issues associated with different regulations for hogfish in the two areas. The Monroe/Collier County line was used in the SEDAR 37 (2014) assessment to differentiate between the FLK/EFL stock of hogfish and that in the West Florida shelf. **Preferred Sub-alternative 2c** considers Shark Point as a starting point for the boundary line to differentiate the two stocks. Shark Point is an area that occurs south of the Monroe/Collier Line on the Florida southwest coast. According to local law enforcement officials, Shark Point constitutes a good demarcation point for fishing activity on the Florida west coast in that individuals who fish north of that line seldom come close to it and vice versa; hence, from a practical standpoint, it would be an effective way to separate fishing activity on the Florida southwest coast.

Commercial landings for annual catch limit (ACL) monitoring by the Southeast Fisheries Science Center (SEFSC) and the National Marine Fisheries Service (NMFS) Southeast Regional Office are assigned to region based on captain-reported catch area. Headboat landings for ACL monitoring are assigned to an area fished; for vessels in Monroe County, landings are assigned to a region based on port. Marine Recreational Information Program (MRIP) hogfish landings for recreational ACL monitoring are based on reported catch area, with Monroe County landings re-assigned ('post-stratified') from the Gulf of Mexico to the South Atlantic, consistent with decisions made in SEDAR 37 (2014). Minor changes to regional boundaries such as those being considered in **Action 1** may facilitate enforcement of management regulations but would not impact approaches to ACL monitoring. Thus, ACL monitoring for hogfish would remain consistent with past approaches with regard to the assignment of landings to region in Monroe County; these approaches are consistent with those used in SEDAR 37 (2014).

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 1

OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 1 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OTHERS?

Action 2. Specify Maximum Sustainable Yield (MSY) for the GA-NC and the Florida Keys/ East Florida (FLK/EFL) stocks of hogfish

Alternative 1 (No Action). Do not define MSY for the GA-NC or the FLK/EFL stocks of hogfish. ~~Do not modify the current definition of MSY for hogfish.~~ Currently, MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy for hogfish in the South Atlantic.

Alternative 2. MSY equals the yield produced by F_{MSY} or the F_{MSY} proxy ($F_{30\%SPR}$). MSY and F_{MSY} are recommended by the most recent SEDAR/SSC. ~~The MSY value for the GA-NC stock of hogfish is unknown. The MSY value for the Florida Keys/East Florida stock of hogfish equals 346,095 pounds whole weight (lbs ww).~~

Sub-alternative 2a. GA-NC stock of hogfish.

Sub-alternative 2b. FLK/EFL stock of hogfish.

Alternatives	Equation	F_{MSY}	MSY Values (lbs whole weight)
Alternative 1 (No Action)	~~Do not modify the current definition of MSY for hogfish. Currently, MSY equals the yield produced by F_{MSY}. $F_{30\%SPR}$ is used as the F_{MSY} proxy.~~ MSY is not defined for the GA-NC stock or the FLK/EFL stock	unknown	unknown
Alternative 2	MSY equals the yield produced by F_{MSY} or the F_{MSY} proxy. MSY and F_{MSY} are recommended by the most recent SEDAR/SSC.	Sub-alt 2a: GA-NC = unknown Sub-alt 2b: FLK/EFL = 0.138	GA-NC = unknown FLK/EFL = 346,095

Discussion

Maximum Sustainable Yield (MSY) is the largest long-term average catch that can be taken from a stock or stock complex under prevailing ecological and environmental conditions. MSY for snapper grouper species was initially specified in Amendment 11 (SAFMC 1998) to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Snapper Grouper FMP). For hogfish, Amendment 11 defined MSY as the yield produced when fishing at a rate that will produce MSY where $F_{30\%SPR}$ is used as the F_{MSY} proxy. At that time, MSY was unknown for hogfish due to a lack of data. When a stock assessment is conducted; however, the model produces estimates of MSY. In the case of hogfish, a stock assessment

could only be conducted for the FLK/EFL stock; hence, an estimate of MSY is available for the FLK/EFL stock but not the GA-NC stock. The South Atlantic Council needs to take action to adopt the new definition and value for MSY. Selecting a definition for MSY would allow for any subsequent revisions to that value when the stock assessment is updated or a new assessment is performed without the Council having to take action. **Alternative 2** would provide the South Atlantic Council with that option. SEDAR 37 (2014) produced estimates for F_{MSY} and the yield at F_{MSY} for the FLK/EFL stock. Those values are 0.138 and 346,095 lbs ww, respectively, and correspond to **Sub-alternative 2b (Table 1)**.

Table 1. Hogfish recommendations for the Florida Keys/East Florida stock of hogfish. Note: values are in metric tons.

Criteria	Deterministic	Probabilistic
Overfished evaluation	Yes, F/Fmsy= 1.593	1.440
Overfishing evaluation	Yes, SSB/MSST= 0.466	0.494
MFMT (Fmsy)	0.138	0.140
SSBmsy (male & female mature biomass, units not reported)	1,043.44	1,033.725
MSST (male & female mature biomass, units not reported)	856.664	848.688
MSY (1000 lb)	156.986	156.973
Y at 75% Fmsy (1000 lb)	Not reported	Not reported
ABC Control Rule Adjustment	22.5%	
P-Star (Prebuild)	27.5% (72.5%)	
OFL (1000 lb)		
ABC RECOMMENDATIONS: Projection results at the recommended P* were not available when this report was finalized. The projection report will be included as an appendix to this report.		

Source: SSC report, October 2014.

For the GA-NC stock of hogfish, the MSY value is still unknown (**Sub-alternative 2a**) because a stock assessment could not be performed. However, should data become available to conduct an assessment on that stock, **Alternative 2** would allow the South Atlantic Council to adopt the new MSY value without having to prepare an additional amendment to do so.

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED EDITS FOR ACTION 2

OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS FOR ACTION 2 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 4. SELECT ALTERNATIVE 2, SUB-ALTERNATIVES 2A AND 2B AS PREFERRED ALTERNATIVES

OTHERS?

Action 3. Specify Minimum Stock Size Threshold (MSST) for the GA-NC and the Florida Keys/ East Florida (FLK/EFL) stocks of hogfish

Alternative 1 (No Action). Do not define minimum stock size threshold (MSST) for the GA-NC and Florida Keys/East Florida (FLK/EFL) stocks of hogfish. ~~Do not modify the current definition of MSST for hogfish. MSST = SSB_{MSY} ((1-M) or 0.5, whichever is greater).~~ MSST for hogfish in the South Atlantic is equal to SSB_{MSY} ((1-M) or 0.5, whichever is greater).

Alternative 2. Minimum Stock Size Threshold (MSST) = SSB_{MSY} ((1-M) or 0.5, whichever is greater).

Sub-alternative 2a. For the GA-NC stock of hogfish.

Sub-alternative 2b. For the FLK/EFL stock of hogfish.

Alternative 3. Minimum Stock Size Threshold (MSST) = 50% of SSB_{MSY}

Sub-alternative 3a. For the GA-NC stock of hogfish. ~~, MSST = unknown.~~

Sub-alternative 3b. For the FLK/EFL stock of hogfish~~., MSST = 1,150,195 lbs ww.~~

Alternative 4. Minimum Stock Size Threshold (MSST) = 75% of SSB_{MSY}

Sub-alternative 4a. For the GA-NC stock of hogfish.~~, MSST = unknown.~~

Sub-alternative 4b. For the FLK/EFL stock of hogfish.~~, MSST = 1,725,293 lbs ww.~~

Alternatives	MSST Equation	M	MSST Values (lbs whole weight)
1 (No Action)	~~Do not change the current definition of MSST for hogfish.~~ MSST = SSB_{MSY} ((1-M) or 0.5, whichever is greater).	0.25	unknown
2	MSST = SSB_{MSY} ((1-M) or 0.5, whichever is greater).	0.179	GA-NC = unknown FLK/EFL = 1,888,621
3	MSST = 50% of SSB_{MSY}	0.179	GA-NC = unknown FLK/EFL = 1,150,195
4	MSST = 75% of SSB_{MSY}	0.179	GA-NC = unknown FLK/EFL = 1,725,293

Discussion

The Minimum Stock Size Threshold (MSST) is the level below which a stock is considered to be overfished. MSST for hogfish in the South Atlantic is currently specified as MSST = SSB_{MSY}*((1-M) or 0.5, whichever is greater) where SSB_{MSY} is the spawning stock biomass at the MSY level and M is the natural mortality rate. MSST has not been specified for the GA-NC and

FLK/EFL stocks (**Alternative 1 (No Action)**). Regulatory Amendment 21 to the Snapper Grouper FMP, effective November 6, 2014, changed the definition for MSST for select snapper grouper species (red snapper, blueline tilefish, gag, black grouper, yellowtail snapper, vermilion snapper, red porgy, and greater amberjack) with low natural mortality (M) from MSST = SSB_{MSY}*((1-M) or 0.5, whichever is greater) to MSST = 75% SSB_{MSY}. Other Snapper Grouper FMP amendments changed MSST to 75% SSB_{MSY} for snowy grouper, golden tilefish, and red grouper because natural mortality rate is very low (Amendments 15A, 15B, and 24, respectively). When the natural mortality rate is low (i.e., less than 0.25), even small fluctuations in biomass due to natural variations not related to fishing mortality may cause a stock to vary between an overfished or rebuilt condition. When a species is identified as overfished, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires that a plan be implemented to rebuild the stock. Redefining MSST for these species was done to help prevent unnecessary overfished designations when small drops in biomass are due to natural variation in recruitment or other environmental variables, and ensure that rebuilding plans are applied to stocks when truly appropriate. Natural mortality for the FLK/EFL stock of hogfish is estimated at 0.179, which is within the range of natural mortality values for species addressed in Regulatory Amendment 21, Amendment 15A, Amendment 15B, and Amendment 24 (0.08 – 0.23). **Alternative 2** would retain the current MSST formula (SSB_{MSY} *(1-M) or 0.5, whichever is greater) but apply it to each of the two hogfish stocks. **Alternative 3** would specify MSST for the GA-NC and FLK/EFL stocks, allowing MSST to be set at 50% of the SSB_{MSY}, which would result in a lower threshold than that proposed under **Alternative 4** (75% SSB_{MSY}).

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 3

OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 2 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 4. SELECT PREFERRED ALTERNATIVE

OTHERS?

Action 4. Establish Annual Catch Limits (ACLs) for the GA-NC stock of hogfish

Alternative 1 (No action). Do not establish ACLs for the GA-NC stock of hogfish. ~~Maintain the current commercial and recreational ACLs for hogfish (FL to NC) based on the South Atlantic Council's Snapper Grouper Fishery Management Plan that applies to the stock of hogfish throughout the South Atlantic Council's jurisdiction.~~ The current ABC for the entire stock of hogfish is 137,824 lbs ww and ACL = OY = ABC. The commercial ACL = 49,469 lbs ww (36.69%) and the recreational ACL = 85,355 lbs ww (63.31%).

Alternative 2. Establish an ACL for the GA-NC stock. Specify commercial and recreational ACLs using re-calculated sector allocations based on proposed modifications to the management unit (81.91% commercial and 18.09% recreational). The ABC for the GA-NC stock = 28,161 pounds whole weight (lbs ww).

Sub-alternative 2a. ~~GA-NC~~ ACL = ~~GA-NC~~ OY = ~~GA-NC~~ ABC ~~= 28,161 lbs ww. Commercial ACL = 23,066 lbs ww. Recreational ACL = 5,094 lbs ww.~~

Sub-alternative 2b. ~~GA-NC~~ ACL = ~~GA-NC~~ OY = 95% ~~GA-NC~~ ABC ~~= 26,753 lbs ww. Commercial ACL = 21,913 lbs ww. Recreational ACL = 4,839 lbs ww.~~

Sub-alternative 2c. ~~GA-NC~~ ACL = ~~GA-NC~~ OY = 90% ~~GA-NC~~ ABC ~~= 25,345 lbs ww. Commercial ACL = 20,760 lbs ww. Recreational ACL = 4,585 lbs ww.~~

Discussion

The South Atlantic Council established sector allocations for hogfish in the Comprehensive ACL Amendment (SAFMC 2011) using (0.5 * catch history) + (0.5 * current trend) where catch history = average landings 1986-2008, current trend = average landings 2006-2008. The same allocation formula was used to determine sector allocations for hogfish for each of the two stocks (**Actions 4** and **6**). However, because the landings stream was constrained to a specific area, the allocation percentages differ from status quo but more accurately reflect the distribution of landings for each region.

At their June 2015 meeting, the South Atlantic Council requested that the recreational ACL be specified in numbers of fish. **Table 2** below shows the recreational ACLs in both pounds (lbs ww) and numbers. Conversion to numbers of fish used an average weight of 9.99 lbs ww applied to the recreational ACL for the GA-NC stock in pounds based on the re-calculated sector allocations. The average weight was obtained from recreational landings in SEDAR 37 for 1999-2007. **Table 3** shows the difference in landings between the proposed ACLs and average 2006-2008 landings from GA-NC.

Tracking the recreational ACL could be more timely if the South Atlantic Council were to specify the recreational ACL in numbers of fish and not pounds. MRIP and the headboat logbook programs collect data in numbers of fish. Quota/ACL tracking is delayed beyond the 2-month MRIP waves for the SEFSC to conduct their own conversion of numbers to pounds separate from the conversion MRIP provides for the rest of the regions. Headboat owners are now required to provide electronic data each week in terms of numbers of fish, and time is needed for quality control, expanding values for non-compliance, and to convert numbers into

pounds. The South Atlantic and Gulf Councils are considering a similar weekly/electronic requirement for charter vessels.

Table 2. Commercial and recreational ACLs provided by **Sub-alternatives 2a-2c**. Pounds are in whole weight. Recreational catch converted from pounds to numbers using a conversion factor of 9.99 lbs ww per fish.

ABC lbs	Sub-alternative 2a			Sub-alternative 2b			Sub-alternative 2c		
	Rec lbs	Rec #s	Comm lbs	Rec lbs	Rec #s	Comm lbs	Rec lbs	Rec #s	Comm lbs
28,161	5,094	510	23,067	4,840	484	21,913	4,585	459	20,760

Table 3. Difference (in pounds) from proposed recreational and commercial ACLs and average 2006-2008 landings of hogfish, 2006-2008.

ABC lbs	Sub-alternative 2a		Sub-alternative 2b		Sub-alternative 2c	
	Rec ACL	Comm ACL	Rec ACL	Comm ACL	Rec ACL	Comm ACL
28,161	1,175	-1,808	921	-2,961	666	-4,115

The text below is an excerpt from the summary report of the October 2014 South Atlantic Council SSC meeting. It explains the rationale for the SSC's recommendation of ABC for the GA-NC stock of hogfish:

The SSC agreed with recommendations from the Council of Independent Experts (CIE) reviewers to not consider assessment results for the GA-NC stock as sufficient to determine stock status and inform management decisions. Although there isn't another analysis available for this stock a statistical catch at age model is not the appropriate modeling framework to analyze the available data and therefore this assessment is not considered the best available science. The Committee recommends that catch level recommendations for the GA-NC hogfish stock be developed using the ORCS approach, as outlined in the Council's ABC control rule:

For application of the ORCS approach the SSC considered the fishery-dependent indices in the assessment model as well as landings trends. Significant discussion points included:

- *Many uncertainties in the trends displayed, including competing trends between some of the indices. This indicates a critical need for data workshop participants to prioritize indices for modeling uses and for determination of abundance trends over time. Prioritization of indices would have helped the SSC with respect to decisions used to complete the ORCs approach.*
- *The SSC did not feel compelling evidence was available to change the Risk of Overexploitation designation given to hogfish during the ORCS Workshop. Therefore, the Committee recommended the use a Risk of Overexploitation of Moderate-High:*
    - *Leads to a risk of overexploitation scalar of 1.25*
    - *1999 is the year of maximum landings within the 1999-2007 time period designated as appropriate during ORCS Workshop.*

Results from applying the ORCS approach are shown in **Table 4.**

Table 4. The SSC's ABC recommendation for the GA-NC stock of hogfish.

Statistic	Value
Risk of Overexploitation	Moderately High
Associated Scalar	1.25
Range of Years	1999-2007
Year of Max Landings	1999
Catch Statistic	32,184 lbs ww
Council Risk Scalar (Preferred from Am 29)	0.7
Proposed ABC	28,161 lbs ww

The allocation formula from the Comprehensive ACL Amendment (SAFMC 2011) was used to specify commercial and recreational allocations for the GA-NC hogfish stock: (0.5 * catch history) + (0.5 * current trend) where catch history = average landings 1986-2008, current trend = average landings 2006-2008. The formula was applied to commercial ACL data (accessed in July 2014) and recreational data (accessed in February 2015) from the SEFSC. Commercial and recreational landings used to recalculate sector allocations are shown in **Table 5**.

Table 5. Commercial and recreational landings used to re-calculate hogfish sector allocations for the GA-NC and FLK/EFL.

Year	Recreational (lbs ww)		Commercial (lbs ww)		Total (lbs ww)	
	FLK/EFL	GA-NC	FLK/EFL	GA-NC	FLK/EFL	GA-NC
1986	133,346	10,571	28,878	8,040	162,224	18,611
1987	88,805	4,457	44,300	9,295	133,105	13,752
1988	61,183	603	48,362	10,186	109,545	10,789
1989	12,633	1,619	54,155	15,177	66,788	16,796
1990	3,345	1,543	53,914	27,862	57,259	29,405
1991	38,521	3,181	53,590	23,886	92,111	27,067
1992	67,363	3,534	54,495	32,274	121,858	35,808
1993	132,208	4,093	42,646	31,739	174,854	35,832
1994	125,667	1,245	34,716	23,063	160,383	24,308
1995	88,972	84,247	39,433	36,903	128,405	121,150
1996	69,917	691	40,136	17,471	110,053	18,162
1997	53,227	1,728	42,573	25,394	95,800	27,122
1998	50,125	2,004	31,211	21,959	81,336	23,963
1999	79,525	2,998	24,155	29,186	103,680	32,184
2000	35,553	2,387	28,015	24,104	63,568	26,491
2001	79,061	1,372	18,455	14,193	97,516	15,565
2002	60,415	3,626	19,525	20,557	79,940	24,183
2003	93,334	579	20,623	17,337	113,957	17,916
2004	77,458	1,021	23,299	19,295	100,757	20,316
2005	54,066	3,746	12,380	19,255	66,446	23,001
2006	36,590	4,653	11,337	23,433	47,927	28,086
2007	140,561	4,289	14,402	20,754	154,963	25,043
2008	53,806	2,815	17,882	30,437	71,688	33,252

Sources: SEFSC Recreational (Feb 2015) and Commercial (July 2014) ACL Datasets and 2014 SEFSC Commercial In-Season Monitoring data.

The Council has indicated that the recreational ACL should be specified in numbers of fish rather than in pounds. There are two ways of going about calculating the recreational ACL in numbers. The first is to take the existing ACL and convert it from pounds to numbers using the average weight from recreationally sampled fish. This is a less preferred method due to the fact that the sampling of fish in the recreational sector is not as frequent or widespread as the sampling of commercial fish through the TIP sampling program. The increased commercial samples from TIP give a better estimate of average weight than does the sampling of the recreational catch.

The second alternative is to specify the ABC and total ACL in numbers of fish from the beginning and convert the commercial ACL into pounds using more robust weight data from the TIP program. This method would result in a less uncertain estimate of recreational landings, since they are originally estimated in numbers and must be converted to weight after the end of each wave. This is especially true for the GA-NC stock of hogfish, which traditionally has very few samples of measured hogfish annually (between 2 and 5 annually). Also, historical intercepts of hogfish have suffered from pigfish being accidentally miscoded as hogfish. Pigfish

are a more plentiful inshore species that are significantly smaller than hogfish, especially in the GA-NC stock, where 18-20 lb. hogfish have been recorded. This infusion of pigfish can skew the average weight to be much smaller than is appropriate for hogfish in this stock.

Re-specifying the ACL in numbers also brings up the issue of allocations. Originally, sector allocations were specified using landings in pounds (see **Table 5**). However, if the ACL is to be specified in numbers, then it may be necessary to also calculate the allocations using landings in numbers rather than pounds. This may not be necessary if the average weights are similar between sectors and the sampling is sufficient to trust the estimate of average weight.

For the FLK/EFL stock, the average weight of recreationally caught hogfish is 2.140 lbs whereas the average weight of commercially caught hogfish is 3.496 lbs. With such a large difference in weight, it is recommended to recalculate the allocation using landings in numbers for this stock. Otherwise, the current allocation will favor the commercial sector and penalize the recreational sector simply because the commercial sector lands larger fish on average.

The GA-NC shows an average commercial weight of hogfish of 8.83 lbs. The recreational sector, however, has an average weight of hogfish between 5.896 lbs and 9.794 lbs. The wide range of average weights may be the result of samples being contaminated with pigfish samples and it is very difficult to efficiently remove those trips that have pigfish mixed in with hogfish. Regardless of whether the issue with pigfish is real or not, both estimates of average weight are significantly different from that of the commercial sector so it is still recommended to recalculate the sector allocations using landings in numbers.

The issue of pigfish contaminating some of the historical hogfish intercepts will still skew the estimates of hogfish landings in numbers. However, eliminating the use of weight from the equation removes a second large source of uncertainty that was already incorporated into the previous calculation of allocations. Also, recreational hogfish only make up approximately one quarter of the total landings in the GA-NC stock, on average, which should lessen the effect of pigfish contamination in the early years. Finally, the Council's allocation formula ("bowtie" formula) only utilizes 50% of historical landings, which seems to be where the bulk of the pigfish problem exists.

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED CHANGES TO ACTION 4

OPTION 2. DO NOT ACCEPT THE IPT'S SUGEGSTED CHANGES TO ACTION 4 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. ADOPT RISK TOLERANCE SCALAR OF 0.7 FOR HOGFISH BASED ON PREFERRED IN AMENDMENT 29 FOR SPECIES WITH MODERATELY HIGH RISK OF OVEREXPLOITATION:

Preferreds from Amendment 29:

- For **moderate** risk of overexploitation (scalar = 1.5): risk tolerance scalar of 0.80.
- For **moderately high** risk of overexploitation (scalar = 1.25): risk tolerance scalar of 0.70 for rock hind, tomtate, white grunt and gray triggerfish and 0.50 for scamp.

OPTION 4. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 5. SELECT PREFERRED ALTERNATIVE

OTHERS?

Action 5. Establish a rebuilding plan ~~and Acceptable Biological Catch~~ for the Florida Keys/East Florida (FLK/EFL) stock of hogfish

Alternative 1 (No action). Do not establish a rebuilding plan ~~or specify an Acceptable Biological Catch (ABC) for~~ the Florida Keys/East Florida (FLK/EFL) stock of hogfish. The current ABC for the entire stock of hogfish is 137,824 lbs ww

Alternative 2. Define a rebuilding plan where the rebuilding strategy for the Florida Keys/East Florida (FLK/EFL) stock of hogfish sets ABC equal to the yield at 75% F_{MSY} and rebuilds the stock in 11 years ~~with X probability of rebuilding success~~. The Overfishing Limit (OFL) is the yield at F_{MSY}. The Spawning Stock Biomass (SSB_{MSY})is 2,300,391 lbs ww. Year 1 = 2016.

Year	F	ABC (lbs ww)	ABC (numbers)	OFL* (lbs ww)	OFL* (numbers)	Spawning Stock Biomass (lbs ww)
2016	0.104	95,380	39,710	127,490	53,140	806,960
2017	0.104	113,180	45,900	146,850	59,930	965,140
2018	0.104	131,870	51,660	166,560	66,060	1,133,820
2019	0.104	150,840	57,520	185,930	72,140	1,306,580
2020	0.104	169,700	63,430	204,610	78,130	1,479,650
2021	0.104	188,110	69,190	222,310	83,830	1,649,810
2022	0.104	205,760	74,660	238,830	89,130	1,813,950
2023	0.104	222,410	79,750	253,990	93,950	1,969,510
2024	0.104	237,870	84,430	267,700	98,280	2,114,570
2025	0.104	252,030	88,670	279,930	102,120	2,247,960
2026	0.104	264,800	92,470	290,720	105,500	**2,368,780**

Source: Table 4, Appendix A (*) OFL values from Table 5, Appendix A.

Note: While the probably of rebuilding for this projection was not provided in the analysis, it is probably very close to 50% since the estimated Spawning Stock Biomass is very close to SSB_{MSY}. However, the probability of rebuilding would be lower over a 10-year timeframe.

Alternative 3. Define a rebuilding plan where the rebuilding strategy for the Florida Keys/East Florida (FLK/EFL) stock of hogfish sets ABC equal to the yield at a constant fishing mortality rate and rebuilds the stock in 10 years with a 50% probability of rebuilding success. The Overfishing Limit (OFL) is the yield at F_{MSY}. The Spawning Stock Biomass (SSB_{MSY}) is 2,300,391 lbs ww. Year 1 = 2016.

Year	F	ABC (lbs ww)	ABC (numbers)	OFL* (lbs ww)	OFL* (numbers)	Spawning Stock Biomass (lbs ww)
2016	0.10	91,660	38,160	127,490	53,140	806,960
2017	0.10	109,130	44,230	146,850	59,930	968,620
2018	0.10	127,540	49,900	166,560	66,060	1,141,610
2019	0.10	146,310	55,680	185,930	72,140	1,319,490
2020	0.10	165,030	61,530	204,610	78,130	1,498,360
2021	0.10	183,370	67,250	222,310	83,830	1,674,830
2022	0.10	201,010	72,700	238,830	89,130	1,845,660
2023	0.10	217,700	77,780	253,990	93,950	2,008,090
2024	0.10	233,250	82,460	267,700	98,280	2,160,050
2025	0.10	247,540	86,710	279,930	102,120	2,300,230

Source: Table 6, Appendix A. (*) OFL values from Table 5, Appendix A.

Alternative 4. Define a rebuilding plan where the rebuilding strategy for the Florida Keys/East Florida (FLK/EFL) stock of hogfish sets ABC equal to the yield at a constant fishing mortality rate and rebuilds the stock in 10 years with a 72.5% probability of rebuilding success. The Overfishing Limit (OFL) is the yield at F_{MSY}. The Spawning Stock Biomass (SSB_{MSY}) is 2,300,391 lbs ww. Year 1 = 2016.

Year	F	ABC (lbs ww)	ABC (numbers)	OFL* (lbs ww)	OFL* (numbers)	Spawning Stock Biomass (lbs ww)
2016	0.089	81,610	33,970	127,490	53,140	806,960
2017	0.087	96,230	38,930	146,850	59,930	977,990
2018	0.086	111,800	43,570	166,560	66,060	1,164,540
2019	0.085	127,900	48,380	185,930	72,140	1,360,450
2020	0.084	144,210	53,330	204,610	78,130	1,561,760
2021	0.083	160,440	58,250	222,310	83,830	1,764,760
2022	0.083	176,310	63,000	238,830	89,130	1,965,690
2023	0.082	191,560	67,490	253,990	93,950	2,161,160
2024	0.082	206,010	71,680	267,700	98,280	**2,348,410**
2025	0.081	219,520	75,540	279,930	102,120	2,525,440

Source: Table 7, Appendix A. (*) OFL values from Table 5, Appendix A.
Note: Projections for various F scenarios were completed using Stock Synthesis (SS3). Under a constant F scenario, the F values vary over the span of the projection due to changes in the stock's vulnerable biomass and age composition.

Note: The projection calculated what the landings should be to give a 72.5% chance of rebuilding in 10 years. Because of the inherent uncertainties in the model, the estimated SSB at the end of the 10-year period will be necessarily higher than the SSB_{MSY} estimate from the model. Therefore, in order to have a 72.5% chance of rebuilding, the projections continue until the model estimates the SSB to be 2,525,440 for this particular scenario. In 9 years, the probability of rebuilding success is actually closer to 50% (or more likely somewhere between 50% and 72.5%).

Alternative 5. Define a rebuilding plan where the rebuilding strategy for the Florida Keys/East Florida (FLK/EFL) stock of hogfish sets ABC equal to the yield at a constant fishing mortality rate and rebuilds the stock in 7 years with a 50% probability of rebuilding success. The Overfishing Limit (OFL) is the yield at F_{MSY}. The Spawning Stock Biomass (SSB_{MSY}) is 2,300,391 lbs ww. Year 1 = 2016.

Year	F	ABC (lbs ww)	ABC (numbers)	OFL* (lbs ww)	OFL* (numbers)	Spawning Stock Biomass (lbs ww)
2016	0.049	44,580	18,530	127,490	53,140	806,960
2017	0.049	55,360	22,250	146,850	59,930	1,012,600
2018	0.049	67,250	25,870	166,560	66,060	1,242,980
2019	0.049	79,960	29,700	185,930	72,140	1,491,870
2020	0.049	93,250	33,720	204,610	78,130	1,754,380
2021	0.049	106,870	37,800	222,310	83,830	2,025,520
2022	0.049	120,560	41,840	238,830	89,130	2,299,990

Source: Table 8, Appendix A. (*) OFL values from Table 5, Appendix A.

Alternative 6. Define a rebuilding plan where the rebuilding strategy for the Florida Keys/East Florida (FLK/EFL) stock of hogfish sets ABC equal to the yield at a constant fishing mortality rate that rebuilds the stock in 7 years with a 72.5% probability of rebuilding success. The Overfishing Limit (OFL) is the yield at F_{MSY}. The Spawning Stock Biomass (SSB_{MSY}) is 2,300,391 lbs ww. Year 1 = 2016.

Year	F	ABC (lbs ww)	ABC (numbers)	OFL (lbs ww)	OFL (numbers)	Spawning Stock Biomass (lbs ww)
2016	0.044	39,820	16,550	127,490	53,140	806,960
2017	0.043	48,950	19,650	146,850	59,930	1,017,060
2018	0.043	59,060	22,680	166,560	66,060	1,254,210
2019	0.042	69,980	25,920	185,930	72,140	1,512,500
2020	0.042	81,520	29,370	204,610	78,130	1,787,130
2021	0.042	93,480	32,920	222,310	83,830	2,073,050
2022	0.042	105,630	36,470	238,830	89,130	**2,364,740**

Source: Table 9, Appendix A. (*) OFL values from Table 5, Appendix A.
Note: Projections for various F scenarios were completed using Stock Synthesis (SS3). Under a constant F scenario, the F values vary over the span of the projection due to changes in the stock's vulnerable biomass and age composition.

In the tables above, the terminal Spawning Stock Biomass (SSB) in the rebuilding projections may not equal or exceed the base run estimate of SSB_{MSY} because the SSB estimates in the projections were generated from multiple bootstrap iterations in order to incorporate uncertainty into the projections. Therefore, the actual SSB_{MSY} that the projections are rebuilding to is not the estimate from the base run but the median (or other type of estimate in the case of the 72.5% probability of success runs) from the bootstrap distribution.

Table 6 below provides a summary of the alternatives for **Action 5**.

Table 6. A summary of the various rebuilding scenarios (Alternatives 1-6) for the Florida Keys/East Florida (FLK/EFL) stock of hogfish.

Alternatives	F rate strategy	F rate	Year 1 ABC (pounds)	Rebuilt stock (years)	Probability of rebuilt stock
1 (no action)	Do not specify a rebuilding plan. The current ABC for the entire stock of hogfish is 137,824 lbs ww				
2	75% F_{MSY}	0.104	95,380	10	<50%
3	Constant	0.100	91,660	10	50%
4	Constant	0.089 (year 1)	81,610	10	72.5%
5	Constant	0.049	44,580	7	50%
6	Constant	0.044 (year 1)	39,820	7	72.5%

Discussion

The last year of data in the hogfish assessment report (SEDAR 37 2014) was 2012. Projections for various fishing mortality (F) scenarios were completed using Stock Synthesis (SS3) base model configurations for the Florida Keys/East Florida (FLK/EFL) hogfish stock (SEDAR 37 2014). Projection results are based on year 1 = 2016 and extending through 2026, or to the point of stock rebuilding if a scenario did not result in rebuilding within 10 years. The projected OFLs and ABCs in **Appendix A** assume the current minimum size limit (12 inches fork length). If this size limit is modified in Action 8, updated average weights would be used to update the yield streams in numbers.

Since the stock assessment for the FLK/EFL stock falls under Tier 1 of the ABC control rule, the SSC recommended a P* = 0.275 with a probability of rebuilding success of 72.5%, which corresponds to the values shown under **Alternative 4**. **Alternative 2** would rebuild the stock in 10 years, but would do so with less than 50% probability of rebuilding success. **Alternative 3** would rebuild the stock in the required 10 years but at a lower probability of success than that recommended by the SSC. **Alternatives 5** and **6** would rebuild the stock in 7 years with 50% and 72.5% probabilities of rebuilding success, respectively. Since the stock would rebuild in a shorter time period, **Alternatives 5** and **6** would implement lower ABCs (and consequently lower ACLs) than alternatives that rebuild the stock in the required 10 years.

IPT RECOMMENDATIONS:

- replace "Spawning Stock Biomass (in pounds)" columns with biomass ratios (percent rebuilt) instead.
- Consider moving Alternative 2 to Considered But Rejected Appendix because the probability of rebuilding success is less than 50% (based on attaining a biomass above SSB_{MSY} in 11 years instead of 10)

COMMITTEE ACTION:

OPTION 1. ACCEPT IPT'S SUGGESTED EDITS AND RECOMMENDATIONS FOR ACTION 5

OPTION 2. DO NOT ACCEPT IPT'S SUGGESTED EDITS AND RECOMMENDATIONS FOR ACTION 5 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 4. SELECT PREFERRED ALTERNATIVE FOR REBUILDING AND INSTRUCT STAFF TO SUBSTITUTE ABC VALUES BASED ON THE NEW PROJECTIONS AS SOON AS THEY BECOME AVAILABLE

OTHERS?

NOTE: To meet the timeline, preferred alternatives need to be identified at the September 2015 meeting.

NOTE: The recreational fishery for hogfish was closed recently, due to an increase in landings observed during Wave 2 of the MRIP survey (224,566 pounds). As a result, preliminary landings for 2015 are above the landings level assumed in the stock projections, raising concerns that the projections may no longer represent Best Scientific Information Available. Therefore, the Council has requested updated projections for the Florida Keys/East Florida hogfish stock using the most recent landings estimates. The SSC will review the projections at their October 20-22, 2015 meeting. Since the Florida Keys/East Florida stock of hogfish is overfished and undergoing overfishing, the timing for Amendment 37 needs to meet the two-year statutory deadline. The Council received notification of the overfished status of hogfish on February 17, 2015.

To meet the timing, the Council must approve Amendment 37 for formal review at the March 2016 meeting. We are requesting guidance to prepare analyses using the new projections so that the document you receive for the December 2015 meeting is ready to be approved for pubic hearings. If we delay any, we will not meet the 2-year deadline for having regulations in place.

OPTION 1. GIVE GUIDANCE TO STAFF AND THE IPT TO CONDUCT ANALYSES BASED ON NEW PROJECTIONS AS SOON AS THOSE PROJECTIONS ARE RECEIVED (ON OR BEFORE OCTOBER 2, 2015) AND INCLUDE THE ANALYSES IN AMENDMENT 37 FOR THE DECEMBER 2015 MEETING

OPTION 2. WAIT FOR THE SSC REVIEW OF THE PROJECTIONS AND APPROVE FOR USE IN ANALYSES AT THE DECEMBER 2015 MEETING AND INCLUDE THE ANALYSES IN AMENDMENT 37 FOR THE MARCH 2016 MEETING

OTHERS?

Action 6. Establish Annual Catch Limits (ACLs) for the Florida Keys/East Florida (FLK/EFL) stock of hogfish

Alternative 1 (No action). ~~Maintain the current commercial and recreational ACLs for hogfish (FL to NC) based on the South Atlantic Council's Snapper Grouper Fishery Management Plan that applies to the stock of hogfish throughout the South Atlantic Council's jurisdiction.~~ Do not establish ACLs for the Florida Keys/East Florida (FLK/EFL) hogfish stock. The current Acceptable Biological Catch (ABC) for the entire stock of hogfish is 137,824 lbs ww and Annual Catch Limit (ACL) = OY = ABC. The commercial annual catch limit (ACL) = 49,469 lbs ww (36.69%) and the recreational annual catch limit (ACL) = 85,355 lbs ww (63.31%).

Alternative 2. Establish annual catch limits (ACLs) for the Florida Keys/East Florida (FLK/EFL) stock of hogfish. Specify commercial and recreational ACLs for 2016-20xx. ACLs will not increase automatically in a subsequent year if present year projected catch has exceeded the total ACL. Specify commercial and recreational ACLs using re-calculated sector allocations based on proposed modifications to the management unit (24.29% commercial and 75.71% recreational).

Sub-alternative 2a. ~~FLK/EFL~~ ACL = ~~FLK/EFL~~ OY = ~~FLK/EFL~~ ABC ~~= X. Commercial ACL = x lbs. Recreational ACL = x fish~~

Sub-alternative 2b. ~~FLK/EFL~~ ACL = ~~FLK/EFL~~ OY = 95% ~~FLK/EFL~~ ABC ~~= X. Commercial ACL = x lbs. Recreational ACL = x fish~~

Sub-alternative 2c. ~~FLK/EFL~~ ACL = ~~FLK/EFL~~ OY = 90% ~~FLK/EFL~~ ABC ~~= X. Commercial ACL = x lbs. Recreational ACL = x fish~~

Discussion:

The allocation formula from the Comprehensive ACL Amendment (SAFMC 2011) was used to specify commercial and recreational allocations for the FLK/EFL hogfish stock: (0.5 * catch history) + (0.5 * current trend) where catch history = average landings 1986-2008, current trend = average landings 2006-2008. The formula was applied to commercial ACL data (accessed in July 2014), and recreational data (accessed in February 2015) from the SEFSC. Recreational data were post-stratified to include MRIP landings from Monroe County in the FLK/EFL sub-region, consistent with the SEDAR 37 stock assessment. Commercial and recreational landings data used to re-calculate sector allocations are shown in **Table 5**.

Tables 7-11 show commercial and recreational (in pounds and numbers) for the three sub-alternatives (**Sub-alternatives 2a-2c**) under **Action 6**. To translate the recreational ACL values from pounds to numbers of fish an average weight of 2.14 pounds was obtained from recreational landings of hogfish in SEDAR 37 for 1999-2007.

Table 7. Sector Annual Catch Limits (ACLs) in pounds and numbers of fish (recreational) for **Sub-alternatives 2a-2c** in **Action 6** and based on Acceptable Biological Catch (ABC) projections from **Alternative 2** in **Action 5** where ABC equal to the yield at 75% F_{MSY}.

		Sub-Alternative 2a			Sub-Alternative 2b			Sub-alternative 2c		
Year	ABC	Rec ACL (lbs)	Rec ACL (#s)*	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (bs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)
2016	95,380	72,212	33,744	23,168	68,602	32,057	22,009	64,991	30,370	20,851
2017	113,180	85,689	40,041	27,491	81,404	38,039	26,117	77,120	36,037	24,742
2018	131,870	99,839	46,654	32,031	94,847	44,321	30,430	89,855	41,988	28,828
2019	150,840	114,201	53,365	36,639	108,491	50,697	34,807	102,781	48,028	32,975
2020	169,700	128,480	60,037	41,220	122,056	57,035	39,159	115,632	54,034	37,098
2021	188,110	142,418	66,551	45,692	135,297	63,223	43,407	128,176	59,895	41,123
2022	205,760	155,781	72,795	49,979	147,992	69,155	47,480	140,203	65,515	44,981
2023	222,410	168,387	78,685	54,023	159,967	74,751	51,322	151,548	70,817	48,621
2024	237,870	180,091	84,155	57,779	171,087	79,947	54,890	162,082	75,739	52,001
2025	252,030	190,812	89,164	61,218	181,271	84,706	58,157	171,731	80,248	55,096
2026	264,800	200,480	93,682	64,320	190,456	88,998	61,104	180,432	84,314	57,888

*Average weights used to compute Recreational ACLs in numbers will be updated based on Council preferred alternative recreational minimum size limit (**Action 8**) and scaled according to projected rebuilding in **Action 5**.

Table 8. Sector Annual Catch Limits (ACLs) in pounds and numbers (recreational) for **Sub-alternatives 2a-2c** in **Action 6** and based on Acceptable Biological Catch (ABC) projections from **Alternative 3** in **Action 5** where ABC is equal to the yield at a constant fishing mortality rate and rebuilds the stock in 10 years with a 50% probability of rebuilding success.

		Sub-Alternative 2a			Sub-Alternative 2b			Sub-alternative 2c		
Year	ABC	Rec ACL (lbs)	Rec ACL (#s)*	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)
2016	91,660	69,396	32,428	22,264	65,926	30,807	21,151	62,456	29,185	20,038
2017	109,130	82,622	38,609	26,508	78,491	36,678	25,182	74,360	34,748	23,857
2018	127,540	96,561	45,122	30,979	91,733	42,866	29,430	86,904	40,610	27,882
2019	146,310	110,771	51,762	35,539	105,233	49,174	33,762	99,694	46,586	31,985
2020	165,030	124,944	58,385	40,086	118,697	55,466	38,081	112,450	52,547	36,077
2021	183,370	138,829	64,874	44,541	131,888	61,630	42,314	124,946	58,386	40,087
2022	201,010	152,185	71,114	48,825	144,575	67,559	46,384	136,966	64,003	43,943
2023	217,700	164,821	77,019	52,879	156,580	73,168	50,235	148,339	69,317	47,591
2024	233,250	176,594	82,520	56,656	167,764	78,394	53,824	158,934	74,268	50,991
2025	247,540	187,413	87,576	60,127	178,042	83,197	57,121	168,671	78,818	54,115

*Average weights used to compute Recreational ACLs in numbers will be updated based on Council preferred alternative recreational minimum size limit (**Action 8**) and scaled according to projected rebuilding in **Action 5**.

Table 9. Sector Annual Catch Limits (ACLs) in pounds and numbers (recreational) for **Sub-alternatives 2a-2c** in **Action 6** and based on Acceptable Biological Catch (ABC) projections from **Alternative 4** in **Action 5** where ABC equal to the yield at a constant fishing mortality rate and rebuilds the stock in 9 years with a 72.5% probability of rebuilding success.

		Sub-Alternative 2a			Sub-Alternative 2b			Sub-alternative 2c		
Year	ABC	Rec ACL (lbs)	Rec ACL (#s)*	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)
2016	81,610	61,787	28,872	19,823	58,698	27,429	18,832	55,608	25,985	17,841
2017	96,230	72,856	34,045	23,374	69,213	32,342	22,206	65,570	30,640	21,037
2018	111,800	84,644	39,553	27,156	80,412	37,576	25,798	76,179	35,598	24,441
2019	127,900	96,833	45,249	31,067	91,991	42,987	29,514	87,150	40,724	27,960
2020	144,210	109,181	51,019	35,029	103,722	48,468	33,277	98,263	45,917	31,526
2021	160,440	121,469	56,761	38,971	115,396	53,923	37,022	109,322	51,085	35,074
2022	176,310	133,484	62,376	42,826	126,810	59,257	40,684	120,136	56,138	38,543
2023	191,560	145,030	67,771	46,530	137,779	64,383	44,203	130,527	60,994	41,877
2024	206,010	155,970	72,883	50,040	148,172	69,239	47,538	140,373	65,595	45,036
2025	219,520	166,199	77,663	53,321	157,889	73,780	50,655	149,579	69,897	47,989

*Average weights used to compute Recreational ACLs in numbers will be updated based on Council preferred alternative recreational minimum size limit (**Action 8**) and scaled according to projected rebuilding in **Action 5**.

Table 10. Sector Annual Catch Limits (ACLs) in pounds and numbers (recreational) for **Sub-alternatives 2a-2c** in **Action 6** and based on Acceptable Biological Catch (ABC) projections from **Alternative 5** in **Action 5** where ABC equal to the yield at a constant fishing mortality rate and rebuilds the stock in 7 years with a 50% probability of rebuilding success.

		Sub-Alternative 2a			Sub-Alternative 2b			Sub-alternative 2c		
Year	ABC	Rec ACL (lbs)	Rec ACL (#s)*	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)
2016	44,580	33,752	15,772	10,828	32,064	14,983	10,287	30,376	14,195	9,746
2017	55,360	41,913	19,586	13,447	39,817	18,606	12,775	37,722	17,627	12,102
2018	67,250	50,915	23,792	16,335	48,369	22,602	15,518	45,823	21,413	14,702
2019	79,960	60,538	28,289	19,422	57,511	26,874	18,451	54,484	25,460	17,480
2020	93,250	70,600	32,990	22,650	67,070	31,341	21,518	63,540	29,691	20,385
2021	106,870	80,911	37,809	25,959	76,866	35,919	24,661	72,820	34,028	23,363
2022	120,560	91,276	42,652	29,284	86,712	40,520	27,820	82,148	38,387	26,356

*Average weights used to compute Recreational ACLs in numbers will be updated based on Council preferred alternative recreational minimum size limit (**Action 8**) and scaled according to projected rebuilding in **Action 5**.

Table 11. Sector Annual Catch Limits (ACLs) in pounds and numbers (recreational) for **Sub-alternatives 2a-2c** in **Action 6** and based on Acceptable Biological Catch (ABC) projections from **Alternative 6** in **Action 5** where ABC equal to the yield at a constant fishing mortality rate that rebuilds the stock in 7 years with a 72.5% probability of rebuilding success.

		Sub-Alternative 2a			Sub-Alternative 2b			Sub-alternative 2c		
Year	ABC	Rec ACL (lbs)	Rec ACL (#s)*	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)	Rec ACL (lbs)	Rec ACL (#s)	Comm ACL (lbs)
2016	39,820	30,148	14,088	9,672	28,640	13,383	9,189	27,133	12,679	8,705
2017	48,950	37,060	17,318	11,890	35,207	16,452	11,295	33,354	15,586	10,701
2018	59,060	44,714	20,895	14,346	42,479	19,850	13,628	40,243	18,805	12,911
2019	69,980	52,982	24,758	16,998	50,333	23,520	16,148	47,684	22,282	15,298
2020	81,520	61,719	28,841	19,801	58,633	27,399	18,811	55,547	25,957	17,821
2021	93,480	70,774	33,072	22,706	67,235	31,418	21,571	63,696	29,765	20,436
2022	105,630	79,972	37,370	25,658	75,974	35,502	24,375	71,975	33,633	23,092

*Average weights used to compute Recreational ACLs in numbers will be updated based on Council preferred alternative recreational minimum size limit (**Action 8**) and scaled according to projected rebuilding in **Action 5**.

Because the South Atlantic Council has not selected a preferred alternative under **Action 5** that would establish an ABC for the FLK/EFL stock, a comparison between the proposed level of harvest and current harvest is not yet possible. However, **Tables 12** and **13** below show average commercial and recreational landings; respectively, for hogfish by state from 1986 to 2012.

Table 12. Annual commercial landings (lbs ww) of hogfish by state (South Atlantic and Gulf of Mexico), with percent of total landings in Florida.

Year	Florida	Other states	Total	% Florida
1986-1987	127,328	17,335	144,663	88%
1988	75,840	10,186	86,026	88%
1989	109,408	15,225	124,633	88%
1990	115,395	27,862	143,257	81%
1991	107,564	23,886	131,450	82%
1992-1996	475,255	141,576	616,831	77%
1997	65,974	25,394	91,368	72%
1998	47,153	21,959	69,112	68%
1999	47,266	29,186	76,452	62%
2000	49,123	24,104	73,227	67%
2001	45,514	14,193	59,707	76%
2002	49,912	20,557	70,469	71%
2003	48,659	9,307	57,966	84%
2004	48,553	19,295	67,848	72%
2005	32,490	19,255	51,745	63%
2006	26,967	23,433	50,400	54%
2007	32,427	20,754	53,181	61%
2008	42,032	30,437	72,469	58%

Year	Florida	Other states	Total	% Florida
2009	44,322	34,242	78,564	56%
2010	45,480	41,898	87,378	52%
2011	54,496	35,959	90,455	60%
2012	55,055	20,561	75,616	73%

Note: Cells have been aggregated to maintain confidentiality.
Source: NMFS SERO.

Table 13. Annual recreational landings (lbs ww) of hogfish by state (South Atlantic and Gulf of Mexico), with percent of total landings in Florida.

Year	FL	GA	SC	NC	Gulf states	Total	% FL
1986	359,413		534	10,218	8	370,174	97%
1987	660,122		48	4,487	4	664,661	99%
1988	504,254		293	315	37	504,899	100%
1989	299,828		1,506	141		301,475	99%
1990	366,149		63	1,500	1,269	368,981	99%
1991	417,043		1,131	2,050	15	420,239	99%
1992	580,626		1,204	2,330		584,160	99%
1993	568,576		553	3,540	48	572,717	99%
1994	431,784		541	706	6	433,038	100%
1995	404,160	17	5,196	79,034		488,407	83%
1996	220,948	27	201	463	4	221,643	100%
1997	264,344	133	562	1,041		266,079	99%
1998	172,314	512	766	735		174,327	99%
1999	234,449	134	687	2,177	8	237,455	99%
2000	118,323	21	797	1,570	8	120,718	98%
2001	203,300	73	293	1,006		204,672	99%
2002	193,334	261	647	2,769		197,010	98%
2003	390,389	65	59	463		390,976	100%
2004	263,699		76	960		264,734	100%
2005	261,432		51	3,762	2	265,246	99%
2006	163,027	91	256	4,384	7	167,764	97%
2007	299,288		3,828	485	5	303,606	99%
2008	526,653		611	2,243	3	529,509	99%
2009	356,106		102	406	4	356,619	100%
2010	379,324		2,056	1,828		383,208	99%
2011	164,158		79	476	4	164,716	100%
2012	499,611		3	4,178	4	503,795	99%
2013	387,486			960		388,446	100%

Note: data include Gulf of Mexico and South Atlantic region headboat, MRIP, and TPWD-reported landings.
Source: NMFS SERO.

NOTE: Refer to discussion regarding specification of ACL in pounds vs. numbers of fish under Action 4.

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 6

OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 6 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. SPECIFY RANGE OF YEARS FOR ACLS

OPTION 4. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 5. SELECT PREFERRED ALTERNATIVE AND INSTRUCT STAFF TO SUBSTITUTE ACL VALUES BASED ON THE NEW PROJECTIONS AS SOON AS THEY BECOME AVAILABLE

OPTION 6. PROVIDE GUIDANCE ON METHODOLOGY TO SPECIFY THE RECREATIONAL ACL IN NUMBERS OF FISH AND THE COMMERCIAL ACL CONVERSION FROM NUMBERS TO POUNDS

OTHERS?

Action 7. ~~Modify the~~ Establish a recreational Annual Catch Target (ACT) for the GA-NC and the Florida Keys/East Florida (FLK/EFL) stocks of hogfish

Alternative 1 (No Action). Do not ~~modify the~~ establish recreational annual catch targets (ACTs) ~~for hogfish~~ for the GA-NC and Florida Keys/East Florida (FLK/EFL) stocks of ~~recreational sector~~ hogfish. The current ACT is 59,390 lbs ww and applies to hogfish throughout the South Atlantic Council's jurisdiction. The ACT = recreational ACL*(1-PSE) or ACL*0.5, whichever is greater, and where Percent Standard Error (PSE) = average PSE 2005-2009.

Year	Hogfish PSE
2005	28.7
2006	34.3
2007	23.9
2008	30.9
2009	29.5
Average	29.5

Source: NMFS Office of Science and Technology MRIP Domain Catch Totals (2015)

Alternative 2. Establish an annual catch target (ACT) for the GA-NC stock of hogfish for the recreational sector.

Sub-alternative 2a. ACT = recreational ACL*(1-PSE) or ACL*0.5, whichever is greater.

Sub-alternative 2b. ACT =85% recreational ACL.

Sub-alternative 2c. ACT = 75% recreational ACL.

	Hogfish ACT (numbers of fish)								
Year	Action 4, Sub-alt 2a (ACL=ABC)			Action 4, Sub-alt 2b (ACL=95%ABC)			Action 4, Sub-alt 2c (ACL=90%ABC)		
Action 7, Alternative	2a	2b	2c	2a	2b	2c	2a	2b	2c
2016	255	433	382	242	412	363	229	390	344

Note: Sub-alternative 2a calculations used rec ACL*0.5 because it is greater than 1-PSE. ACTs in pounds were converted to numbers of fish using 9.99 lbs average weight.

Year	Hogfish PSE (GA-NC)
2010	61.9
2011	67.3
2012	63.1
2013	56.1
2014	n/a
Average	**62.1%**

Source: NMFS Office of Science and Technology MRIP Domain Catch Totals (2015)

Alternative 3. Establish an annual catch target (ACT) for the Florida Keys/East Florida (FLK/EFL) stock of hogfish for the recreational sector.

Sub-alternative 3a. ACT = recreational ACL*(1-PSE) or ACL*0.5, whichever is greater.

Sub-alternative 3b. ACT =85% recreational ACL.

Sub-alternative 3c. ACT = 75% recreational ACL.

Year	Hogfish PSE East FL-FL Keys
2010	30.5
2011	22.0
2012	24.7
2013	14.7
2014	10.7
Average	**20.5**

Source: NMFS Office of Science and Technology MRIP Domain Catch Totals (2015)

Note: Tables of proposed ACT values for the FLK/EFL stock of hogfish (in numbers of fish) will be generated after the Council has selected a preferred alternatives under Action 5 (rebuilding plan and ABC) & 6 (ACL).

Discussion:

The National Standard 1 guidelines recommend the use of ACTs to prevent ACLs from being exceeded. For species without in-season management control to prevent the ACL from being exceeded, managers may utilize ACTs that are set below ACLs so that catches do not exceed the ACLs. If an ACT is specified as part of the system of accountability measures (AMs) for hogfish, an ACT control rule that accounts for management uncertainty may be utilized for setting the ACT. The objective for establishing an ACT and related AMs is to prevent the ACL from being exceeded. In managing the snapper grouper fishery; however, the South Atlantic Council has chosen not to use ACTs to trigger AMs because it is anticipated that improvements in reporting will significantly reduce management uncertainty.

Since the ACT is typically set lower and would be reached sooner than the ACL for any given species, using an ACT rather than the ACL as a trigger for AMs in the recreational sector may prevent an ACL overage. This more conservative approach, would likely help to ensure that recreational data uncertainties do not cause or contribute to excessive ACL overages for vulnerable species. Using recreational ACTs rather than the ACLs to trigger recreational AMs may not eliminate ACL overages completely; however, using such a strategy for the recreational sector may reduce the need to compensate for very large overages.

The updated framework procedure included in Amendment 17B to the Snapper Grouper FMP (SAFMC 2010b) allows for the timely establishment and adjustment of ACTs (and ACLs) if the South Atlantic Council and NOAA Fisheries determine they are necessary.

The NS1 guidelines recommend a performance standard by which the efficacy of any system of ACLs and AMs can be measured and evaluated. According to the guidelines:

...if catch exceeds the ACL for a given stock or stock complex more than once in the last four years, the system of ACLs and AMs should be re-evaluated, and modified if necessary, to improve its performance and effectiveness (74 FR 3178).

If an evaluation concludes that the ACL is being chronically exceeded for any one species or species group, and post-season AMs are repeatedly needed to correct for ACL overages, adjustments to management measures would be made. As stated previously, the updated framework procedure implemented through Amendment 17B (SAFMC 2010b) could be utilized to modify management measures such as bag limits, trip limits, seasonal closures, and gear prohibitions in a timely manner. Using the regulatory amendment process to implement such changes, if needed, is the most timely method of addressing issues associated with repeated ACL overages through permanent regulations.

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 7

OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 7 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 4. SELECT PREFERRED ALTERNATIVES AND, FOR THE FLK/EFK STOCK OF HOGFISH, INSTRUCT STAFF TO SUBSTITUTE ACT VALUES BASED ON THE NEW PROJECTIONS AS SOON AS THEY BECOME AVAILABLE

OTHERS?

Action 8. ~~Modify~~ Increase the commercial and recreational minimum size limit for ~~hogfish for the commercial and recreational sectors for~~ the GA-NC and the Florida Keys/East Florida (FLK/EFL) stocks of hogfish

Alternative 1 (No Action). Do not increase the commercial and recreational minimum size limit for hogfish. The current minimum size limit for hogfish is 12 inches fork length (FL) for both the commercial and recreational sectors in federal waters of the South Atlantic Region, and state waters of South Carolina, North Carolina, and Florida. There is no minimum size limit for hogfish in state waters of Georgia.

Alternative 2. Increase the commercial and recreational minimum size limit for the GA-NC stock of hogfish in the South Atlantic Region.

Sub-alternative 2a. 13 inches FL
Sub-alternative 2b. 14 inches FL
Sub-alternative 2c. 15 inches FL
Sub-alternative 2d. 16 inches FL
Sub-alternative 2e. 17 inches FL
Sub-alternative 2f. 18 inches FL
Sub-alternative 2g. 19 inches FL
Sub-alternative 2h. 20 inches FL
Sub-alternative 2i. Increase the minimum size limit from 12" to X" in year 1, to Y" in year 2, and to Z" in year 3. Council to specify X, Y, and Z.

Alternative 3. Increase the commercial and recreational minimum size limit for the Florida Keys/East Florida (FLK/EFL) stock of hogfish in the South Atlantic Region.

Sub-alternative 3a. 13 inches FL
Sub-alternative 3b. 14 inches FL
Sub-alternative 3c. 15 inches FL
Sub-alternative 3d. 16 inches FL
Sub-alternative 3e. 17 inches FL
Sub-alternative 3f. 18 inches FL
Sub-alternative 3g. 19 inches FL
Sub-alternative 3h. 20 inches FL
Sub-alternative 3i. Increase the minimum size limit from 12" to X" in year 1, to Y" in year 2, and to Z" in year 3. Council to specify X, Y, and Z.

Discussion

Commercial and recreational hogfish size limit analysis assumed a 10% release mortality rate based on estimates for hook-and-line releases SEDAR 37 (2014). Spearfishing release mortality is estimated to be 100%, but for the purposes of the recreational size limit analysis for hogfish, all landings were treated as hook-and-line. Spearfishing gear is not used on headboats, and MRIP does not collect information on gear used. Although the majority of MRIP landings are likely from spearfishing gear, it is unlikely that all fishermen would spear undersized fish when the size limit is increased. Further, it is unlikely that fishermen who use spear would discard many fish. Hence, the assumption of 10% release mortality for size limit analysis is more

realistic. A similar rationale was applied to the size limit analysis for the commercial sector; the assignment of a 10% release mortality rate to spearfishing records of fish that would be undersized if the size limit were increased accounts for some level of estimation error by spearfishermen but avoids the unrealistic assumption that 100% of undersized fish between the current and increased size limit would be killed. Projected reductions in recreational hogfish harvest under different minimum size limits for the recreational and commercial sectors are shown in **Tables 14** and **15**, respectively.

Hogfish are monandric, protogynous hermaphrodites. Fish mature as females first, and are expected to eventually become male if they live long enough. A single male maintains harems of 5 to 15 females (Colin 1982; Munoz et al. 2010) during extended spawning seasons that last for months. Hogfish are pair spawners (Davis 1976, Colin 1982), and spawning occurs daily during spawning season (McBride and Johnson 2007, Collins and McBride 2008, Munoz et al. 2010). The size (7.8-28.6 inches FL) and age (1-11 years) range at which sexual transition occurs indicates that transition is socially mediated (Collins and McBride 2011).

Life history studies have estimated female size and age at 50% maturity to occur between 6.0 and 7.6 inches fork length (FL) and 0.9 to 1.6 years (McBride et al. 2008, Collins and McBride 2011). Males may occur as small as 7.8 inches FL, but size at 50% male maturity has been estimated as 16.4 inches FL and 7 years in the Florida Keys (McBride et al. 2008; **Figure 2**). Sex change in hogfish can take several months (McBride and Johnson 2007), so removal of the dominant male has the potential to significantly affect harem stability and decrease reproductive potential (Munoz et al. 2010). Size limits above 16 inches FL (**Sub-alternatives e-h**) may provide hogfish the opportunity to form harems and transition to males. McBride et al. (2008) state: "…the size of 50% male maturation, approximately 415 to 425 mm (16.3-16.7 inches) FL, is well above the current minimum size limit. Evidently, to reduce disruption to spawning harems and avoid recruitment overfishing, the minimum size limit should be increased."

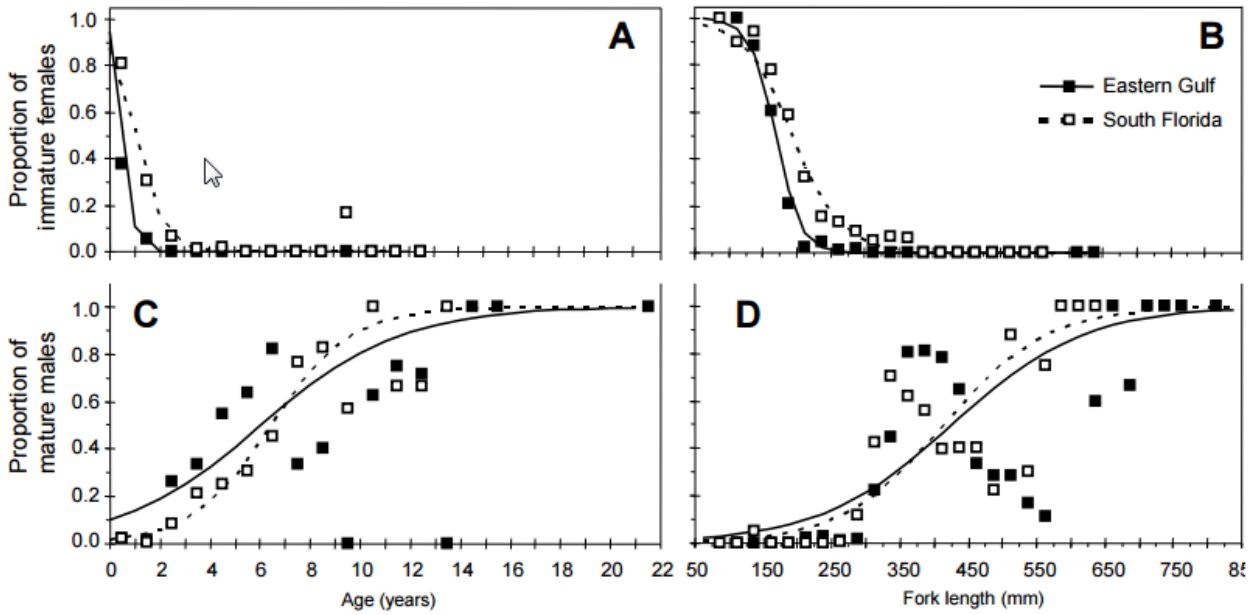


Figure 2 (Fig. 4 in McBride et al. 2008): Maturation of hogfish (*Lachnolaimus maximus*) from the eastern Gulf of Mexico and south Florida for (A) females by age, (B) females by size, (C) males by age, and (D) males by size.

Table 14. Projected reductions in recreational hogfish harvest under different minimum size limits based on the mean of 2012-2014 MRIP data and 2011-2013 Southeast Region Headboat Survey data. Note some months have been pooled to achieve sample sizes >30.

	Wave											
	1	2	3	4	5	6	1	2	3	4	5	6
Size Limit	**% reduction FLK/EFL stock**						**% reduction GA-NC stock**					
12" FL (current)	0	0	0	0	0	0	0	0	0	0	0	0
13	24	30	10	26	24	24	22	22	14	11	22	22
14	52	45	19	45	52	52	39	39	34	35	39	39
15	58	51	62	45	58	58	51	51	43	53	51	51
16	69	64	64	53	69	69	55	55	59	71	55	55
17	79	68	78	65	79	79	66	66	63	78	66	66
18	89	72	90	87	89	89	68	68	65	78	68	68
19	90	76	90	90	90	90	71	71	65	78	71	71
20	90	82	90	90	90	90	79	79	70	85	79	79

Sources: SEFSC Southeast Region Headboat Survey data, MRIP post-stratified data, SEFSC Recreational ACL data.

Table 15. Projected reductions in commercial hogfish harvest under different minimum size limits based on mean of 2012-2014 TIP data. Note some months have been pooled with surrounding months to achieve sample size > 30.

% reduction - FLK/EFL stock												
	Month											
Size Limit	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
12" FL (current)	0	0	0	0	0	0	0	0	0	0	0	0
13	29	46	48	7	2	5	6	19	34	45	30	30
14	58	64	66	12	3	9	12	24	45	68	48	61
15	71	71	73	18	9	15	17	59	61	68	58	76
16	76	77	77	19	9	66	22	61	64	68	66	80
17	81	77	77	21	13	70	36	62	72	90	76	85
18	81	77	77	24	16	71	42	71	80	90	80	85
19	81	77	77	25	17	76	47	71	80	90	90	85
20	81	77	77	25	19	77	48	71	80	90	90	85
% reduction - GA-NC stock												
	Month											
Size Limit	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
12" FL (current)	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	1	0	0	0	0	0	0	0	0	0
16	1	1	1	1	0	1	0	0	0	0	0	0
17	1	3	3	4	3	3	3	1	1	1	1	1
18	3	4	4	5	3	4	3	2	2	1	2	2
19	7	7	9	7	4	6	5	5	2	2	5	6
20	9	12	11	8	5	8	8	7	3	4	7	9
20	81	77	77	25	19	77	48	71	80	90	90	85

Sources: SEFSC TIP data (accessed May 2015).

Figure 3 shows the length composition of recreationally caught hogfish from 1995 to 2012. The solid black line represents the 12-inch (fork length) minimum size limit. The average length in the time series was 14.07 inches.

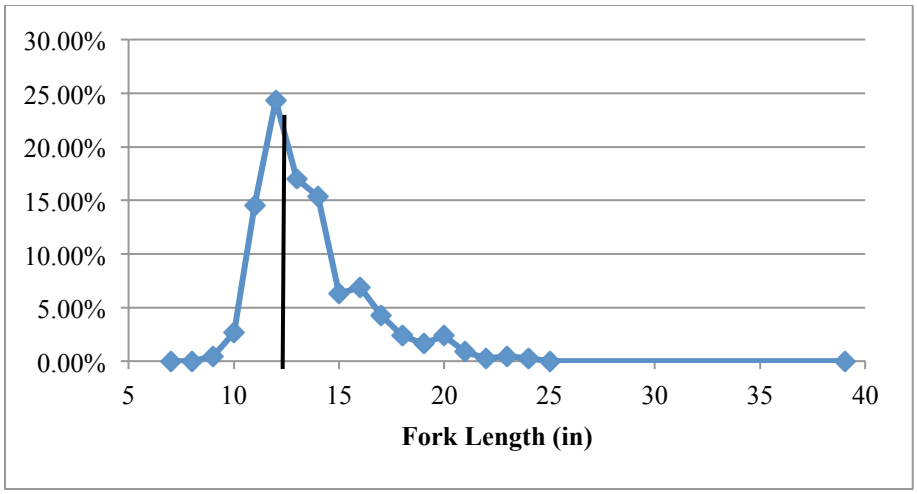
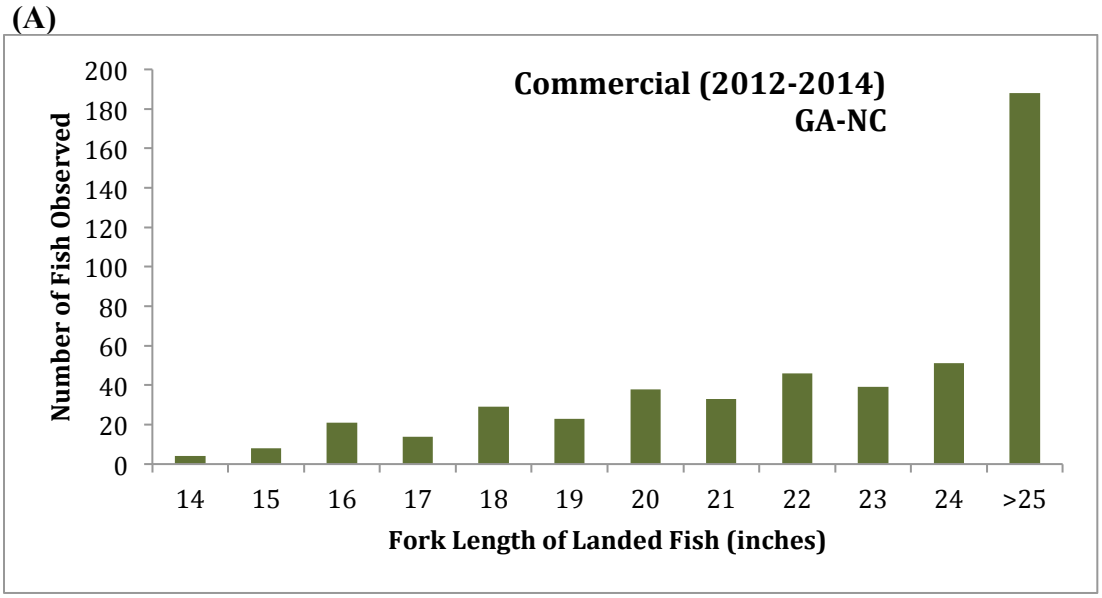


Figure 3. Length composition (inches fork length) of recreationally caught hogfish, 1995-2012. N=682. Source: SEDAR 37 (2014).

Figure 4 shows the size distribution (inches fork length) of commercially-harvested hogfish in the South Atlantic.



(B)

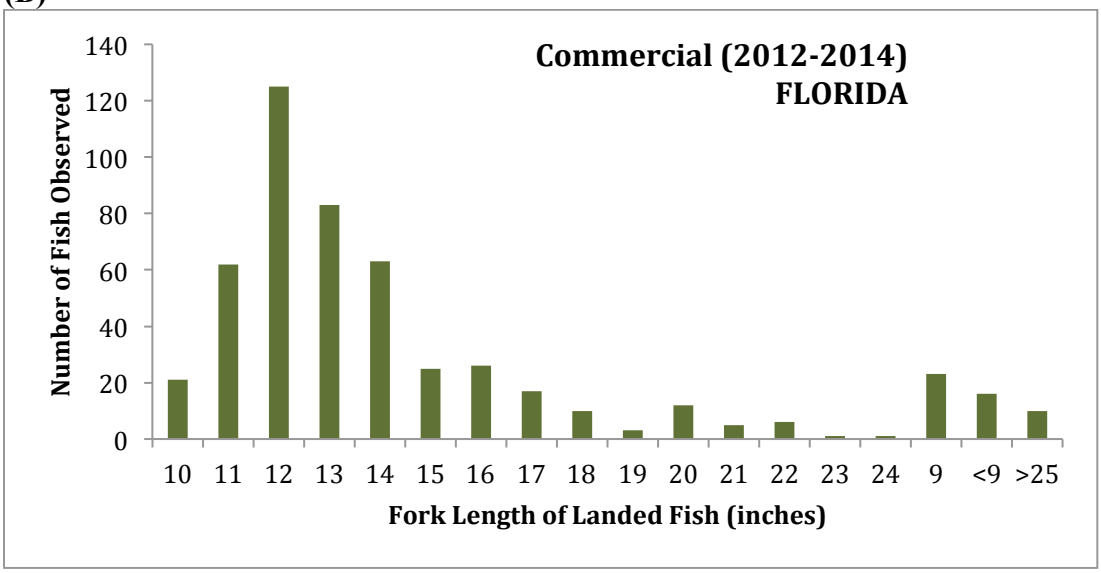
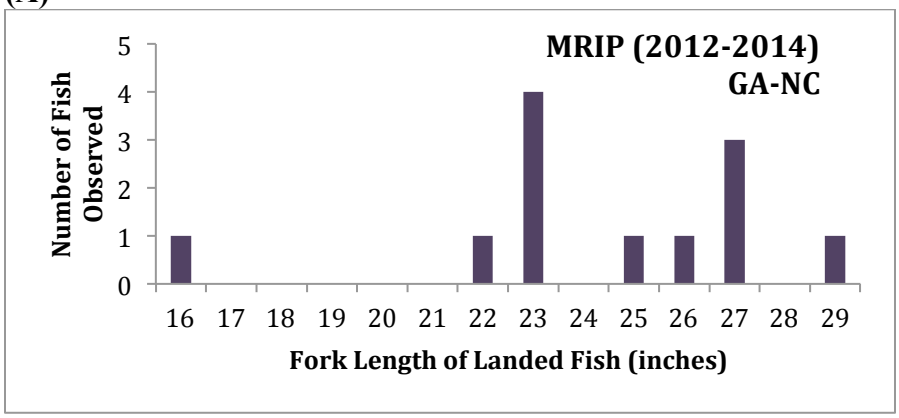


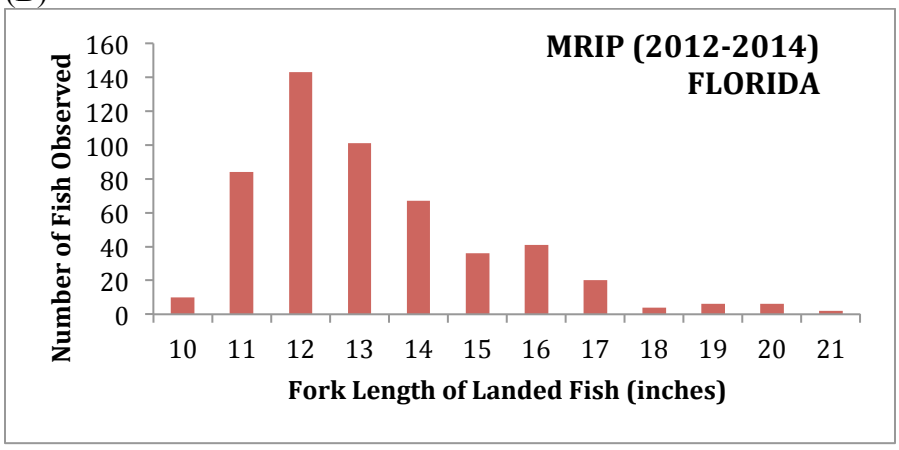
Figure 4. Size distribution in inches fork length (FL) of hogfish landed commercially in two areas: (A) GA-NC and (B) Florida Keys/East Florida, 2012-2014.
Source: NMFS SERO. Commercial TIP data (L. Beerkircher, SEFSC, pers. comm.)

Figure 5 shows the size distribution (inches fork length) of hogfish harvested recreationally in the South Atlantic.

(A)



(B)



(C)

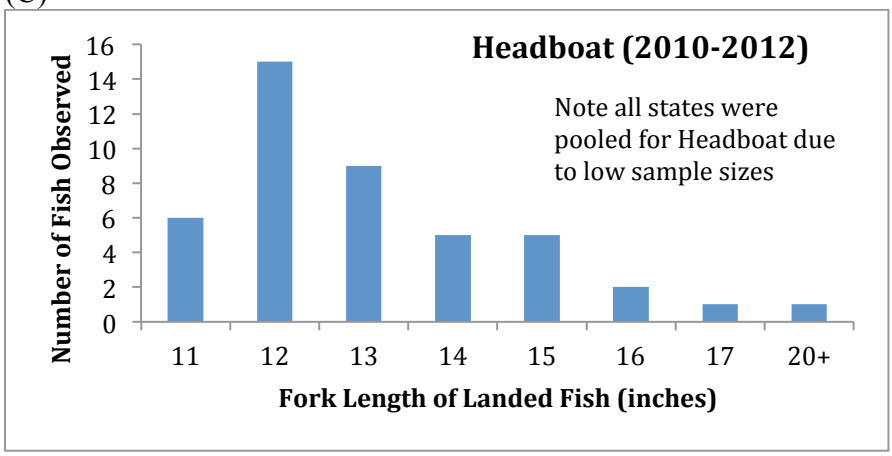


Figure 5. Size distribution in inches fork length (FL) of hogfish landed recreationally in 2012-2014: (A) GA-NC based on Marine Recreational Information Program (MRIP) estimates; (B) Florida Keys/East Florida based on Marine Recreational Information Program (MRIP) estimates, and (C) entire South Atlantic based on Southeast Headboat Survey.
Sources: NMFS SERO. MRIP (NMFS OST, accessed May 2015) and Southeast Headboat Survey (HBS bp72_13 file).

NOTE: The Snapper Grouper Advisory Panel (AP) has made the following recommendations to the Council regarding the hogfish minimum size limit:

- April & November 2012: increase the minimum size limit of hogfish to 14 inches.
- April 2013: increase the minimum size limit of hogfish to 14 inches fork length (FL).
- November 2013: consider modifications to the hogfish minimum size limit – look at 14 to 18 inches.
- April 2015: In Florida, hogfish are being impacted by the annual spawning season closure for shallow water grouper (Jan 1 to Apr 30).

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGEGSTED EDITS TO ACTION 8

OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 8 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 4. SPECIFY SIZES FOR SUB-ALTERNATIVES 2I AND 3I (STEP-UP SIZE LIMIT INCREASE OVER X YEARS)

OPTION 5. SELECT PREFERRED ALTERNATIVES

OTHERS?

Action 9. Establish a commercial trip limit for the GA-NC and the Florida Keys/East Florida (FLK/EFL) stocks of hogfish

Alternative 1 (No Action). Do not establish a commercial trip limit for the GA-NC and Florida Keys/East Florida (FLK/EFL) stocks of hogfish in the South Atlantic Region. Currently there is no commercial trip limit for hogfish in the South Atlantic Region.

Alternative 2. Establish a commercial trip limit for the GA-NC stock of hogfish in the South Atlantic Region.

Sub-alternative 2a. 250 lbs per trip.
Sub-alternative 2b. 500 lbs per trip.
Sub-alternative 2c. 750 lbs per trip.
Sub-alternative 2d. 1,000 lbs per trip.

NOTE: The Acceptable Biological Catch (ABC) for the GA-NC stock = 28,161 lbs ww. Commercial ACL if ACL = ABC = 23,066 lbs ww. The Council should consider removing some of the larger trip limits.

Alternative 3. Establish a commercial trip limit for the Florida Keys/East Florida stock of hogfish in the South Atlantic Region.

Sub-alternative 3a. 25 lbs per trip.
Sub-alternative 3b. 50 lbs per trip.
Sub-alternative 3c. 100 lbs per trip.
Sub-alternative 3d. 150 lbs per trip
Sub-alternative 3e. 200 lbs per trip

NOTE: The Acceptable Biological Catch (ABC) for the Florida Keys/East Florida (FLK/EFL) stock = 81,610 lbs ww for 2016 based on SSC recommendation (**Alternative 4** of **Action 5**). The commercial ACL would be 19,823 lbs ww in 2016 (see **Table 9**). These numbers will be lower based on the new projections incorporating higher landings data.

Discussion:

Commercial logbook data (accessed April 2, 2015) were explored to determine harvest of South Atlantic hogfish per trip and to develop trip limit options. The most recent years of complete data (2012-2014) had 2,008 trips landing hogfish in the South Atlantic. **Figure 6** displays the distribution of hogfish landings per trip.

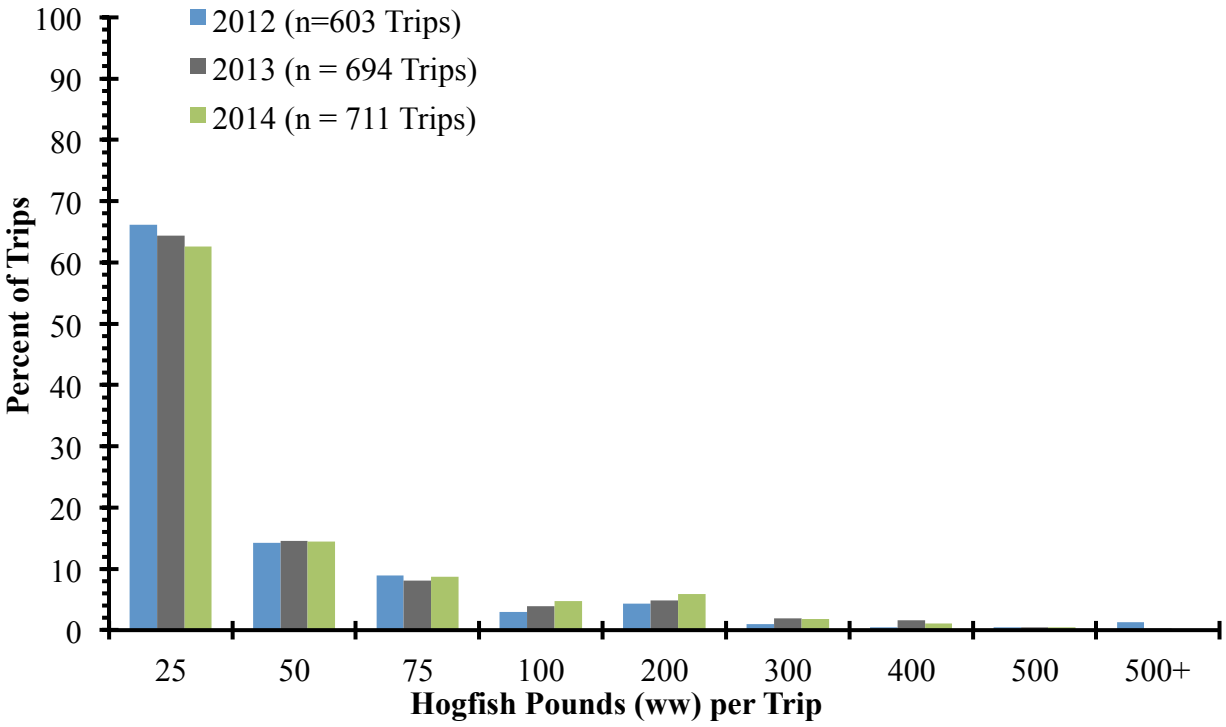


Figure 6. Distribution of the South Atlantic hogfish harvested per trip (lbs ww) by year from the commercial logbook dataset from 2012 to 2014.
Source: NMFS SERO

Hogfish are commercially harvested primarily by spear and hook and line gear. **Figure 7** displays the distribution of hogfish landings per trip by gear type. The majority of the trips that landed hogfish from 2012-2014 used spear (47%, 950 trips) with hook and line gear (42%, 842 trips) the second most frequently used gear for hogfish.

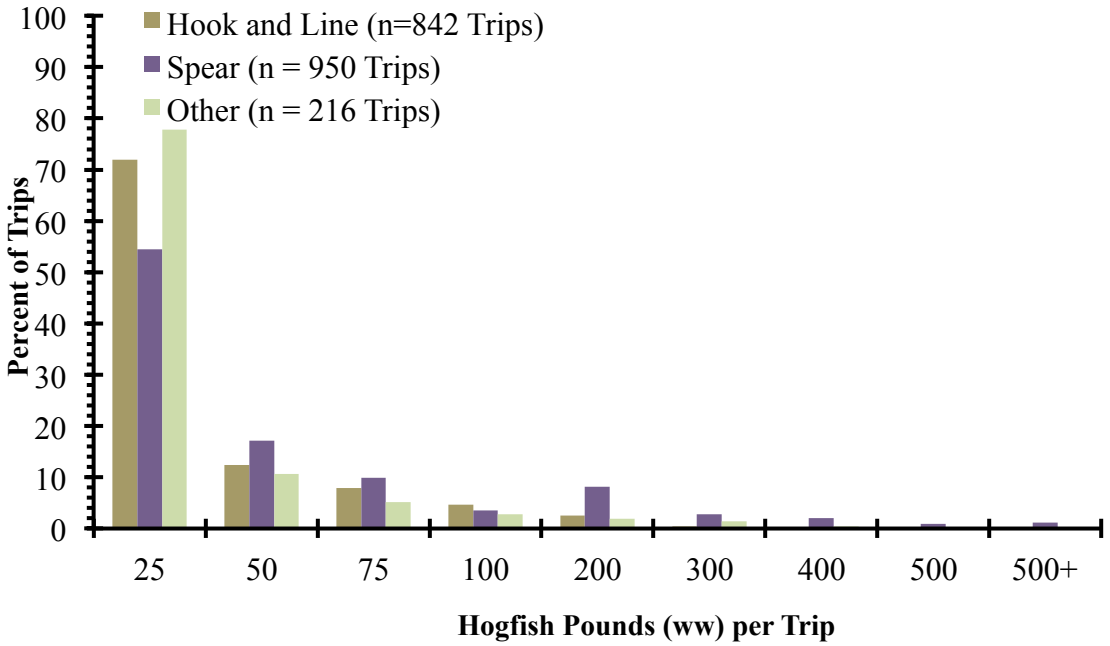


Figure 7. Distribution of the South Atlantic hogfish harvested per trip (lbs ww) by gear from the commercial logbook dataset from 2012 to 2014. The "Other" gear type consist of hogfish landings from gill nets, traps, and if the gear type was not provided.

Amendment 37 proposes applying trip limits to the GA-NC and Florida Keys/East Florida (FLK/EFL) stocks of hogfish. The landings per trip for the stocks in the two different areas are shown in **Figure 8**. The two areas had distributional differences with GA-NC having a higher percentage of trips that landed 50 pounds or more of hogfish.

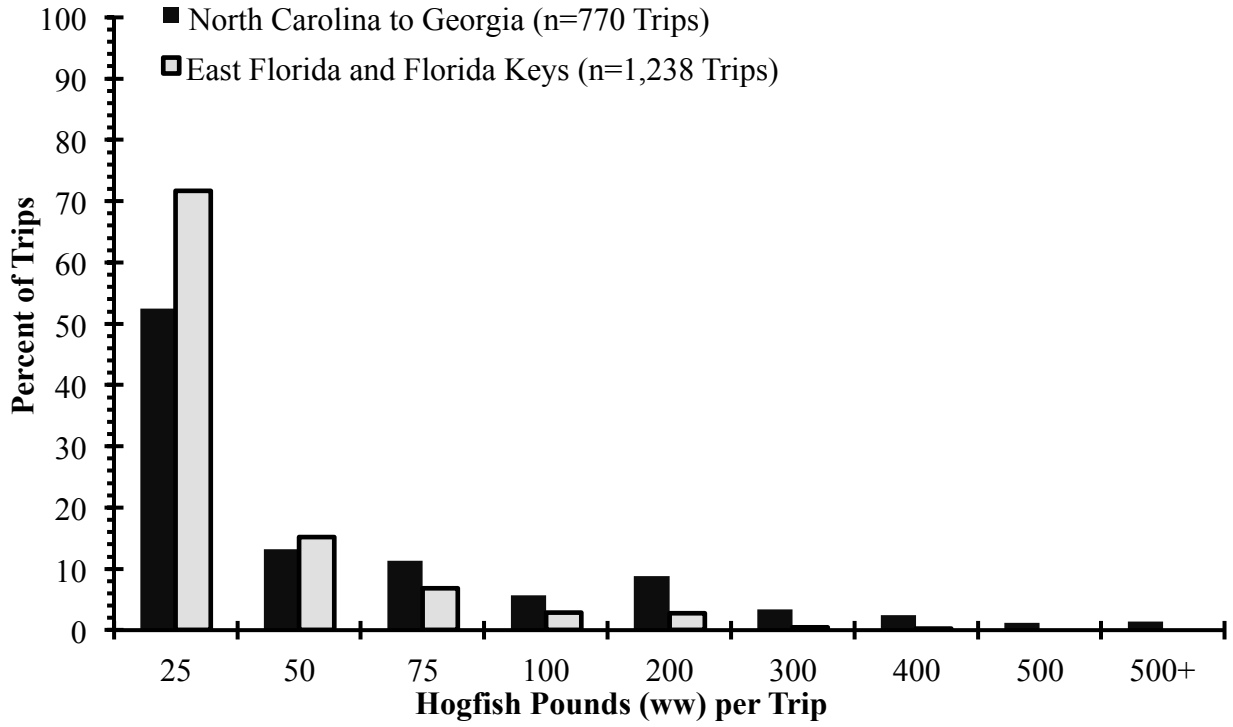


Figure 8. Distribution of the South Atlantic hogfish harvested per trip (lbs ww) by area from the commercial logbook dataset from 2012 to 2014. The areas were defined as Georgia to North Carolina and Florida Keys/East Florida.
Source: NMFS SERO

Percent decrease in landings from imposing trip limits were calculated by isolating the landings that exceeded the trip limit and evaluating these landings relative to the total landings. Action 9 proposes different trip limits for hogfish stocks in the different areas (GA-NC and FLK/EFL). Therefore, the percent decrease in landings was calculated for each area/stock being considered. Additional percent decrease in landings were calculated if the trip limit was only applied to hook and line or spear only. The estimated percent decrease in commercial landings from **Alternative 2** for the GA-NC stock of hogfish are shown in **Table 16**. Estimates for the Florida Keys/East Florida (FLK/EFL) stock are in **Table 17**.

Table 16. Estimated percent decrease in commercial landings under proposed trip limits for the GA-NC stock of hogfish. The percent decrease estimates were calculated hook-and-line only, spear only, and for all gear combined.

Trip Limit (lbs ww)	% decrease (HL)	% decrease Spear	% decrease All Gear
250	0.1	17.0	17.4
500	0.0	5.0	5.0
750	0.0	2.3	2.3
1,000	0.0	1.3	1.3

Source: South Atlantic commercial logbook data from 2012 to 2014.

Table 17. Estimated percent decrease in commercial landings under proposed trip limits for the Florida Keys/East Florida (FLK/EFL) stock of hogfish. The percent decrease estimates were calculated hook-and-line only, spear only, and for all gear combined.

Trip Limit (lbs ww)	% decrease (HL)	% decrease Spear	% decrease All Gear
25	7.7	27.1	42.1
50	4.3	13.1	21.9
100	2.0	3.8	8.1
150	1.4	1.6	4.3
200	0.8	1.1	2.6

Source: South Atlantic commercial logbook data from 2012 to 2014.

This analysis attempted to predict realistic changes to the landings for a range of trip limit options. 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, results be used with caution as a 'best guess' for future dynamics. In addition to the aforementioned sources of uncertainty, the modeled reductions in harvest associated with proposed management measures assume that past performance in the hogfish portion of the snapper grouper fishery is a good predictor of future dynamics. The range of data considered has been constrained to recent years to reduce the unreliability of this assumption.

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 9

OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 9 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 4. SELECT PREFERRED ALTERNATIVES

OTHERS?

Action 10. Modify and/or establish ~~the~~ recreational bag limits for the GA-NC and the Florida Keys/East Florida (FLK/EFL) stocks of hogfish

Alternative 1 (No Action). Do not modify and/or establish recreational bag limits for the GA-NC and Florida Keys/East Florida (FLK/EFL) stocks of hogfish in the South Atlantic Region. Currently the recreational bag limit is 5 fish per person per day off Florida and there is no recreational bag limit off Georgia, South Carolina, and North Carolina.

Alternative 2. ~~Modify the~~ Establish a recreational bag limit for the GA-NC stock of hogfish in the South Atlantic Region.

Sub-alternative 2a. 5 fish per person per day.
Sub-alternative 2b. 4 fish per person per day.
Sub-alternative 2c. 3 fish per person per day.
Sub-alternative 2d. 2 fish per person per day.
Sub-alternative 2e. 1 fish per person per day.
Sub-alternative 2f. 1 fish per vessel per day.

NOTE: The Acceptable Biological Catch (ABC) for the GA-NC stock = 28,161 lbs ww. Recreational ACL if ACL = ABC = 5,094 lbs ww.

Alternative 3. Modify the recreational bag limit for the Florida Keys/East Florida (FLK/EFL) stock of hogfish in the South Atlantic Region.

Sub-alternative 3a. 5 fish per person per day
Sub-alternative 3b. 4 fish per person per day.
Sub-alternative 3c. 3 fish per person per day.
Sub-alternative 3d. 2 fish per person per day.
Sub-alternative 3e. 1 fish per person per day.
Sub-alternative 3f. 1 fish per vessel per day.

NOTE: The Acceptable Biological Catch (ABC) for the Florida Keys/East Florida (FLK/EFL) stock = 81,610 lbs ww for 2016 based on SSC recommendation (**Alternative 4** of **Action 5**). The Recreational ACL would be 61,787 lbs ww in 2016 (based on SSC's recommended ABC; see **Table 9**). These numbers will be lower based on the new projections incorporating higher landings data.

Alternative 4. Establish a season for the GA-NC stock of hogfish in the South Atlantic region.

Sub-alternative 4a. May-June
Sub-alternative 4b. July-August
Sub-alternative 4c. August-September
Sub-alternative 4d. Others?

NOTE: Recreational ACLs for the GA-NC stock of hogfish under consideration range from 459 to 510 fish.

Alternative 5. Establish a season for the Florida Keys/East Florida (FLK/EFL) stock of hogfish in the South Atlantic region.

Sub-alternative 5a. May-June
Sub-alternative 5b. July-August
Sub-alternative 5c. Others?

Note: Recreational ACLs for the FLK/EFL stock of hogfish range from 28,872 to 25,985 fish (based on SSC's recommended ABC; see **Table 9**). These numbers will be lower based on the new projections incorporating higher landings data.

Discussion

MRIP catch and effort data from 2012 to 2014 were explored to determine trips that harvested hogfish in the South Atlantic. This resulted in 555 trips (194 MRIP and 361 Headboat trips) from North Carolina through Monroe County, Florida that harvested hogfish. The distribution of hogfish harvested per angler is shown in **Figure 9**. The distribution of hogfish harvested per vessel is shown in **Figure 10**.

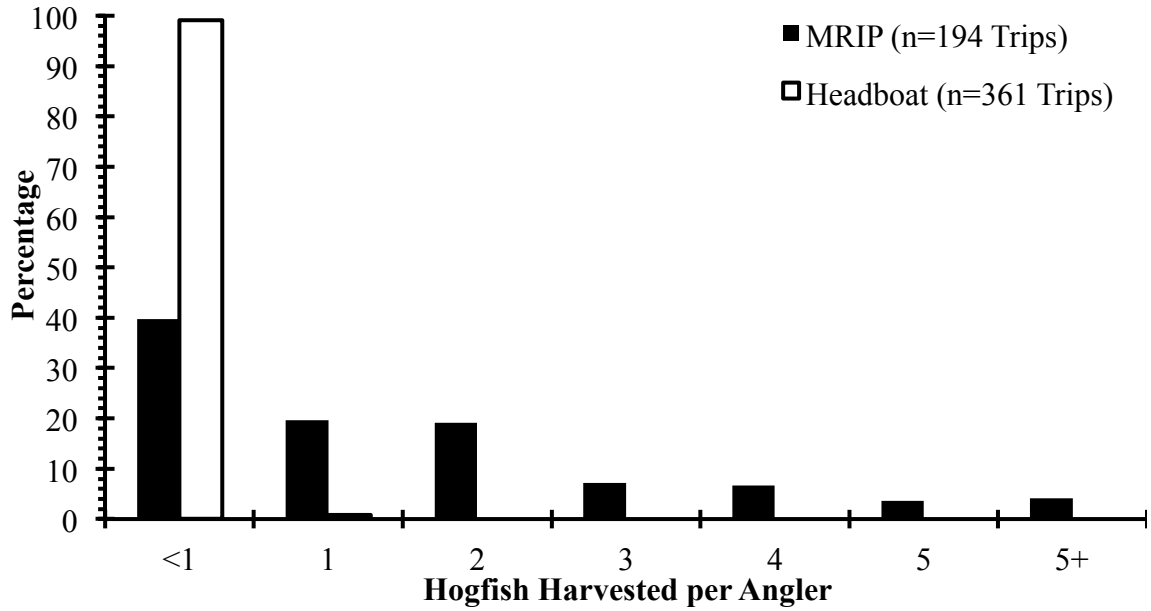


Figure 9. Distribution of South Atlantic hogfish harvested per angler from the two recreational datasets (MRIP and Headboat) from 2012 to 2014.
Source: NMFS SERO

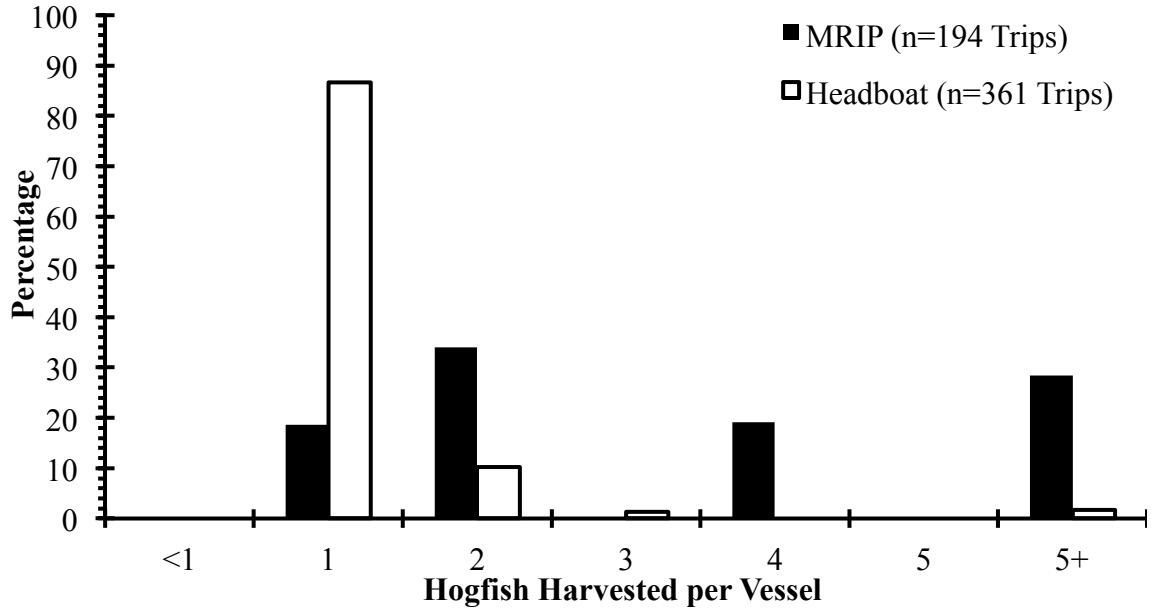


Figure 10. Distribution of South Atlantic hogfish harvested per vessel from the two recreational datasets (MRIP and Headboat) from 2012 to 2014.

Action 10 includes alternatives that would specify a bag limit for the GA-NC and Dlorida Keys/East Florida (FLK/EFL) hogfish stocks. The analysis calculates the reduction in landings from the proposed bag limits in **Alternatives 2** and **3**. A discard mortality of 10% (Following SEDAR 37 2014) was applied to the bag limit analysis. The majority of the MRIP trips from 2012-2014 harvested hogfish while spearfishing (56%, n=109 trips). Discard mortality for spearfishing trips was assumed to be zero because spearfishing is very selective and any reduction in bag limit would result in the spearing fewer fish. For example, if the bag limit is reduced from five to three fish then spear fishermen would focus their efforts to only spear three fish, and it is assumed the spearfisher would not spear five fish and then release two in the water.

The calculated percent decrease in landings by mode is shown in **Table 18**. There were no calculated reductions in landings for headboat because there were no trips in 2012 to 2014 that harvested more than one hogfish per person. The calculated percent decrease in landings for one hogfish per vessel was higher than the calculated percent decrease in landings from the range of bag limits per angler because no matter how many anglers on the boat, the proposed bag limit of one hogfish per vessel would only allow a single hogfish to be harvested on a trip. This leads to a very high calculated percent decrease for the MRIP data since most of these trips harvested more than one hogfish (**Figure 10**). The percent decrease in landings from North Carolina to Georgia was very small because only 5% (n=9 trips) of the MRIP trips occurred from North Carolina to Georgia from 2012 to 2014.

Table 18. Calculated percent decrease in South Atlantic recreational landings from decreasing the bag limit. Percent decrease in landings were calculated by mode, and applied the bag limit reduction to 3 areas: 1) All of South Atlantic region; 2) only North Carolina to Georgia; and 3) only east Florida and the Florida Keys. Data from 2012 through 2014.

Bag Limit	MRIP		Headboat
	Charter	Private	
% decrease for South Atlantic			
5	0.0	0.0	0.0
4	0.0	4.9	0.0
3	3.1	12.9	0.0
2	7.8	25.4	0.0
1	20.3	49.3	0.0
1/vessel	93.3	99.1	39.5
% decrease for GA-NC			
5	0.0	0.0	0.0
4	0.0	0.0	0.0
3	0.0	0.0	0.0
2	0.0	0.0	0.0
1	0.0	0.4	0.0
1/vessel	33.3	75.0	56.5
% decrease for FLK/EFL			
5	0.0	0.0	0.0
4	0.0	4.9	0.0
3	3.1	12.9	0.0
2	7.8	25.4	0.0
1	20.3	48.9	0.0
1/vessel	99.2	99.7	25.0

Source: NMFS SERO

This bag limit analysis attempted to predict realistic changes to hogfish recreational landings by decreasing the bag limit. 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 analysis 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 predicted decrease in landings associated with bag limit options assume past performance in the hogfish portion of the snapper grouper fishery is a good predictor of future dynamics. The analysis constrained the range of data considered to recent years to reduce the unreliability of this assumption.

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 10

OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 10 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 4. SELECT PREFERRED ALTERNATIVES

OTHER?

Action 11. Establish commercial and recreational accountability measures (AMs) for the GA-NC and the Florida Keys/East Florida (FLK/EFL) stocks of hogfish

Alternative 1 (No Action). ~~Retain the current commercial and recreational AMs, if applicable, for hogfish as revised through Amendment 34 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic region.~~ Do not establish AMs for the GA-NC and Florida Keys/East Florida (FLK/EFL) stocks of hogfish. Current commercial and recreational AMs apply to ~~the entire stock of~~ hogfish ~~in~~ throughout the South Atlantic Council's area of jurisdiction.

ALTERNATIVES BELOW MODELED AFTER AMENDMENT 34; PREFERRED ALTERNATIVES FROM AMENDMENT 34 ARE SHOWN BELOW:

Preferred Alternative 2. If commercial landings of the GA-NC or Florida Keys/East Florida (FLK/EFL) stocks of hogfish, as estimated by the Science and Research Director, reach or are projected to reach their respective commercial annual catch limit (ACL), the Regional Administrator shall publish a notice to close the commercial sector of the respective stock for the remainder of the fishing year. On and after the effective date of such a notification, all sale or purchase is prohibited and harvest or possession of hogfish in or from the South Atlantic exclusive economic zone (EEZ) for the respective stock is limited to the bag and possession limit. This bag and possession limit applies in the South Atlantic on board a vessel for which a valid Federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, without regard to where hogfish were harvested, i.e., in state or federal waters.

Sub-alternative 2a. If the commercial annual catch limit (ACL) of either hogfish stock is exceeded, the Regional Administrator shall publish a notice to reduce the commercial ACL for the respective stock in the following fishing year by the amount of the commercial overage, only if hogfish is overfished.

Sub-alternative 2b. If the commercial annual catch limit (ACL) of either hogfish stock is exceeded, the Regional Administrator shall publish a notice to reduce the commercial ACL for the respective stock in the following fishing year by the amount of the commercial overage, only if the total ACL (commercial ACL and recreational ACL) for the respective stock is exceeded.

Preferred Sub-alternative 2c. If the commercial annual catch limit (ACL) of either hogfish stock is exceeded, the Regional Administrator shall publish a notice to reduce the commercial ACL for the respective stock in the following fishing year by the amount of the commercial overage, only if hogfish is overfished **and** the total ACL (commercial ACL and recreational ACL) for the respective stock is exceeded.

Preferred Alternative 3. If recreational landings of the GA-NC or Florida Keys/East Florida (FLK/EFL) stocks of hogfish, as estimated by the Science and Research Director, exceed the recreational ACL of the respective stock, then during the following fishing year, recreational landings will be monitored for a persistence in increased landings.

Sub-alternative 3a. If necessary, the Regional Administrator shall publish a notice to reduce the length of fishing season and the recreational annual catch limit (ACL) of the respective stock in the following fishing year by the amount of the recreational overage,

only if hogfish is overfished. The length of the recreational season and recreational ACL of the respective stock will not be reduced if the Regional Administrator determines, using the best scientific information available, that a reduction is unnecessary.

Sub-alternative 3b. If necessary, the Regional Administrator shall publish a notice to reduce the length of fishing season and the recreational annual catch limit (ACL) of the respective stock in the following fishing year by the amount of the recreational overage, only if the total ACL (commercial ACL and recreational ACL) of the respective stock is exceeded. The length of the recreational season and recreational ACL of the respective stock will not be reduced if the Regional Administrator determines, using the best scientific information available, that a reduction is unnecessary.

Preferred Sub-alternative 3c. If necessary, the Regional Administrator shall publish a notice to reduce the length of fishing season and the recreational annual catch limit (ACL) of the respective stock in the following fishing year by the amount of the recreational overage, only hogfish is overfished **and** the total ACL (commercial ACL and recreational ACL) of the respective stock is exceeded. The length of the recreational season and recreational ACL of the respective stock will not be reduced if the Regional Administrator determines, using the best scientific information available, that a reduction is unnecessary.

Preferred Alternative 4. If recreational landings of the GA-NC or Florida Keys/East Florida (FLK/EFL) stocks of hogfish reach or are projected to reach their respective recreational annual catch limit (ACL), National Marine Fisheries Service will file a notification with the Office of the Federal Register to close the recreational sector of the respective stock for the remainder of the fishing year, unless, using the best scientific information available, the Regional Administrator determines that a closure is unnecessary.

Sub-alternative 4a. If hogfish is overfished.

Preferred Sub-alternative 4b. Regardless of the overfished status.

IPT SUGGESTED FORMAT (MODELED AFTER JOINT SOUTH FLORIDA AMENDMENT):

Preferred Alternative 2. If commercial landings reach or are projected to reach the commercial annual catch limit (ACL), NMFS would close the commercial sector for the remainder of the fishing year. On and after the effective date of such a notification, all sale or purchase is prohibited and harvest or possession of hogfish in or from the EEZ would be limited to the recreational bag and possession limit. Additionally, if the commercial ACL is exceeded, NMFS would reduce the commercial ACL in the following fishing year by the amount of the commercial overage, only if hogfish is overfished **and** the total ACL (commercial ACL and recreational ACL) of the respective stock is exceeded.

Preferred Sub-alternative 2a: For the GA-NC stock of hogfish.

Preferred Sub-alternative 2b: For the Florida Keys/East Florida (FLK/EFL) stock of hogfish.

Preferred Alternative 3. If recreational landings reach or are projected to reach the recreational ACL, NMFS would close the recreational sector for the remainder of the fishing year, unless, using the best scientific information available, NMFS determines that a closure is unnecessary.

Sub-alternative 3a: For the GA-NC stock of hogfish if the stock is overfished.

Preferred Sub-alternative 3b: For the GA-NC stock of hogfish regardless of stock status.
Sub-alternative 3a: For the Florida Keys/East Florida (FLK/EFL) stock of hogfish if the stock is overfished.
Preferred Sub-alternative 3d: For the Florida Keys/East Florida (FLK/EFL) stock of hogfish regardless of stock status.

Preferred Alternative 4: If recreational landings exceed the recreational annual catch limit (ACL), then during the following fishing year, recreational landings will be monitored for a persistence in increased landings. If necessary, NMFS would reduce the length of fishing season and the recreational ACL in the following fishing year by the amount of the recreational overage, only if the species is overfished **and** the total ACL (commercial ACL and recreational ACL) of the respective stock is exceeded. The length of the recreational season and recreational ACL will not be reduced if NMFS determines, using the best scientific information available, that a reduction is unnecessary.
Preferred Sub-alternative 4a. For the GA-NC stock of hogfish.
Preferred Sub-alternative 4b. For the Florida Keys/East Florida (FLK/EFL) stock of hogfish.

Discussion:

The proposed action would contribute to creating a consistent regulatory environment in the South Atlantic. The Generic AM and Dolphin Allocations Amendment (Amendment 34 to the Snapper Grouper FMP), currently pending approval by the Secretary of Commerce, would make AMs for hogfish consistent with those for other snapper grouper species. However, since this amendment proposes two hogfish stocks, AMs need to be specified for each stock. Current AMs for hogfish throughout the South Atlantic region are below. The South Atlantic Council's preferred alternatives from the Generic AM and Dolphin Allocations Amendment are shown above.

Commercial: If commercial landings, as estimated by the Science and Research Director, reach or are projected to reach the commercial ACL, the Assistant Administrator will file a notification with the Office of the Federal Register to close the commercial sector for the remainder of the fishing year. On and after the effective date of such a notification, all sale or purchase is prohibited and harvest or possession of this species in or from the South Atlantic EEZ is limited to the bag and possession limit. This bag and possession limit applies in the South Atlantic on board a vessel for which a valid Federal commercial or charter vessel/headboat permit for South Atlantic snapper grouper has been issued, without regard to where such species were harvested, i.e., in state or Federal waters. If commercial landings exceed the ACL, and the species is overfished, based on the most recent Status of U.S. Fisheries Report to Congress, the Assistant Administrator will file a notification with the Office of the Federal Register, at or near the beginning of the following fishing year to reduce the ACL for that following year by the amount of the overage in the prior fishing year.

Recreational: If recreational landings, as estimated by the Science and Research Director, exceed the recreational ACL, then during the following fishing year, recreational landings will be

monitored for a persistence in increased landings and, if necessary, the Assistant Administrator will file a notification with the Office of the Federal Register, to reduce the length of the following recreational fishing season by the amount necessary to ensure recreational landings do not exceed the recreational ACL in the following fishing year. However, the length of the recreational season will also not be reduced during the following fishing year if the Regional Administrator determines, using the best scientific information available, that a reduction in the length of the following fishing season is unnecessary.

COMMITTEE ACTION:

OPTION 1. ACCEPT THE IPT'S SUGEGSTED EDITS TO ACTION 11

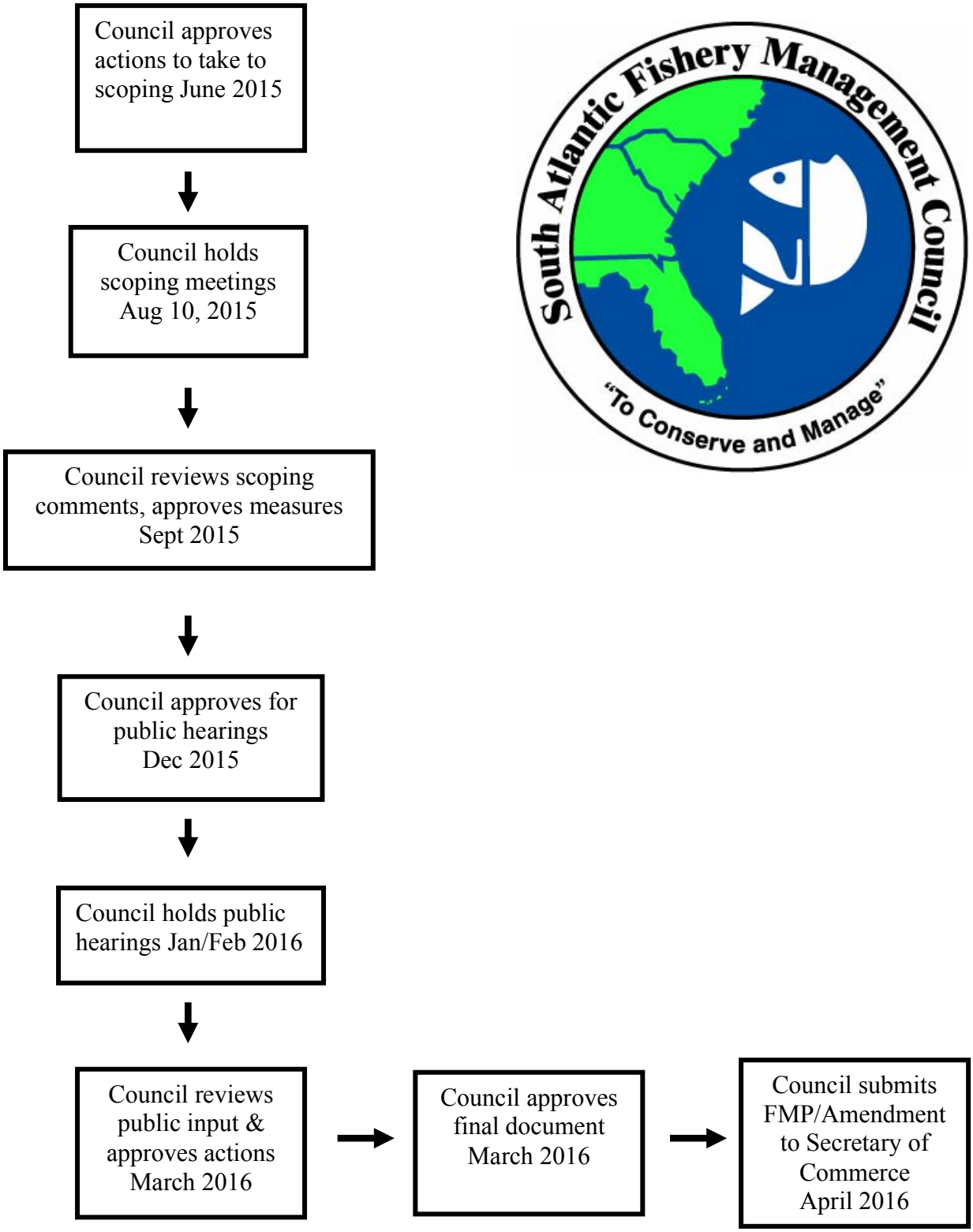
OPTION 2. DO NOT ACCEPT THE IPT'S SUGGESTED EDITS TO ACTION 11 (COMMITTEE TO SUGGEST CHANGES AND APPROVE)

OPTION 3. CONSIDER THE RANGE OF ALTERNATIVES, MODIFY AS NEEDED, AND APPROVE

OPTION 4. SELECT PREFERRED ALTERNATIVES

OTHERS?

Timing for Amendment 37



COMMITTEE ACTION:

OPTION 1. APPROVE TIMING FOR DEVELOPMENT OF AMENDMENT 37

OPTION 2. DO NOT APPROVE TIMING FOR DEVELOPMETN OF AMENDMENT 37 (COMMITTEE TO MODIFY AND APPROVE)

OTHERS?

References

Colin, P. L. 1982. Spawning and larval development of the hogfish, *Lachnolaimus maximus* (Pisces: Labridae). Fishery Bulletin, U. S. 80 (4): 853-862.

Collins A, R McBride. 2008. Final report for integrating life history, mating system, fishing effects, and habitat of hogfish, *Lachnolaimus maximus*, a harem spawning fish in the southeast U.S. FWRI File Code F2541-05-07-F.

Collins, A.B. & McBride, R.S. 2011. Demographics by depth: Spatially explicit life-history dynamics of a protogynous reef fish. Fishery Bulletin, U. S., 109, 232–242.

Davis, J. C. 1976. Biology of the hogfish, *Lachnolaimus maximus* (Walbaum), in the Florida Keys. M. S. Thesis. University of Miami. Coral Gables, FL. pp: 86.

McBride, R. S., P. E. Thurman, and L. H. Bullock. 2008. Regional variations of hogfish (*Lachnolaimus maximus*) life history: Consequences for spawning biomass and egg production models. J. Northw. Atl. Fish. Sci. 41:1–12.

McBride, R.S. and Johnson, M. R. 2007. Sexual development and reproductive seasonality of hogfish (Labridae: *Lachnolaimus maximus*), an hermaphroditic reef fish. Journal of Fish Biology 71:1270-1292.

Muñoz, R. C., M. L. Burton, K. J. Brennan, and R. O. Parker. 2010. Reproduction, habitat utilization, and movements of hogfish (*Lachnolaimus maximus*) in the Florida Keys, U.S.A.: comparisons from fished versus unfished habitats. Bull. Mar. Sci. 86:93–116.

APPENDIX A

Projections of the South Florida/Florida Keys Hogfish Stock under Various Rebuilding Scenarios

A report to the SAFMC SSC

April 2015

Dustin Addis and Mike Murphy
Florida Fish and Wildlife Research Institute
100 8th Ave. S.E., Saint Petersburg, FL 33701
(727) 502-4935
Dustin.Addis@myfwc.com

Introduction

Projections of Hogfish biomass were approved by the SAFMC at its March 2015 meeting to develop alternatives for rebuilding the Florida Keys including the Dry Tortugas and Eastern Florida (FLK/EFL) hogfish stock. Preliminary projections indicated the stock can be rebuilt within 10 years under an F=0 scenario, so the maximum rebuilding time for projections is 10 years.

Methods

Interim Landings

The last year of data in the Hogfish assessment report (SEDAR 37, 2014) was 2012 and changes in regulations will impact 2016 landings for the FLK/EFL stock. Therefore, recent catch data were generated for commercial (2013, 2014, and the 2013-2014 average for 2015) and recreational fleets (2013, a 2012-2013 average for 2014, and a 2013-2014 average for 2015). The construction of landings and discard data follow methods within SEDAR 37 unless otherwise specified. Recent commercial catch data were based on landings from the FWC-FWRI Marine Fisheries Information System (Trip ticket) and discard logbook program discards (2013, a 2012-2013 average for 2014, and a 2013-2014 average for 2015). Recent recreational catch data were based on landings and discards from the Marine Recreational Information Program (MRIP) and Southeast Region Headboat Survey (SRHS) (2013, a 2012-2013 average for 2014, and a 2013-2014 average for 2015). In order to generate these landings within the assessment model, the level of fishing mortality rate (F) needed to project the annual total dead biomass (landings and dead discards) for 2013-2015 was estimated and used for all considered projection scenarios.

Projections

Projections for various F scenarios were completed using Stock Synthesis (SS3) base model configurations for the FLK/EFL hogfish stock (SEDAR 37, 2014):

- F=0: no directed fishing scenario (constant discard mortality)
- $F=F_{Current}$: total fishing rate was held constant during 2016-2026 at the geometric mean rate for 2010-2012

- Constant F at F=75% F_{MSY}: a constant fishing mortality rate at 75% of F_{MSY}
- Constant F at F=F_{MSY}: a constant fishing mortality rate at MSY
- Constant F that rebuilds to the spawning stock biomass at MSY level in 10 years and F's associated with 72.5% probability of rebuilding in 10 years
- Constant F that rebuilds to the spawning stock biomass at MSY level in 7 years and F's associated with 72.5% probability of rebuilding in 7 years

Projection results are based on year 1 = 2016 and extending through 2026, or to the point of stock rebuilding if a scenario did not result in rebuilding within 10 years.

Within SS3 forecasting, projections were run assuming that biology, recruitment, selectivity, and relative apical F's among fleets are the same as the last three years of the assessment (2010-2012). The predicted fleet (commercial: spear, hook-and-line, trap; recreational spear and hook-and-line) catch allocations reflected the average distribution of apical F's among fleets during 2010-2012. These allocations were also applied to 2013-2015 interim catch totals. Forecast catches within the projections were total dead fish (biomass or numbers) because hogfish discards were included in the landings in the assessment model. The predicted discarded portions of the forecasted total dead catches were estimated using observed landings and discards during 2010-2012. The base model estimates of 2010-2012 fleet-specific exploitation rates were partitioned into landed and discarded components by dividing observed discards by the total biomass or numbers to estimate fleet-specific discard exploitation rates. These discard rates were subtracted from the corresponding fleet-specific total exploitation rates estimated within all projections and applied to the stock biomass or abundance to calculate discards. Retained catch was then calculated by subtracting these predicted discards from the total dead biomass or numbers.

All projection analyses involved iterative searches used to solve for annual scalars applied to fleet-specific exploitations to match the target exploitation rate for each projection scenario. Similar iterative searches were run for rebuild projections but the F was found by matching to the target spawning biomass at MSY. These scalars changed through time to keep the overall force of fishing constant despite the changing age structure of the stock encountered by fisheries with different selectivity patterns.

Results

The total interim landings (2013-2015) including dead discards by fishery, year, and fishing gear are presented in thousands of pounds and numbers in Table 1. Projection results under scenarios: F_0, $F_{Current}$, 75% F_{MSY}, and F_{MSY} for 2016-2026 are presented in Tables 2,3,4, and 5, respectively in terms of fishing mortality rate applied, spawning stock biomass, annual stock biomass, and yield expressed in pounds (thousands) and numbers (thousands) for landings and discards. Projection results under rebuilding scenarios for constant F projections that rebuild in 10 years are presented for Prebuild=50% (Table 6) and Prebuild=72.5% (Table 7). Projection results under Prebuild scenarios for constant F projections that rebuild in 7 years are presented for Prebuild=50% (Table 8) and Prebuild=72.5% (Table 9).

References

SEDAR 37. 2014. The 2013 Stock Assessment Report for Hogfish in the South Atlantic and Gulf of Mexico. SEDAR, North Charleston, SC. 295 p.

Tables

Table 1. FLK/EFL Hogfish combined landings and dead discards for commercial and recreational fisheries by gear for 2013-2015.

Pounds in 1000's

Year	Commercial Spear	Commercial Hook/Line	Commercial Traps	Recreational Spear	Recreational Hook/Line	Total
2013	9.133	9.357	2.876	103.519	24.261	149.158
2014	17.064	18.042	5.590	192.288	44.278	277.264
2015	12.926	13.454	4.104	141.746	33.503	205.732

Numbers in 1000's

Year	Commercial Spear	Commercial Hook/Line	Commercial Traps	Recreational Spear	Recreational Hook/Line	Total
2013	3.339	2.943	0.808	40.549	11.484	59.123
2014	5.855	5.337	1.477	71.924	20.596	105.190
2015	4.658	4.165	1.109	55.873	16.652	82.456

Table 2. Projection results from the FLK/EFL stock for the F_0 rebuilding scenario. Pounds and numbers are in thousands. The calculated SSB_{MSY} = 2300.39

Year	F	SSB (pounds)	Annual Stock Biomass (pounds)	Yield (pounds)	Yield (numbers)	Discards (pounds)	Discards (numbers)
2016	0.001	806.96	928.37	0	0	0.93	0.39
2017	0.001	1054.40	1198.03	0	0	1.20	0.48
2018	0.001	1343.87	1508.43	0	0	1.51	0.58
2019	0.001	1671.36	1855.59	0	0	1.86	0.68
2020	0.001	2032.80	2234.93	0	0	2.24	0.78
2021	0.001	2423.16	2641.00	0	0	2.65	0.89
2022	0.001	2836.29	3067.75	0	0	3.08	0.99
2023	0.001	3265.90	3509.14	0	0	3.52	1.09
2024	0.001	3705.83	3959.19	0	0	3.97	1.19
2025	0.001	4150.59	4412.48	0	0	4.43	1.28
2026	0.001	4594.69	4863.63	0	0	4.88	1.36

Table 3. Projection results from the FLK/EFL stock for the $F_{Current}$ rebuilding scenario, where $F_{Current}$ is the geometric mean of the terminal three years (2010-2012). Pounds and numbers are in thousands. The calculated SSB_{MSY} = 2300.39

Year	F	SSB (pounds)	Annual Stock Biomass (pounds)	Yield (pounds)	Yield (numbers)	Discards (pounds)	Discards (numbers)
2016	0.220	806.96	928.37	203.59	85.08	0.93	0.39
2017	0.220	864.69	993.13	217.80	90.35	1.00	0.44
2018	0.220	921.64	1055.61	231.50	94.77	1.06	0.47
2019	0.220	974.37	1113.01	244.09	98.90	1.12	0.51
2020	0.220	1022.31	1164.91	255.47	102.74	1.17	0.54
2021	0.220	1065.37	1211.28	265.64	106.22	1.22	0.58
2022	0.220	1103.55	1252.23	274.62	109.31	1.26	0.61
2023	0.220	1136.97	1287.96	282.45	112.02	1.29	0.64
2024	0.220	1165.96	1318.88	289.24	114.37	1.32	0.66
2025	0.220	1190.93	1345.45	295.06	116.40	1.35	0.69
2026	0.220	1212.15	1367.97	300.00	118.13	1.37	0.71

Table 4. Projection results from the FLK/EFL stock for the 75% F_{MSY} rebuilding scenario. Pounds and numbers are in thousands. The calculated SSB_{MSY} = 2300.39

Year	F	SSB (pounds)	Annual Stock Biomass (pounds)	Yield (pounds)	Yield (numbers)	Discards (pounds)	Discards (numbers)
2016	0.104	806.96	928.37	95.38	39.71	0.93	0.39
2017	0.104	965.14	1101.65	113.18	45.90	1.11	0.46
2018	0.104	1133.82	1283.52	131.87	51.66	1.29	0.53
2019	0.104	1306.58	1468.17	150.84	57.52	1.47	0.59
2020	0.104	1479.65	1651.76	169.70	63.43	1.66	0.66
2021	0.104	1649.81	1830.97	188.11	69.19	1.84	0.72
2022	0.104	1813.95	2002.78	205.76	74.66	2.01	0.79
2023	0.104	1969.51	2164.80	222.41	79.75	2.17	0.84
2024	0.104	2114.57	2315.27	237.87	84.43	2.32	0.90
2025	0.104	2247.96	2453.08	252.03	88.67	2.46	0.94
2026	0.104	2368.78	2577.44	264.80	92.47	2.59	0.99

Table 5. Projection results from the FLK/EFL stock for the F_{MSY} rebuilding scenario. Pounds and numbers are in thousands. The calculated SSB_{MSY} = 2300.39

Year	F	SSB (pounds)	Annual Stock Biomass (pounds)	Yield (pounds)	Yield (numbers)	Discards (pounds)	Discards (numbers)
2016	0.138	806.96	928.37	127.49	53.14	0.93	0.39
2017	0.138	935.24	1069.36	146.85	59.93	1.07	0.45
2018	0.138	1067.98	1212.89	166.56	66.06	1.22	0.51
2019	0.138	1199.45	1353.95	185.93	72.14	1.36	0.57
2020	0.138	1327.04	1489.94	204.61	78.13	1.50	0.62
2021	0.138	1448.81	1618.89	222.31	83.83	1.62	0.68
2022	0.138	1563.00	1739.13	238.83	89.13	1.75	0.73
2023	0.138	1668.30	1849.51	253.99	93.95	1.86	0.78
2024	0.138	1763.94	1949.39	267.70	98.28	1.96	0.82
2025	0.138	1849.70	2038.61	279.93	102.12	2.05	0.86
2026	0.138	1925.46	2117.17	290.72	105.50	2.12	0.89

Table 6. Projection results from the FLK/EFL stock for the Rebuild 10 scenario, referring to a constant fishing rate that will rebuild the stock in 10 years associated with a probability of rebuilding (Prebuild) of 50%. Pounds and numbers are in thousands. The calculated SSB_{MSY} = 2300.39

Year	F	SSB (pounds)	Annual Stock Biomass (pounds)	Yield (pounds)	Yield (numbers)	Discards (pounds)	Discards (numbers)
2016	0.100	806.96	928.37	91.66	38.16	0.93	0.39
2017	0.100	968.62	1105.40	109.13	44.23	1.11	0.46
2018	0.100	1141.61	1291.87	127.54	49.90	1.30	0.53
2019	0.100	1319.49	1481.92	146.31	55.68	1.49	0.60
2020	0.100	1498.36	1671.57	165.03	61.53	1.68	0.66
2021	0.100	1674.83	1857.32	183.37	67.25	1.86	0.73
2022	0.100	1845.66	2036.01	201.01	72.70	2.04	0.79
2023	0.100	2008.09	2205.06	217.70	77.78	2.21	0.85
2024	0.100	2160.05	2362.56	233.25	82.46	2.37	0.91
2025	0.100	2300.23	2507.29	247.54	86.71	2.52	0.96

Table 7. Projection results from the FLK/EFL stock for the Rebuild 10 scenario, referring to a constant fishing rate that will rebuild the stock in 10 years associated with a probability of rebuilding (Prebuild) of 72.5%. Pounds and numbers are in thousands. The calculated SSB_{MSY} = 2300.39

Year	F	SSB (pounds)	Annual Stock Biomass (pounds)	Yield (pounds)	Yield (numbers)	Discards (pounds)	Discards (numbers)
2016	0.089	806.96	928.37	81.61	33.97	0.93	0.39
2017	0.087	977.99	1115.53	96.23	38.93	1.12	0.47
2018	0.086	1164.54	1316.45	111.80	43.57	1.32	0.53
2019	0.085	1360.45	1525.54	127.90	48.38	1.53	0.61
2020	0.084	1561.76	1738.67	144.21	53.33	1.75	0.68
2021	0.083	1764.76	1951.97	160.44	58.25	1.96	0.75
2022	0.083	1965.69	2161.74	176.31	63.00	2.17	0.82
2023	0.082	2161.16	2364.76	191.56	67.49	2.37	0.89
2024	0.082	2348.41	2558.42	206.01	71.68	2.57	0.95
2025	0.081	2525.44	2740.76	219.52	75.54	2.75	1.00

Table 8. Projection results from the FLK/EFL stock for the Rebuild 7 scenario, referring to a constant fishing rate that will rebuild the stock in 7 years associated with a probability of rebuilding (Prebuild) of 50%. Pounds and numbers are in thousands. The calculated SSB_{MSY} = 2300.39

Year	F	SSB (pounds)	Annual Stock Biomass (pounds)	Yield (pounds)	Yield (numbers)	Discards (pounds)	Discards (numbers)
2016	0.049	806.96	928.37	44.58	18.53	0.93	0.39
2017	0.049	1012.60	1152.90	55.36	22.25	1.16	0.47
2018	0.049	1242.98	1400.47	67.25	25.87	1.41	0.55
2019	0.049	1491.87	1665.21	79.96	29.70	1.67	0.64
2020	0.049	1754.38	1941.95	93.25	33.72	1.95	0.72
2021	0.049	2025.52	2225.45	106.87	37.80	2.23	0.81
2022	0.049	2299.99	2510.51	120.56	41.84	2.52	0.89

Table 9. Projection results from the FLK/EFL stock for the Rebuild 7 scenario, referring to a constant fishing rate that will rebuild the stock in 7 years associated with a probability of rebuilding (Prebuild) of 72.5%. Pounds and numbers are in thousands. The calculated SSB_{MSY} = 2300.39

Year	F	SSB (pounds)	Annual Stock Biomass (pounds)	Yield (pounds)	Yield (numbers)	Discards (pounds)	Discards (numbers)
2016	0.044	806.96	928.37	39.82	16.55	0.93	0.39
2017	0.043	1017.06	1157.71	48.95	19.65	1.16	0.47
2018	0.043	1254.21	1412.50	59.06	22.68	1.42	0.56
2019	0.042	1512.50	1687.13	69.98	25.92	1.69	0.64
2020	0.042	1787.13	1976.49	81.52	29.37	1.98	0.73
2021	0.042	2073.05	2275.26	93.48	32.92	2.28	0.82
2022	0.042	2364.74	2577.97	105.63	36.47	2.59	0.90