

Evaluating the Effects of Amendment 16 Regulations on 2005-2007 South Atlantic Red Snapper Headboat Catches

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Introduction/Background

A recent stock assessment of South Atlantic red snapper indicates the stock is undergoing overfishing and is severely overfished (SEDAR 15 2008). Red snapper fishing mortality during 2006 was 7.67 times higher than the fishing mortality rate associated with F_{MSY} ($=F_{40\%SPR}$) and spawning stock biomass (SSB) was 2% of the SSB at maximum sustainable yield (SEFSC 2009). The South Atlantic Fishery Management Council (SAFMC) is currently developing Amendment 17 to the Snapper-Grouper Fishery Management Plan to address overfishing of red snapper and rebuild this stock (SAFMC 2009). Alternatives under consideration include a year-round prohibition on red snapper harvest, possession, and retention in the South Atlantic EEZ, as well as year-round spatial area closures for all snapper-grouper harvest and possession (except spearfishing equipment) to reduce bycatch mortality of red snapper. The overall size and extent of these area closures is contingent on bycatch mortality outside the closed areas and the overall percent reduction in fishing mortality needed to end overfishing. Based on an $F_{MSY} = F_{40\%SPR}$, an 87% reduction in red snapper fishing mortality is needed to end overfishing (SEDAR 15 2009).

In September 2008, the SAFMC approved Snapper-Grouper Amendment 16. This amendment was developed to address overfishing of gag and vermilion snapper, and also reduces the harvest of several other snapper-grouper species. NOAA Fisheries Service partially approved Amendment 16 in March 2009. If implemented through final rule, this amendment would establish a four month commercial and recreational closed season (January-April) for shallow-water grouper (SWG), establish a five-month recreational closed season for vermilion snapper (November-March), modify gag and vermilion snapper commercial quotas, and reduce bag limits for vermilion snapper, gag, and other groupers. These regulations may indirectly affect the harvest of red snapper caught on trips targeting either vermilion snapper or SWG. The intent of this analysis is to evaluate potential changes in red snapper harvest associated with Amendment 16 regulatory changes.

Methods

Status quo landings (Amendment 16 has no effect on red snapper catches)

Headboat landings data provided by the Southeast Fisheries Science Center (SEFSC), Beaufort Laboratory were used to determine the magnitude and geographic location of red snapper

landings during 2005-2007 along the southeast coast of the United States. Landings in both numbers and pounds were first summarized by headboat statistical area. To maintain confidentiality, some landings were aggregated across headboat statistical areas. Landings were further summarized by year using the location of the inlet from which each headboat departed on a fishing excursion, following Williams et al. (2009). A total of 109 headboats operate in South Atlantic statistical areas 1-17 and berth in ports located between Cape Hatteras, North Carolina and Key West, Florida. For those vessels that reported red snapper landings during 2005-2007, the home port and assigned inlet fields are complete. In a few instances, the home port of the vessel was a considerable distance from the assigned inlet; port agent information was used in assigning departure inlets (Brennan, pers. comm.). Additionally, some vessels berth in a single port, but utilize different routes and therefore different inlets for their departure. Because landings by inlet include confidential data, this information is not summarized herein. However, these data are available if methods can be established for assigning headboat landings and discards into finer spatial areas using the reported inlet of landing (see Williams et al. 2009 for further discussion).

Defining target trips

Target trips can be defined in numerous ways depending on the data available. For instance, primary and secondary species or species complexes are reported through the Marine Recreational Fisheries Statistics Survey, allowing for determination of species of interest when a trip is made. In the commercial fishery, trips can be evaluated based on their profitability to determine how fishermen may or may not respond to regulations (see SERO 2009). Target trips may also be defined based on what species were or were not caught on a particular trip. Although this may not provide information on the target species sought if it was not caught or only caught in small quantities, it does give an indication of the frequency of occurrence and relative amount of various species caught on trips. Trips and landings occurring during 2005-2007 were assumed to be representative of future behavior and effort in the fishery.

Headboat landings of vermilion snapper, SWG, and red snapper were first summarized by month for the years 2005-2007 and a frequency plot was created to compare monthly landings distributions. Next, headboat catch effort files (CRNF05, CRNF06, and CRNF07) were used to evaluate vermilion snapper and SWG landings frequencies. Only trips occurring during November-March were considered for vermilion snapper and only trips occurring during January-April were considered for SWG. These time periods correspond to proposed closures for these species in Amendment 16. The number of vermilion snapper or SWG caught for each trip was determined and used to evaluate the relative frequency of trips catching various amounts of vermilion snapper or SWG. To determine the relative contribution of vermilion snapper or SWG landings on a particular trip, the ratio of vermilion snapper or SWG landings to overall snapper-grouper landings (all 73 regulated species) was computed for each trip. The percentage of landings for each trip was then used to determine the frequency of trips where vermilion snapper or SWG accounted for a majority (>50%) of the snapper-grouper landings. The overall quantity of vermilion snapper and/or SWG landed on a particular trip combined with the overall percentage of snapper-grouper landings accounted for by vermilion snapper

and/or SWG (e.g., percent landings threshold) were then used to define a 'target' trip. All trips not landing a minimum number of vermilion snapper, SWG, or vermilion snapper/SWG combined and not having a minimum percentage of snapper-grouper landings accounted for by vermilion snapper, SWG, or vermilion snapper/SWG combined were defined as 'non-target' trips during the Amendment 16 closed seasons. By defining 'target' trips in terms of both quantity and percentage of landings, trips landing small quantities but high percentages of fish or trips landing large quantities representing a small percentage of the trip's landings were excluded. All trips not occurring during the Amendment 16 closed seasons were defined as 'open-season' trips.

Evaluating changes in overall landings

Once trips were defined as target, non-target, or open-season trips, the sensitivity of 2005-07 red snapper landings to Amendment 16 closed seasons for vermilion snapper and SWG was evaluated. Status quo landings were derived from SEFSC headboat datafiles as described above. These landings were used as a proxy for estimating future red snapper headboat landings.

Catch-effort headboat files provided by the SEFSC were used to evaluate the sensitivity of headboat red snapper landings to Amendment 16 regulations. Reported catch effort files were modified by either eliminating target trips or altering the catch rates on target trips. For this analysis, four scenarios were considered. Scenarios 1 and 2 defined target trips as 25 or more vermilion snapper and/or SWG and 50% or more of the snapper-grouper landings on a trip had to be from vermilion snapper and/or SWG. Scenario 1 eliminated all 'target' trips and assumed those trips would no longer occur when vermilion snapper and/or SWG were closed. Scenario 2 modified 'target' trips, rather than eliminating the entire trip. For this scenario, average catch rates were computed for target and non-target trips for each vessel by dividing the total number of red snapper caught by the number of anglers fishing on the vessel. Target trip catch rates were then replaced with the average non-target trip catch rates for each vessel. The new catch rate was then multiplied by the number of anglers fishing to determine the new amount of red snapper caught on the trip. If target catch rates were less than non-target catch rates, then no adjustments to the number of red snapper caught were made. Scenarios 3 and 4 were similar to Scenarios 1 and 2, except the 'percent landings threshold' was reduced from 50% to 25% of total snapper-grouper landings.

Modified landings estimates derived using the catch-effort headboat files were then used to calculate annual headboat landings based on methods and statistical programs provided by the SEFSC, Beaufort Laboratory. Briefly, catch-effort logbook files were used to estimate landings in numbers. Adjustments to reported landings for each vessel were then made to account for under-reporting, over-reporting, or non-reporting of angler effort. Adjusted landings in numbers were then converted to landings in weight using average weight estimates by species from annual bio-profile data files. A minimum sample size of 10 fish was used to generate average weight estimates.

Results

Status Quo

During 2005-2007, red snapper headboat landings averaged 45,862 pounds (Table 1). Despite the broad geographic extent of headboat fishing activities along the southeast coast of the U.S., most red snapper landings occurred in the area between Lazaretto Creek Inlet in south Georgia and Port Canaveral, Florida. During 2005-2007, 48.4 percent of all landings occurred in statistical area 8 (Ponce Inlet-Sebastian) (Table 1). Statistical areas 6 and 7 (Georgia-St. Augustine) accounted for an additional 27.7 percent of landings during this same time period (Table 1). The inlet location from which peak landings activities are realized varied among years, but Port Canaveral, Florida was a landing leader during most years. Relatively few red snapper were caught on vessels operating from inlets located north of the St. John's River or south of Port Canaveral.

Table 1. Average 2005-2007 headboat red snapper landings in numbers and pounds by statistical area.

Area	Area Description	Landings by year (numbers)				Landings by year (lbs)			
		2005	2006	2007	2005-07 avg	2005	2006	2007	2005-07 avg
3, 9, 10	Cape Lookout & Cape Fear, NC	106	33	52	64	1,114	385	389	629
4,5	South Carolina	1,004	303	701	669	10,399	3,540	5,016	6,318
6, 7	St. Augustine-Georgia	2,455	1,245	2,389	2,030	16,408	9,536	12,118	12,687
8	Ponce Inlet-Sebastian	4,226	4,148	2,922	3,765	24,333	26,513	15,744	22,197
11	Ft. Pierce-Miami	1,091	111	480	561	6,297	749	2,795	3,280
12, 17	Florida Keys & Dry Tortugas	25	105	345	158	144	709	1,398	750
TOTAL		8,907	5,945	6,889	7,247	58,695	41,432	37,460	45,862

Note: some areas have been aggregated to protect confidentiality.

Target Trips

Peak headboat landings of vermilion snapper and SWG occurred during summer 2005-2007, whereas red snapper landings were more constant throughout the fishing year (Figure 1). Vermilion snapper landings during November-March averaged 8.3% of the total annual landings. Shallow-water grouper landings during January-April accounted for 22.5% of the total annual landings. In comparison, 38.7% of red snapper landings occurred during November-March and 36.2% of red snapper landings occurred during January-April.

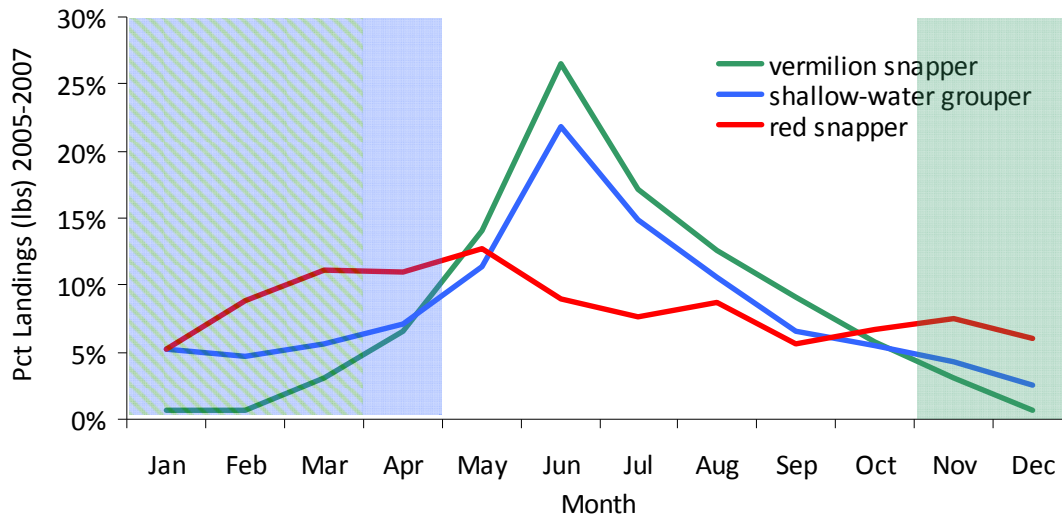


Figure 1. Frequency distribution of vermilion snapper and SWG headboat landings by month, 2005-2007. Shaded areas represent vermilion snapper (green) and SWG closed seasons (blue).

A total of 1,085 trips reported catching one or more vermilion snapper during November-March 2005-2007 (Table 2). Of these trips, 58% landed fewer than 25 vermilion snapper, 73% landed fewer than 50 vermilion snapper, and 16% landed more than 100 vermilion snapper. Vermilion snapper accounted for a majority of the harvest on approximately 25% of these trips (271 of 1,085 trips) (Table 3).

Most trips landing SWG during January-April 2005-2007 landed fewer than 25 SWG on a trip (Table 4). Approximately 5 percent of headboat trips landed more than 25 SWG on a trip (Table 4). Landings of SWG on these trips typically accounted for a small fraction of the total number of snapper-grouper harvested (Table 5); only 27 of the 2,029 trips (1.3%) had SWG landings that accounted for 50% or more of the overall snapper-grouper landings.

Table 2. Percent frequency of trips landing various amounts of vermilion snapper during Nov-Mar, 2005-2007.

N caught	N trips	Pct trips	Cum Pct trips
1-25	627	58%	58%
26-50	166	15%	73%
51-75	57	5%	78%
76-100	58	5%	84%
101+	177	16%	100%
TOTAL	1,085	100%	n/a

Table 3. Number of headboat trips and the relative percentage of vermilion snapper versus total snapper-grouper landings on those trips during Nov-Mar, 2005-2007.

Pct VS vs. Total SG	N trips	Pct trips	Cum Pct trips
1-10%	152	14%	14%
11-20%	210	19%	33%
21-30%	185	17%	50%
31-40%	156	14%	65%
41-50%	111	10%	75%
51-60%	57	5%	80%
61-70%	66	6%	86%
71-80%	47	4%	91%
81-90%	49	5%	95%
91-100%	52	5%	100%
TOTAL	1,085	100%	n/a

Table 4. Percent frequency of trips landing various amounts of shallow-water grouper during Jan-Apr, 2005-2007.

N caught	N trips	Pct trips	Cum Pct trips
1-5	1,451	72%	72%
6-10	299	15%	86%
11-15	112	6%	92%
16-20	51	3%	94%
21-25	22	1%	95%
26-30	19	1%	96%
31-35	15	1%	97%
36-40	15	1%	98%
41-45	11	1%	98%
46-50	7	0%	99%
50+	27	1%	100%
TOTAL	2,029	100%	n/a

Table 5. Number of headboat trips and the relative percentage of shallow-water grouper versus total snapper-grouper landings on those trips during Jan-Apr, 2005-2007.

Pct SWG vs Total SG	N trips	Pct trips	Cum Pct trips
1-5%	1,263	62%	62%
6-10%	395	19%	82%
11-15%	142	7%	89%
16-20%	93	5%	93%
21-25%	38	2%	95%
26-30%	26	1%	96%
31-35%	15	1%	97%
36-40%	11	1%	98%
41-45%	5	0%	98%
46-50%	22	1%	99%
>50%	19	1%	100%
TOTAL	2,029	100%	n/a

Tables 6 and 7 summarize the number of 'target' trips for vermilion snapper and SWG during their respective closed seasons. The number of 'target' trips varied depending on the landing and percent snapper-grouper thresholds. For vermilion snapper, 'target' trips represented 12-35% of the overall trips occurring during the five month closure. These trips accounted for 10-36% of the red snapper landings (in numbers) during the closure months and 2-8% of the total 2005-2007 landings (n = 18,610 for 2005-2007 CRNF files). For SWG, 'target' trips represented 0-10% of the overall trips occurring during the four-month closure. Red snapper landings on these 'target' trips accounted for 0-6% of the red snapper landings (in numbers) during the closure months and 0-1% of the total 2005-2007 landings

Table 6. Number of vermilion snapper 'target' headboat trips during Nov-Mar 2005-2007 based on various trip landings and snapper-grouper thresholds. N red snapper = number of red snapper caught on 'target' trips. Note: red snapper landings are from CRNF headboat files and have not been adjusted.

N landed	Pct VS vs Total SG	N trips	Pct trips	N red snapper
25	50%	204	19%	633
50	50%	171	16%	547
75	50%	149	14%	500
100	50%	125	12%	426
25	25%	380	35%	1,489
50	25%	270	25%	1,001
75	25%	222	20%	841
100	25%	173	16%	643
Total	n/a	1,085	100%	4,149

Table 7. Number of shallow-water grouper ‘target’ headboat trips during Jan-Apr 2005-2007 based on various trip landings and snapper-grouper thresholds. N red snapper = number of red snapper caught on ‘target’ trips. Note: red snapper landings are from CRNF headboat files and have not been adjusted.

N landed	Pct SWG vs Total SG	N trips	Pct trips	N red snapper
25	50%	<3	0%	0
10	50%	3	0%	0
25	25%	4	0%	0
10	25%	34	2%	13
25	10%	36	2%	47
10	10%	109	5%	82
25	5%	78	4%	77
10	5%	204	10%	218
Total	n/a	2,029	100%	3,749

Change in Landings Resulting from Amendment 16

During 2005-2007, an average of 45,862 pounds of red snapper was landed on headboats in the South Atlantic. Elimination or modification of ‘target’ trips in response to Amendment 16 regulatory actions and various ‘target’ trip definitions resulted in landings being reduced by 1.1 to 7.7 percent relative to status quo (Table 8).

Table 8. Estimated reductions in red snapper headboat landings associated with Amendment 16 closed seasons for vermilion snapper and SWG.

Scenario	Criteria		2005-2007 avg. landings (lbs)	% change relative to status quo
	Trip Landings	% Landings		
Status quo (no effect from A16)	n/a	n/a	45,862	0.0%
Target trips become non-target trips	25	50%	45,358	1.1%
Target trips eliminated	25	50%	44,394	3.2%
Target trips become non-target trips	25	25%	44,389	3.2%
Target trips eliminated	25	25%	42,312	7.7%

Discussion

Based on the results of this analysis, Amendment 16 closed seasons are estimated to have only a small effect on red snapper landings. Few trips, relative to the total number of trips annually, were estimated to target vermilion snapper or SWG during the closure months. In fact, almost no trips were determined to ‘target’ SWG. Although a greater percentage of trips targeted vermilion snapper during the closure months, landings of red snapper on these trips represented a small fraction of the overall red snapper annual landings. Red snapper landings during May-October accounted for 50% of the total landings during 2005-2007 (see Figure 1). Because SWG trips have little to no effect on harvest, including the month of April increases the

amount of landings unaffected by the closures to 61%. This means that the largest reductions that could be achieved as a result of Amendment 16 management actions is 39-50% relative to status quo. The realized reduction from these regulatory actions was estimated to be much less than 39-50%, because a majority of vermilion snapper and SWG trips were classified as non-target trips during the Amendment 16 closed seasons.

The results of this analysis may have greatly differed if landings in pounds rather than landings in numbers were used. Because landings in pounds from the headboat catch-effort files are not used for estimating annual landings, quantity rather than weight was used for purposes of this analysis. This results in 'target' trips being defined more often for smaller, more abundant species, such as vermilion snapper, and potentially less often for higher level predators, such as groupers. Regardless, evaluating a range of potential 'target' trip definitions allows for the sensitivity of results to be explored. Numerous additional 'target' trip definitions could have been considered in this report. Any definitions that require higher amounts of fish or higher percentages of fish to be landed, will reduce any reductions occurring from Amendment 16 closed seasons. Similarly, lower landing threshold will increase the number of 'target' trips and result in greater assumed reductions from Amendment 16.

Discard data were not summarized in this report, but equivalent reductions in discards will be presumed to be proportional to landings in subsequent analyses. Additional work is now ongoing to estimate headboat red snapper discards for 2005-2007. Southeast Regional Office staff and Southeast Fisheries Science Center staff are also evaluating whether appropriate data and methods are available for assigning headboat red snapper landings to South Atlantic statistical grids or other spatial areas. If methods and data are identified, then status quo or Amendment 16 adjusted landings from this analysis can be assigned to statistical grids for evaluating the size and extent of proposed snapper-grouper spatial closures.

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Literature Cited

SAFMC. 2008. Snapper Grouper Amendment 16 (gag and vermilion snapper) including a final environmental impact statement, initial regulatory flexibility analysis, final regulatory impact review, and social impact assessment/fishery impact statement. SAFMC, Charleston, SC 443 pp. + appendices.

SAFMC. 2009. First briefing book draft of Snapper Grouper Amendment 17. SAFMC, Charleston, SC

SEDAR 15. 2009. Stock Assessment Report 1 (SAR1) South Atlantic red snapper. Southeast Data, Assessment, and Review, Charleston, SC 511 pp.

SEFSC. 2009. Red snapper projections V. NMFS, SEFSC, Beaufort, NC 34 pp.

SERO. 2009. Evaluating the Effects of Amendment 13C, Amendment 16, and Amendment 17 Regulations on Red Snapper Removals by South Atlantic Commercial Fisheries. SERO-LAPP-2009-03, NMFS, SERO, St. Petersburg, FL 44 pp.

Williams, E., R. Cheshire, and K. Brennan. 2009. Distribution of red snapper catches from headboats operating in the South Atlantic – CONFIDENTIAL DATA. NMFS, SEFSC, Beaufort, NC 11 pp.