South Atlantic Red Snapper Reopening
Southeast Regional Office
SERO-LAPP-2012-04
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Abstract

South Atlantic red snapper has been closed to harvest since January 2010. At the June 2012 South Atlantic Fishery Management Council meeting, the Council reviewed red snapper mortality estimates for 2010 and 2011 and projected mortality estimates for 2012. Estimated mortalities for 2012 were less than projected mortalities and the Council recommended reopening red snapper to harvest in 2012. This report evaluates the amount of fish that could be landed during the reopening and estimates the length of the recreational and commercial fishing seasons. Recreational catch rates for 2012 were predicted using a Seasonal Autoregressive Integrated Moving Average Model, which uses historical monthly landings and projected changes in exploitable abundance to predict future monthly landings. Commercial season lengths were estimated by imposing trip limits of 25 to 100 pounds gutted weight on 2009 logbook data. Both methods do not account for potential increases in fishing effort that may occur due to a short reopening and therefore likely overestimate the length of the season. Allowable landings for 2012 ranged from 2,121 to 19,600 fish. Season lengths were contingent on the amount of fish allowed for harvest. Based on the Council's recommended ACL of 13,067 fish (9,399 recreational/3,668 commercial), recreational fishing season lengths ranged from 11-25 days depending on the month reopened and monthly catch. For the commercial sector, season lengths ranged from 16-175 days depending on the trip limit chosen and start date of the reopening. Given the uncertainties in estimating season length, as well as discard mortalities, and the Council's recommendation to reopen weekends only, it is recommended that the recreational season be reopened no more than 2-3 consecutive three day weekends. For the commercial sector, landings will be monitored in season through the SEFSC's quota monitoring program. Lower trip limits will provide longer seasons and deter targeting of red snapper, while higher trip limits may result in more trips targeting red snapper compared to historic and current effort levels.

Background

The South Atlantic Fishery Management Council (Council) manages red snapper (*Lutjanus campechanus*) in U.S. Atlantic Ocean waters from the Virginia/North Carolina border through the Florida Keys. The SEDAR-24 (2010) benchmark stock assessment of U.S. South Atlantic red snapper determined the stock was undergoing overfishing and was severely overfished (SEDAR-24 2010). On January 4, 2010, NOAA Fisheries Service implemented interim regulations at the request of the Council to close the red snapper segment of the Snapper-Grouper fishery. Interim regulations were implemented to address overfishing until the Council could establish more permanent regulations through Amendment 17A and Regulatory Amendment 10 to the Snapper-Grouper Fishery Management Plan. A complete prohibition of red snapper harvest was necessary to end overfishing and rebuild the stock.

Red snapper has been closed for two and a half years. In April 2012, the Council requested NOAA Fisheries Service's Southeast Fisheries Science Center (SEFSC) provide estimates of mortalities during 2010 and 2011 to determine if red snapper could be reopened. Results were compared to projected mortalities from the SEDAR-24 (2010) stock assessment. At the June 2012 Council meeting, the Council reviewed the mortality data and requested NOAA Fisheries Service implement an emergency rule to

reopen red snapper during 2012. This report evaluates the amount of fish that could be landed during the reopening and provides estimates of how long the recreational and commercial fishing seasons may be open to harvest. Commercial trip limits for reducing the rate of harvest are also evaluated.

Methods

2012 Mortality Estimates

Red snapper discard mortality estimates for 2010 and 2011 were obtained from SEFSC (2012). Results were compared to projected mortalities summarized in Table 9c of SEFSC (2010). Projections summarized in Table 9c were used as the basis for management decisions in Regulatory Amendment 10. Under current data collection protocols, discard mortalities cannot be calculated in-season; thus, discard mortality estimates for 2012 were predicted using four methods:

1. The average of 2010 and 2011 estimated mortalities;
2. The average of 2010 and 2011 estimated mortalities and 2012 projected mortalities;
3. Estimated mortalities for 2011 increased by the change in exploitable abundance projected for 2011 to 2012 and decreased by the change in fishing effort from 2010 to 2011; and,
4. Estimated mortalities for 2011 increased by the change in exploitable abundance projected for 2011 to 2012.

The change in exploitable abundance was obtained from SEDAR-24 (2010) projections (K. Shertzer, SEFSC, personal communication; Figure 1). Projections described in Table 9c of SEFSC (2010) indicate exploitable abundance will increase by 36.6% from 2011 to 2012. Changes in fishing effort were obtained from the Marine Recreational Information Program (MRIP) and from commercial coastal logbook records (Figures 2 and 3). MRIP summarizes effort as angler trips, while commercial logbooks provide days away from port and number of trips. Only recreational fishing effort occurring in the federal economic exclusive zone was used to determine the reduction in fishing effort from 2010 to 2011. Commercial effort was based on trips harvesting any stocks in the Snapper-Grouper Fishery Management Unit. From 2010 to 2011, there was a 7.7% reduction in recreational fishing effort and a 9.1% reduction in the number of days fished by commercial vessels. Reductions in fishing effort (see method 3 above) were applied to sector specific mortality estimates summarized in SEFSC (2012) then increased by the change in exploitable abundance from 2011 to 2012.

The mortality estimates generated from each of the four methods described above were subtracted from the projected mortalities in Table 9c of SEFSC (2010) to determine the number of fish that could be allowed for harvest in 2012. Projected mortalities in 2012 are estimated to equal 86,000 fish (SEFSC 2010). The difference in projected versus estimated mortalities is equivalent to an annual catch limit (ACL) specified in numbers of fish landed. Calculated ACLs in numbers of fish were further allocated 71.93% to the recreational sector and 28.07% to the commercial sector based on the allocation specified in the Council's Comprehensive ACL Amendment (2011). To calculate the commercial ACL in pounds gutted weight, the commercial ACL in numbers of fish was multiplied by the projected average weight of mortalities (in gutted pounds) from Table 9c in SEFSC (2010).

Estimation of Recreational Fishing Season Length

Red snapper landings (in numbers) for 2012 were forecast using a SARIMA model (Box and Jenkins 1976). A SARIMA model analyzes and forecasts equally-spaced univariate time series data, predicting values in a response time series as a linear combination of its own past values, past errors, and past, current, and projected future values of other time series. Because the time series of red snapper recreational catch per month shows strong seasonality, a SARIMA (p,d,q)*(P,D,Q) model was used. The auto-regressive component, designated as p, represents the lingering effects of previous observations. The integrated component, designated as d, represents trends, including seasonality. The moving average component, designated as q, represents lingering effects of previous random shocks (or error). In the SARIMA model, monthly catch (in numbers) of recreational red snapper was projected as a linear combination of past values. The SARIMA model used 2001-2010 red snapper landings. Landings were obtained from the SEFSC's ACL database and aggregated across all modes. Headboat landings are reported on a monthly basis, but Marine Recreational Fisheries Statistical Survey landings are reported by two-month wave. Landings for MRFSS were converted from wave to monthly landings by multiplying wave landings by the ratio of days in a month to total days in the wave.

Exploitable abundance at age was used as a predictive co-variate to account for increasing fish abundance as the stock rebuilds. Abundance at age data were obtained from the most recent red snapper stock assessment and projections (K. Shertzer, SEFSC, pers. comm.) and converted to exploitable abundance using selectivity at age (Figure 1). Projected values of exploitable abundance from projections summarized in Table 9c of SEFSC 2010 ($F=F_{rebuild}$) were used to seed the forecast of the final SARIMA model (K. Shertzer, SEFSC, pers. comm.). It should be noted that the assessment model estimated large increases in exploitable abundance in 2007-2008 due high recruitment progressing through the fishery. Exploitable abundance was estimated to decline from 2008 through 2010 before increasing at a rapid rate beginning in 2011.

The SARIMA model was implemented using Proc ARIMA in SAS v9.2 for Windows (SAS Institute, Inc., Cary, NC). SARIMA model selection was guided by examination of autocorrelations, inverse autocorrelations, partial autocorrelations, and cross-correlations. Stationarity tests were used to guide differencing selection. Residual diagnostics and Akaike Information Criterion (AIC) values were used to select the final model, which was specified as a SARIMA(0,0,1)X(0,1,1)s model where s=12 months, with model fit using conditional least squares. The final model incorporated exploitable abundance as a predictor and explained 66% of the variability in non-seasonal and seasonal trends in monthly catch using an MA(1,1) model (Moving Average Operator: 1 + 0.93028 B**(1)), an SMA(2,1) model at a 12 month lag (Moving Average Operator: 1 - 0.75416 B**(12)), and a predictor term for exploitable abundance (Regression Factor: 0.012651).

Monthly catches predicted by the SARIMA model were then converted to daily catches by dividing the monthly catches by the number of days in the month. Because predictions of catch are highly uncertain and effort may be substantially higher than historic levels if the season is opened for only a short period of time, monthly catches using the upper 95% confidence limit were also generated. A cumulative sum of consecutive daily catch rates was then used to predict how many days it would take to catch the 2012 annual catch limit (ACL). Estimates were generated based on starting the season at the beginning of each month to take into account seasonal changes in landings and fishing effort.

Season lengths were estimated for each of the 2012 ACLs estimated above.

Commercial Trip Limits and Season Length

SEFSC commercial logbook records were used to evaluate how long the commercial fishing season would remain open if various trip limits were imposed. Trip limits were imposed on logbook landings data from 2009, the last year the red snapper commercial sector was open. Trip limits considered ranged from 25 to 100 pounds gutted weight. If a trip reported landing red snapper above a specified trip limit, then landings were reduced to the trip limit. All trips landing quantities of red snapper below the trip limit were increased to the trip limit. Not adjusting landings below a trip limit was considered, but because the Council recommended during their June 2012 meeting to eliminate the minimum size limit, it was presumed that trips previously not catching the trip limit would have a much higher probability of catching the trip limit if the size limit is eliminated. The size limit and geographic availability of red snapper are limiting factors in catching red snapper. By eliminating the size limit, the likelihood of catching the trip limit will increase, especially in the areas of highest abundance, as fish will no longer be discarded due to regulations. Although this might overestimate the amount of fish landed on trips previously occurring, effort may also be underestimated if additional trips occur due to red snapper being reopened.

Results

2012 Mortality Estimates

Red snapper mortality estimates for 2010 and 2011 were comparable to projected mortalities (Figure 4). In 2010, 71,394 red snapper were estimated to be killed (SEFSC 2012). In 2011, 61,405 red snapper were estimated to be killed (SEFSC 2012). Projected mortalities for 2010 and 2011 were 65,000 and 64,000 red snapper, respectively. In 2012, mortalities are projected to increase to 86,000 fish. Estimated mortalities for 2012 ranged from 66,400 to 83,879 fish (Table 1) and varied based on assumed changes in fishing effort, exploitable abundance, and years used to approximate mortalities. Based on the range of projected mortalities, possible ACLs ranged from 2,121 to 19,600 fish (Table 1). The lowest estimate of allowable landings for 2012 assumed mortalities from 2011 to 2012 would increase at the same rate as projected exploitable abundance. The highest estimate of allowable landings assumed mortalities would be on average similar to 2010 and 2011 mortalities.

Estimation of Recreational Fishing Season Length

The SARIMA model explained 66% of the variability in seasonal and non-seasonal monthly catch trends. Model fit was generally very good with the exception of the last four months of 2009, which were overestimated by the model (Figure 5). Estimated mean monthly landings ranged from 11,666-17,591 fish. The upper 95% confidence limit projection estimated monthly landings ranging from 20,177-26,102 fish. Monthly landings were highest during late spring and early summer and lowest during fall and winter.

Projected recreational season lengths for each of the recreational ACLs are summarized in Tables 2 and 3. Based on the mean projected landings from the SARIMA model, the season length ranged from 3-4 days for an ACL = 1,526 fish, 11-17 days for an ACL = 6,462 fish, 16-25 days for an ACL = 9,399 fish, and 24-36 days for an ACL = 14,098 fish. Based on the 95% upper confidence limit projected landings from the SARIMA model, the season length was 2 days for an ACL = 1,526 fish, 7-10 days for an ACL = 6,462

fish, 11-14 days for an ACL = 9,399 fish, and 16-21 days for an ACL = 14,098 fish. Season lengths were longer during fall and winter than spring and summer.

Commercial Trip Limits and Season Length

Tables 4-8 summarize projected commercial red snapper season lengths for various trip limits. As expected, season lengths were longest for lower trip limits and shortest if no trip limit was imposed. Season lengths ranged from as few as 3 days up to 244 days depending on the trip limit and ACL chosen

Discussion

During the June 2012 South Atlantic Council meeting, the Council recommended NOAA Fisheries Service implement emergency regulations to reopen the red snapper segment of the snapper-grouper fishery. Given harvest has been prohibited since January 2010, predicting recreational and commercial fishing season lengths for a limited opening in 2012 is difficult. The Council recommended the following management actions for reopening red snapper:

- Set the 2012 Annual Catch Limit (ACL) for red snapper = 13,067 fish;
- Set the 2012 recreational allocation at 71.93% of the ACL = 9,399 fish;
- Set the 2012 commercial allocation at 28.07% of the ACL = 3,668 fish or 20,818 pounds gutted weight;
- Establish Recreational Accountability Measures (AMs) = track recreational landings and close the recreational sector when the recreational ACL is met or projected to be met;
- Establish Commercial Accountability Measures (AMs) = track commercial landings and close the commercial sector when the commercial ACL is met or projected to be met;
- Allow for the recreational ACL to be landed during 3-day weekends (Fri-Sun) the number of which would be determined by the agency and the opening dates would be subject to modification based on weather conditions;
- Open the season as soon as possible;
- Set the recreational bag limit at 1 fish per person per day with no size limit;
- Open the commercial season in 7-day mini-season increments subject to the remaining quota; and,
- Allow for the commercial ACL to be landed under a 50-pound trip limit with no size limit.

Predicting changes in angler behavior in response to a reopening is difficult. Many factors can influence fishing activity including: fuel costs and trip expenses, weather (Figure 6, SERO 2012a), changes in regulations, changes in fishing behavior, and conflicting activities (e.g., family activities, sporting events on weekends). It is difficult to predict how South Atlantic fishermen will respond to a 'derby-style' opening of red snapper. Although the recreational red snapper sector in the Gulf of Mexico has never been completely closed, the fishing season has been shortened in each of the last five fishing years. Despite reductions in the fishing season length, the average catch-per-day has increased at a linear rate (Figure 7), due in large part to increases in stock abundance, increases in the average size of fish caught, and effort compensation (SERO 2012b). During 2011, recreational anglers landed approximately the same amount of red snapper in 48 days (in pounds) as they did during 2006 and prior when the season was 194 days.

In this analysis, historical South Atlantic red snapper landings data were forward-projected based on increases in exploitable abundance and used to estimate future monthly recreational catch rates. Although this approach accounts for changes in underlying stock size and seasonal dynamics in fishing pressure, it does not factor in changes in fishing pressure likely from a shortened season. However, even this approach may underestimate fishing effort and landings resulting from a short 'derby-style' reopening of red snapper. If effort is underestimated, then season lengths predicted in this report would be too long and would result in an overage of the ACL.

Maximum recreational season lengths ranged from 11-25 consecutive days based on the Council's recommended ACL of 13,067 fish. As the majority of private recreational fishing pressure occurs on weekends, the number of weekend days available would be much less than the 11-25 consecutive days projected. For example, 11-25 consecutive days is the equivalent of 1.6-3.6 weeks. Assuming 75% of a week's recreational landings are landed over the three-day weekend, 2.1-4.8 three-day weekends would be the equivalent of 11-25 consecutive days. Given uncertainties in estimated discard mortalities for 2012, and the potential for large shifts in fishing effort, it is recommended that the recreational fishing season be no longer than 2-3 consecutive three-day weekends.

For the commercial sector, fishing season lengths were highly variable and contingent on the trip limits chosen and the amount of trips made during a week/month. Lower trip limits would result in the longest fishing season and would limit direct targeting of red snapper while reducing wasteful dead discards. Higher trip limits would result in more trips directly targeting red snapper. Based on the Council's preferred commercial ACL (3,668 fish or 20,818 gutted pounds) and trip limit (50 pounds gutted weight), it is estimated the season length could be 2-3 months. This assumes effort is comparable to 2009 levels. In 2009, 1,997 logbook trips reported landing red snapper. Trips per month ranged from 113-235, or approximately 30-60 per week. During 2009, the maximum amount of pounds landed during a week was 21,423 pounds gutted weight between October 3-9, 2009. This amount was landed by 44 vessels taking 60 trips. Logbook records indicate there were 107 vessels fishing in statistical zones from Central-east Florida (Fort Pierce/Cape Canaveral) through Georgia in 2011 that landed species commonly associated with red snapper (i.e., vermilion snapper, scamp, red porgy, black grouper, gag, red grouper, gray triggerfish, and greater amberjack). Most trips occurred off Florida and averaged 2-3 days (Figure 8). If each of these vessels made two trips per week and caught a 50 pound trip limit, then the season would be open 14 days. If these vessels each made three trips per week and caught a 50 pound trip limit, then the season would be open 9 days. Given that vessels off South Carolina and North Carolina will also be catching some red snapper, it is likely the season could be even shorter than 9-14 days.

Quota monitoring by the SEFSC will allow commercial landings to be monitored during and after the 7-day opening(s). Once landings have been reported for the first seven-day commercial opening, the SEFSC will evaluate if the ACL has been met. If the ACL is not met, the season will be reopened for an additional 7 days or less if the quota is met sooner. Given the potential for large shifts in fishing effort, lower trip limits will reduce the risk of exceeding the ACL during these 7-day mini-season openings.

References

SAFMC. 2011. Comprehensive annual catch limit amendment for the South Atlantic region. South Atlantic Fishery Management Council, Charleston, SC. 755 pp.

SEDAR-24. 2010. Stock Assessment Report: South Atlantic red snapper. Southeast Data, Assessment, and Review, Charleston, SC. 524 pp.

SEFSC. 2010. SEDAR-24 South Atlantic red snapper: Management quantities and projections requested by the SSC and SERO. NOAA Fisheries Service, Southeast Fisheries Science Center, Beaufort, NC. 15 pp.

SEFSC. 2012. South Atlantic red snapper: Estimated mortalities in 2010 and 2011. NOAA Fisheries Service, Southeast Fisheries Science Center, Beaufort, NC. 6 pp.

SERO. 2012a. Extension of the Gulf of Mexico recreational red snapper fishing season. NOAA Fisheries Service, Southeast Regional Office, St. Petersburg, FL. 13 pp.

SERO. 2012b. 2012 Recreational red snapper quota closure analysis. NOAA Fisheries Service, Southeast Regional Office, St. Petersburg, FL. 17 pp.

Table 1. Estimated discard mortalities for 2012 and potential allowable landings allocated to each sector.

Method for Estimating 2012 Discard Mortalities	2012 Discard Mortalities (n)		Potential Allowable Landings (n) / ACL
	Projected	Estimated	
2010-11 average mortalities	86,000	66,400	19,600 rec = 14,098 comm = 5,502 or 31,226 lbs gw
Average of 2010-11 estimated mortalities and 2012 projected mortalities	86,000	72,933	13,067 rec = 9,399 comm = 3,668 or 20,818 lbs gw
2011 mortalities increased by Δ in 2011-2012 exploitable abundance and decreased by Δ in 2010-2011 fishing effort	86,000	77,016	8,984 rec = 6,462 comm = 2,522 or 14,313 lbs gw
2011 increased by Δ in 2011-2012 exploitable abundance (36.6%)	86,000	83,879	2,121 rec = 1,526 comm = 595 or 3,379 lbs gw

Table 2. Estimated recreational red snapper fishing season length based on mean monthly 2012 landings projected by the SARIMA model. 'Month' refers to when the season would be reopened.

Month	Estimated Recreational Season Length (SARIMA mean)			
	ACL = 1,526	ACL = 6,462	ACL = 9,399	ACL = 14,098
Jan	3	14	20	31
Feb	3	11	16	24
Mar	3	12	17	26
Apr	3	12	17	25
May	3	11	17	25
Jun	3	11	16	24
Jul	3	14	20	30
Aug	3	14	21	31
Sep	4	17	24	36
Oct	4	17	25	36
Nov	4	16	23	34
Dec	4	16	23	34

Table 3. Estimated recreational red snapper fishing season lengths based on 95 percent upper confidence limit of monthly 2012 landings projected by the SARIMA model. ACLs are in numbers of fish and are based on results summarized in Table 1. 'Month' refers to when the season would be reopened.

	Estimated Recreational Season Length (SARIMA 95% CL)			
Month	**ACL = 1,526**	**ACL = 6,462**	**ACL = 9,399**	**ACL = 14,098**
Jan	2	9	13	19
Feb	2	7	11	16
Mar	2	8	11	17
Apr	2	8	11	17
May	2	8	11	17
Jun	2	7	11	16
Jul	2	9	13	19
Aug	2	9	13	19
Sep	2	10	14	21
Oct	2	10	14	22
Nov	2	9	13	20
Dec	2	10	14	21

Table 4. Estimated commercial red snapper fishing season lengths based on 2009 logbook landings data and a 25-pound gutted weight trip limit. ACLs are in gutted pounds and are based on results summarized in Table 1. 'Month' refers to when the season would be reopened.

	Estimated Season Length (25 lb gw trip limit)			
Month	**ACL = 3,379**	**ACL = 14,313**	**ACL = 20,818**	**ACL = 31,226**
Jan	26	122	162	229
Feb	25	118	152	227
Mar	36	105	150	223
Apr	30	94	141	210
May	22	86	135	198
Jun	17	92	135	214
Jul	23	100	143	229
Aug	27	99	152	240
Sep	22	96	152	244
Oct	22	107	156	244
Nov	23	112	175	237
Dec	33	126	175	236

Table 5. Estimated commercial red snapper fishing season lengths based on 2009 logbook landings data and a 50-pound gutted weight trip limit. ACLs are in gutted pounds and are based on results summarized in Table 1. 'Month' refers to when the season would be reopened.

	Estimated Season Length (50 lb gw trip limit)			
Month	**ACL = 3,379**	**ACL = 14,313**	**ACL = 20,818**	**ACL = 31,226**
Jan	13	54	88	131
Feb	13	64	92	125
Mar	19	67	89	116
Apr	15	55	73	102
May	11	43	60	96
Jun	9	39	61	101
Jul	12	52	75	109
Aug	13	52	73	108
Sep	11	47	68	109
Oct	11	47	73	117
Nov	11	57	83	123
Dec	17	62	86	138

Table 6. Estimated commercial red snapper fishing season lengths based on 2009 logbook landings data and a 75-pound gutted weight trip limit. ACLs are in gutted pounds and are based on results summarized in Table 1. 'Month' refers to when the season would be reopened.

	Estimated Season Length (75 lb gw trip limit)			
Month	**ACL = 3,379**	**ACL = 14,313**	**ACL = 20,818**	**ACL = 31,226**
Jan	9	37	53	88
Feb	8	39	62	92
Mar	12	48	66	89
Apr	10	39	54	73
May	7	31	42	60
Jun	6	22	37	61
Jul	8	33	50	75
Aug	9	37	51	73
Sep	7	31	45	68
Oct	7	31	46	73
Nov	8	33	55	83
Dec	11	44	60	86

Table 7. Estimated commercial red snapper fishing season lengths based on 2009 logbook landings data and a 100-pound gutted weight trip limit. ACLs are in gutted pounds and are based on results summarized in Table 1. 'Month' refers to when the season would be reopened.

	Estimated Season Length (100 lb gw trip limit)			
Month	**ACL = 3,379**	**ACL = 14,313**	**ACL = 20,818**	**ACL = 31,226**
Jan	7	28	40	59
Feb	6	26	44	70
Mar	9	38	52	72
Apr	8	31	42	59
May	6	25	33	47
Jun	4	14	27	43
Jul	6	24	37	57
Aug	7	29	40	56
Sep	6	23	34	51
Oct	5	23	34	51
Nov	6	22	38	63
Dec	8	34	47	67

Table 8. Estimated commercial red snapper fishing season lengths based on 2009 logbook landings data and no trip limit. ACLs are in gutted pounds and are based on results summarized in Table 1. 'Month' refers to when the season would be reopened.

	Estimated Season Length (no trip limit)			
Month	**ACL = 3,379**	**ACL = 14,313**	**ACL = 20,818**	**ACL = 31,226**
Jan	4	16	24	36
Feb	4	17	25	40
Mar	5	22	32	45
Apr	4	18	26	39
May	4	19	27	39
Jun	4	15	22	33
Jul	3	13	20	29
Aug	6	24	35	46
Sep	4	18	26	35
Oct	3	11	16	25
Nov	4	16	24	36
Dec	4	18	26	39

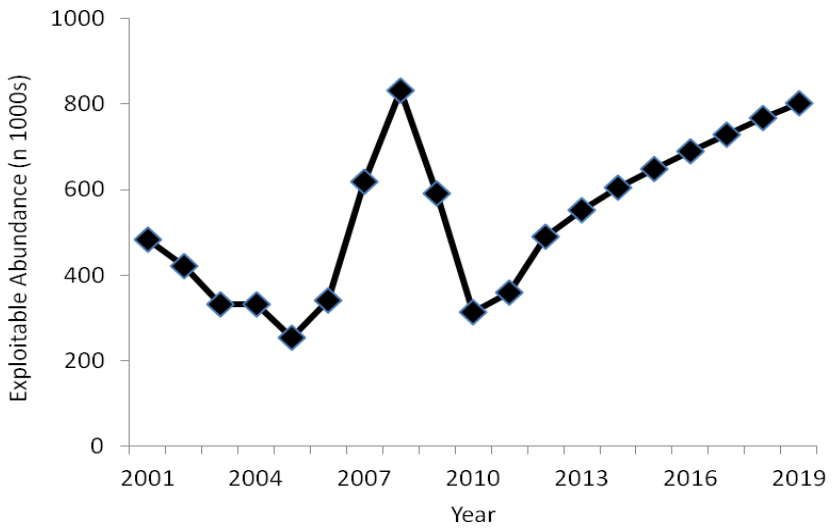

Figure 1. Red snapper exploitable abundance (thousands o f fish), 2001-2019.

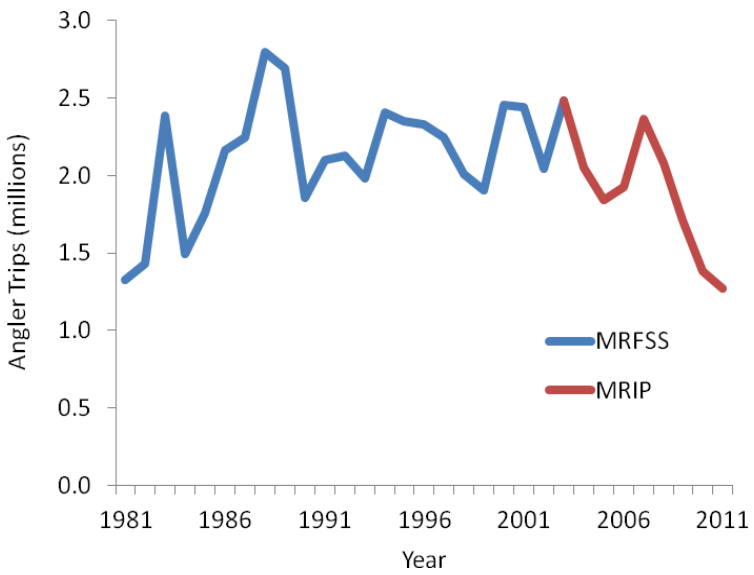

Figure 2. Recreational angler trips in federal waters of the South Atlantic, 1981-2011. Angler trips were estimated using the Marine Recreational Fisheries Statistics Survey from 1981-2003. From 2004-2011, angler trips are estimated based on Marine Recreational Information Program methods.

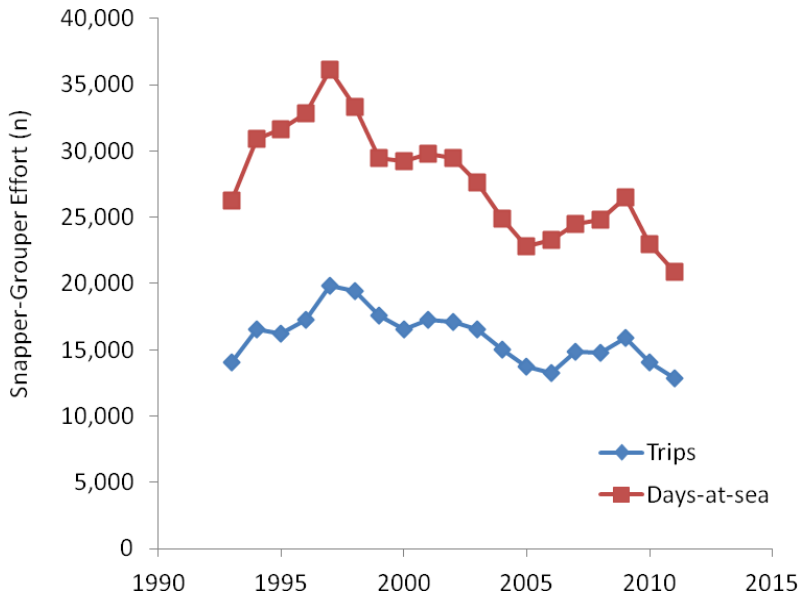

Figure 3. Snapper-grouper commercial fishing trips and days-at-sea, 1993-2011. Source: Coastal logbook records.

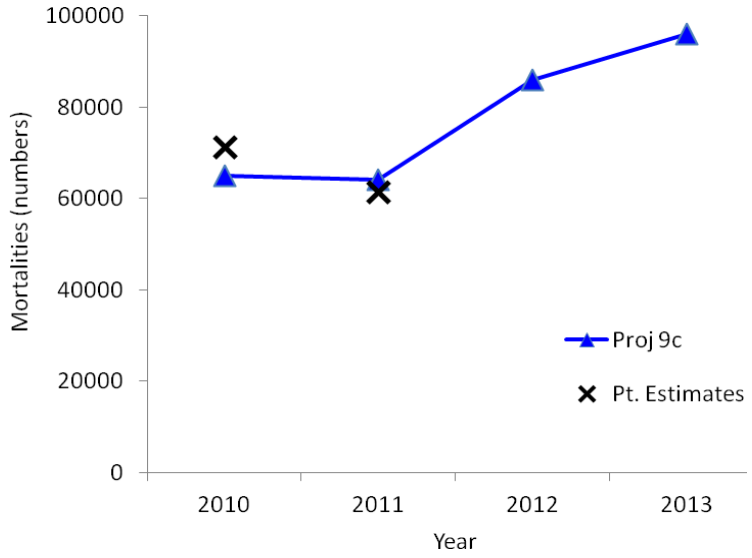

Figure 4. Projected (blue triangles) and estimated (black x) red snapper mortalities, 2010-2013. Projected mortalities are from Table 9c in SEFSC (2010). Estimated mortalities are from SEFSC (2012).

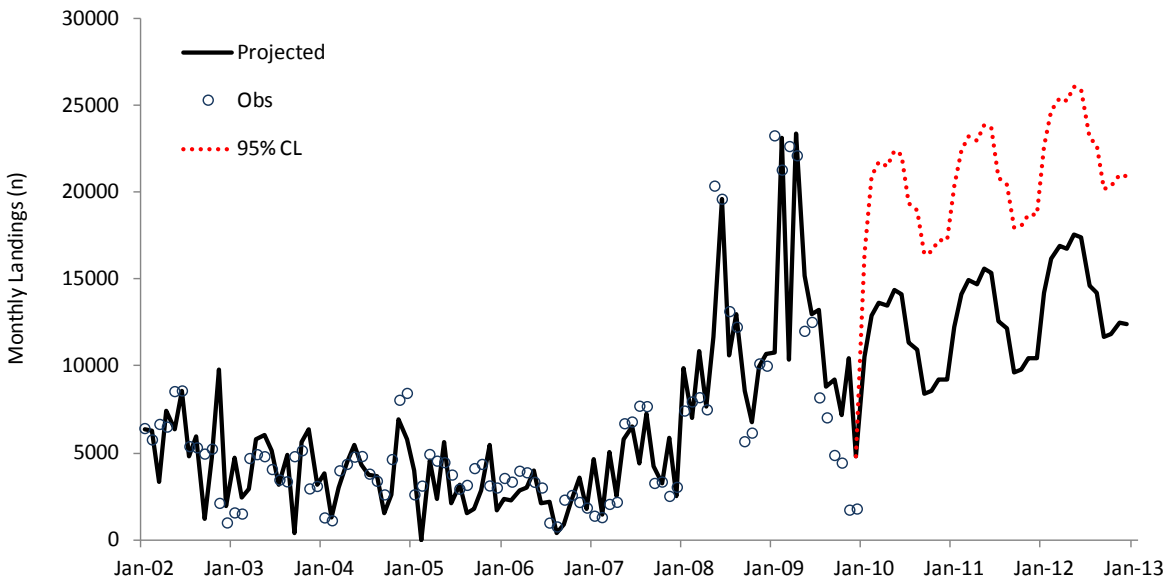

Figure 5. SARIMA model fit to recreational landings-per-month (in numbers). Red dashed line represents 95% upper confidence limit. Monthly landings are projected for 2010 through 2012.

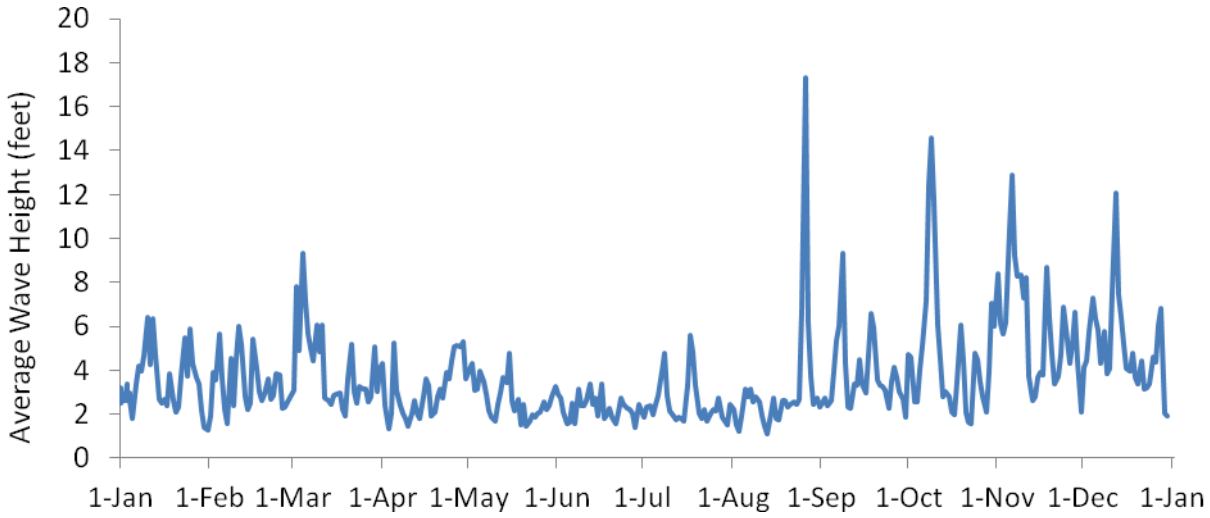

Figure 6. Average daily wave heights (feet) during 2011 at buoy 41012, east of St. Augustine, Florida. Source: www.ndbc.noaa.gov

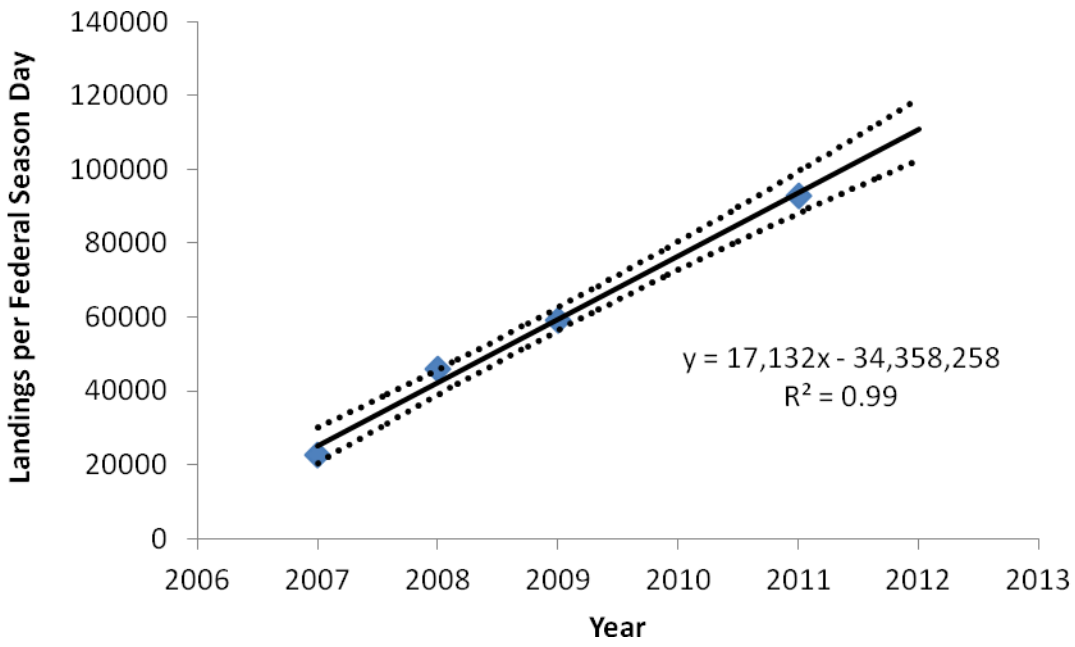

Figure 7. Linear regression (± 80% confidence limits) of Gulf of Mexico red snapper landings per federal season day versus year, 2007-2011 (excluding 2010 due to Deepwater Horizon oil spill).

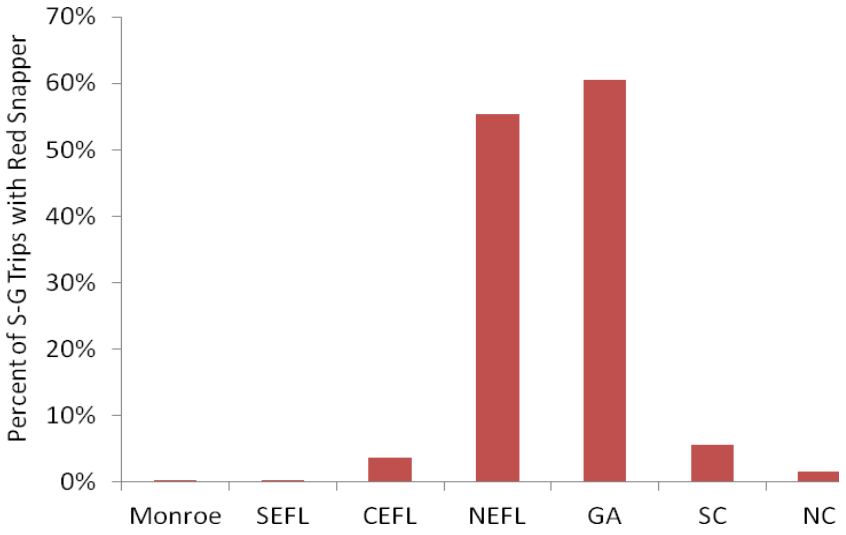

Figure 8. Percentage of snapper-grouper fishing trips in 2009 landing red snapper by state/region. Monroe = Florida Keys, SEFL = West Palm Beach-Miami, CEFL = Cape Canaveral – Fort Pierce, NEFL = Jacksonville – St. Augustine)

ADDENDUM

At the June 2012 South Atlantic Fishery Management Council (Council) meeting, the Council reviewed estimated 2012 red snapper mortalities summarized in Table 1 of this report. The Council selected an annual catch limit (ACL) for red snapper of 13,067 fish. This ACL was based on the difference in projected 2012 mortalities from Table 9c of SEFSC (2010) relative to the average of 2010-11 estimated mortalities and 2012 projected mortalities. Since the June Council meeting, the Southeast Regional Office and Southeast Fisheries Science Center have reviewed additional discard and effort data for 2012 to further evaluate whether or not discard mortalities in 2012 will be less than projected mortalities to determine if reopening the red snapper segment of the snapper-grouper fishery is justified.

Red snapper discard estimates from the Marine Recreational Information Program (MRIP) and Marine Recreational Fisheries Statistics Survey (MRFSS) were obtained for waves 1-2 (January-April) in 2010-2012 (Table A1). Discards estimated through the shore mode were excluded consistent with SEDAR-24 (2010). Dead discards were calculated by multiplying discards by mode-specific mortality rates from SEDAR-24 (i.e., 0.39 for private/rental and 0.41 for charter). No data were available to evaluate commercial or headboat red snapper mortalities for 2012.

Table A1. Discard and dead discard estimates from MRIP and MRFSS waves 1-2, 2010-2012.

	MRFSS (waves 1-2)		**MRIP (waves 1-2)**	
Year	**Discards (n)**	**Dead Discards (n)**	**Discards (n)**	**Dead Discards (n)**
2010	21,312	8,315	24,536	9,577
2011	3,186	1,259	5,842	2,294
2012	6,154	2,407	5,707	2,270

MRFSS discard estimates were higher than 2011 estimates but well below discard estimates for 2010. MRIP discard and dead discard estimates were comparable to 2011 estimates and much lower than 2010 estimates. There does not appear to be a significant change in discards for the first four months of 2012. Given that discard estimates are low and in-line with last year using MRIP and slightly higher, but still low under MRFSS, there is no evidence at this time to indicate mortalities will be higher than the amount assumed by the Council when setting the ACL. Even though MRFSS discard estimates are up for 2012 relative to 2011, they are still much lower than 2010. Total mortalities in 2010 and 2011 (see SEFSC 2012; 71,394 fish in 2010 and 61,405 fish in 2011) were both below the assumed level of total mortalities for 2012 (i.e., 72,933) selected by the Council for setting the ACL.

NOAA Fisheries Service also reviewed MRIP effort data to evaluate effort relative to prior years. MRIP estimates angler trips by state, area, wave, and mode. Angler trips for the South Atlantic Exclusive Economic Zone (EEZ) were extracted for waves 1-2, 1983-2012, and for waves 1-6, 1983-2011 (Figure A1). Effort in the South Atlantic EEZ generally declined from 2003-2011. Total and wave 1-2 EEZ angler trips in 2011 were the lowest on record. In 2012, wave 1-2 EEZ angler trips were the third lowest since 1983. Angler trips in waves 1-2 increased in 2012 relative to both 2010 and 2011 angler trips. Angler trips during the first two waves in 2012 were 47.7% higher than 2011 and 18.9% higher than 2010. Charter angler trips for waves 1-2 in 2012 were lower than 2010 and 2011 levels (23,255 trips vs. 30,060

in 2010 and 17,498 in 2011), while private angler trips were higher than 2010 and 2011 levels (316,384 trips vs. 257,387 in 2010 and 195,961 in 2011).

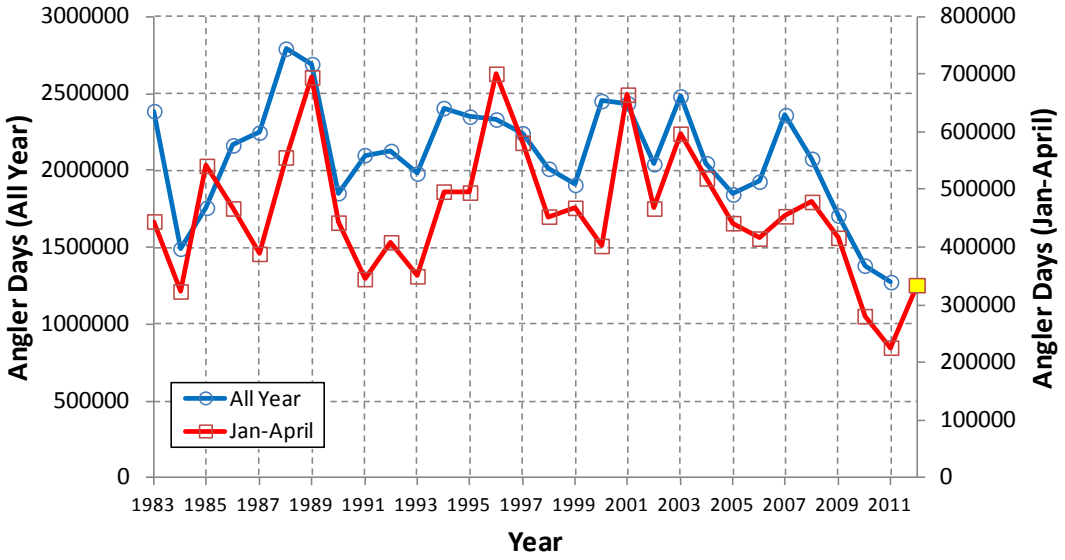

Figure A1. MRIP angler trips in South Atlantic federal waters.

In conclusion, discard estimates for waves 1-2, 2012, are comparable to previous estimates in 2010 and 2011. There appears to be no evidence based on data through April that discards are increasing in 2012. Despite increases in private fishing effort during waves 1-2, 2012, discards have remained low and comparable to previous years. Several reasons may explain the low number of discards including, but not limited to: 1) fishermen avoiding red snapper and other snapper-grouper due to regulatory restrictions, 2) discards being underreported or underestimated by MRFSS and MRIP, 3) effort being overestimated by MRIP, or 4) increases in exploitable abundance being lower than previously projected.