An Economic Impact Study of the Effects of Closures in the South Atlantic Snapper-Grouper Fishery on the Bait and Tackle Retail Industry

Ariel Collis
Georgetown Economic Services
April 2010

I. Introduction

On January 4, 2010, the National Marine Fisheries Service ("NMFS") implemented a six-month ban on commercial and recreational fishing for Atlantic red snapper in federal waters off the southern Atlantic coast of the United States. While NMFS analyzed the effects of the red snapper ban on the commercial fishing industry, head boats,[1] and charter vessels,[2] it chose not to explore the impacts of the ban on "directly affected businesses such as fish dealers and bait and tackle shops" because data on these businesses allegedly were not available.[3]

The purpose of this report is to contribute to the agency's and public's understanding of the impact of the red snapper fishery closure by providing an economic study of the effects of the closure on the south Atlantic bait and tackle stores. This report also explores the impact of a ban on all bottom fishing[4] off the south Atlantic coast that was presented by NMFS as a possible long-term measure for reducing red snapper mortality in the region.[5] In addition, this report presents research and a methodology to assist NMFS with its impact analysis of these closures on bait and tackle shops and the fishing communities they serve.[6]

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1 A headboat is a for-hire vessel with a crew that carries a number of people on recreational fishing trips. It is sometimes referred to as a party boat.

2 A charter boat is a rented vessel.

3 74 Fed. Reg. 63673, 63680 (Dec. 4, 2009)

4 Bottom fishing is fishing done at or near the seabed. To accomplish this, a weight is attached near the end of the fishing line.

5 As of March of 2010, the South Atlantic Fishery Management Council has stated that its preferred alternative for reduction of red snapper mortality is a closure to all bottom fishing in an area that includes the waters off the coasts of Georgia and Northern Florida from 98 feet to 240 feet deep. "Council Modifies Preferred Alternative for Area Closure," South Atlantic Fishery Management Council Press Release, March 8, 2010. However, the ban on all bottom fishing off the entire South Atlantic coast is the most expansive alternative under consideration by SAFMC. It can be thought of as an upper bound on the level of impact bait and tackle stores might experience.

6 This paper provides a simple and inexpensive method of examining the impacts of a regulation on industries that have not been studied extensively, such as bait and tackle stores. The quantity and variety of information that we were able to gather suggests that this method may be useful in future regulatory procedures in which information appears to be unavailable about an industry.

To assess the impact of the closures on bait and tackle stores, we surveyed a sample of bait and tackle sellers in the south Atlantic region.[7] The responses to these surveys provided a qualitative description of the bait and tackle industry as well as a measure of the impact of the closures on the revenues, profits, and employment levels of the businesses in this region. The data show that roughly 1200 stores selling bait and tackle will be directly affected by the six month red snapper ban. These businesses will lose an estimated $10,000,000 in sales due to the ban. This comes to an average loss of $8,300 in sales per store. The data also show that roughly 1300 stores selling bait and tackle will be directly affected by the proposed bottom fishing ban. These businesses will lose an estimated $78,000,000 in sales in the first year of the ban. This comes to an average loss of $60,000 in sales per store.[8]

II. Background

A. Red Snapper Fishery Closure

On July 8, 2008 NMFS notified the South Atlantic Fisheries Management Council ("SAFMC") that red snapper in the south Atlantic region were undergoing overfishing and are overfished according to the current definition of the minimum red snapper stock size threshold.[9] In response, in March of 2009, SAFMC requested that NMFS implement a short term prohibition on the harvest and possession of red snapper. NMFS accepted SAFMC's recommendation and, on January 4, 2010, implemented a six-month ban on commercial and recreational fishing for Atlantic red snapper in federal waters off North Carolina, South Carolina, Georgia and the Atlantic coast of Florida.[10] The agency also kept open the possibility of extending the red snapper fishing ban for an additional 186 days.

The ban and its possible extension are intended only as interim measures while SAFMC considers long term solutions to the overfishing of red snapper.[11] One suggested solution includes a prohibition on all bottom fishing in south Atlantic coastal waters 98 feet to 300 feet

[7] Throughout the report we will refer to Florida, Georgia, South Carolina, and North Carolina as the south Atlantic states or the south Atlantic region.

[8] These are conservative estimates of the impacts of the bans on sales and employment for bait and tackle stores because these estimates are adjusted downward to account for non-response bias. For extrapolation methodology, see Methodology Appendix.

[9] Under the Magnuson-Stevenson Fishery Conservation and Management Act ("Magnuson-Stevens Act"), the management council must take action to end overfishing within one year of receiving notification that a stock is overfished or undergoing overfishing. *See* 16 U.S.C. § 1854(e).

[10] This rule was implemented at the request of the SAFMC. 74 Fed. Reg. at 63673-82.

[11] The SAFMC is charged under the Magnuson-Stevens Act with managing the snapper-grouper complex and recommending changes to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region to NMFS. The SAFMC is drafting Amendment 17A to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region to address long term solutions to over fishing in the red snapper fishery. (Available at: http://www.safmc.net/Portals/6/Library/FMP/SnapGroup/Amend17Asummary.pdf)

deep. The closure to all bottom fishing, as well as other options being considered, seek to address the overfishing of red snapper and the high mortality associated with discards of snapper-grouper species fished off the south Atlantic coast.[12]

III. Methodology

Two separate, but complementary surveys of bait and tackle stores, known as the "short survey" and the "long survey", as well as follow up interviews of survey respondents were conducted by Georgetown Economic Services ("GES") to study the bait and tackle industry. The responses from these surveys and interviews provide a qualitative description of the businesses that sell bait and tackle in the south Atlantic States, as well as an estimation of the impacts of the red snapper fishery closure and the potential bottom fishing ban on these businesses.

The surveys targeted a wide range of businesses that sell bait and tackle in the states of North Carolina, South Carolina, Georgia, and Florida. A near comprehensive list of establishments that sell bait and tackle in all of these southeastern states was provided to GES by Big Rock Sports, LLC, a leading wholesaler of fishing equipment. This list includes contact information for roughly 3,300 sellers of bait and tackle. These 3,300 stores make up the population from which samples for the two surveys are drawn.[13]

A. Short Survey Methodology

The responses to the short survey provide a general picture of south Atlantic bait and tackle stores, both on the Atlantic coast as well as within the interior of these coastal states. A sample of 600 independent distributors from the list of the 3,300 stores were selected at random and sent a six question survey.[14]

Respondents were asked to provide information on the size of their workforce, years of operation, approximate annual sales, a characterization of their community, and an assessment of the impact of both the interim red snapper fishery closure as well as the proposed bottom fishing ban, as either negligible, moderate, or significant. 140 short surveys were returned from the sample of 600 for a response rate of 23 percent.

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12 "Council Approves Measures To Address Over Fishing of Nine Snapper Grouper Species" South Atlantic Fisheries Management Council News Release, December 15, 2009.

13 It is assumed on the recommendation of Big Rock Sports that there are a total of 3,300 bait and tackle stores in the south Atlantic region, and our sample was drawn from a list of these 3,300 stores. As there is no state level Census data on bait and tackle stores, we believe that Big Rock Sports is the most reliable source for information about the scope of the bait and tackle industry. Big Rock supplies more than 15,000 hunting and fishing retailers from coast to coast in the U.S. Within the south Atlantic states, it supplies bait and tackle stores in all geographic regions with no large geographic gaps in coverage. According to Big Rock, it serves nearly 100% of bait and tackle retail stores in the south Atlantic region.

14 For more detail about the method of randomization, see Methodology Appendix.

B. Long Survey Methodology

To explore the impact of the closures in more depth, GES sent a longer survey to a non-random sample of 198 businesses, out of the list of 3,300 stores, that were likely to be impacted by the red snapper fishery closure and the closure to bottom fishing.[15] The businesses were chosen based upon three factors:

1) Location of the business on or near the south Atlantic coast;

2) An established relationship between the business and the recreational fishing industry; and

3) Known sales of bottom-fishing gear by the business.

In addition to questions contained in the short survey, respondents to the long survey were asked to provide greater detail about the composition of their annual sales figures. Specifically, businesses were asked to break down sales by customer type into local or non-local, freshwater angler, saltwater angler, or non-angler. Saltwater angler sales were further classified by intended use in fishing for red snapper, other bottom fish, or other saltwater fish. Respondents were also asked to provide their business' expected reduction in sales, profits, and employment due to the red snapper fishery closure and potential bottom fishing ban. Out of the 198 long surveys sent out, 64 surveys were returned for a response rate of 32 percent. That there was a higher response rate for the long survey than the short survey, even though the long survey requested confidential business information, suggests the long survey sample was well selected to include businesses that were impacted by the bans.

C. Interview Methodology

In order to look at the respondents' answers to the long survey in more detail, we randomly selected seven of the long survey respondents to interview over the phone. These interviews focused on the direct effects of the red snapper closure and potential bottom fishing ban on these establishments as well as the impact of the bans on the respondents' communities.

IV. Description of Bait and Tackle Shops Operating in the South Atlantic Region

Data from the short survey provide a general description of the stores selling bait and tackle located in North Carolina, South Carolina, Georgia, and Florida. The data show that these businesses are overwhelmingly small businesses[16] that are located in fishing communities.[17] On

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[15] Addresses for 200 businesses were provided by Big Rock Sports, LLC, a leading fishing equipment wholesaler but only 198 surveys were sent out due to insufficient mailing information for two of the selected businesses. Out of these 198 businesses selected for the long survey, 41 businesses sent the long survey were also selected to receive the short survey.

[16] Bait and tackle stores are classified under the NAICS code, 45111025, Tackle Shops. This category is defined as "Establishments primarily engaged in retailing tackle, bait, and fishing equipment and supplies. These establishments may also rent fishing equipment."

average these stores have five full time employees and four part time employees. These stores have been in operation for an average of 26 years.[18]

A. Types of Bait and Tackle Stores

Because a store's size, as well as the variety of tackle that a store carries will affect the severity of the red snapper closure and bottom fishing ban's impact on that store, it is important to understand the types of bait and tackle stores found in the south Atlantic region. Bait and tackle sellers operating in the south Atlantic region can be roughly categorized as one of six types: local independent, small independent, mid-sized independent, full service independent, fishing-focused chain, and non-fishing focused stores.[19]

Local independent stores sell a narrow assortment of fishing supplies that are specific to fishing done in their immediate area. To attract anglers interested in a particular fish, these sellers tend to be located in close proximity to fishing sites. The selection of gear at these shops is usually limited to bait and terminal tackle.[20] Because of their limited selection, these shops tend to carry small quantities of inventory. Total yearly retail sales at these stores range from less than $100,000 up to $400,000.

The next larger type are small independent shops.[21] These shops also carry area specific gear, but they sell a wider assortment of bait and tackle for a variety of local fish. They might

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Monthly Retail Trade and Food Services NAICS Codes, Titles, and Descriptions, U. S. Census Bureau.

The Small Business Administration defines a business of this category as a small business if they have sales of less than $7 million. "U. S. Small Business Administration Table of Small Business Size Standards Matched to North American Industry Classification System Codes." U. S. Small Business Administration, Effective August 22, 2008. No survey respondent reported total annual sales greater than or equal to $7,000,000.

17 A fishing community is defined by the Magnuson-Stevens Act as "a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs." 16 U.S.C. § 1802(17). Seventy-four percent of the respondents to the short survey answered "yes" to the question, "Would you characterize your location as a 'fishing community' that substantially depends on recreational and commercial fishing?"

18 Statistics calculated using data from the short survey. For summary statistics detailing the effects of the bans by fishing community status and by state calculated from the responses to the long survey, see the Summary Statistics Appendix.

19 Information about the types of bait and tackle stores found in the south Atlantic region was gathered from interviews with industry sources and from responses to the long survey.

20 Terminal tackle is a general term for describing hooks, weights, and other gear used at the end of a fishing line.

21 These stores are sometimes known as "mom and pop" stores. Information on this type of store was taken from interviews with industry sources

also carry a limited selection of food and beverages. To accommodate this variety of gear, they keep a somewhat larger inventory stock. They are generally run by the owners and have few employees. Total yearly sales at these stores range from $400,000 to $700,000.

Still larger are mid-sized independent stores. These stores sell bait and tackle that can be used to catch a wide variety of fish, including fish found beyond the immediate area of the store. To accommodate the greater variety of customers that come to these stores, the tackle sold has a wider range of quality and prices than small independent stores. Therefore, these stores have to invest significantly in inventory. In addition to bait and tackle, mid-sized stores sell fishing related items including food, beverages, and clothing. These stores hire a number of full time and part time employees. Total retail sales at these stores range from $700,000 to $1,000,000.

The largest independent store type is the full service store. Full service stores cater to fishermen fishing in all regions, using all gear types. These stores carry millions of dollars worth inventory. They also tend to hire a large number of part time and full time employees. These stores sell a wide assortment of fishing related goods including clothing, food, boats, motors, and fuel. Some of these stores also sell hunting gear. Total annual sales at full service stores range from $1,000,000 to $4,000,000.

Beside independent stores, several chains, such as Bass Pro Shops, carry a comprehensive selection of fishing gear, often matching the selection of tackle carried in large independent stores. This type of store can be thought of as a "fishing focused chain." However, many of these chains also carry a wide variety of other boating, sporting, and outdoors gear.

In addition to stores that are associated with fishing, stores without a fishing or sporting focus may also sell bait and tackle, particularly in coastal areas. These non-fishing focused stores range in size from "big-box" retailers like Wal-Mart, that sell motors, fish-finders, rods, reels, and bait, to gas stations that offer a small selection of bait and tackle.

V. Estimated Effects of Red Snapper Fishery and Bottom Fishing Closure

Bait and tackle sellers of all sizes will be affected by both the red snapper ban and the potential bottom fishing ban. However, the intensity with which these effects are felt will not be uniform across all bait and tackle businesses. A store's location and size, as well as the variety of tackle that a store carries will affect the severity of the impact on that store. This paper will break down the effects of the bans by store type and region.

A. Total Impacts

In summary, the effects of both bans will be significant and wide ranging. While a similar number of businesses will be directly affected by both bans, the financial loss expected for the bottom fishing ban is over seven times the loss in sales expected for the six month red snapper ban. Table 1 below presents the estimated losses in sales and employees for the 3,300 bait and tackle stores in the south Atlantic.[22]

[22] Calculations for this table were made using data taken from the short survey and the long survey. For information about how these aggregate effects are distributed among the types of

Table 1

Total Losses in Sales and Employees for Stores in the South Atlantic Region

	Sales	FT Emp	PT Emp	Total Emp	Avg. Loss[23]
Red Snapper Ban (Six Months)	$10,405,000	68	86	154	$8,743.70
Red Snapper Ban (One Year)	$26,166,071	143	163	307	$21,988.29
Bottom Fishing Ban (One Year)	$77,813,058	270	308	578	$58,418.21

The reductions in sales and employment will not be the only consequences of the red snapper and bottom fishing bans. Because of the bans, stores must also contend with increased inventory costs and altered sales expectations. These added impacts are felt acutely by bait and tackle sellers because of the increases in sales and inventory levels for red snapper and bottom fishing gear over the past five years.[24]

There is widespread agreement across the bait and tackle shops surveyed that sales of bait and tackle have been on the rise for at least the past five years in the south Atlantic region.[25] As bait and tackle sales rose, sales of red snapper and bottom fishing gear rose also. Shops responded to this trend by carrying increasing amounts of inventory in red snapper and bottom fishing gear.[26]

The interim and long term bans will cause much of the red snapper and bottom fishing bait and tackle in store inventories to go unsold.[27] Not only will stores lose sales but they will be saddled with additional holding costs. With money tied up in inventory, these stores will have fewer dollars available to make new purchases.[28] As a consequence, many stores will slow orders for all new fishing equipment. The decrease in orders for new supplies negatively impacts tackle suppliers such as wholesalers and manufacturers.

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stores, see Effects By Store Size and Estimation of Total Impact sections below. For calculation methodology see Methodology Appendix .

23 Average loss refers to the average loss in sales per affected store.

24 Conclusion is based on interviews conducted with survey respondents.

25 Many shops interviewed describe a steady rise in bait and tackle sales over the past 15 years. *Id*.

26 Conclusion is based on interviews conducted with industry sources.

27 Conclusion is based on interviews conducted with survey respondents.

28 *Id*.

In addition to financial losses, the bans have dampened what was expected to be a good year for gear sales. Red snapper and bottom fishing gear sales had been increasing over the last few years and were expected to continue to increase.[29] The red snapper closure and the ban on bottom fishing make it likely that sales of these items will decline for the duration of the bans.[30] Owners will likely measure the effects of the ban as the difference between the expected positive growth in sales and actual decline in sales caused by the bans. Thus, the bans may impose a greater loss in sales on these businesses than the year over year trends in sales indicate.

B. Distribution Of Impacts

Among the stores affected by the red snapper ban and the bottom fishing ban, a store's location and size, as well as the variety of tackle that a store carries will affect the severity of the impact on that store. Over all, the severity of the impact of the bottom fishing ban will be greater than the impact of the red snapper closure.[31] That is, the percentage of stores that expect to be moderately affected by the red snapper ban is roughly equal to the percentage of stores that expect to be significantly affected by this ban. However, nearly twice as many stores expect to be significantly affected than expect to be moderately affected by the bottom fishing ban. The sections that follow provide some explanation as to how the level of impact will differ across stores of different incomes and in different regions. Table 2, below, presents the percentages of bait and tackle stores in the south Atlantic region affected by the red snapper and bottom fishing ban by effect category.[32]

Table 2

Percentage of Stores Affected by the Red Snapper and Bottom Fishing Bans by Effect Category

	Stores Significantly Affected	Stores Moderately Affected	Stores Not Affected
Red Snapper	17%	19%	64%
Bottom Fishing	27%	14%	60%

C. Effects By Store Size

The data from the long survey indicate that the impact of the red snapper and bottom fishing ban will differ across income levels. In particular, the data show that on average, a local independent store will be more negatively impacted by both of the bans, in terms of the percent

29 *Id*.

30 *Id*.

31 Calculations of these percentages were made based on data taken from responses to the short survey.

32 Figures in Tables 3a-c were calculated from data gathered from responses to the short survey. For calculation method, see Methodology appendix. Rows may not sum exactly to 100% due to rounding.

of sales and profits lost, then a full service store. Both small and mid-sized stores also indicated that, on average, they will see significant percentage reductions in both sales and profits due to the bans. However, in dollar terms, as a store's annual sales increase, the expected losses due to the bans also increase. Table 3a, Table 3b, and Table 3c below provide a summary of the expected effects of the bans by income level for the long survey respondents. [33]

Table 3a

Average Percentage Loss in Sales and Profits By Store Type
(Six Month Red Snapper Ban)

	Local (Less Than $400,000)	Small ($400,000 - $700,000)	Mid-Sized ($700,000 - $1,000,000)	Full Service (Greater Than $1,000,000)
Avg. % Loss (Sales)	18%	17%	21%	9%
Avg. % Loss (Profits)	21%	15%	23%	7%

Table 3b

Average Percentage Loss in Sales and Profits By Store Type
(One Year Red Snapper Ban) [34]

	Local (Less Than $400,000)	Small ($400,000 - $700,000)	Mid-Sized ($700,000 - $1,000,000)	Full Service (Greater Than $1,000,000)
Avg. % Loss (Sales)	18%	21%	18%	12%
Avg. % Loss (Profits)	20%	21%	12%	12%

Table 3c

Average Percentage Loss in Sales and Profits By Store Type
(Bottom Fishing Ban, One Year)

	Local (Less Than $400,000)	Small ($400,000 - $700,000)	Mid-Sized ($700,000 - $1,000,000)	Full Service (Greater Than $1,000,000)
Avg. % Loss (Sales)	32%	30%	36%	26%
Avg. % Loss (Profits)	28%	30%	21%	21%

33 Rows may not sum exactly to 100% due to rounding.

34 The decline in average percentage of sales lost, from the six month ban to the one year red snapper ban in the mid sized business category, is due to businesses averaging out losses over a longer period of time involved in the one year ban.

D. Estimation of Total Impact

Using impact information given in the long survey and the distribution of effects given in the short survey, we can extrapolate the total impact to sales and employment for the roughly 3300 bait and tackle stores located in the south Atlantic region.[35] Table 4a, Table 4b, and Table 4c present the expected total losses in sales and employees for each store type due to the red snapper and bottom fishing bans.[36]

Table 4a

Total Losses in Sales and Employees for Stores in the South Atlantic Region by Store Type (Six Month Red Snapper Ban)

	Local (Less Than $400,000)	Small ($400,000 - $700,000)	Mid-Sized ($700,000 - $1,000,000)	Full Service (Greater Than $1,000,000)	Total
Sales	$ 643,929	$ 875,357	$ 2,050,000	$ 6,835,714	$10,405,000
FT Emp	9	9	13	37	68
PT Emp	7	16	17	46	86
Total Emp	16	25	30	83	154

Table 4b

Total Losses in Sales and Employees for Stores in the South Atlantic Region by Store Type (One Year Red Snapper Ban)

	Local (Less Than $400,000)	Small ($400,000 - $700,000)	Mid-Sized ($700,000 - $1,000,000)	Full Service (Greater Than $1,000,000)	Total
Sales	$ 1,287,857	$ 2,208,214	$ 3,377,143	$ 19,292,857	$26,166,071
FT Emp	17	26	32	69	143
PT Emp	17	30	33	83	163
Total Emp	34	56	65	151	307

35 For methodology, see Methodology Appendix.

36 Rows and columns may not sum exactly due to rounding.

Table 4c

Total Losses in Sales and Employees for Stores in the South Atlantic Region by Store Type (Bottom Fishing Ban, One Year)

	Local (Less Than $400,000)	**Small ($400,000 - $700,000)**	**Mid-Sized ($700,000 - $1,000,000)**	**Full Service (Greater Than $1,000,000)**	**Total**
Sales	$ 3,486,607	$ 5,462,612	$10,689,732	$ 58,174,107	$77,813,058
FT Emp	31	48	57	134	270
PT Emp	31	60	60	156	308
Total Emp	63	108	117	290	578

E. Regional Effects

For smaller stores that cater to anglers looking to fish locally, the level of impact on a particular store will be decided in large part by that store's location. For example, shops located near the gulf stream are less dependent on gear sales for any one type of fish because the warmer waters of the gulf stream bring a greater number and variety of fish.[37] Stores in these areas would be less likely to be feel the impact of the closures because anglers can shift to other types of fishing and will consequently purchase other types of tackle.

Conversely, some of the stores that have been and will be most affected, are located in areas with few options for recreational fishing aside from red snapper fishing. The red snapper ban has been "devastating" for such businesses.[38] The businesses in these red snapper dependant areas have seen steep declines in bait and tackle sales. Since the red snapper fishery closure went into effect, several of these stores have begun to layoff employees.[39] Many of the local and small-sized independent stores in these areas have closed.[40] It is likely that if the red snapper ban will be extended until December, all local and small-sized independent stores would close in these areas. If a ban on all bottom fishing were imposed, it is expected that several mid-sized independent stores will also close in these areas.

37 Conclusion is based on interviews conducted with survey respondents.

38 Conclusion is based on interviews with industry sources; *see also* 74 Fed. Reg. at 63673 ("…the interim rule would have the most negative short-term effects on communities which target red snapper exclusively"). The impact of the red snapper ban has received national media attention, See: "Fishermen Reeling over Red Snapper Fishing Ban," Greg Allen. All Things Considered, NPR, Broadcast January 4, 2010. ("Johnson says that [the red snapper ban] will very likely put him and the two dozen other charter captains in the town of St. Augustine out of business and take a toll on the restaurants, hotels and others in town who benefit from the influx of anglers.")

39 Conclusion is based on interviews conducted with survey respondents.

40 *Id.*

Even in areas that are not dependant on red snapper gear sales year-round, red snapper is an important seasonal fish in several areas. Several shops stated that from January to March red snapper tackle sales provide much of their income.[41] The effects of the red snapper ban coupled with the abnormally harsh weather and the downturn in the economy have made the winter of 2010 especially difficult for these businesses.

F. Economic Impact Outside the Bait and Tackle Sector

The interim red snapper ban and a potential bottom fishing ban would have an economic impact on sectors of the economy other than the bait and tackle stores detailed in this report.[42] Marine boating equipment and fuel are also likely influenced by these bans as well as businesses operating in fishing communities that are affected by drops in tourist activity including, but not limited to restaurants, motels, and grocery stores. Although not quantified in this report, the effect on these sectors, which constitute a large percentage of total marine recreational expenditures, should also be considered when evaluating the total impact of the red snapper fishery ban on fishing communities.

VI. Conclusion

NOAA and NMFS's decision to enact a six month closure of the red snapper fishery off the coasts of Florida, Georgia, South Carolina, and North Carolina has had, and will continue to have significant financial impacts on stores selling bait and tackle in these states. Using data gathered through a survey of a sample of these businesses, we estimate that the six month closure will result in a loss of $10,405,000 in annual sales for 1,200 businesses. We estimate that if the Agencies decide to impose a ban on all bottom fishing off the coasts of these states, bait and tackle stores will lose $77,813,058 in annual sales for 1,300 businesses.

These financial losses are just one consequence of the closure and potential ban on bottom fishing. These actions will impose inventory holding costs and will reverse what had been expected to be positive sales growth for many of the bait and tackle sellers in this region. These consequences are acutely felt because of the positive sales and inventory growth experienced by bait and tackle sellers over the past five years. The significant effects on bait and tackle sellers demonstrate the need for the agencies to analyze the impact on all directly effected entities, especially those within fishing communities, otherwise important effects on fishing communities will be overlooked when determining how and whether to solve the problem of overfishing red snapper.

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41 *Id.*

42 A more exhaustive analysis of marine angler expenditures at the national and state levels is provided by Brad Gentner and Scott Steinback. *See* Gentner, Brad, and Scott Steinback. 2008. The Economic Contribution of Marine Angler Expenditures in the United States, 2006. U.S. Dep. Commerce, NOAA Tech. Memo. NMFSF/SPO-94, p. 301, available online at: http://spo.nmfs.noaa.gov/tm/. Table 233 of the report provides estimated expenditures on a wide range of economic activities linked to the marine recreational fishing sector, including the bait-and-tackle sector and other activities not considered by NMFS in its analysis.

Methodology Appendix

VII. Extrapolation Methodologies

In the sections that follow, we explain the mathematical techniques used in this report to extrapolate to the roughly 3,300 bait and tackle stores in the south Atlantic region, the measures of the effects of the ban calculated using the 140 short and 64 long survey responses

A. Short Survey Extrapolation Methodology

The businesses sent the short survey were selected at random from among the approximately 3,300 bait and tackle shops in the south Atlantic region. Specifically, the list of 3,300 stores was provided in Microsoft Excel format. Each store was assigned a random number using Excel's "rand" function. The list was then sorted in ascending order by its assigned number. The first 600 stores were selected to be in the sample.

By the law of large numbers, the summary statistics taken from the entire random sample of 600 stores would likely be close in value to these same statistics calculated using information from all 3,300 stores making up the general population of bait and tackle stores.[43] For example, the average income of the stores in the sample will likely be close to the average income of all bait and tackle stores in the south Atlantic states.

However, out of the 600 surveys that were sent out, 140 surveys were returned to us. Therefore, there is a possibility that our sample has a non-response bias. That is, businesses that responded to the surveys may be different from businesses that did not respond to the surveys. For example, if the businesses that did not respond to the short survey have lower income levels than business that sent in their short survey, the average income of the short survey respondents may be higher than the average income of the south Atlantic bait and tackle shop population as a whole. This would lead to a biased estimate of the average income of all bait and tackle shops in the south Atlantic region using the short survey data.

There may be differences in the level of effects of the bans reported between businesses that sent in their surveys and businesses that did not send surveys in. These differences are likely to occur if stores that will be more affected by the bans are more motivated to respond to the short survey than stores that will not be impacted by the ban.[44] Therefore, if the sample has a non-response bias, it is more likely that our sample will produce estimates of the percentages of businesses that are significantly and moderately affected by the bans that are higher than the actual population values, rather than estimates that are lower than the actual population values.

We decreased our estimates of the level of effects of the bans to account for the possibility of non-response bias. To produce conservative estimates that factor in a possible non-response bias, we multiplied the sample percentages found for the "Significantly" and

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43 Freedman, David, Robert Pisani, and Roger Purves. Statistics. 4th Edition, W. W. Norton & Company. 2007, at 339.

44 *Id.* at 336.

"Moderately" effect categories by one half. We then increased the percentage of businesses that are not affected by the ban so that the sum of the percentages of significantly, moderately, and not affected businesses equals 100%. Surveys that left the questions assessing the impact of the bans blank are counted as if these businesses are not affected by the bans. This method allows for a significant portion of non responders to be less affected than responders. Table A below presents an example of the short extrapolation method.

Table A: Example of Short Survey Extrapolation Method

Percentage of Stores Affected by The Six Month Red Snapper Closure

Effect Category	Sample Estimate	Population Estimate
Significantly	30%	15%
Moderately	50%	25%
No Effect	10%	60%
No Response	10%	-

B. Long Survey Extrapolation Methodology

A sample of 198 businesses out of the 3,300 bait and tackle stores in the south Atlantic states were sent the long survey. This sample was selected non-randomly so as to find, in the most efficient, lowest cost manner possible, a broad array of businesses that are were likely to be impacted by the bans on red snapper and bottom fishing.[45] The sampled businesses had significant sales of red snapper and bottom fishing gear prior to 2010, and were likely to be significantly affected by the bans. In other words, we oversampled the population that were likely to be significantly affected in order to fully capture the effects of the bans on a broad array of businesses. The data confirmed that these businesses will be greatly impacted by the bans. Thus, it appears that businesses sent the long survey should be categorized as "Significantly" affected. Therefore, statistics calculated using data from the long survey are only representative of the effects for the significantly affected bait and tackle businesses in the south Atlantic region.

To extrapolate from the long survey responses to all of the significantly affected bait and tackle stores, we use proportional extrapolation. Our method consists of:

1. Adjusting for possible non-response bias by assuming businesses that did not return surveys were not affected by the red snapper closure or the ban on bottom fishing.

[45] For more detail about selection criteria, see the Long Survey Methodology section in the main body of the paper.

2. Multiplying the total losses in sales and employment broken out by store type[46] by the ratio of the number of significantly affected stores in the south Atlantic region to the number of stores sampled.

Because of the lack of data on the financial impact of the red snapper and bottom fishing ban on moderately affected stores, and to produce conservative estimations, we take our estimate of the loss in employment and loss in sales for significantly affected stores as a lower bound on the loss in employment and sales for all 3,300 stores. These estimations are a lower bound because we know from the short survey that a significant percentage of the 3,300 bait and tackle stores will also be moderately affected by the red snapper and bottom fishing ban.

[46] For more description of the types of bait and tackle stores see the Types of Bait and Tackle Stores section.

VIII Summary Statistics Appendix

The following tables provide summary statistics calculated from the responses to the long survey, broken out by fishing community status in Table α and by state in Table β.

Table α

Summary Statistics For Fishing Community Respondents and Non-Fishing Community Respondents				
	Fishing Community	Non-Fishing Community	NA	Total
No. of Respondents	55	7	2	64
Average Annual Sales ($)	$1,126,667	$1,670,833	NA	$1,190,686
Six Month Red Snapper Ban				
Average Sales Reduction (%)	15.7%	3.9%	10.0%	14.2%
Average Sales Reduction ($)	$80,477	$30,208	NA	$74,321
One Year Red Snapper Ban				
Average Sales Reduction (%)	16.9%	4.1%	0.0%	14.8%
Average Sales Reduction ($)	$207,515	$73,750	NA	$190,794
Bottom Fishing Ban				
Average Sales Reduction (%)	29.9%	13.1%	0.0%	27.1%
Average Sales Reduction ($)	$370,281	$127,917	NA	$341,767

Table β

Summary Statistics By State					
	Florida	**Georgia**	**North Carolina**	**South Carolina**	**Total**
No. of Responses	24	1	29	10	64
No. Serving Fishing Community	19	1	26	9	55
Percent Serving Fishing Community	79.2%	100.0%	89.7%	90.0%	85.9%
Average Annual Sales ($)	$1,150,952	NA	$1,179,286	$1,310,000	$1,190,686
Six Month Red Snapper Ban					
Average Sales Reduction (%)	17.6%	20.0%	12.2%	10.6%	14.2%
Average Sales Reduction ($)	$64,238	NA	$71,375	$104,069	$74,321
One Year Red Snapper Ban					
Average Sales Reduction (%)	14.8%	20.0%	14.8%	14.3%	14.8%
Average Sales Reduction ($)	$113,925	NA	$182,072	$380,028	$190,794
Bottom Fishing Ban					
Average Sales Reduction (%)	34.1%	20.0%	23.6%	20.9%	27.1%
Average Sales Reduction ($)	$322,524	NA	$301,030	$481,722	$341,767