

Economic Analysis of Proposed Management Alternatives in Amendment 17A  
for the Commercial Snapper-Grouper Fishery

James R. Waters  
NOAA National Marine Fisheries Service  
Southeast Fisheries Science Center  
101 Pivers Island Road  
Beaufort, NC 28557  
[Jim.Waters@noaa.gov](mailto:Jim.Waters@noaa.gov)

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## Economic Analysis of Proposed Management Alternatives in Amendment 17A for the Commercial Snapper-Grouper Fishery

### *Introduction*

The red snapper (*Lutjanus campechanus*) resource within the jurisdiction of the South Atlantic Fishery Management Council has been determined to be severely overfished, and all management measures proposed in Amendment 17A would prohibit their harvest, possession and sale. These management measures differ in their proposed restrictions on the harvest of other species in the snapper-grouper management unit as a means of reducing the incidental catch and discard of red snapper.

This report describes the results of a simulation model that calculated the expected economic effects of the proposed management alternatives for the commercial snapper-grouper fishery from North Carolina through the Atlantic side of the Florida Keys. These results are preliminary and could change as the proposed management alternatives evolve during the development of Amendment 17A.

### *Historical Background*

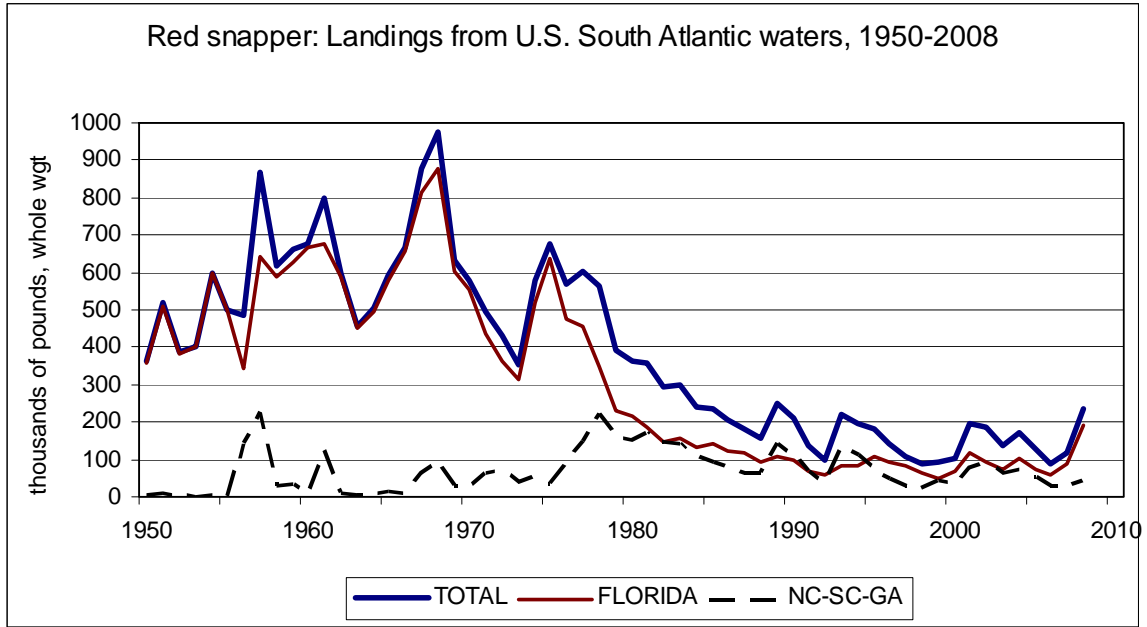
A small commercial fishery for red snapper along the Atlantic coast has existed at least since 1902 when 155,000 pounds were landed, primarily in Georgia.<sup>1</sup> The fishery continued at relatively low levels until after World War 2. Landings jumped to approximately 250,000 pounds in 1945 and 363,000 pounds in 1950. Landings fluctuated along a generally increasing trend through 1968 when they peaked at 974,000 pounds, declined to less than 100,000 pounds in 2006, and then increased in 2007 and 2008 (Figure 1). Landings in 2008 of 236,000 pounds were the highest since 1989 but remain far below historical catches prior to 1975. Commercial landings of red snapper averaged 540,000 pounds per year from 1950-1959, 678,000 pounds per year from 1960-1969, 524,000 pounds per year from 1970-1979, 259,000 pounds per year from 1980-1989, 147,000 pounds per year from 1990-2000, and 152,000 pounds per year from 2001-2008.

Fishermen along the east coast of Florida dominated the commercial fishery for red snapper until the mid-1970s, and accounted for more than 90% of landings from 1950-1975 (Figures 1 and 2). Geographic expansion of the fishery occurred during the late 1970s. Landings increased in Georgia, South Carolina and North Carolina and declined in Florida where landings averaged less than 60% of the total commercial fishery from 1978-2008 (Figure 2). Recently, however, the proportion of landings from Florida has increased from about 50% in 2002 to 80% in 2008 as landings increased in Florida and the combined landings from North Carolina, South Carolina and Georgia declined.

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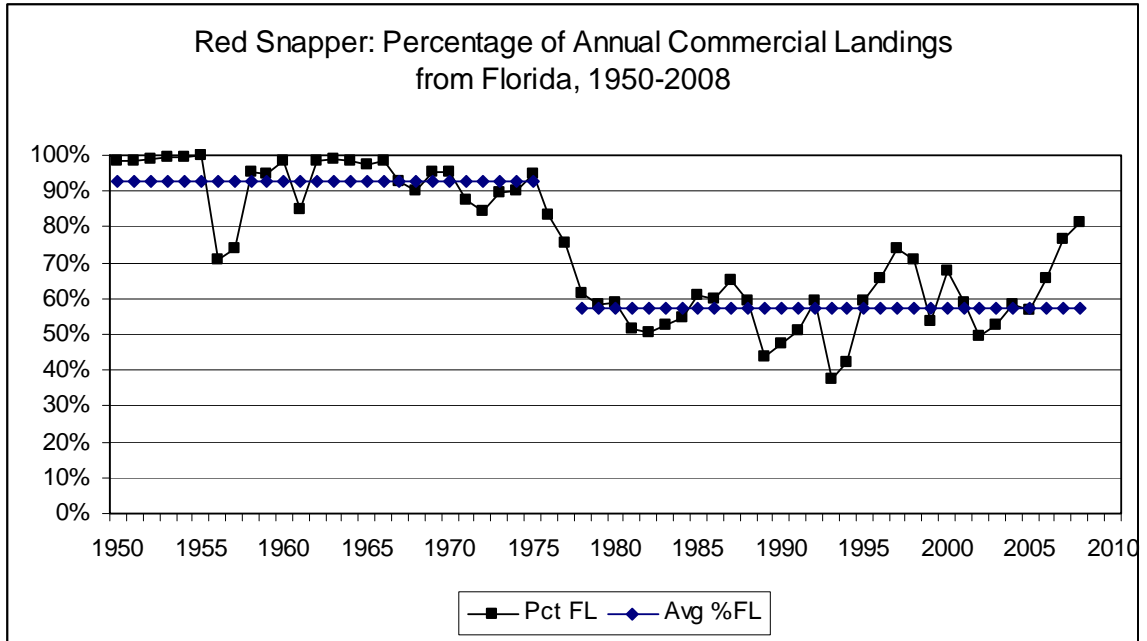
<sup>1</sup> NOAA. 1990. Historical catch statistics: Atlantic and Gulf coast states, 1879-1989. Current Fishery Statistics 9010, NMFS Fishery Statistics Division, 107p.

Figure 1. Commercial landings of red snapper from U.S. south Atlantic waters, 1950-2008.



Sources: SEDAR 15 for 1950-2006, and NOAA Fisheries Southeast Fisheries Science Center Accumulated Landings System for 2007-2008.

Figure 2. Percentage of commercial red snapper landings from Florida, 1950-2008.

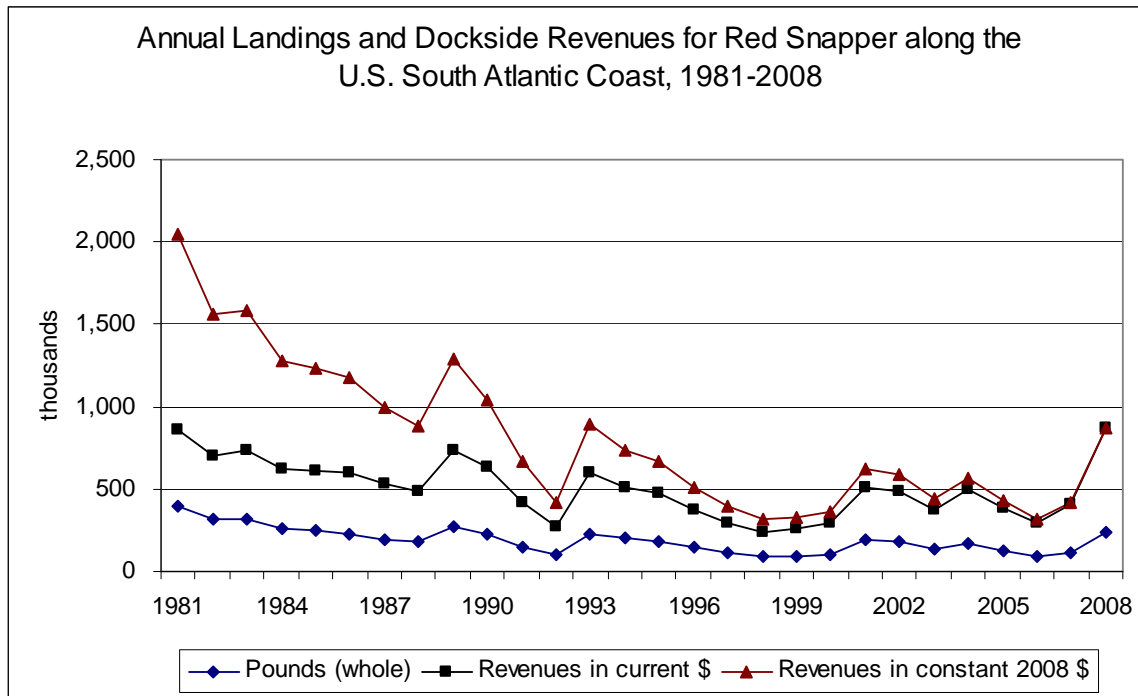


Sources: SEDAR 15 for 1950-2006, and NOAA Fisheries Southeast Fisheries Science Center Accumulated Landings System for 2007-2008.

Figure 3 displays landings and dockside revenues during the latter portion of the time series. Between 1981 and 2008, commercial landings of red snapper ranged from a high of 391,000 pounds (whole weight) worth \$863,000 in current year dollars in 1981 to a low of 88,000 pounds worth approximately \$292,000 in 2006. Dockside revenues increased to nearly \$866,000 in 2008. In current year dollars, 2008 produced the highest revenues for red snapper since 1978. In constant 2008 dollars, dockside revenues in 2008 were the highest since 1993 after accounting for inflation with the consumer price index for all urban consumers.

Dockside revenues and pounds landed fluctuate in the same direction (Figure 3), which suggests that ex-vessel demand is price elastic. The policy implication is that regulations that reduce industry landings in the short-term are expected to reduce dockside revenues in the short-term. Conversely, dockside revenues are expected to increase over time if regulation successfully increases biomass and landings.

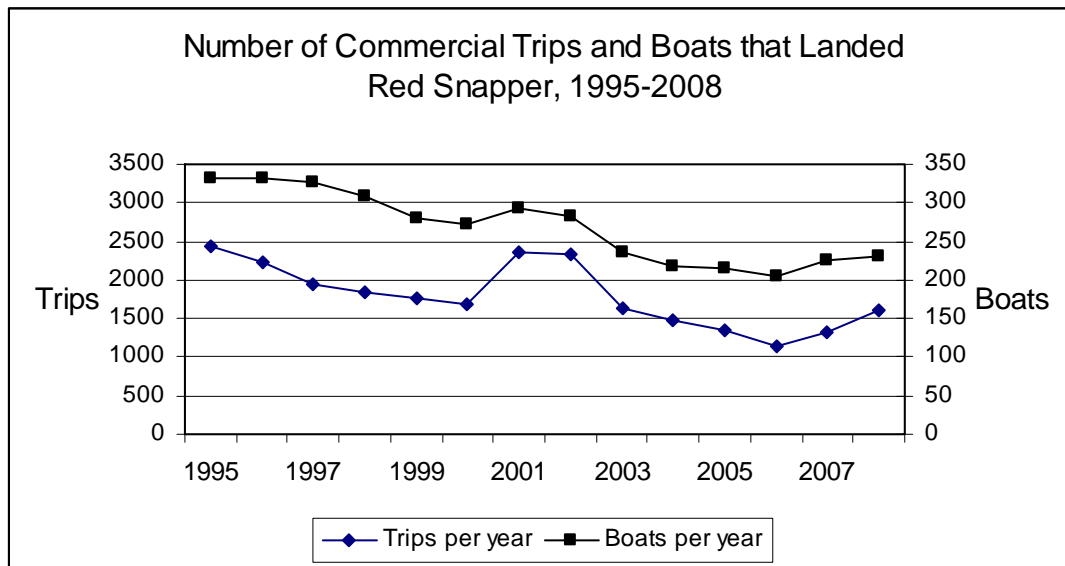
Figure 3. Annual dockside revenues from commercial red snapper landings, 1981-2008.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of July 8, 2009.

Logbook trip reports provide additional details about the commercial fishery for red snapper.<sup>2</sup> The number of vessels and trips that landed red snapper declined from 1995-2008, with a brief exception in 2001 and 2002 (Figure 4). Between 2005 and 2008 (which represent the subset of data that will be used to analyze the proposed management alternatives in Amendment 17A), an average of 220 vessels reported an average of 1,357 trips that landed at least one pound of red snapper (Table 1). These trips totaled an annual average of 135,000 pounds of red snapper worth \$467,000 in current year dollars, and produced an average of 1.93 million pounds of other species worth \$4.58 million.

Figure 4. Number of commercial trips and boats that landed red snapper in federal waters, 1995-2008.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of June 29, 2009.

Clearly, red snapper was not the primary revenue species on most of these trips. Red snapper was the primary source of trip revenue on an average of 190 trips per year and a lesser source of revenue on 1,167 trips per year (Table 1). On average from 2005-2008, red snapper was the primary source of trip revenue on less than 15% of the total number of trips on which they were landed. These trips accounted for approximately 40% of the total commercial harvest of red snapper, with an annual average for the entire fishery of

<sup>2</sup> Since 1993, snapper-grouper fishermen with a permit to fish in Federal waters have been required to submit logbook trip reports to the NMFS with information about landings by species and gear type, approximate location of trip and date of landing. Unlike the ALS database, the logbook database does not include landings from trips in state waters by fishermen who do not have Federal permits. A comparison of red snapper landings from the logbook and ALS databases suggests that landings may have been underreported in the logbook database during 1993 and 1994, the first two years for mandatory logbook reporting. By 1995 landings in the two databases were relatively close, which conforms with expectations that red snapper are landed primarily in federal waters. Between 2005 and 2008, landings reported to the logbook database were about 95% of total red snapper landings as defined by the ALS database.

54,000 pounds of red snapper worth \$189,000 in current dollars and 57,000 pounds of other species worth \$124,000. Approximately 60% of the total commercial harvest of red snapper occurred on trips when red snapper was a secondary source of trip revenue. Trips with red snapper as a lesser source of revenue accounted for an annual average of 81,000 pounds of red snapper worth \$279,000 in current dollars and 1.87 million pounds of other species worth \$4.46 million.

*Table 1. Average annual landings and dockside revenues on trips that landed at least one pound of red snapper, 2005-2008.<sup>3</sup>*

	Trips with at least one pound of red snapper	Trips with red snapper as primary source of trip revenue	Trips with red snapper as secondary source of trip revenue
	Annual averages for 2005-2008		
Number of vessels	220	67	205
Number of trips	1,357	190	1,167
Red snapper landings (thousand pounds, whole weight)	135	54	81
Dockside revenue from red snapper in current year dollars (thousands)	\$467	\$189	\$279
Landings of other species (thousand pounds, whole weight)	1,928	57	1,871
Dockside revenue from other species in current year dollars (thousands)	\$4,584	\$124	\$4,460

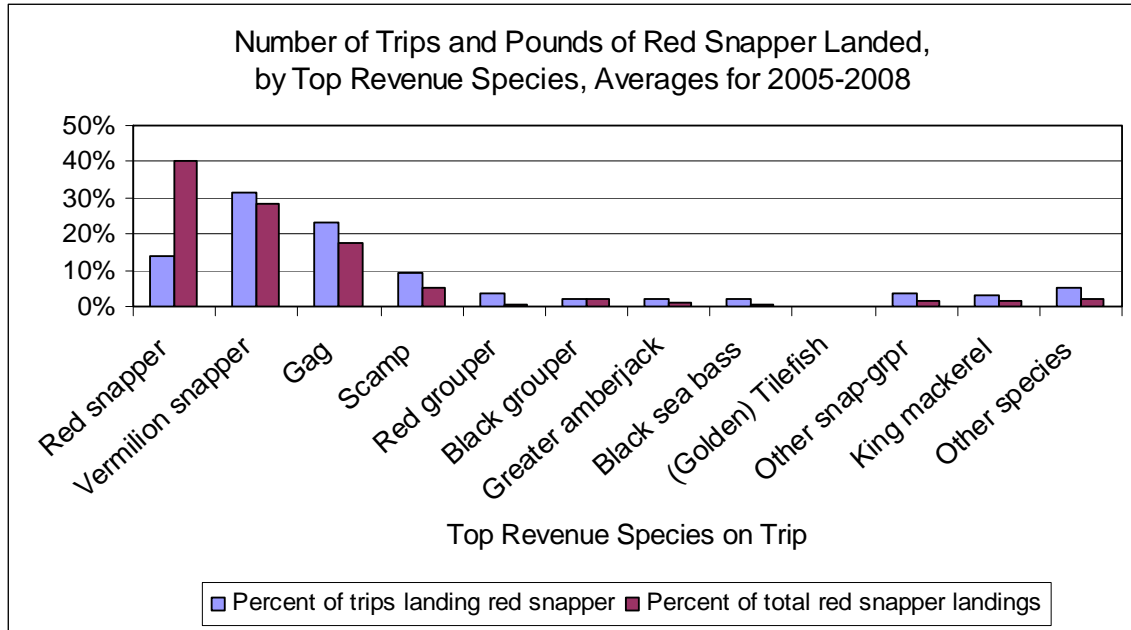
Sources: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of June 29, 2009, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of July 8, 2009.

Red snapper were most commonly caught as a secondary revenue species on trips with vermilion snapper, gag or scamp as the primary revenue species on the trip (Figure 5). On average for 2005-2008, vermilion snapper was the primary source of trip revenue for

<sup>3</sup> The logbook database does not collect prices or revenues for landed fish. Trip revenues were approximated as reported landings multiplied by average prices, by species, from the NMFS Accumulated Landings System.

approximately 31% of the trips that landed red snapper, and accounted for 28% of total red snapper landings. Gag was the primary source of trip revenue for 23% of trips that landed red snapper and accounted for nearly 18% of total red snapper landings. Scamp was the primary source of trip revenue for 9% of trips that landed red snapper and accounted for 5% of total red snapper landings. The top revenue species was not part of the snapper-grouper management unit for 8% of the trips with red snapper. These trips accounted for less than 2.5% of total red snapper landings.

Figure 5. Number of trips and pounds of red snapper landed, classified according to the top revenue species on each trip, averages for 2005-2008.



Sources: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of June 29, 2009, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of July 8, 2009.

*Method of Analyzing Economic Effects of Proposed Management Alternatives*

Fishermen with permits to fish in federal waters for species in the snapper-grouper fishery have been required since 1993 to submit trip reports of their landings by species. Logbook trip reports from 2005-2008 constitute the source of data used in this analysis. Data prior to 2005 were not used in the analysis because they did not include information about the depth of water where fish were caught. Several proposed alternatives in Amendment 17A would regulate fishing activity by water depth.

The simulation model uses logbook trip reports to predict the short-term economic effects of proposed management alternatives. The general method of analysis is to hypothetically impose proposed regulations on individual fishing trips as reported to the logbook database, and then calculate their effects on trip catches, revenues and costs. Trip-level results are totaled by year for 2005-2008, and the four-year average of

simulated results is interpreted as the expected annual outcome of proposed regulations. The four-year average is used so that short-term anomalies that may have affected fishing success in any one year will be averaged out. The average annual simulated fishing incomes net of trip costs (also referred to as *net operating revenues*) for the proposed alternatives are compared to the no-action alternative to estimate the expected economic effects on commercial fishermen.

Net operating revenues for trip  $j$  in year  $t$  were calculated as trip revenues from all species minus predicted trip costs, which include fuel, oil, bait, ice, and other supplies, and exclude fixed costs and labor costs. Therefore, net operating revenues represent the return to fixed factors of production, labor (including crew) and boat owner. Net operating revenues were adjusted to constant 2008 dollars with the consumer price index for all items and all urban consumers.

The simulation model examines the effects of proposed management alternatives on trip revenues and trip costs. If trip revenues remain greater than trip costs plus opportunity cost of labor after accounting for the likely effects of proposed restrictions, then the trip is recorded as taken in the simulation model, and the economic effect of the proposed restriction is measured as the loss in revenues associated with the expected reduction in landings per trip. On the other hand, if the proposed alternatives would cause trip revenues to fall below the sum of trip costs and opportunity cost for labor after accounting for the likely effects of proposed restrictions on trip-level harvests, then the trip is recorded as not taken in the simulation model, and losses are measured as a reduction in net operating revenues, which included the loss in revenues from all species minus the savings of trip costs not incurred.

This method of analysis has advantages and disadvantages. The advantages are that logbook data are reported by fishermen, and are available in sufficient detail to analyze and compare the proposed alternatives. The disadvantage is that logbook data reflect fishing patterns and strategies given regulations that will no longer apply. Fishermen will modify their fishing patterns and strategies to minimize the effects of new regulations, but the simulation model does not account for these changes. Therefore, it can only approximate the true, but unknown, outcomes of proposed regulations. Nevertheless, the approach provides useful insights about the relative magnitudes of change due to proposed alternatives and the distribution of effects among subgroups within the fishery.

#### *The No-Action Alternative*

The objective of this analysis is to predict the extra economic effects associated with implementation of Amendment 17A. It accomplishes this objective by comparing the predicted outcomes of simulations given proposed regulations for Amendment 17A with the predicted outcome of simulations for the no-action alternative. For purposes of this analysis, the no-action alternative is defined by the predicted outcomes of rules specified in Amendments 13C, 15A and 16.



The effects of proposed regulations in Amendment 17A are compared to the simulated effects of Amendments 13C, 15A and 16 rather than to observed fishery landings and revenues because historical data for 2005-2008 do not reflect the effects of regulations recently implemented by these amendments. Amendment 13C to the Snapper-Grouper Fishery Management Plan was implemented in October 2006 and Amendment 15A was implemented in March 2008. Both amendments primarily regulate the harvest of deep water groupers, tilefish and black sea bass. Amendment 16 was implemented at the end of July 2009 and imposes limits on the harvest of vermilion snapper, gag and other shallow water groupers. Landings of other species, such as red snapper, in the snapper-grouper management unit could change if they are indirectly affected by regulations in Amendments 13C, 15A and 16.

Figure 6. Percentage change in pounds landed compared to the No-Action alternative for Amendment 13C after accounting for regulations implemented by Amendments 13C, 15A and 16.

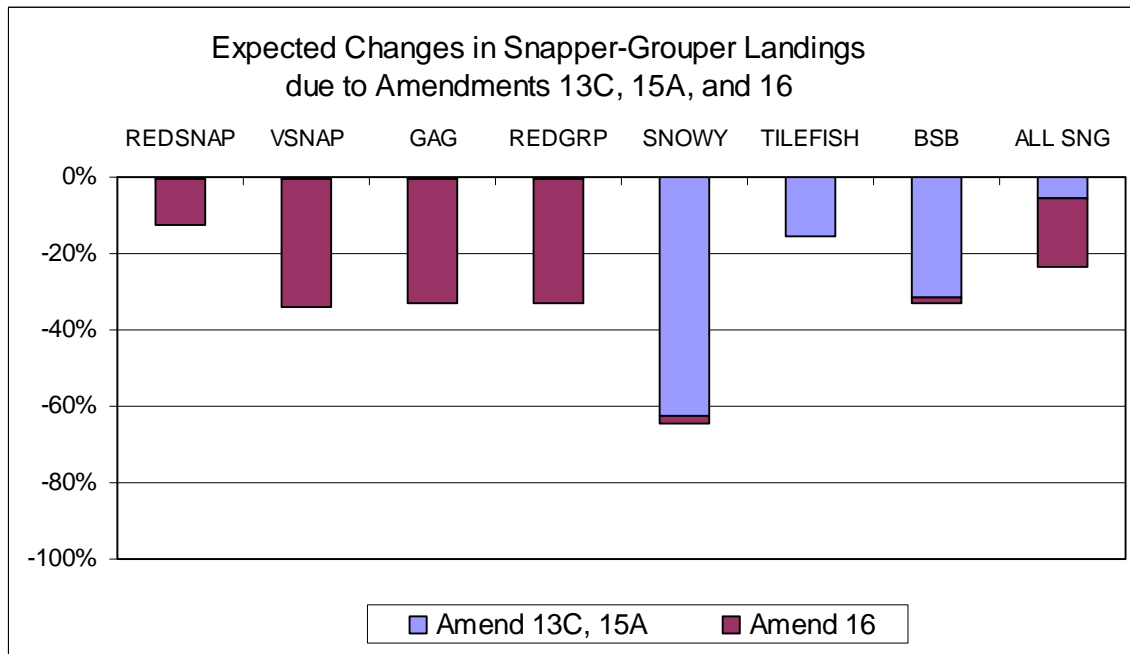


Figure 6 illustrates the differences between observed fishery landings and the simulated landings that comprise the no-action alternative for Amendment 17A. The light shading in Figure 6 illustrates that Amendments 13C and 15A are expected to affect landings of snowy grouper, golden tilefish and black sea bass. The dark shading in Figure 6 illustrates that Amendment 16 is expected to affect landings of mid-shelf species such as vermilion snapper, gag and red grouper, and to a lesser extent, red snapper. The cumulative effects on landings are illustrated by the total length of each bar in Figure 6. Amendments 13C, 15A and 16 are predicted to reduce landings of: red snapper by approximately 13 percent; gag and red grouper by approximately 33 percent; snowy grouper by approximately 65 percent; (golden) tilefish by approximately 15 percent; and

vermillion snapper and black sea bass by approximately 34 percent. The right-most bar in Figure 6 (labeled ALL SNG) illustrates that Amendments 13C, 15A and 16 are expected to reduce the aggregate total landings of all species (including species not shown in Figure 6) in the snapper-grouper management unit by approximately 25 percent compared to reported average annual landings from 2005-2008.

*Economic Effects of Proposed Management Alternatives for Red Snapper*

Table 2 lists the management alternatives that are proposed in Amendment 17A. Alternative 1 is the No Action alternative and reflects regulations currently in place for the snapper-grouper fishery. Alternatives 2-6 all would prohibit the possession and sale of red snapper. However, red snapper often are caught while fishing for other species in the snapper-grouper management unit (Table 1). Alternatives 3-6 are intended to reduce the incidental catch and discard of red snapper by specifying conditions under which the possession and sale of other species in the snapper-grouper management unit would be prohibited.

*Table 2. Alternatives proposed in Amendment 17A for the management of commercial fishing activity for red snapper. (Table 2 paraphrases rather than includes a verbatim statement of alternatives from Amendment 17A.)*

<i>Model Name</i>	<i>Description</i>
A17_NO_ACTION	<i>Alternative 1 ( No Action).</i> Retain existing regulations for red snapper, including a 20 inch size limit (commercial & recreational) and a recreational 2 fish bag limit (included in the 10 snapper per person limit).
A17_RedSnap_ALT2	<i>Alternative 2:</i> Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ.
A17_RedSnap_ALT3	<i>Alternative 3:</i> Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ. Prohibit commercial and recreational harvest, possession, and retention of other species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180 between a depth of 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m). Allow black sea bass harvest, possession, and retention in the closed area if fish were harvested with black sea bass pots with endorsements. Allow golden tilefish harvest, possession, and retention in the closed area. Allow harvest, possession, and retention of snapper grouper species in the closed area if fish were harvested with spearfishing gear.
A17_RedSnap_ALT4	<i>Alternative 4:</i> Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ. Prohibit commercial and recreational harvest,

<i>Model Name</i>	<i>Description</i>
	possession, and retention of other species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279 between a depth of 98 feet (16 fathoms; 30 m) to 240 feet (40 fathoms; 73 m). Allow black sea bass harvest, possession, and retention in the closed area if fish were harvested with black sea bass pots with endorsements. Allow golden tilefish harvest, possession, and retention in the closed area. Allow harvest, possession, and retention of snapper grouper species in the closed area if fish were harvested with spearfishing gear.
A17_RedSnap_ALT5	<i>Alternative 5:</i> Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ. Prohibit commercial and recreational harvest, possession, and retention of other species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, and 3180. Allow black sea bass harvest, possession, and retention in the closed area if fish were harvested with black sea bass pots with endorsements. Allow golden tilefish harvest, possession, and retention in the closed area. Allow harvest, possession, and retention of snapper grouper species in the closed area if fish were harvested with spearfishing gear.
A17_RedSnap_ALT6	<i>Alternative 6.</i> Prohibit all commercial and recreational harvest, possession, and retention of red snapper year-round in the South Atlantic EEZ. Prohibit commercial and recreational harvest, possession, and retention of other species in the snapper grouper FMU year-round in an area that includes commercial logbook grids 2880, 2980, 3080, 3179, 3180, 3278, and 3279. Allow black sea bass harvest, possession, and retention in the closed area if fish were harvested with black sea bass pots with endorsements. Allow golden tilefish harvest, possession, and retention in the closed area. Allow harvest, possession, and retention of snapper grouper species in the closed area if fish were harvested with spearfishing gear.

Figure 7 presents results for each year of logbook data used in the analysis. After accounting for the expected effects of Amendment 16, the simulation model predicted that the commercial fishery<sup>4</sup> would earn an average of approximately \$8.8 million per year after deducting routine trip costs such as fuel, bait, ice, food and other supplies, but before accounting for fixed costs (Figure 7). This estimate is the no action baseline for Amendment 17A, and represents income to boat owners, captains and crew members for their labor, plus income to boat owners to pay fixed costs and earn a return to capital invested in boat and equipment. This estimate is less than what fishermen currently earn because Amendment 16 was implemented in late July 2009 and its effects are now being incurred for the first time.

<sup>4</sup> The commercial fishery is defined in this analysis as consisting of all trips in the logbook database that reported landing at least one pound of any species in the snapper-grouper management unit.

Figure 7. Predicted net operating revenues by year for the commercial snapper-grouper fishery.

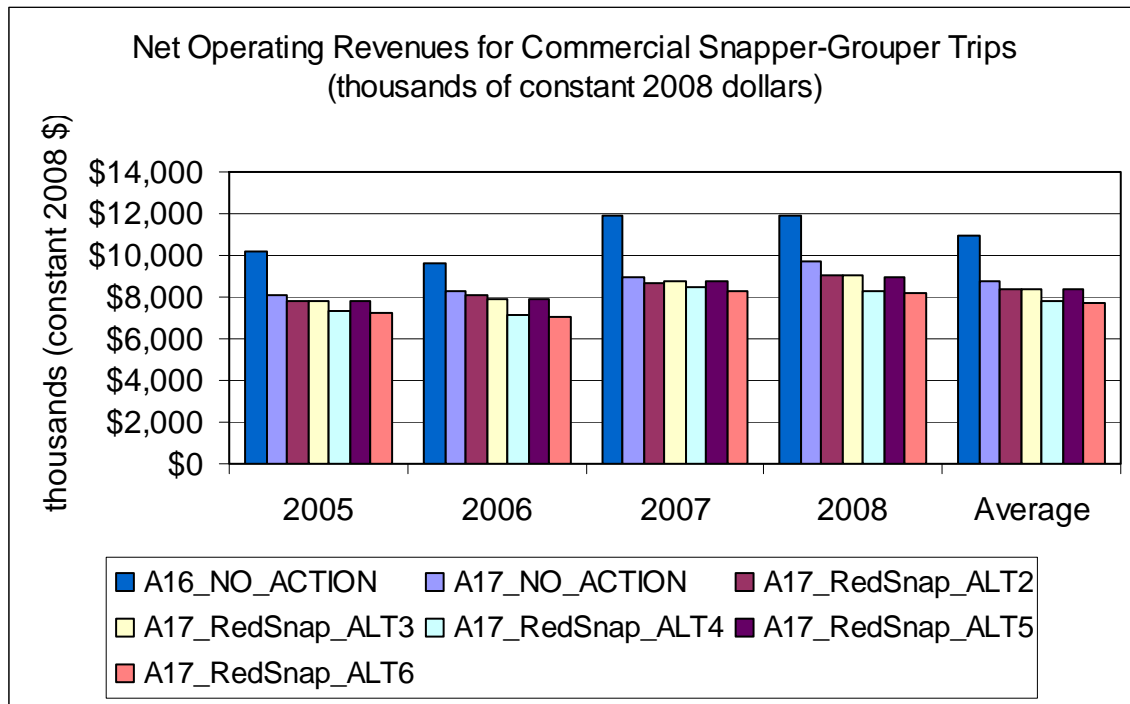


Figure 7 is interpreted as follows. The simulation model uses information from the recent past as a predictor of the near future. If environmental and biological conditions in the near future most closely resemble conditions that existed in 2008, for example, then the simulation model predicts that fishermen would earn \$9.8 million without the regulatory constraints that would be implemented with Amendment 17A. However, if environmental conditions in the near future most closely resemble conditions that existed in 2005, then the model predicts that fishermen would earn \$8.1 million. Because the future is unknown and because environmental conditions vary over time, we do not know which year is the best predictor of the near future. Therefore, the 4-year average of \$8.8 million is used as the expected predictor of the near future. During the 2005-2008 period, hindsight suggests that conditions in 2007 and 2008 yielded above average economic outcomes, while conditions in 2005 and 2006 yielded below average economic outcomes (Figure 7).

The management alternatives proposed in Amendment 17A would reduce net operating returns to commercial fishermen. Figures 8a and 8b indicate that the expected reductions would be greatest if conditions in the near future most closely resemble conditions in 2008, and would be the smallest if conditions most closely resemble 2007.

There is an inverse relationship between the predicted effects of Amendments 16 and 17A because red snapper often are caught on trips with vermilion snapper or gag (Figure 5). The economic and biological conditions present in 2005 and 2007 were conducive to

the greatest economic effects in percentage terms due to Amendment 16 (Figure 7), and the simulation model predicts the smallest additional effects on the commercial fishery due to Amendment 17A (Figures 8a and 8b). Conversely, the conditions present in 2006 and 2008 were predicted to yield the smallest effects in percentage terms due to Amendment 16 and the largest additional effects due to Amendment 17A.

Figure 8a. Predicted changes in net operating revenues compared to the No Action alternative for Amendment 17A.

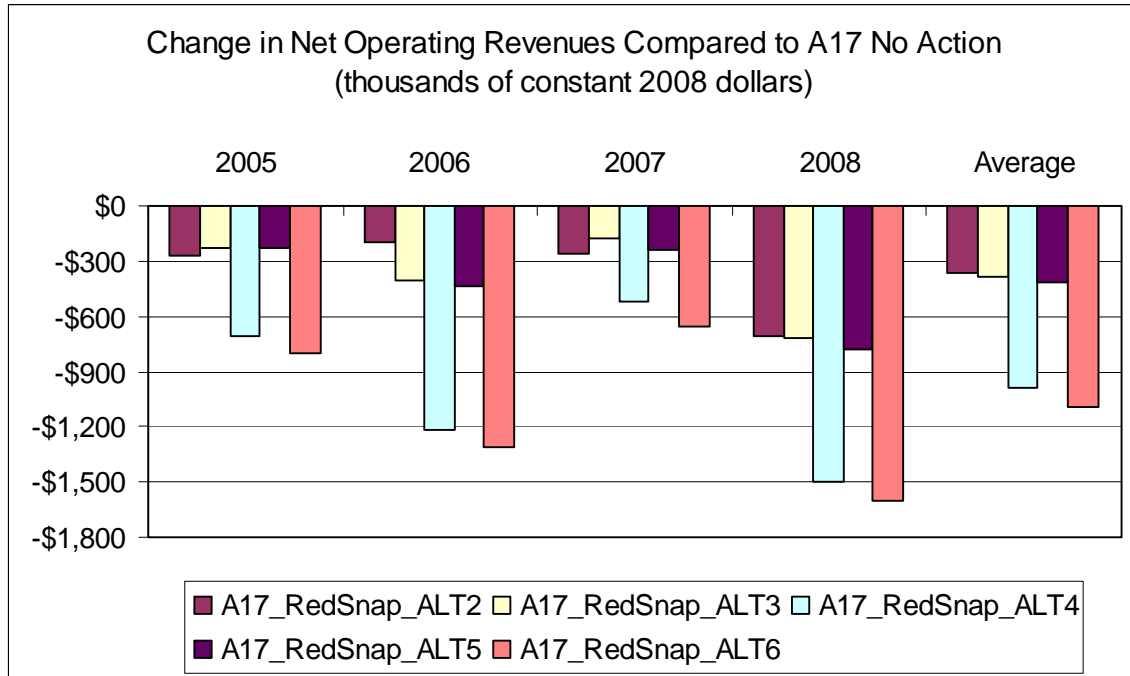
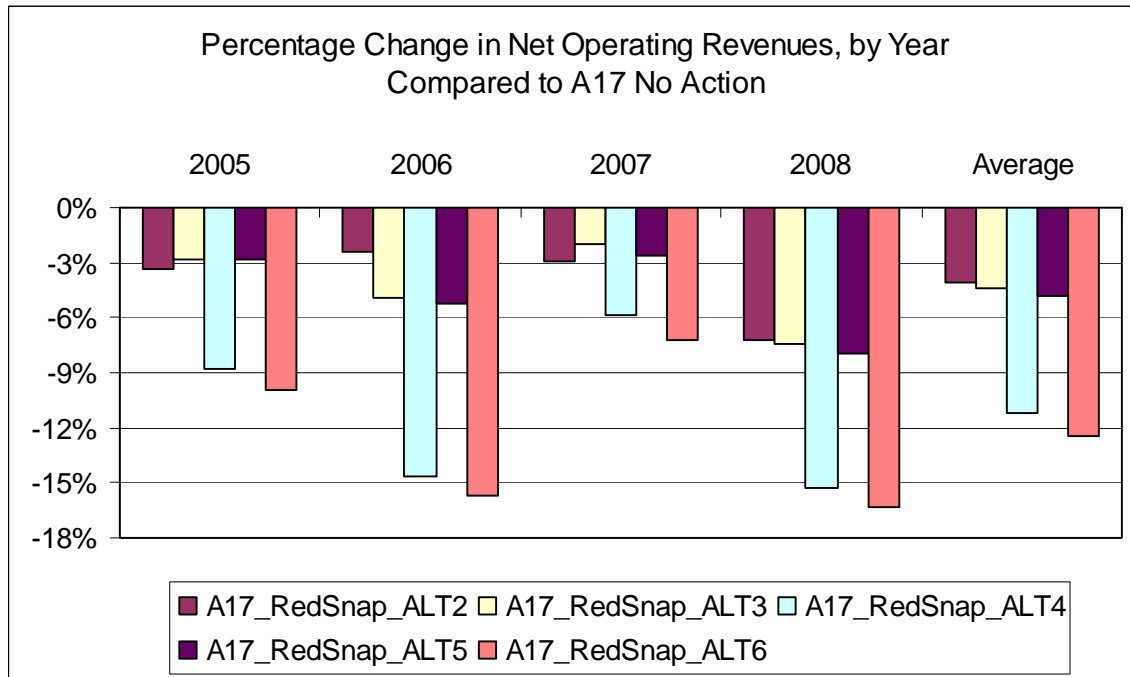


Figure 8b. Predicted percentage changes in net operating revenues compared to the No Action alternative for Amendment 17A.



Alternative 2 is the least restrictive alternative because it would prohibit the harvest of red snapper only, and is expected to reduce net operating revenues for commercial fishermen by an average of approximately 4 percent per year (Figure 8b). For individual years of data used in the analysis, the expected losses in net operating revenues associated with Alternative 2 ranged from 2.4 percent for 2006 to 7.3 percent for 2008. The expected losses are relatively small because red snapper is not a high-volume species in the commercial snapper-grouper fishery.

Alternatives 3 and 4 would prohibit the harvest of all species in the snapper-grouper management unit between 98 and 240 foot water depths in specific geographic locations. Alternative 3 would prohibit harvests of snapper-grouper species off northeast Florida and Georgia, while Alternative 4 would prohibit harvests off portions of South Carolina in addition to northeast Florida and Georgia. Therefore, Alternative 4 is expected to generate greater losses for the commercial fishery than Alternative 3 because it encompasses a broader range of restricted waters. Alternative 3 is predicted to reduce net operating revenues for commercial fishermen by an average of approximately 4.4 percent per year, whereas Alternative 4 is predicted to reduce net operating revenues by 11.2 percent (Figure 8b). For Alternative 3, the expected losses for individual years range from 2.0 percent for 2007 to 7.4 percent for 2008. For Alternative 4, the expected losses for individual years range from 5.9 percent for 2007 to 15.3 percent for 2008.

Alternatives 5 and 6 would prohibit the harvest of all species in the snapper-grouper management unit regardless of water depth in specific areas. Alternative 5 would

prohibit fishing for species in the snapper-grouper management unit in the same areas off Georgia and northeast Florida as would Alternative 3, and Alternative 6 would prohibit fishing in the same areas as would Alternative 4. Therefore, Alternative 5 is expected to generate greater losses than Alternative 3 because Alternative 3 would prohibit harvests only in water depths between 98 and 240 feet. Alternative 6 is expected to generate greater losses than Alternative 4 for the same reason. On average, Alternative 5 is expected to generate reductions of about 4.8 percent in net operating revenues, and Alternative 6 is expected to generate reductions of about 12.4 percent (Figure 8b). For Alternative 5, the expected losses for individual years range from 2.6 percent for 2007 to 8.0 percent for 2008. For Alternative 6, the expected losses for individual years range from 7.3 percent for 2007 to 16.4 percent for 2008.

Although the average overall expected reductions in net operating revenues range from 4 percent to slightly more than 12 percent for the entire commercial snapper-grouper fishery, the effects of Amendment 17A would be highly focused on fishermen in northeast Florida and Georgia because that region represents the center of the red snapper fishery (Figures 9a and 9b). Fishermen there would incur the largest losses in absolute and relative terms. The predicted reductions in net operating revenues for fishermen in northeast Florida and Georgia are expected to average approximately 24 percent for Alternative 2, 64 percent for Alternative 3, 70 percent for Alternative 4, 65 percent for Alternative 5, and 71 percent for Alternative 6 (Figure 9b).

Figure 9a. Change in net operating revenues by state of landing for red snapper alternatives compared to the No-Action alternative for Amendment 17A.

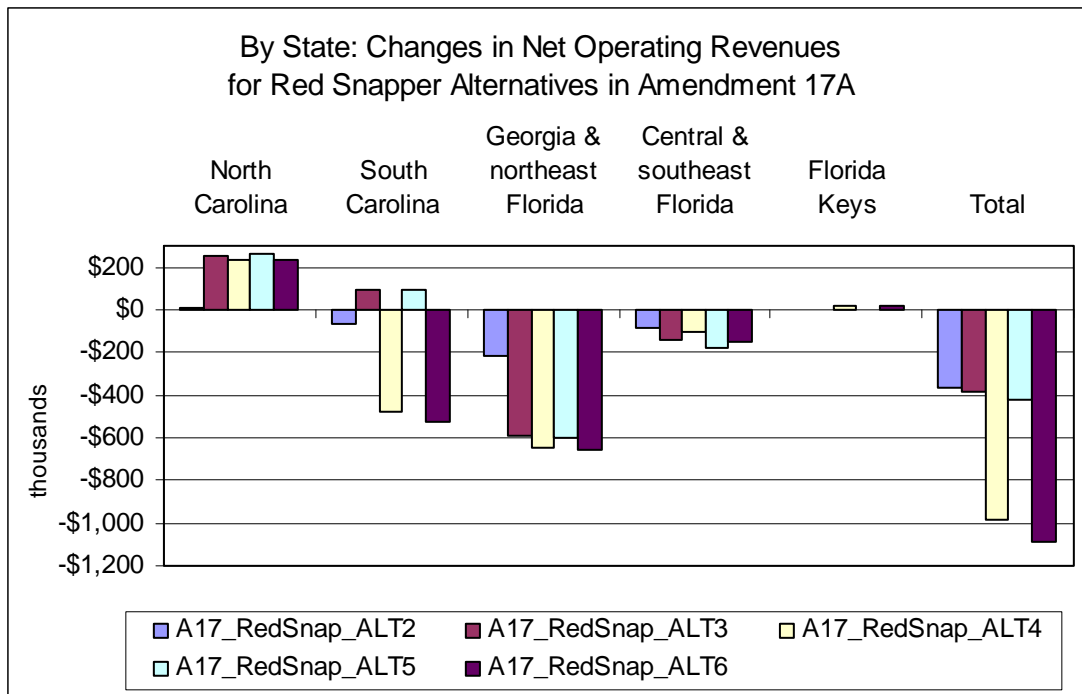
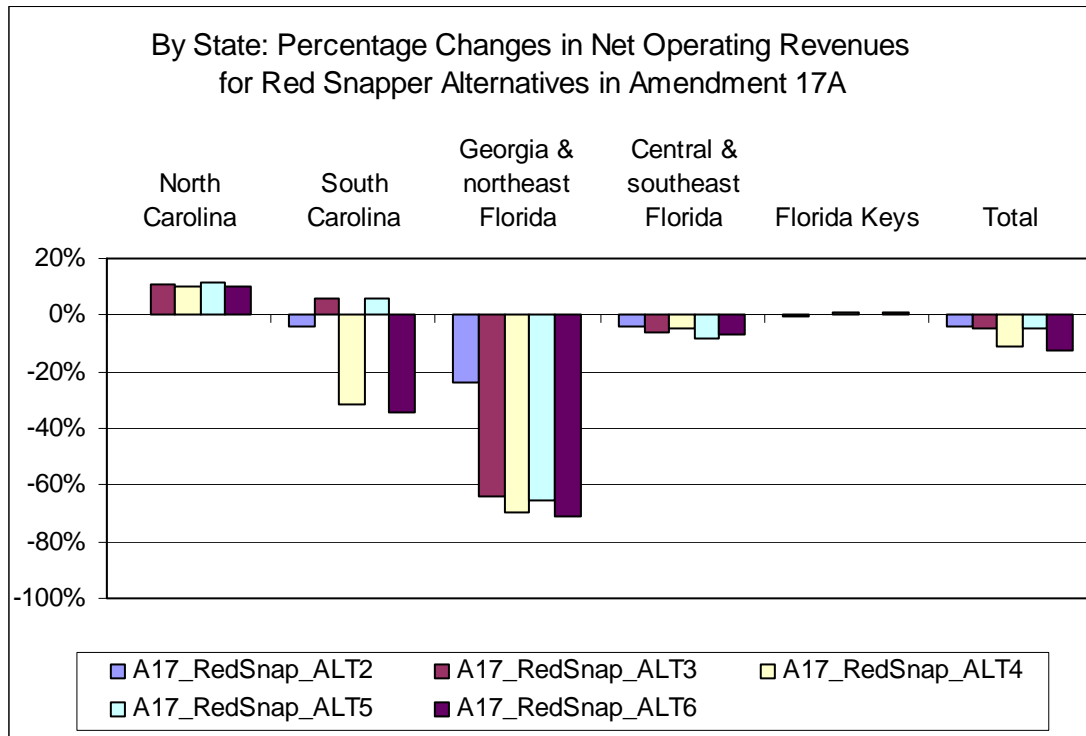


Figure 9b. Percentage change in net operating revenues by state of landing for red snapper alternatives compared to the No-Action alternative for Amendment 17A.

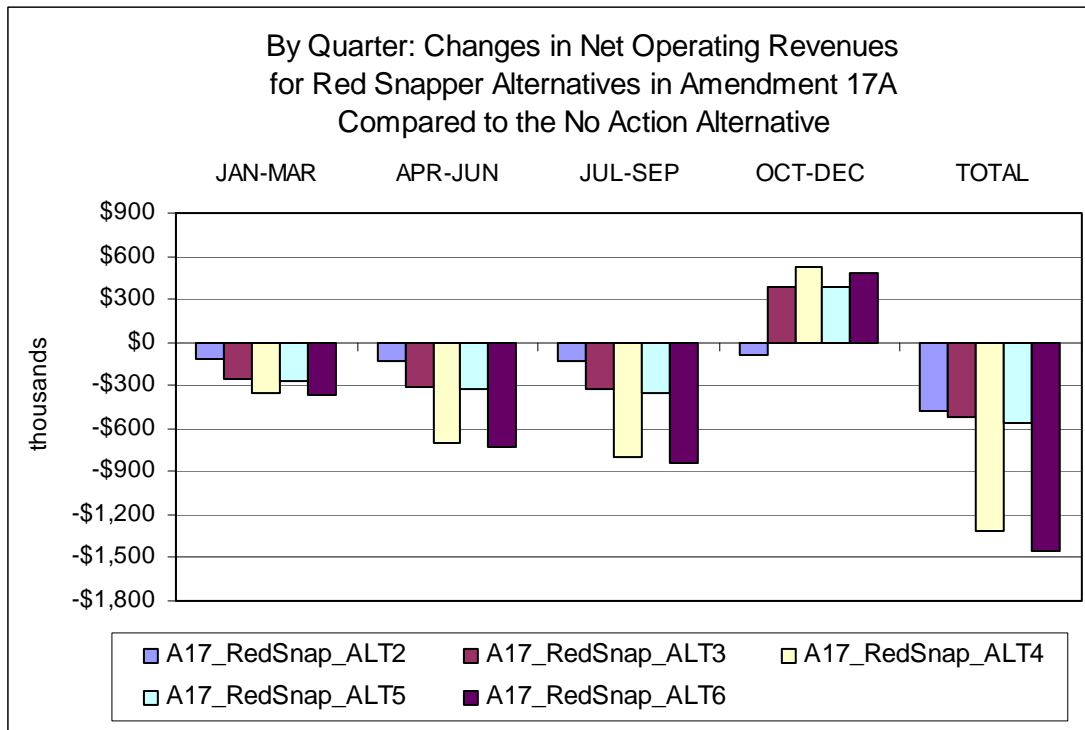


Alternatives 3 and 5 would limit the closures to areas off the coast of northeast Florida and Georgia, whereas Alternatives 4 and 6 also would close areas off the coast of South Carolina. Net operating revenues for fishermen in South Carolina are expected to decline by an average of approximately 31 percent with Alternative 4 and 34 percent with Alternative 6 (Figure 9b).

An unexpected finding of the simulation analysis was that proposed Alternatives 3-6 would increase catches of red grouper and various other species during the fourth calendar quarter of the year compared to the No-Action alternative (Figure 10). The predicted effects of Amendment 16 are included in the No-Action alternative for Amendment 17A. Amendment 16 specifies a commercial quota for gag, with the additional provision that the entire shallow water grouper fishery will be closed when the quota for gag is filled. The simulation analysis for Amendment 17A predicts that the proposed restrictions on the harvest of red snapper and other species in the snapper-grouper unit, including gag, would enable the fishery for shallow water groupers to remain open longer than with Amendment 16 only. Therefore, while the commercial fishery still would land its quota for gag, landings of other shallow water groupers and species commonly caught with shallow water groupers could be greater than with No Action. One implication of this prediction is that a longer open season for shallow water groupers would partially offset the overall losses that normally would be expected from the proposed alternatives for red snapper.



Figure 10. Change in net operating revenues by calendar quarter for red snapper alternatives compared to the No-Action alternative for Amendment 17A.



Fishermen in North Carolina are predicted to gain if the shallow water grouper fishery remains open longer than with the No-Action alternative (Figures 9a and 9b). Fishermen in South Carolina are predicted to gain with Alternatives 3 and 5 because these alternatives would not close areas off the coast of South Carolina.

Losses would be incurred primarily by fishermen who use vertical lines, although fishermen who dive for groupers could gain with Alternatives 4 and 6 because dive gear would be exempt from the prohibition on harvesting activities within the restricted areas (Figures 11a and 11b).

Figure 11a. Change in net operating revenues by gear type for red snapper alternatives compared to the No-Action alternative for Amendment 17A.

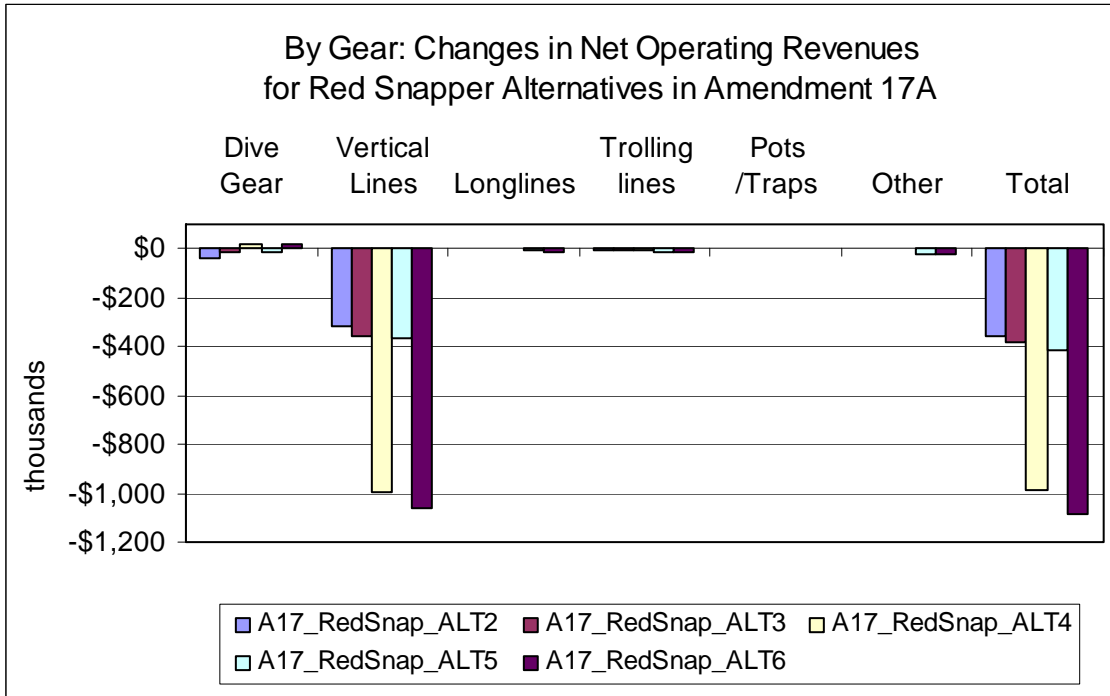
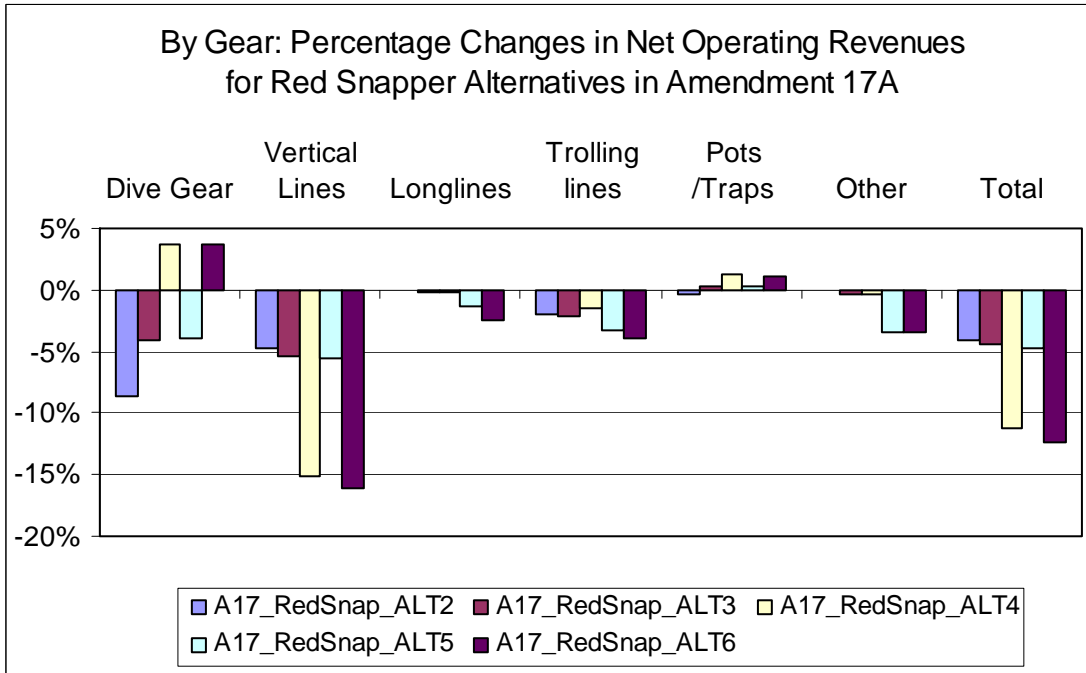


Figure 11b. Percentage change in net operating revenues by gear type for red snapper alternatives compared to the No-Action alternative for Amendment 17A



## *Summary*

This report described the results of a simulation model that calculated the expected economic effects of management alternatives proposed in Amendment 17A for the commercial snapper-grouper fishery. Six management scenarios were simulated. The baseline scenario assumed management conditions that were implemented recently by Amendment 16. Proposed alternatives 2-6 all would prohibit the harvest and sale of red snapper, while alternatives 3-6 also would prohibit the harvest and sale of any species in the snapper-grouper management unit based on conditions defined by water depth and/or area fished.

The analysis suggests that the proposed alternatives would reduce net operating revenues for the entire commercial snapper-grouper fishery by an overall average of between 4% and 12% per year. However, red snapper are harvested primarily in northeast Florida and Georgia, and fishermen in these areas are expected to incur reductions in net operating revenues of up to 71%. The costs associated with these management scenarios would be borne primarily by fishermen who use vertical line gear.

The finding that proposed alternatives for Amendment 17A could result in a longer open season for shallow water groupers and potential increases in net operating revenues for fishermen who land shallow water groupers during the longer open season is intriguing. However, the simulation model is based on historical fishing patterns and strategies, and fishermen probably will respond to Amendments 16 and 17A by redirecting some of their fishing activity to unrestricted areas and unrestricted depths. The redirected fishing effort may not be as productive and profitable, and hence the proposed alternatives in Amendment 17A probably will slow the rate at which gag are harvested. However, the simulation model probably overestimates the likelihood of a significantly shorter season for shallow water groupers because it does not account for changes in fishing patterns as fishermen respond to Amendments 16 and 17A. Therefore, the predicted increases in net operating revenues during the fourth quarter and in North Carolina probably are overestimated.

Alternatives for the management of red snapper could interact with additional alternatives proposed in Amendment 17B that are not considered in these analyses. In particular, the proposed alternatives considered in Amendment 17A do not include any commercial quotas for red grouper or black grouper, while Amendment 17B proposes to limit the harvest of both species. Therefore, the prediction of a longer open season for shallow water groupers could be an artifact of the way in which the two amendments were defined, and the simulation analysis of alternatives in Amendment 17A might not have predicted a longer season if commercial quotas for red and black groupers had been proposed in Amendment 17A rather than Amendment 17B. The simulation analysis for Amendment 17A predicted average annual landings for red grouper that were greater than the proposed commercial quota in Amendment 17B, but it also predicted average annual landings for black grouper that were less than its quota proposed in Amendment 17B.