The Economic Contribution of Fisheries for Species Managed by the South Atlantic Fishery Management Council

May 22, 2018

Executive Summary

Introduction

The South Atlantic Fishery Management Council (South Atlantic Council; SAFMC) is responsible for the management of fisheries for 66 species of finfish and crustaceans occurring in the U.S Exclusive Economic Zone (EEZ). The management jurisdiction of the South Atlantic Council for the majority of these species occurs from the Florida Keys through North Carolina, however there are some exceptions for which this range is expanded. The SAFMC manages king mackerel, Spanish mackerel, and cobia from the South Florida through New York as well as dolphin and wahoo from the Florida Keys through Maine. The SAFMC also co-manages several species with partners such as the Gulf of Mexico Fishery Management Council, the Atlantic States Marine Fisheries Commission, and multiple state fisheries management agencies.

Recreational and commercial fishing in the South Atlantic Region alone is a multi-billion-dollar industry that supports tens of thousands of jobs and billions of dollars in income in the U.S. economy each year (NMFS 2017). Fishing activity for species managed by the South Atlantic Council plays a large role in supporting these annual economic contributions. The following report summarizes the annual estimated economic impacts generated by fishing activity for species managed by the South Atlantic Council. These contributions are characterized in the form of jobs[1], income impacts[2], value-added impacts[3], and sales impacts[4].

Fishing Activity and Economic Impacts

Commercial Fisheries

Landings

From 2014 through 2016, commercial landings of species managed by the South Atlantic Council averaged approximately 40 million pounds whole weight (ww) with an ex-vessel value of $131 million (2016 dollars) (**Table 1**). Of these landings, the top ten SAMFC managed species ranked by ex-vessel value of commercial landings were spiny lobster, white shrimp, brown shrimp, unclassified shrimp species, king mackerel, yellowtail snapper, Spanish mackerel, vermillion snapper, dolphin, and golden crab (**Table 2**). This group of species accounted for 87% of the total ex-vessel value of landings from species managed by the South Atlantic

[1] Full- and part-time jobs.
[2] Represents estimates of wages, salaries, and self-employed income.
[3] Represents estimates of contribution to the gross domestic product (GDP) in a state or region.
[4] Represents estimates of gross business sales. Also known as output impacts.

Council. The top ten SAFMC managed species ranked by weight of commercial landings were white shrimp, brown shrimp, spiny lobster, Spanish mackerel, unclassified shrimp species, king mackerel, yellowtail snapper, dolphin, vermilion snapper, and greater amberjack (**Table 2**). These group of species accounted for 85% of the total weight of landings from species managed by the South Atlantic Council. A similar ranking of finfish species only can be seen in **Table 3**.

Economic Impacts

The commercial harvest and subsequent sales and consumption of seafood generates economic activity as fishermen expend funds to harvest the seafood and consumers spend money on goods and services, such as seafood served during a restaurant visit. These expenditures spur additional economic activity in the region(s) where the harvest and purchases are made, such as supporting jobs in local fish markets, grocers, restaurants, and fishing supply establishments. In the absence of the availability of locally or regionally caught seafood for purchase, consumers would likely spend their money on substitute goods and services. As a result, the economic impact analysis presented represents a distributional analysis; that is, it shows the economic contributions of the fishing activity and how economic effects may be distributed through regional markets. These analyses should not be interpreted to represent the net impacts if these species were not available for harvest or purchase.

In total, the examined average annual commercial landings of species managed by the South Atlantic Council supported an estimated 17,000 jobs, $462.5 million in income, $662.3 million in value added impacts, and $1.3 billion in business sales in the U.S. economy (2016 dollars) (**Table 4**). Approximately 27% of these economic impacts were attributed to landings of finfish species, with 3% attributed to landings of golden crab and rock shrimp, 30% to landings of spiny lobster, and the remaining 40% to landings of white shrimp, brown shrimp, pink shrimp, and mixed shrimp species.

Table 1. Average annual commercial landings of species managed by the South Atlantic Council, 2014-2016.

Species Category	Species Grouping	Pounds (ww)	Ex-Vessel Value (2016 dollars)
Finfish	Snapper Grouper[1]	7,113,169	$21,228,106
	Coastal Migratory Pelagics[1]	5,686,422	$10,332,772
	Dolphin Wahoo[1]	1,082,573	$3,215,434
	Total Finfish	13,882,164	$34,776,312
Crustaceans	Spiny Lobster	4,484,799	$40,328,526
	Golden Crab	708,800	$2,442,168
	Rock Shrimp	580,382	$1,203,542
	Other Shrimp[2]	20,251,216	$52,115,853
	Total Crustacean	26,025,197	$96,090,090
All Species	Total All Species	39,907,362	$130,866,402

Source: Landings and ex-vessel value estimates from the ACCSP database as queried on August 11, 2017.
[1]See Appendix for list of species within grouping.
[2]Includes landings of white shrimp, brown shrimp, pink shrimp, and unclassified shrimp species.

Table 2. Top ten species managed by the South Atlantic Council ranked by ex-vessel value and weight of commercial landings, average from 2014-2016.

Top Ten Species by Ex-Vessel Value	
Species	**Ex-Vessel Value (2016 Dollars)**
Spiny Lobster	$40,328,526
White Shrimp	$29,634,588
Brown Shrimp	$12,137,682
Unclassified Shrimp Species[1]	$8,212,738
King Mackerel	$6,154,266
Yellowtail Snapper	$5,466,799
Spanish Mackerel	$3,734,873
Vermillion Snapper	$3,175,041
Dolphin	$2,994,056
Golden Crab	$2,442,168

Top Ten Species by Weight	
Species	**Pounds Landed (ww)**
White Shrimp	10,544,429
Brown Shrimp	6,029,272
Spiny Lobster	4,484,799
Spanish Mackerel	3,018,966
Unclassified Shrimp Species[1]	2,934,289
King Mackerel	2,520,961
Yellowtail Snapper	1,752,051
Dolphin	1,022,784
Vermillion Snapper	901,741
Greater Amberjack	900,518

Source: Landings and ex-vessel value estimates from the ACCSP database as queried on August 11, 2017.
[1]Species not specified.

Table 3. Top ten finfish species managed by the South Atlantic Council ranked by ex-vessel value and weight of commercial landings, average from 2014-2016.

Top Ten Finfish Species by Ex-Vessel Value	
Species	**Ex-Vessel Value (2016 Dollars)**
King Mackerel	$6,154,266
Yellowtail Snapper	$5,466,799
Spanish Mackerel	$3,734,873
Vermilion Snapper	$3,175,041
Dolphin	$2,994,056
Golden Tilefish	$2,165,308
Gag Grouper	$1,612,972
Black Sea Bass	$1,429,997
Greater Amberjack	$1,370,252
Wreckfish	*

Top Ten Finfish Species by Weight	
Species	**Pounds Landed (ww)**
Spanish Mackerel	3,018,966
King Mackerel	2,520,961
Yellowtail Snapper	1,752,051
Dolphin	1,022,784
Vermilion Snapper	901,741
Greater Amberjack	900,518
Golden Tilefish	659,183
Black Sea Bass	505,458
Gag Grouper	330,612
Wreckfish	*

Source: Landings and ex-vessel value estimates from the ACCSP database as queried on August 11, 2017.
*Landings removed due to potential confidentiality concerns.

Table 4. Average annual economic impacts (2014 through 2016) associated with the commercial harvest of species managed by the South Atlantic Council. All monetary estimates are in 2016 dollars.

Species Category	Sector	Jobs	Income Impacts (thousands of dollars)	Value Added Impacts (thousands of dollars)	Sales Impacts (thousands of dollars)
Finfish	Harvesting Sector[2]	1,082	$30,247	$46,697	$91,464
	Other Sectors[3]	3,541	$95,957	$131,952	$253,801
	Total	4,623	$126,204	$178,649	$345,265
Golden Crab and Rock Shrimp	Harvesting Sector	116	$3,225	$5,083	$9,707
	Other Sectors	371	$9,956	$13,683	$26,287
	Total	487	$13,181	$18,766	$35,994
Spiny Lobster	Harvesting Sector	1,034	$29,898	$51,245	$111,025
	Other Sectors	4,106	$111,276	$153,018	$294,321
	Total	5,140	$141,174	$204,263	$405,346
Other Shrimp[1]	Harvesting Sector	1,358	$39,353	$64,931	$141,370
	Other Sectors	5,449	$142,568	$195,675	$375,016
	Total	6,807	$181,921	$260,606	$516,386
All Species	Harvesting Sector	3,590	$102,722	$167,956	$353,566
	Other Sectors	13,467	$359,758	$494,328	$949,425
	Total	17,057	$462,480	$662,284	$1,302,991

Source: Ex-vessel value estimates from the ACCSP database as queried on August 11, 2017; economic impacts calculated with tool developed by NMFS SERO using the model developed for and applied in NMFS (2017).
[1]Includes landings of white shrimp, brown shrimp, pink shrimp, and unclassified shrimp species.
[2]Harvesting sector encompasses commercial fishermen involved in the harvest and landing of a species.
[3]Other sectors include primary seafood dealers and processors, secondary wholesalers and distributions, grocers, and restaurants.

Recreational Fisheries

Fishing Effort and Landings

The recreational sector effort data is comprised of private and for-hire modes. The private mode includes anglers fishing from shore (all land-based structures) and private or rental vessels. The for-hire mode is composed of charter boats and headboats (also called party boats). Charter boats generally carry fewer passengers and charge a fee on an entire vessel basis, whereas headboats often carry more passengers and payment is typically per person. Data for headboats are not included in the following analyses or tables for reasons previously explained in the Data and Methods section. The effort estimates discussed focus on directed recreational trips, as this trip type is seen an in-range estimate for recreational effort, however "harvest only" and "interacting" trip estimates are also provided to show an upper and lower bound of potential effort estimates that could be examined.

On average from 2014 through 2016, recreational anglers took approximately 3 million directed trips annually for species managed by the South Atlantic Council (**Table 5**). Of these trips, the top ten SAFMC managed species ranked by the number of directed trips were dolphin, Spanish mackerel, king mackerel, gray snapper, cobia, yellowtail snapper, black seabass, mutton

snapper, wahoo, and gray triggerfish (**Table 6**). Regardless of the type of trip examined, the private/rental vessel mode saw the most effort followed by the shore based trips and charter trips.

During the timeframe examined, anglers annually landed approximately 19.6 million pounds of species managed by the South Atlantic Council (**Table 5**). The highest recreational landings were attributed to dolphin, followed by cobia, king mackerel, wahoo, Spanish mackerel, greater amberjack, yellowtail snapper, gray snapper, mutton snapper, and red snapper (**Table 6**). Overall, these ten species accounted for 78% of the total recreational landings for species managed by the SAFMC.

E*conomic Impacts*

Recreational fishing generates economic impacts (business activity) as anglers expend funds on various goods and services used in recreational fishing including bait, groceries, fuel, and charter fees. These expenditures spur additional business activity in the region(s) where the purchases are made, such as supporting jobs in bait and tackle stores, marinas, lure manufacturers, and fishing charter businesses. In the absence of the opportunity to fish, the expendable income would presumably be spent on other goods and services and these expenditures could similarly generate economic impacts. As such, the analyses presented represent a distributional analysis, showing how economic effects may be distributed through regional markets but should not be interpreted to represent the net impacts if these species were not available to anglers.

In total, the examined directed recreational fishing trips for species managed by the South Atlantic Council supported an estimated 3,598 jobs, $167.9 million in income, $276.9 million in value added impacts, and $532 million in business sales annually in the U.S. economy (2016 dollars) (**Table 7**). As noted in the Data and Methods section, all of these impacts could be attributed to finfish species. Approximately 5% of the economic impacts could be attributed to fishing activity occurring in the Mid-Atlantic and New England Regions, with the remaining 95% to fishing activity occurring in the South Atlantic Region. The economic impacts provided in **Table 7** are intended to be an in-range estimate of the likely economic contributions of recreational fishing activity for SAFMC managed species. A sensitivity analysis providing lower and upper bound estimates for trip impacts examining “harvest only” trips and “interacting” trips is also provided. Depending on the trip metric examined, the estimated economic impacts associated with recreational trips for SAFMC managed species range from 1,976 to 4,351 jobs, $93 to $202 million in income, $152 to $334 million in value added impacts, and $290 to $643 million in business sales annually in the U.S. economy (2016 dollars).

Table 5. Angler effort and recreational landings by mode and by region for species managed by the South Atlantic Council, average 2014-2016.

Region	Mode[1]	Harvest Only Trips[2]	Directed Trips[3]	Interacting Trips[4]	Pounds Harvested (ww)
South Atlantic Region	Charter	157,770	236,855	274,779	5,257,555
	Private/Rental Vessel	841,831	1,828,467	2,317,215	11,388,742
	Shore	265,624	640,938	909,495	934,157
	All Modes	1,265,225	2,706,260	3,501,490	17,580,454
Total Atlantic	Charter	168,532	250,801	286,456	5,431,113
	Private/Rental Vessel	907,863	2,009,583	2,428,684	13,234,635
	Shore	265,672	665,570	915,494	944,280
	All Modes	1,342,067	2,925,954	3,630,635	19,610,028

Source: MRIP database as queried on August 11, 2017 and May 15, 2018.
[1]Headboat data are unavailable for harvest only or directed trips under the MRIP program.
[2]Harvest only trips include the number of individual angler trips, regardless of duration, where at least one species managed by the SAFMC was harvested.
[3]Directed trips include the number of individual angler trips, regardless of duration, where the intercepted angler indicated that at least one species managed by the SAFMC was the primary or secondary target for the trip or at least one of these species was harvested.
[4]Interacting trips include the number of individual angler trips, regardless of duration, where the intercepted angler indicated that at least one species managed by the SAFMC was the primary or secondary target for the trip or at least one of these species was harvested or released.

Table 6. Top ten species managed by the South Atlantic Council ranked by directed recreational fishing trips and by weight of recreational landings, average from 2014-2016.

Top Ten Species by Directed Trips	
Species	**Directed Trips[1,2]**
Dolphin	938,251
Spanish Mackerel	866,158
King Mackerel	474,676
Gray Snapper	444,020
Cobia	417,566
Yellowtail Snapper	352,616
Black Sea Bass	203,718
Mutton Snapper	163,440
Wahoo	96,688
Gray Triggerfish	84,595

Top Ten Species by Weight of Harvest	
Species	**Pounds (ww)**
Dolphin	6,537,000
Cobia	1,662,074
King Mackerel	1,455,438
Wahoo	1,282,298
Spanish Mackerel	1,054,063
Greater Amberjack	1,040,608
Yellowtail Snapper	792,158
Gray Snapper	604,224
Mutton Snapper	536,164
Red Snapper	355,073

Source: MRIP database as queried on August 11, 2017.
[1]Directed trips include the number of individual angler trips, regardless of duration, where the intercepted angler indicated that at least one species managed by the SAFMC was the primary or secondary target for the trip or at least one of these species was harvested.
[2]Trips are not additive across species, since multiple species may be harvested or targeted on the same trip.

Table 7. Average annual economic impacts (2014 through 2016) associated with recreational fishing on directed trips for species managed by the South Atlantic Council. All monetary estimates are in 2016 dollars.

Region	Mode[1]	Jobs	Income Impacts (thousands of dollars)	Value Added Impacts (thousands of dollars)	Sales Impacts (thousands of dollars)
South Atlantic	Charter	1,717	$84,349	$130,750	$244,030
	Private/Rental Vessel	1,136	$51,696	$91,283	$182,649
	Shore	565	$23,529	$40,605	$77,344
	All Modes	3,418	$159,574	$262,638	$504,023
Total Atlantic	Charter	1,753	$86,149	$133,540	$249,237
	Private/Rental Vessel	1,266	$57,610	$101,726	$203,545
	Shore	579	$24,100	$41,590	$79,220
	All Modes	3,598	$167,859	$276,856	$532,002

Source: Economic impacts calculated with tool developed by NMFS SERO using NMFS (2017) and underlying data provided by the NOAA Office of Science and Technology.
[1]Headboat data are unavailable for directed trips under the MRIP program.

Conclusions

While there is some double counting that can occur in simply adding commercial and recreational economic impacts together, given the likely underestimates inherent in calculating recreational fishing economic impacts, it is reasonable to conclude that the combined recreational and commercial components of fisheries for species managed by the South Atlantic Council support upwards of 19,000 to 21,000 jobs, $556 million to $665 million in income, $814 million to nearly $1 billion in valued added impacts, and $1.6 billion to $2 billion in business sales (2016 dollars) in the U.S. economy each year. These economic contributions are especially important for many of the coastal communities where this fishing activity occurs. Continued responsible long-term management of these fisheries resources is highly important in leading to sustained economic activity well into the future.

Full Report

Introduction

The South Atlantic Fishery Management Council (South Atlantic Council; SAFMC) is responsible for the management of fisheries for 66 species of finfish and crustaceans[5] occurring in the U.S Exclusive Economic Zone (EEZ). The management jurisdiction of the South Atlantic Council for the majority of these species occurs from the Florida Keys through North Carolina, however there are some exceptions for which this range is expanded. The SAFMC manages king mackerel, Spanish mackerel, and cobia from the South Florida through New York as well as dolphin and wahoo from the Florida Keys through Maine. The SAFMC also co-manages several species with partners such as the Gulf of Mexico Fishery Management Council, the Atlantic States Marine Fisheries Commission, and multiple state fisheries management agencies.

Recreational and commercial fishing in the South Atlantic Region alone is a multi-billion-dollar industry that supports tens of thousands of jobs and billions of dollars in income in the U.S. economy each year (NMFS 2017). Fishing activity for species managed by the South Atlantic Council plays a large role in supporting these annual economic contributions. The following report summarizes the annual estimated economic impacts generated by fishing activity for species managed by the South Atlantic Council. These impacts are characterized in the form of jobs, income impacts, value-added impacts, and sales impacts.

Data and Methods

Commercial Fishing Sector

Estimates of the average annual business activity (i.e. economic contributions or impacts) associated with the commercial harvest of species managed by the South Atlantic Council are derived using the input/output model[6] developed for and applied in NMFS (2017) and calculated using the economic impact tool for commercial fishing developed by the National Oceanic and Atmospheric Administration (NOAA) Southeast Regional Office[7]. For the following analyses, the economic multipliers used represent impacts in the U.S. economy. It should be noted that the results provided should be interpreted with some caution and demonstrate the limitations of these types of assessments. The results are based on average economic relationships developed as a seafood product moves down the supply chain through the analysis of many fishing operations that harvest multiple species. Separate models to address individual species are not available, and as a result generic categories have been developed. For example, when examining gag grouper, the results provided by the economic impact tool apply to a general "reef fish" category rather than specifically to gag grouper and a harvester job is "generated" for approximately every $32,000 (2016 dollars) in ex-vessel revenue. The input categories used in the following economic impact analysis for commercial fishing include generic categories for shrimp, crab, lobster, highly migratory species, reef fish, and "all other finfish" where appropriate.

[5] See Appendix 1 for a full list of SAFMC managed finfish and crustacean species.
[6] A detailed description of the input/output model is provided in NMFS (2011).
[7] The economic impact tool for commercial fishing provides an interface to readily pair commercial revenues with economic multipliers found in NMFS (2011).

The commercial fishing data used to input into the model includes inflation adjusted average annual ex-vessel revenue (i.e. ex-vessel value) derived from all species under the management of the SAFMC, regardless of whether the species was caught in state waters or the EEZ. The years of data examined are from 2014 through 2016. The species included in the analyses are snapper grouper species, shrimp species (white, brown, pink, and rock), and golden crab landed from North Carolina through the Atlantic Ocean side of Monroe County, Florida (the Florida Keys), with the exception of black sea bass and scup landed North of Hatteras, North Carolina which fall under the jurisdiction of the Mid Atlantic Fishery Management Council. For spiny lobster, all commercial landings from the fishery were included, regardless of where caught, since the species is co-managed with the Gulf of Mexico Fishery Management Council without a jurisdictional ACL. Also included were all commercial landings of Spanish mackerel, king mackerel, and cobia from New York through Miami-Dade County, Florida as well as dolphin and wahoo landings from Maine through the Atlantic Ocean side of Monroe County, Florida. Landings weight and ex-vessel value data were gathered from the Atlantic Coast Cooperative Statistics Program (ACCSP) and last queried on August 11, 2017. Ex-vessel value data were adjusted to 2016 dollars where appropriate using the annual U.S. gross domestic product (GDP) implicit price deflator as provided by the U.S. Bureau of Economic Analysis.

Recreational Fishing Sector

Estimates of the average annual business activity associated with recreational fishing were calculated using the economic impact tool for recreational fishing developed by the NOAA Southeast Regional Office[8], which utilizes average trip-level impact coefficients derived from Fisheries Economics of the United States, 2015 (NMFS 2017) and underlying data provided by the NOAA Office of Science and Technology. Economic impact estimates in 2015 dollars were adjusted to 2016 dollars using the annual U.S. GDP implicit price deflator as provided by the U.S. Bureau of Economic Analysis.

The recreational fishing data used in calculating the following analyses was gathered from the Marine Recreational Fishing Program (MRIP) as last queried on August 11, 2017 and May 15, 2018. Specifically, this includes recreational trips and landings for all snapper grouper species occurring from North Carolina through Dade County, Florida, with the exception of black sea bass and scup landed North of Hatteras, North Carolina. Also included were recreational data for Spanish mackerel, king mackerel, and cobia from New York through Miami-Dade County, Florida as well as recreational data for dolphin and wahoo from Maine through the Atlantic Ocean side of Monroe County, Florida. Due to the jurisdictional boundary that exists in Monroe County, Florida between the South Atlantic and Gulf of Mexico fishery management councils and the method that MRIP employs to estimate effort in the county, only trips and landings for dolphin, wahoo, greater amberjack, mutton snapper, yellowtail snapper, gag grouper, black grouper, red grouper, snowy grouper, and blueline tilefish occurring on the Atlantic Ocean side of Monroe County were included. The MRIP data were queried in a manner intended to prevent double counting of trips that targeted or caught more than one SAFMC managed species.

[8] The economic impact tool for recreational fishing provides an interface to readily pair recreational trip estimates and associated expenditures with economic multipliers found in NMFS (2017).

Estimates of recreational effort and landings provided by MRIP are inherently associated with some level of uncertainty. This uncertainty can be qualified with the associated error terms that are provided with the trip estimates. A common metric used to examine these error terms is the percent standard error or "PSE". Higher PSEs are associated with higher levels of uncertainty. Aggregated data on a state or regional level tends to have a lower PSE. As data are examined in a more finite resolution, the associated PSEs tend to increase. For example, when examining the number of trips interacting with SAFMC managed species in the South Atlantic region, the PSEs associated with these trip estimates tend to be fairly low at approximately 5% to 6%. When the same estimate is applied to a specific species in the region, the PSE typically increases, with some PSEs even near or at 100% for some species. For purposes of calculating economic contributions, aggregated trip data on a regional level, which tend to exhibit relatively low PSEs, were used in the model which helps mitigate some of the uncertainty associated with the model outputs.

The primary economic impact estimates associated with recreational fishing activity for species managed by the South Atlantic Council examine the average "directed" effort from 2014 through 2016. In this case, directed effort is defined as an angler trip that either harvested or listed a specific species as either a primary or secondary target for the trip. The average economic coefficients, or multipliers, used in the model are invariant to the "type" of effort and can therefore be directly used to measure the contribution of other effort measures such as "harvest only" or "interacting" trips if desired. The coefficients are variable across regions and modes (i.e. private vessel, shore, charter).

The model used to calculate the economic contributions of recreational fishing in this report is highly sensitive to the number of angler trips entered into the model as well as the mode in which these trips occur. As such, a range of trip types and associated economic impact estimates are also provided in the following section on recreational fishing and in **Appendix 2** in an attempt to provide an upper and lower bound estimate for the economic impacts of recreational fishing activity. As a lower bound estimate, only trips harvesting one or more SAFMC managed species were examined. These are referred to as "harvest only" trips. Intended as an in-range estimate, directed trips, defined in the previous paragraph, are included. Finally, for an upper bound estimate, trips targeting, harvesting, or catching one or more SAFMC managed species are also examined. These trips are termed "interacting trips".

It should be noted that the presented economic contributions of recreational fishing focusses on trip expenditures and do not include the business activity generated by expenditures on durable goods (ex: boats, rods, reels, apparel, tow vehicles, etc.) that are used on fishing trips directed towards SAFMC managed species. While aggregate data does exist on durable goods expenditures, this data cannot be specifically attributed to a species or group of species since these goods can last multiple years and be utilized in a wide range of other fisheries. Further research is necessary to allow assignment of such expenditures to SAFMC managed species. Durable good expenditures are not inconsequential, with anglers spending an estimated $4.3 billion on recreational fishing-related durable goods in the South Atlantic Region alone in 2015 (NMFS 2017).

Additionally, estimates of the business activity associated with headboat effort are not included in the following analyses. Headboat vessels are not covered under MRIP, so metrics such as directed trips are not available. Also, estimation of the appropriate economic multiplier coefficients for headboat effort has not been conducted. Finally, recreational landings and effort for crustaceans (spiny lobster and shrimp) were also not included in the analyses since non-finfish species are not covered by MRIP, which provides the recreational trip estimates that are the main input for the recreational economic impact model. As such, the economic impact estimates provided may be a low estimate for the "true" economic contribution of recreational fishing activity directed towards SAFMC managed species.

Both Sectors

For both sectors, commercial fishing activity (measured in pounds landed and ex-vessel value) and recreational fishing activity (measured in pounds landed and effort) occurring in state waters adjacent to the South Atlantic Council's jurisdiction in federal waters was included in the analyses for the appropriate species[9]. The rationale for including landings of and fishing activity for federally managed species caught in state waters is that many species are found in both jurisdictions and are often landed by vessels possessing both state and federal permits. Additionally, with some exceptions, many states accommodate and enforce both commercial and recreational regulations for federally managed species, regardless of where the species are caught. Conversely, fishing activity for species that occurred in another Council's jurisdiction were excluded. For example, fishing activity for snapper grouper species occurring in the Mid-Atlantic region or coastal migratory pelagic species occurring in the New England region or Gulf of Mexico region were not included in this analysis. The economic impact estimates provided for both sectors are in the form of jobs, income impacts, value-added impacts, and output or sales impacts. These impacts should not be added together since this would result in double counting.

This document refers to and reports results from the economic impact tool as either "economic contributions" or "economic impacts" interchangeably with no implied distinction in the terms. This practice is common in other similar economic reports (NMFS 2011, 2013, 2014, 2017). There is some literature specifying the meaning of the terms, with "economic impact" referring to ex-ante analysis of a change in economic activity while "economic contribution" is used when discussing ex-post analysis of previously occurring economic activity (Watson et al 2015). As such, the title of the document uses "economic contribution" rather than "economic impact", since the analyses are based on previous fishing activity.

Fishing Activity and Economic Impacts

Commercial Fisheries

Landings

From 2014 through 2016, commercial landings of species managed by the South Atlantic Council averaged approximately 40 million pounds whole weight (ww) with an ex-vessel value of $131 million (2016 dollars) (**Table 1**). Of these landings, the top ten SAMFC managed

[9] See Appendix 1 for list of species included.

species ranked by ex-vessel value of commercial landings were spiny lobster, white shrimp, brown shrimp, unclassified shrimp species, king mackerel, yellowtail snapper, Spanish mackerel, vermillion snapper, dolphin, and golden crab (**Table 2**). This group of species accounted for 87% of the total ex-vessel value of landings from species managed by the South Atlantic Council. The top ten SAFMC managed species ranked by weight of commercial landings were white shrimp, brown shrimp, spiny lobster, Spanish mackerel, unclassified shrimp species, king mackerel, yellowtail snapper, dolphin, vermilion snapper, and greater amberjack (**Table 2**). These group of species accounted for 85% of the total weight of landings from species managed by the South Atlantic Council. A similar ranking of finfish species only can be seen in **Table 3**.

Economic Impacts

The commercial harvest and subsequent sales and consumption of seafood generates economic activity as fishermen expend funds to harvest the seafood and consumers spend money on goods and services, such as seafood served during a restaurant visit. These expenditures spur additional economic activity in the region(s) where the harvest and purchases are made, such as supporting jobs in local fish markets, grocers, restaurants, and fishing supply establishments. In the absence of the availability of locally or regionally caught seafood for purchase, consumers would likely spend their money on substitute goods and services. As a result, the economic impact analysis presented represents a distributional analysis; that is, it shows the economic contributions of the fishing activity and how economic effects may be distributed through regional markets. These analyses should not be interpreted to represent the net impacts if these species were not available for harvest or purchase.

In total, the examined average annual commercial landings of species managed by the South Atlantic Council supported an estimated 17,000 jobs, $462.5 million in income, $662.3 million in value added impacts, and $1.3 billion in business sales in the U.S. economy (2016 dollars) (**Table 4**). Approximately 27% of these economic impacts were attributed to landings of finfish species, with 3% attributed to landings of golden crab and rock shrimp, 30% to landings of spiny lobster, and the remaining 40% to landings of white shrimp, brown shrimp, pink shrimp, and mixed shrimp species.

Table 1. Average annual commercial landings of species managed by the South Atlantic Council, 2014-2016.

Species Category	Species Grouping	Pounds (ww)	Ex-Vessel Value (2016 dollars)
Finfish	Snapper Grouper[1]	7,113,169	$21,228,106
	Coastal Migratory Pelagics[1]	5,686,422	$10,332,772
	Dolphin Wahoo[1]	1,082,573	$3,215,434
	Total Finfish	13,882,164	$34,776,312
Crustaceans	Spiny Lobster	4,484,799	$40,328,526
	Golden Crab	708,800	$2,442,168
	Rock Shrimp	580,382	$1,203,542
	Other Shrimp[2]	20,251,216	$52,115,853
	Total Crustacean	26,025,197	$96,090,090
All Species	Total All Species	39,907,362	$130,866,402

Source: Landings and ex-vessel value estimates from the ACCSP database as queried on August 11, 2017.
[1]See Appendix for list of species within grouping.
[2]Includes landings of white shrimp, brown shrimp, pink shrimp, and unclassified shrimp species.

Table 2. Top ten species managed by the South Atlantic Council ranked by ex-vessel value and weight of commercial landings, average from 2014-2016.

Top Ten Species by Ex-Vessel Value	
Species	**Ex-Vessel Value (2016 Dollars)**
Spiny Lobster	$40,328,526
White Shrimp	$29,634,588
Brown Shrimp	$12,137,682
Unclassified Shrimp Species[1]	$8,212,738
King Mackerel	$6,154,266
Yellowtail Snapper	$5,466,799
Spanish Mackerel	$3,734,873
Vermillion Snapper	$3,175,041
Dolphin	$2,994,056
Golden Crab	$2,442,168

Top Ten Species by Weight	
Species	**Pounds Landed (ww)**
White Shrimp	10,544,429
Brown Shrimp	6,029,272
Spiny Lobster	4,484,799
Spanish Mackerel	3,018,966
Unclassified Shrimp Species[1]	2,934,289
King Mackerel	2,520,961
Yellowtail Snapper	1,752,051
Dolphin	1,022,784
Vermillion Snapper	901,741
Greater Amberjack	900,518

Source: Landings and ex-vessel value estimates from the ACCSP database as queried on August 11, 2017.
[1]Species not specified.

Table 3. Top ten finfish species managed by the South Atlantic Council ranked by ex-vessel value and weight of commercial landings, average from 2014-2016.

Top Ten Finfish Species by Ex-Vessel Value	
Species	**Ex-Vessel Value (2016 Dollars)**
King Mackerel	$6,154,266
Yellowtail Snapper	$5,466,799
Spanish Mackerel	$3,734,873
Vermilion Snapper	$3,175,041
Dolphin	$2,994,056
Golden Tilefish	$2,165,308
Gag Grouper	$1,612,972
Black Sea Bass	$1,429,997
Greater Amberjack	$1,370,252
Wreckfish	*

Top Ten Finfish Species by Weight	
Species	**Pounds Landed (ww)**
Spanish Mackerel	3,018,966
King Mackerel	2,520,961
Yellowtail Snapper	1,752,051
Dolphin	1,022,784
Vermilion Snapper	901,741
Greater Amberjack	900,518
Golden Tilefish	659,183
Black Sea Bass	505,458
Gag Grouper	330,612
Wreckfish	*

Source: Landings and ex-vessel value estimates from the ACCSP database as queried on August 11, 2017.
*Landings removed due to potential confidentiality concerns.

Table 4. Average annual economic impacts (2014 through 2016) associated with the commercial harvest of species managed by the South Atlantic Council. All monetary estimates are in 2016 dollars.

Species Category	Sector	Jobs	Income Impacts (thousands of dollars)	Value Added Impacts (thousands of dollars)	Sales Impacts (thousands of dollars)
Finfish	Harvesting Sector[2]	1,082	$30,247	$46,697	$91,464
	Other Sectors[3]	3,541	$95,957	$131,952	$253,801
	Total	4,623	$126,204	$178,649	$345,265
Golden Crab and Rock Shrimp	Harvesting Sector	116	$3,225	$5,083	$9,707
	Other Sectors	371	$9,956	$13,683	$26,287
	Total	487	$13,181	$18,766	$35,994
Spiny Lobster	Harvesting Sector	1,034	$29,898	$51,245	$111,025
	Other Sectors	4,106	$111,276	$153,018	$294,321
	Total	5,140	$141,174	$204,263	$405,346
Other Shrimp[1]	Harvesting Sector	1,358	$39,353	$64,931	$141,370
	Other Sectors	5,449	$142,568	$195,675	$375,016
	Total	6,807	$181,921	$260,606	$516,386
All Species	Harvesting Sector	3,590	$102,722	$167,956	$353,566
	Other Sectors	13,467	$359,758	$494,328	$949,425
	Total	17,057	$462,480	$662,284	$1,302,991

Source: Ex-vessel value estimates from the ACCSP database as queried on August 11, 2017; economic impacts calculated with tool developed by NMFS SERO using the model developed for and applied in NMFS (2017).
[1]Includes landings of white shrimp, brown shrimp, pink shrimp, and unclassified shrimp species.
[2]Harvesting sector encompasses commercial fishermen involved in the harvest and landing of a species.
[3]Other sectors include primary seafood dealers and processors, secondary wholesalers and distributions, grocers, and restaurants.

Recreational Fisheries

Fishing Effort and Landings

The recreational sector effort data is comprised of private and for-hire modes. The private mode includes anglers fishing from shore (all land-based structures) and private or rental vessels. The for-hire mode is composed of charter boats and headboats (also called party boats). Charter boats generally carry fewer passengers and charge a fee on an entire vessel basis, whereas headboats often carry more passengers and payment is typically per person. Data for headboats are not included in the following analyses or tables for reasons previously explained in the Data and Methods section. The effort estimates discussed focus on "directed" recreational trips, as this trip type is seen an in-range estimate for recreational effort, however "harvest only" and "interacting" trip estimates are also provided to show an upper and lower bound of potential effort estimates that could be examined.

On average from 2014 through 2016, recreational anglers took approximately 3 million directed trips annually for species managed by the South Atlantic Council (**Table 5**). Of these trips, the top ten SAFMC managed species ranked by the number of directed trips were dolphin, Spanish mackerel, king mackerel, gray snapper, cobia, yellowtail snapper, black seabass, mutton snapper, wahoo, and gray triggerfish (**Table 6**). Regardless of the type of trip examined, the private/rental vessel mode saw the most effort followed by the shore based trips and charter trips.

During the timeframe examined, anglers annually landed approximately 19.6 million pounds of species managed by the South Atlantic Council (**Table 5**). The highest recreational landings were attributed to dolphin, followed by cobia, king mackerel, wahoo, Spanish mackerel, greater amberjack, yellowtail snapper, gray snapper, mutton snapper, and red snapper (**Table 6**). Overall, these ten species accounted for 78% of the total recreational landings for species managed by the SAFMC.

E*conomic Impacts*

Recreational fishing generates business activity as anglers expend funds on various goods and services used in recreational fishing including bait, groceries, fuel, and charter fees. These expenditures spur additional business activity in the region(s) where the purchases are made, such as supporting jobs in bait and tackle stores, marinas, lure manufacturers, and fishing charter businesses. In the absence of the opportunity to fish, the expendable income would presumably be spent on other goods and services and these expenditures could similarly generate economic impacts. As such, the analyses presented represent a distributional analysis, showing how economic effects may be distributed through regional markets but should not be interpreted to represent the net impacts if these species were not available to anglers.

In total, the examined directed recreational fishing trips for species managed by the South Atlantic Council supported an estimated 3,598 jobs, $167.9 million in income, $276.9 million in value added impacts, and $532 million in business sales annually in the U.S. economy (2016 dollars) (**Table 7**). As noted in the Data and Methods section, all of these impacts could be attributed to finfish species. Approximately 5% of the economic impacts could be attributed to

fishing activity occurring in the Mid-Atlantic and New England Regions, with the remaining 95% to fishing activity occurring in the South Atlantic Region. The economic impacts provided in **Table 7** are intended to be an in-range estimate of the likely economic contributions of recreational fishing activity for SAFMC managed species. A sensitivity analysis providing lower and upper bound estimates for trip impacts examining "harvest only" trips and "interacting" trips is provided in **Appendix 2**. Depending on the trip metric examined, the estimated economic impacts associated with recreational trips for SAFMC managed species range from 1,976 to 4,351 jobs, $93 to $202 million in income, $152 to $334 million in value added impacts, and $290 to $643 million in business sales annually in the U.S. economy (2016 dollars).

Table 5. Angler effort and recreational landings by mode and by region for species managed by the South Atlantic Council, average 2014-2016.

Region	Mode[1]	Harvest Only Trips[2]	Directed Trips[3]	Interacting Trips[4]	Pounds Harvested (ww)
South Atlantic Region	Charter	157,770	236,855	274,779	5,257,555
	Private/Rental Vessel	841,831	1,828,467	2,317,215	11,388,742
	Shore	265,624	640,938	909,495	934,157
	All Modes	1,265,225	2,706,260	3,501,490	17,580,454
Total Atlantic	Charter	168,532	250,801	286,456	5,431,113
	Private/Rental Vessel	907,863	2,009,583	2,428,684	13,234,635
	Shore	265,672	665,570	915,494	944,280
	All Modes	1,342,067	2,925,954	3,630,635	19,610,028

Source: MRIP database as queried on August 11, 2017 and May 15, 2018.
[1]Headboat data are unavailable for harvest only or directed trips under the MRIP program.
[2]Harvest only trips include the number of individual angler trips, regardless of duration, where at least one species managed by the SAFMC was harvested.
[3]Directed trips include the number of individual angler trips, regardless of duration, where the intercepted angler indicated that at least one species managed by the SAFMC was the primary or secondary target for the trip or at least one of these species was harvested.
[4]Interacting trips include the number of individual angler trips, regardless of duration, where the intercepted angler indicated that at least one species managed by the SAFMC was the primary or secondary target for the trip or at least one of these species was harvested or released.

Table 6. Top ten species managed by the South Atlantic Council ranked by directed recreational fishing trips and by weight of recreational landings, average from 2014-2016.

Top Ten Species by Directed Trips	
Species	**Directed Trips[1,2]**
Dolphin	938,251
Spanish Mackerel	866,158
King Mackerel	474,676
Gray Snapper	444,020
Cobia	417,566
Yellowtail Snapper	352,616
Black Sea Bass	203,718
Mutton Snapper	163,440
Wahoo	96,688
Gray Triggerfish	84,595

Top Ten Species by Weight of Harvest	
Species	**Pounds (ww)**
Dolphin	6,537,000
Cobia	1,662,074
King Mackerel	1,455,438
Wahoo	1,282,298
Spanish Mackerel	1,054,063
Greater Amberjack	1,040,608
Yellowtail Snapper	792,158
Gray Snapper	604,224
Mutton Snapper	536,164
Red Snapper	355,073

Source: MRIP database as queried on August 11, 2017.
[1]Directed trips include the number of individual angler trips, regardless of duration, where the intercepted angler indicated that at least one species managed by the SAFMC was the primary or secondary target for the trip or at least one of these species was harvested.
[2]Trips are not additive across species, since multiple species may be harvested or targeted on the same trip.

Table 7. Average annual economic impacts (2014 through 2016) associated with recreational fishing on directed trips for species managed by the South Atlantic Council. All monetary estimates are in 2016 dollars.

Region	Mode[1]	Jobs	Income Impacts (thousands of dollars)	Value Added Impacts (thousands of dollars)	Sales Impacts (thousands of dollars)
South Atlantic	Charter	1,717	$84,349	$130,750	$244,030
	Private/Rental Vessel	1,136	$51,696	$91,283	$182,649
	Shore	565	$23,529	$40,605	$77,344
	All Modes	3,418	$159,574	$262,638	$504,023
Total Atlantic	Charter	1,753	$86,149	$133,540	$249,237
	Private/Rental Vessel	1,266	$57,610	$101,726	$203,545
	Shore	579	$24,100	$41,590	$79,220
	All Modes	3,598	$167,859	$276,856	$532,002

Source: Economic impacts calculated with tool developed by NMFS SERO using NMFS (2017) and underlying data provided by the NOAA Office of Science and Technology.
[1]Headboat data are unavailable for directed trips under the MRIP program.

Discussion

Estimating the economic impacts of saltwater recreational fishing activity is inherently difficult, as there are multiple trip types that can be examined when calculating the impacts as well as error terms associated with each trip estimate. In addition, if groups of species are examined rather than generic regional data, as is the case in this report, durable goods are excluded from the economic impact estimates for reasons noted in the Data and Methods section.

In the South Atlantic region, durable goods expenditures are estimated to be approximately four times greater than trip expenditures, with the associated economic impacts likely exhibiting the similar trends (NMFS 2017, NMFS 2013). As such, it is clear that while durable goods should be left out given currently available data and methods for examining economic impacts of fishing activity on a trip level for SAFMC managed species, doing so significantly underestimates the "true" economic impacts of such fishing activity. Future research efforts could be carried out to better incorporate expenditures on durable goods used in SAFMC managed fisheries to provide improved estimates of the economic impacts of recreational fishing activity. An example of such research has been previously accomplished by NMFS for Highly Migratory Species in the New England and Mid-Atlantic Regions (NMFS 2014).

The Socio-Economic Panel (SEP) of the South Atlantic Scientific and Statistical Committee reviewed a previous draft of this economic report in February 2018 (SEP 2018). Several recommendations were provided to strengthen future versions. Some recommendations were addressed in this revised version but others are more long-term recommendations, as they require access to and manipulation of the IMPLAN software on which the NMFS economic impact models are based. Among these recommendations were to include tax impacts in future reports. This is an especially intriguing idea, as past reports from NMFS on the economic contributions of marine recreational fishing expenditures have included such information. In the South Atlantic Region alone, it was estimated that in 2011 marine recreational fishing expenditures generated approximately $464 million in state and local tax revenues and $496 million in federal tax revenues or $961 million in total tax revenues (NMFS 2013). Such information could be updated and also expanded to include the commercial sector in future updates to this report through collaboration with NOAA Office of Science and Technology.

Finally, it is noted several times that economic impact estimates for saltwater recreational fishing are driven largely by trip estimates. MRIP is expected to release recalibrated estimates for saltwater recreational fishing trips in the summer of 2018. Preliminary guidance from the program is that these trip estimates will be several times higher than those previously provided. As such, it can be expected that the economic contributions attributed to recreational fishing will increase in a similar manner. Once available, this report will be updated to incorporate the revised effort data as well as data for 2017 into the economic estimates for recreational fishing. It is anticipated that the resulting economic impact estimates will be well above those stated in this report.

Conclusions

While there is some double counting that can occur in simply adding commercial and recreational economic impacts together, given the likely underestimates inherent in calculating recreational fishing economic impacts[10], it is reasonable to conclude that the combined recreational and commercial components of fisheries for species managed by the South Atlantic Council support upwards of 19,000 to 21,000 jobs, $556 million to $665 million in income, $814 million to nearly $1 billion in valued added impacts, and $1.6 billion to $2 billion in business sales (2016 dollars) in the U.S. economy each year. These economic contributions are especially important for many of the coastal communities where this fishing activity occurs. Continued

[10] See Data and Methods Section

responsible long-term management of these fisheries resources is highly important in leading to sustained economic activity well into the future.

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SEP. 2018. February 2018 Overview and Report. Socio-Economic Panel of the South Atlantic Scientific and Statistical Committee, 24p.

Appendix 1. List of South Atlantic Fishery Management Council managed finfish and crustacean species.

Species Grouping	Species
Snapper Grouper	almaco jack atlantic spadefish banded rudderfish bar jack black grouper black sea bass blackfin snapper blueline tilefish cobia coney cubera snapper dolphin Gag golden tilefish goliath grouper gray snapper gray triggerfish graysby greater amberjack hogfish jolthead porgy king mackerel knobbed porgy lane snapper lesser amberjack margate misty grouper mutton snapper nassau grouper queen snapper red grouper red hind red porgy

Species Grouping	Species
Snapper Grouper	red snapper rock hind sailors choice sand tilefish saucereye porgy scamp scup silk snapper snowy grouper spanish mackerel speckled hind tomtate vermilion snapper wahoo warsaw grouper white grunt whitebone porgy wreckfish yellowedge grouper yellowfin grouper yellowmouth grouper yellowtail snapper
Coastal Migratory Pelagics	king mackerel cobia spanish mackerel
Dolphin Wahoo	dolphin wahoo
Spiny Lobster	spiny lobster
Golden Crab	golden crab
Shrimp	brown shrimp pink shrimp rock shrimp white shrimp

Appendix 2. Sensitivity analysis for economic impacts associated with recreational fishing activity for species managed by the South Atlantic Fishery Management Council based on varying trip types.

Table A-1. Average annual economic impacts (2014 through 2016) associated with recreational fishing on harvest only trips for species managed by the South Atlantic Council. All monetary estimates are in 2016 dollars.

Region	Mode[1]	Jobs	Income Impacts (thousands of dollars)	Value Added Impacts (thousands of dollars)	Sales Impacts (thousands of dollars)
South Atlantic	Charter	1,144	$56,185	$87,093	$162,549
	Private/Rental Vessel	523	$23,801	$42,027	$84,092
	Shore	234	$9,751	$16,828	$32,054
	All Modes	1,901	$89,737	$145,948	$278,695
Total Atlantic	Charter	1,172	$57,574	$89,246	$166,568
	Private/Rental Vessel	570	$25,940	$45,804	$91,649
	Shore	234	$9,752	$16,830	$32,057
	All Modes	1,976	$93,267	$151,880	$290,274

Source: Economic impacts calculated with tool developed by NMFS SERO using NMFS (2017) and underlying data provided by the NOAA Office of Science and Technology.
[1]Headboat data are unavailable for directed trips under the MRIP program

Table A-2. Average annual economic impacts (2014 through 2016) associated with recreational fishing on directed trips for species managed by the South Atlantic Council. All monetary estimates are in 2016 dollars.

Region	Mode[1]	Jobs	Income Impacts (thousands of dollars)	Value Added Impacts (thousands of dollars)	Sales Impacts (thousands of dollars)
South Atlantic	Charter	1,717	$84,349	$130,750	$244,030
	Private/Rental Vessel	1,136	$51,696	$91,283	$182,649
	Shore	565	$23,529	$40,605	$77,344
	All Modes	3,418	$159,574	$262,638	$504,023
Total Atlantic	Charter	1,753	$86,149	$133,540	$249,237
	Private/Rental Vessel	1,266	$57,610	$101,726	$203,545
	Shore	579	$24,100	$41,590	$79,220
	All Modes	3,598	$167,859	$276,856	$532,002

Source: Economic impacts calculated with tool developed by NMFS SERO using NMFS (2017) and underlying data provided by the NOAA Office of Science and Technology.
[1]Headboat data are unavailable for directed trips under the MRIP program

Table A-3. Average annual economic impacts (2014 through 2016) associated with recreational fishing on interacting trips for species managed by the South Atlantic Council. All monetary estimates are in 2016 dollars.

Region	Mode[1]	Jobs	Income Impacts (thousands of dollars)	Value Added Impacts (thousands of dollars)	Sales Impacts (thousands of dollars)
South Atlantic	Charter	1,992	$97,855	$151,685	$283,103
	Private/Rental Vessel	1,440	$65,515	$115,682	$231,471
	Shore	802	$33,388	$57,619	$109,752
	All Modes	4,234	$196,757	$324,987	$624,325
Total Atlantic	Charter	2,022	$99,362	$154,022	$287,463
	Private/Rental Vessel	1,524	$69,327	$122,414	$244,940
	Shore	805	$33,527	$57,859	$110,209
	All Modes	4,351	$202,216	$334,294	$642,612

Source: Economic impacts calculated with tool developed by NMFS SERO using NMFS (2017) and underlying data provided by the NOAA Office of Science and Technology.
[1]Headboat data are unavailable for directed trips under the MRIP program