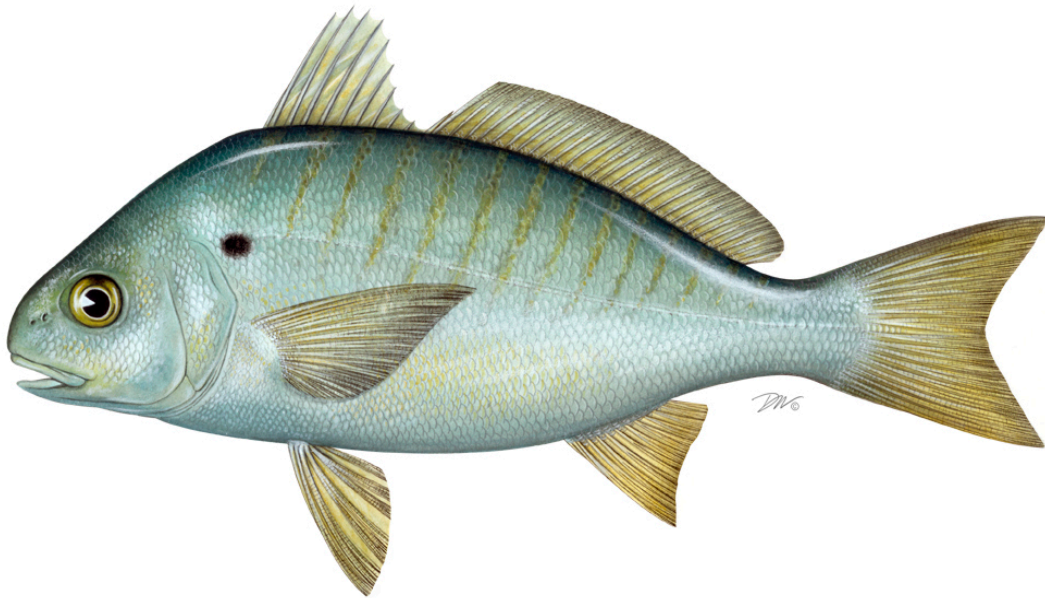


**2018 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR
SPOT
(*Leiostomus xanthurus*)**

2017 FISHING YEAR



The Spot Plan Review Team

Michael Schmidtke, Atlantic States Marine Fisheries Commission, Chair
Harry Rickabaugh, Maryland Department of Natural Resources
Adam Kenyon, Virginia Marine Resources Commission
Dan Zapf, North Carolina Division of Marine Fisheries
Chris McDonough, South Carolina Department of Natural Resources
Dawn Franco, Georgia Department of Natural Resources

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I. Status of the Fishery Management Plan

Date of FMP Approval: October 1987; Omnibus Amendment August 2011

Management Area: The Atlantic coast distribution of the resource from Delaware through Florida

Active Boards/Committees: South Atlantic State/Federal Fisheries Management Board; Spot Plan Review Team; South Atlantic Species Advisory Panel; Omnibus Amendment Plan Development Team

The Fishery Management Plan (FMP) for Spot was adopted in 1987 and includes the states from Delaware through Florida (ASMFC 1987). In reviewing the early plans created under the Interstate Fisheries Management Plan process, the ASMFC found the Spot FMP to be in need of evaluation and possible revision. A Wallop-Breaux grant from the U.S. Fish and Wildlife Service was provided to conduct a comprehensive data collection workshop for spot. The October 1993 workshop at the Virginia Institute of Marine Science was attended by university and state agency representatives from six states. Presentations on fishery-dependent and fishery-independent data, population dynamics, and bycatch reduction devices were made and discussed. All state reports and a set of recommendations were included in the workshop report (Kline and Speir 1993).

Subsequent to the workshop and independent of it, the South Atlantic State/Federal Fisheries Management Board (Management Board) reviewed the status of several plans in order to define the compliance issues to be enforced under the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). The Management Board found recommendations in the plan to be vague and perhaps no longer valid, and recommended that an amendment be prepared to the Spot FMP to define the management measures necessary to achieve the goals of the FMP. In their final schedule for compliance under the ACFCMA, the ISFMP Policy Board adopted the finding that the FMP does not contain any management measures that states are required to implement. In August 2009, the Management Board expanded the initiated amendment to the Spanish Mackerel FMP to include Spot and Spotted Seatrout, creating the Omnibus Amendment for Spot, Spotted Seatrout and Spanish Mackerel. The goal of the Omnibus Amendment was to update all three plans with requirements specified under the Atlantic Coastal Fisheries Cooperative Management Act (1993) and the Interstate Fishery Management Program Charter (1995). In August 2011, the Management Board approved the Omnibus Amendment for Spot, Spotted Seatrout, and Spanish Mackerel. This Amendment did not set specific management measures for Spot but it did align management of the species with the requirements of ACFCMA.

In August 2014, the Board approved Addendum I to the Omnibus Amendment. The Addendum establishes use of a Traffic Light Analysis (TLA) to evaluate fisheries trends and develop state-

specified management actions (e.g., bag limits, size restrictions, time and area closures, and gear restrictions) when harvest and abundance thresholds are exceeded for two consecutive years.

II. Status of the Stock

A benchmark stock assessment for spot was completed in 2017 but was not recommended for management use by the Peer Review Panel (ASMFC 2017). Therefore, stock status is unknown. The stock is monitored annually using the Traffic Light Analysis, described below.

Traffic Light Approach

As part of the requirements under the 2011 Omnibus Amendment, for years in-between benchmark stock assessments, the Spot PRT was tasked with conducting annual monitoring analyses. These trigger exercises compared five data sources to the 10th percentile of the data sets' time series. If two terminal values of the five data sources (at least one of which must be fishery independent) fell below the 10th percentile, the Management Board would be prompted to consider management action.

In August 2014, the Board approved Addendum I to the Omnibus Amendment. The Addendum established the Traffic Light Approach (TLA) as the new precautionary management framework to evaluate fishery trends and develop management actions. The TLA framework replaces the management trigger stipulated in the Omnibus Amendment after concern that the triggers were limited in their ability to illustrate long-term declines or increases in stock abundance. In contrast, the TLA is a statistically-robust way to incorporate multiple data sources (both fishery-independent and -dependent) into a single, easily understood metric for management advice. It is an effective method to illustrate long-term trends in the fishery.

The TLA was originally developed as a management tool for data poor fisheries. The name comes from assigning a color (red, yellow, or green) to categorize relative levels of population indicators. When a population characteristic improves, the proportion of green in the given year increases. Harvest and abundances thresholds of 30% and 60% red were established in Addendum I, representing moderate and significant concern for the fishery. If thresholds for both adult population characteristics achieve or exceed a threshold for a two year period, then management action is enacted.

Analysis of the harvest composite index showed a general decline beginning in 2005 (Figure 1). This decline was driven mostly by the decline in commercial landings rather than the recreational

harvest. The composite harvest index tripped in 2016-2017 with a 2-year red proportion greater than 30%.

The TLA abundance composite index for adult spot (NMFS and SEAMAP surveys) was run using the 1989-2017 time period since that was when the two surveys overlapped (Figure 1). The TLA composite characteristic did not trigger in 2017 and has not triggered since 2004.

The TLA juvenile index, based on the Maryland seine survey, did trip in 2017 (30% threshold), which does not impact potential management action (ASMFC 2018). However, this does indicate some concern with recruitment, as this index has tripped in each of the last four years.

Because the harvest index and adult composite index did not both trip for 2016-2017, management action is not triggered by the TLA. With the benchmark stock assessment now complete, further refinement of the TLA for spot is under consideration. The PRT and Atlantic Croaker TC have submitted several adjustments to the TLA for Board consideration, which include incorporation of additional indices and alterations to the TLA metrics and triggering mechanism.

III. Status of the Fishery

This report includes updated recreational estimates from the Marine Recreational Information Program's transition to the mail-based Fishing Effort Survey (FES) on July 1, 2018. Therefore, recreational estimates will likely be different from those shown in past FMP Reviews and state compliance reports through 2018. Figure 2 shows coastwide recreational landings including estimates using both the previous Coastal Household Telephone Survey (CHTS) and FES calibration for comparison, but other figures, tables, and text will only show data based on the FES calibration. Data based on either survey can be referenced at: <https://www.st.nmfs.noaa.gov/st1/recreational/queries/>.

Total landings of spot from NY to FL in 2017 are estimated at 10 million pounds, an increase of approximately 6 million pounds from 2016 and 317 thousand pounds less than the average of the last 10 years (Tables 1 and 3). The recreational fishery harvested more than the commercial fishery (76% and 24% respectively, by pounds). Although historical harvests were more evenly split between sectors, over the last 10 years, harvests have been more heavily recreational (30% commercial and 70% recreational, by pounds).

Commercial spot landings have ranged between 627,000 and 14.52 million pounds from 1950-2017 (Figure 3). In 2017, 2.36 million pounds were harvested commercially. Coastwide, gill nets were used to capture 77% of commercially harvested spot (Table 2). Virginia landed approximately 74% of the commercial harvest (by pounds) in 2017, followed by North Carolina with 18% of the harvest. Spot are a major component of Atlantic coast scrap landings (NCDMF 2001). A scrap fishery is one in which fish species that are unmarketable as food, due to size or

palatability, are sold unsorted, usually as bait. The majority of removals for spot come from the South Atlantic shrimp trawl fishery (ASMFC 2017).

The recreational harvest of spot along the Atlantic coast from 1981 to 2017 has varied between 13.0 and 54.4 million fish (or 3.6 and 17.3 million pounds; Figures 3 and 4). Recreational harvest has fluctuated widely throughout the time series. Harvest has generally declined from the most recent peak in 2007, with the time series low harvest occurring in 2016. In 2017, recreational landings were 23.7 million fish (10 million pounds), an increase of 10 million fish (4 million pounds) from 2016 (Tables 3 and 4). Anglers in Virginia were responsible for 67% of the total number of fish harvested in 2017, followed by anglers in Maryland (14%) and North Carolina (10%). Many anglers are known to catch spot to use as bait, as well as for other recreational purposes. The estimated number of spot released annually by recreational anglers has varied between 4.8 and 30.3 million fish, with 2017 releases estimated at 8.1 million fish, a 2.5 million fish decline from 2016 (Figure 4, Table 5).

IV. Status of Assessment Advice

A benchmark stock assessment for spot was completed in 2017 but was not recommended by the Peer Review Panel for management use due to uncertainty in biomass estimates due to conflicting signals among abundance indices and catch time series, as well as sensitivity of model results to assumptions and model inputs (ASMFC 2017). The Review Panel recommended continued annual monitoring of spot through the TLA, with incorporation of shrimp trawl discard estimates, and another benchmark assessment in 5 years.

V. Status of Research and Monitoring

Catch and effort data are collected by the commercial and recreational statistics programs conducted by the states and the National Marine Fisheries Service (NMFS). Biological characterization data from fishery landings are also available from several states. Specifically, age data are now available from Maryland, Virginia, North Carolina, and South Carolina. Recruitment indices are available from surveys in Delaware, Maryland, Virginia, North Carolina, and South Carolina. Adult or aggregate (mix of juvenile and older spot) relative abundance indices are available from New Jersey, Delaware, North Carolina, South Carolina, Georgia, and SEAMAP (covering North Carolina through Florida). These surveys, in addition to the Northeast Fisheries Science Center Bottom Trawl Survey, the Northeast Area Monitoring and Assessment Program (NEAMAP), the Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP), and the Chesapeake Bay Fishery-Independent Multispecies Survey (CHESFIMS), collect a variety of biological data elements.

Fishery-Dependent Sampling

Maryland: Maryland conducted an onboard commercial pound net survey on the Potomac River and the Chesapeake Bay, sampling once per week from May 23, 2017 through September 11, 2017. The spot mean length of 200 millimeters TL from 2017 onboard pound net sampling was near the time series mean of 202 millimeters, and increased from the lowest value of the 25 year

time series in 2016. Sixty-five percent of spot encountered in the onboard pound net survey in 2017 were between 190 and 229 millimeters TL, a shift to larger sizes and an overall expansion of the length frequency distribution. Seafood dealer sampling was also conducted in 2017, with 425 spot sampled from the pound net harvest. The mean length, 213 millimeters TL, and length frequency distribution of the seafood dealer sampling indicated harvested spot were larger than those seen during onboard sampling. This indicates some smaller spot are discarded, which is not unexpected, as smaller spot have a very low market value. In 2017 80.5% of spot sampled from the onboard pound net survey were age one, 19.1% were age zero, and 0.3% were age two (228 ages and 1,063 lengths). Age two spot were not encountered in 2016 and remained rare in 2017.

Virginia: Virginia's Marine Resources Commission collects biological data from Virginia's commercial and recreational fisheries, with total length, weight, sex, and age measured whenever possible. The fish are aged by examining otoliths, which is done by Old Dominion University's Center for Quantitative Fisheries Ecology.

North Carolina: Commercial fishing activity is monitored through fishery-dependent sampling conducted under Title III of the Interjurisdictional Fisheries Act and has been ongoing since 1982. Data collected in this program allows the size distribution of spot to be characterized by gear/fishery. Further sub-sampling is conducted to procure samples for age determination (whole otoliths), sex ratio, reproductive condition, and weight.

South Carolina: South Carolina's Spot fishery is generally recreational in nature. Fishery dependent data related to Spot has been available primarily through the SCDNR State Finfish Survey (SFS), the National Marine Fisheries Service's Marine Recreational Information Program (MRIP), and a SCDNR managed mandatory trip reporting system for licensed charterboat operators. Beginning in 2013, the SCDNR took over the MRIP data collection in South Carolina. Since the data previously coming from the SC-SFS is now incorporated into the MRIP data set they will not be reported separately. The one exception to this occurs during wave 1 (Jan-Feb) sampling. The MRIP survey had not sampled during this wave in the past and so the SC-SFS will still be used to cover this time period.

Georgia: The Marine Sportfish Carcass Recovery Project, a partnership with recreational anglers along the Georgia coast, was used to collect biological data from finfish. In 2017, a total of 3,744 fish carcasses were donated through this program. Spot are not on the list of requested species and none were donated in 2017.

Fishery-Independent Sampling

New Jersey: The New Jersey Bureau of Marine Fisheries conducts an Ocean Trawl Survey, Delaware River Seine Survey, and Delaware Bay Trawl Survey. Respective indices of abundance (GM) for the three surveys in 2017 were: 2.12, 0.01, and 0.06 (2016 values were: 0.12, 0.01, and 0.06, respectively).

Delaware: Annual relative abundance estimates (number/nautical mile) of spot in Delaware are monitored through the Division's adult ground fish bottom trawl survey. The relative abundance

of spot increased to 5.82 (#/nm). The Division monitors juvenile fish abundance through a 16-ft bottom trawl survey which has been conducted annually since 1980. Separate spot young of the year (YOY) indices are generated for the Delaware Estuary (Bay and River) and Delaware's "Inland Bays" (Indian River and Rehoboth Bays). YOY spot recruitment, 0.39 per tow (geometric mean), decreased in 2017 relative to 2016 for the Delaware Estuary and was below the time series mean and median. The Inland Bays YOY index decreased to 0.77 per tow, and remained below the time series mean in 2017.

Maryland: Maryland conducted a fisheries independent gill net survey on the Choptank River once per week from June 7, 2017 to August 31, 2017, with the exception of one set in set being missed on one day in June and one day in August, due to mechanical problems with the sampling vessel. Experimental monofilament gill nets with stretched mesh sizes of 63.5, 76.2, 88.9 and 101.6 millimeters were set at four randomly selected locations within the sampling area each sampling day. Spot catch in the Choptank River gill net survey was highest in 2014 (749 fish) and similar in 2013, 2015 and 2017 (272, 222 and 298 fish, respectively), and lowest in 2016 (109 fish). The 6.4 centimeter mesh captured the majority of spot each year, accounting for over 95% of catch in 2013, 2014 and 2016, and accounted for 73% and 78% of the catch in 2015 and 2017 respectively. The length distribution shifted to smaller fish in 2016 with 74% of captured spot being less than 200 millimeters TL, but returned to a broader distribution in 2017.

Four juvenile indices were calculated, two from the Maryland portion of Chesapeake Bay and two from the Maryland coastal bays. Finfish collected by Maryland's Chesapeake Bay Blue Crab Trawl Survey have been enumerated since 1980. However, since some data entry inconsistencies make electronic data files prior to 1989 incomplete for finfish species, only data from 1989 through 2017 were used to generate a Chesapeake Bay spot juvenile index. Spot juvenile trawl index values from 1989-2017 were quite variable. The 2010 GM value of 104.5 spot per tow was the highest value of the time series, the 2011 value declined to the second lowest of the 29 year time series, and the 2012 value increased to nearly the time series mean. The index values declined from 2012 to the time series low in 2015 (0.29 fish per tow). The 2016 and 2017 values increased (2.02 fish per tow in 2017), but were still below the 29 year time series mean.

The second JI was derived from the Striped Bass Juvenile Seine Survey (JSS). The JSS has permanent and auxiliary sites, only permanent sites were used in index calculations for this report, and sampling frequency was standardized in 1967, so that was the first year used to

calculate the JI time series. The 2017 GM catch per haul of 0.40 was the 13th lowest value of the 51 year time series, and well below the mean value of 1.42 fish per haul.

A 4.9-meter semi-balloon otter trawl has been used to sample Maryland's Atlantic coastal bays since 1972. The 2017 GM of 1.7 spot per hectare decreased from 2016, and was below the 29 year time series mean of 8.9 fish per hectare.

The final juvenile index was derived from the coastal bays seine survey, which utilized a 1.8 meter by 30.5 meter seine with a single central bag. The coastal bays seine survey also decreased in 2017 to 4.4 spot per haul, and was below the time series mean of 7.4 spot per haul.

Virginia: The Virginia Institute of Marine Science (VIMS) has been conducting a monthly juvenile trawl survey since 1955 to monitor the abundance and seasonal distribution of finfish and invertebrates in the Chesapeake Bay and its tributaries. An index of age-0 spot abundance is available from 1988 up to 2016, with sampling coming from tributaries of the Chesapeake Bay (fixed and random sites) as well as the bay itself (random sites). The average index value from 1988 through 2016 is 13.43, and the geometric mean value for 2017 was 4.46. This represents an increase from 2.39 in 2016, but is still one of the lowest values in the time series.

North Carolina: North Carolina has no current fishery-independent monitoring programs specifically for spot. However, the NCDMF has conducted a stratified random trawl survey in Pamlico Sound (Pamlico Sound Survey, Program 195) since 1987 to obtain juvenile abundance indices (JAI) for several economically important species, including spot. Spot less than 120 mm from the June portion of the Pamlico Sound Survey are considered in calculating the JAI. The 2017 spot JAI (mean number of individuals/tow) was 720.6, an increase from the 2016 JAI of 291.0 and the sixth highest value in the time series. From 1987-2017 the average JAI was 423.0 with many large fluctuations.

South Carolina: While Spot are not necessarily a specifically targeted species for SCDNR monitoring programs or projects, they are a common component species of four fishery independent monitoring efforts conducted by the SCDNR. The Southeast Area Monitoring and Assessment – South Atlantic Program (SEAMAP-SA) is a shallow water (15 to 30 ft depth) trawl survey that monitors status and trends of numerous coastal species within the South Atlantic Bight seasonally (spring, summer and fall) from Cape Canaveral, FL to Cape Hatteras, NC. The annual stratified mean catch per tow in weight for the entire survey in 2017 declined by 48.2% (5.72 kg/tow) over 2016 (11.1 kg/tow). The second survey is an inshore estuarine trammel net survey conducted by the SCDNR. In 2017, CPUE increased (224%) from 2016 but still remained below the long term mean for the eighth year. It should be noted that the index value for 2016 was the lowest in the time series. The overall trend for Spot in the trammel survey has been in decline since 1999, with only 7 years exceeding the long term mean catch since 2000. The third survey was an electroshock survey conducted in low salinity brackish and tidal freshwater portions of different South Carolina estuaries. The CPUE in 2017 (5.95 ± 1.3 fish per set) increased from 2016 by 100% (2.97 fish per set). The fourth survey is the South Carolina Estuarine and Coastal Assessment Program (SCECAP). The CPUE increased (8.62%) in 2017 from 2016, although

both years represent some of the lowest values in the time series (7.6 and 7.0 fish per hectare, respectively) and remained well below the series long term mean.

Georgia: Spot are occasionally observed during the red drum gillnet survey and the trammel net survey. Lengths of captured spot were recorded and then fish were released. During 2017, 150 trammel and 216 gill net sets captured 115 and 206 spot, respectively. Average fork length of spot in trammel nets was 206 mm and in the gillnet survey was 197 mm. The 2017 geometric mean (#/net set) from trammel nets (0.4) and the mean from gillnets (0.4) were less than those of 2016 (0.81 and 0.59, respectively).

The monthly Ecological Monitoring Survey (EMS) samples estuarine finfish from a total of 42 stations, distributed amongst 6 estuaries, from January to December. In 2017, a total of 321 tows were completed with an estimated 4,908 Spot captured. Lengths ranged from 58 to 215 millimeters FL with a mean of 144.1 millimeters FL.

Florida: The FWC-FWRI's FIM program initiated surveys on estuarine, bay and coastal systems of the Florida Atlantic at northern Indian River Lagoon in 1990, southern Indian River Lagoon in 1997, and northeast Florida (Jacksonville study area) in 2001. Indices of abundance (IOAs) data for juvenile (YOY) spot (<30 mm standard length, SL) were available from 21.3-m seine and 6.1-m trawl samples. IOAs for YOY and sub-adult/adult spot have been low and showed little variations; except in 2010 and 2011.

VI. Status of Management Measures and Issues

The FMP for Spot identified two management measures for implementation: 1) promote the development and use of bycatch reduction devices through demonstration and application in trawl fisheries, and 2) promote increases in yield per recruit through delaying entry to spot fisheries to age one and older.

Considerable progress has been made in developing bycatch reduction devices (BRDs) and evaluating their effectiveness. Proceedings from a 1993 spot and croaker workshop summarized much of the experimental work on bycatch reduction, and many states have conducted subsequent testing. For example, North Carolina Division of Marine Fisheries (NCDMF) conducted research on the four main gear types (shrimp trawl, flynet, long haul seine, and pound net) responsible for the bulk of the scrap fish landings in order to reduce the catch of small fish. State testing of shrimp trawl BRDs achieved finfish reductions of 50-70% with little loss of shrimp, although total bycatch numbers relative to shrimp fishery effort are still unknown. The Virginia Marine Resources Commission investigated the use of culling panels in pound nets and long haul seines to release small croaker, spot, and weakfish. The Potomac River Fisheries Commission (PRFC) also investigated the use of culling panels in pound nets, finding that the panels allowed the release of 28% of captured spot less than six inches in length.

Following favorable testing, devices have been made mandatory or recommended in several state fisheries. The use of BRDs is required in all penaeid shrimp trawl fisheries in the South Atlantic. The PRFC recommends the use of culling panels in pound nets and allows those nets

with panels to keep one bushel of bycatch of flounder and weakfish. In North Carolina, escapement panels have been required in the bunt nets of long haul seines in an area south and west of Bluff Shoals in the Pamlico Sound since April 1999. However, evaluation of the beneficial effects of BRDs to spot stocks continues to need further study.

General gear restrictions, such as minimum mesh sizes or area trawling bans, have helped protect some age classes of spot. Georgia has implemented a spot creel limit (25 fish, both recreational and commercial, except for shrimp trawlers). South Carolina has also implemented an aggregate bag limit (50 fish) for hook and line fishing of spot, Atlantic croaker, and kingfish/whiting (*Menticirrhus* sp.).

Omnibus Amendment (Interstate)

In August 2011, the Management Board approved the development of an amendment to the Spot FMP to address three issues: compliance measures, consistency with federal management in the exclusive economic zone, and alignment with Commission standards. The updated FMP's objectives are to: (1.) Increase the level of research and monitoring on spot bycatch in other fisheries, in order to complete a coastwide stock assessment (2.) Manage the Spot fishery stock to maintain the spawning stock biomass above the target biomass levels. (3.) Develop research priorities that will further refine the spot management program to maximize the biological, social, and economic benefits derived from the spot population. The Omnibus Amendment does not require specific fishery management measures in either the recreational or commercial fisheries for states within the management unit.

Addendum I

In August 2014, the Board approved Addendum I which establishes a new management framework (i.e., Traffic Light Approach) to evaluate fisheries trends and develop state-specified management actions (i.e., bag limits, size restrictions, time & area closures, and gear restrictions) when harvest and abundance thresholds are exceeded over two years. Management measures would remain in place for two years.

Recent Changes in State Regulations

North Carolina: There are no direct restrictions on the commercial harvest of spot within coastal, joint, or inland waters of North Carolina. There are however numerous indirect restrictions that affect the commercial harvest and bycatch of spot in North Carolina. Changes to such restrictions for 2017 include: Gill net restrictions for Internal Coastal Waters pertaining to area closures/openings, gear modifications and attendance rules to avoid interactions with endangered species, or bycatch species.

Georgia: Through 2017, Georgia had a general commercial fishing license. License applications had a voluntary survey asking purchasers to check off the species or species groupings they planned to pursue. The check-off was non-binding and the associated participation data was not useful for determining reporting requirements. In 2013, GADNR began issuing Letters of

Authorization (LOAs) for several target species to improve the participation data. In 2017, the Georgia General Assembly approved the addition of species endorsements to commercial fishing licenses to replace LOAs. (O.C.G.A. 27-4-110 and Regulation 391-2-4-.17) The Board of Natural Resources then approved the proposed endorsement species with an effective date of April 1, 2018.

A new seafood dealer license was also implemented April 1, 2018. Seafood dealers are defined as “any person or entity, other than the end-consumer, who purchases seafood products from a harvester unless the harvester is a licensed seafood dealer.” Georgia requires seafood dealers and commercial fishermen to be properly licensed as described by O.C.G.A Sections 27-4-118, 27-4-136, and Board of Natural Resources Rule 391-2-4-.09. Commercial harvesters fishing in Georgia waters and/or unloading seafood products must possess a commercial fishing license and the appropriate species endorsements. A harvester is required to have a dealer’s license if he is selling his catch to end consumers.

De minimis Guidelines

A state qualifies for *de minimis* status if its past 3-years’ average of the combined commercial and recreational catch is less than 1% of the past 3-years’ average of the coastwide combined commercial and recreational catch. Those states that qualify for *de minimis* are not required to implement any monitoring requirements, none of which are included in the plan.

VII. De Minimis Requests

New Jersey and Georgia request *de minimis* status. The PRT notes that both states meet the requirements of *de minimis*.

VIII. Implementation of FMP Compliance Requirements for 2017

All states within the management unit have submitted compliance reports for the 2017 fishing year. The PRT found no compliance issues.

IX. Recommendations of the Plan Review Team

Management and Regulatory Recommendation

The Spot PRT will continue to monitor the fishery through the Traffic Light Approach. The Spot PRT recommends that the Board consider incorporation of adjustments to the TLA, including additional indices, regions-specific metrics, age-partitioned indices, and alteration of the management-triggering mechanism, submitted in their collaborative memo with the Atlantic Croaker Technical Committee.

Research and Monitoring Recommendations

High Priority

- Expand collection of life history data for examination of lengths and age, especially fishery-dependent data sources.
- Organize an otolith exchange and develop an ageing protocol between ageing labs.
- Increase observer coverage for commercial discards, particularly the shrimp trawl fishery. Develop a standardized, representative sampling protocol and pursue collection of individual lengths and ages of discarded finfish.
- Continue state and multi-state fisheries-independent surveys throughout the species range and subsample for individual lengths and ages. Ensure NEFSC trawl survey continues to take lengths and ages. Examine potential factors affecting catchability in long-term fishery independent surveys.
- Continue to develop estimates of length-at-maturity and year-round reproductive dynamics throughout the species range. Assess whether temporal and/or density-dependent shifts in reproductive dynamics have occurred.
- Re-examine historical ichthyoplankton studies for an indication of the magnitude of estuarine and coastal spawning, as well as for potential inclusion as indices of spawning stock biomass in future assessments. Pursue specific estuarine data sets from the states (NJ, VA, NC, SC, DE, ME) and coastal data sets (MARMAP, EcoMon).

Medium Priority

- Develop and implement sampling programs for state-specific commercial scrap and bait fisheries in order to monitor the relative importance of Spot. Incorporate biological data collection into program.
- Conduct studies of discard mortality for commercial fisheries. Ask commercial fishermen about catch processing behavior for spot when trawl/gillnets brought over the rail to determine if the discard mortality rate used in the assessment is reasonable.
- Conduct studies of discard mortality for recreational fisheries.
- Collect data to develop gear-specific fishing effort estimates and investigate methods to develop historical estimates of effort.
- Identify stocks and determine coastal movements and the extent of stock mixing, via genetic and tagging studies.
- Investigate environmental and recruitment/ natural mortality covariates and develop a time series of potential covariates to be used in stock assessment models.
- Investigate environmental covariates in stock assessment models, including climate cycles (e.g., Atlantic Multi-decadal Oscillation, AMO, and El Nino Southern Oscillation, El Nino) and

recruitment and/or year class strength, spawning stock biomass, stock distribution, maturity schedules, and habitat degradation.

- Investigate the effects of environmental changes (especially climate change) on maturity schedules for spot, particularly because this is an early-maturing species, and because the sSPR estimates are sensitive to changes in the proportion mature.
- Investigate environmental and oceanic processes in order to develop better understanding of larval migration patterns into nursery grounds.
- Investigate the relationship between estuarine nursery areas and their proportional contribution to adult biomass. I.e., are select nursery areas along Atlantic coast contributing more to SSB than others, reflecting better juvenile habitat quality?
- Develop estimates of gear-specific selectivity.

X. References

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X. Figures

Figure 1. Traffic Light Approach for spot, 2017. Top figure shows the harvest composite index and the bottom figure shows the abundance composite index.

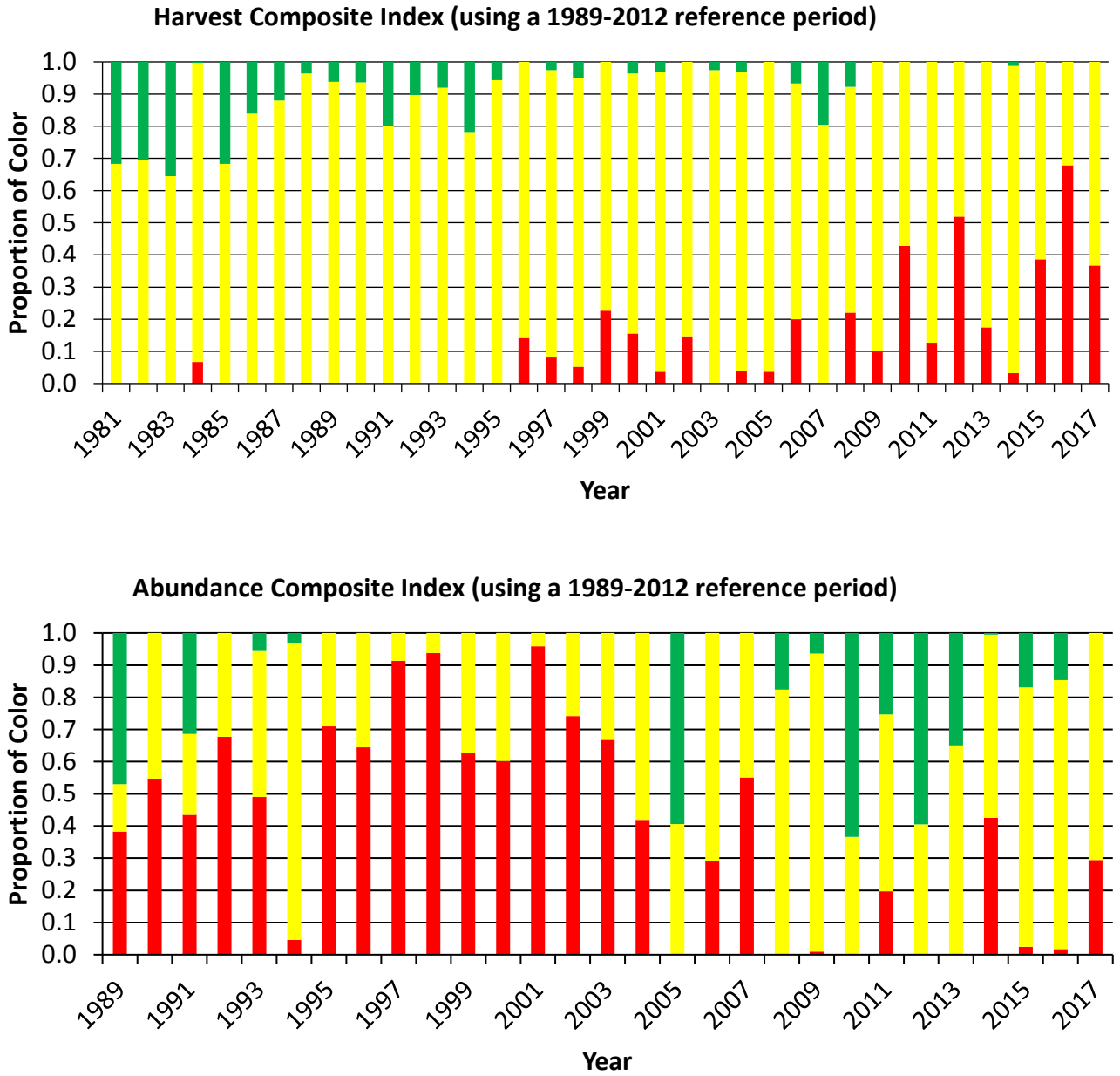


Figure 2. Recreational harvest in pounds, estimated using the Coastal Household Telephone Survey (CHTS) and the mail-based Fishing Effort Survey (FES). (Source: personal communication with NOAA Fisheries, Fisheries Statistics Division. [01/23/2019])

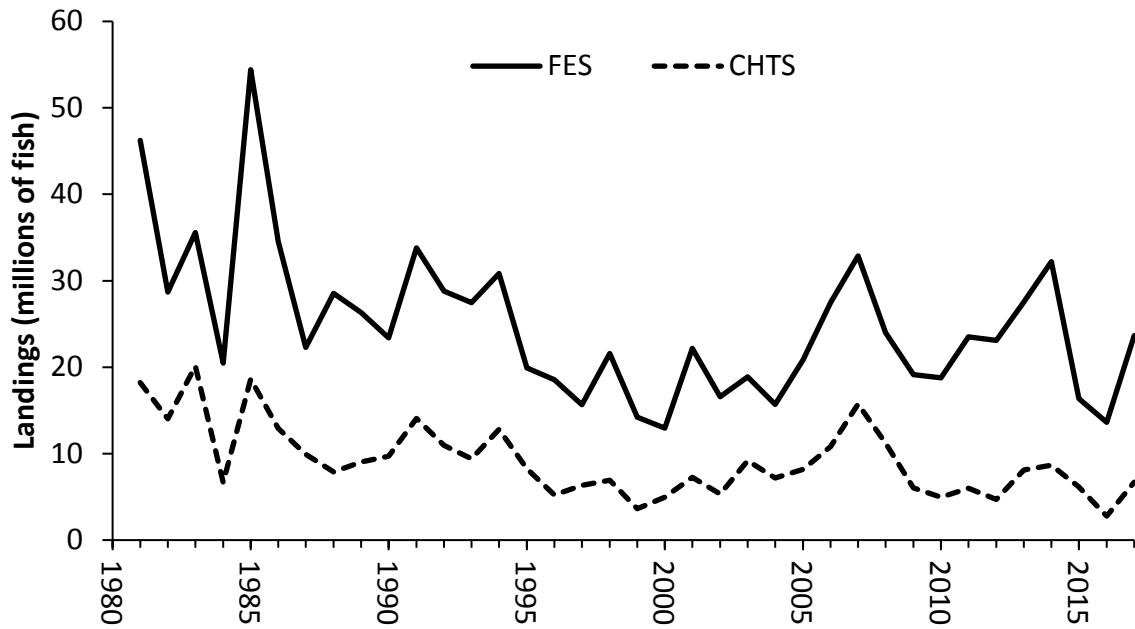


Figure 3. Spot commercial and recreational landings (pounds), 1950-2017. (Recreational landings available from 1981-present; see Tables 1 and 3 for state-by-state values and data sources)

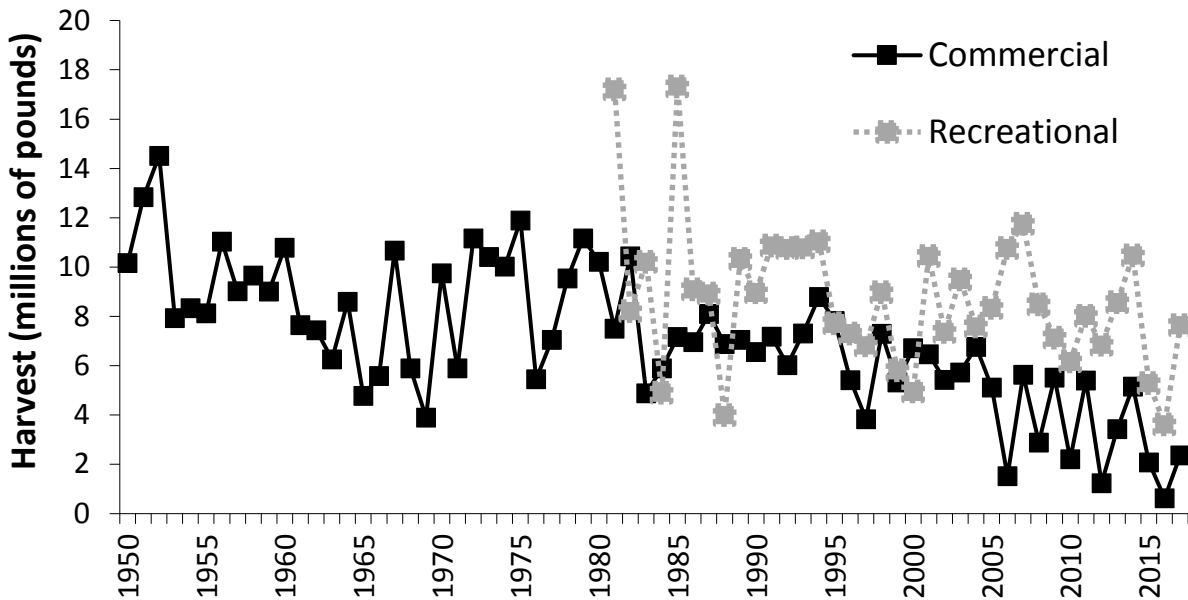
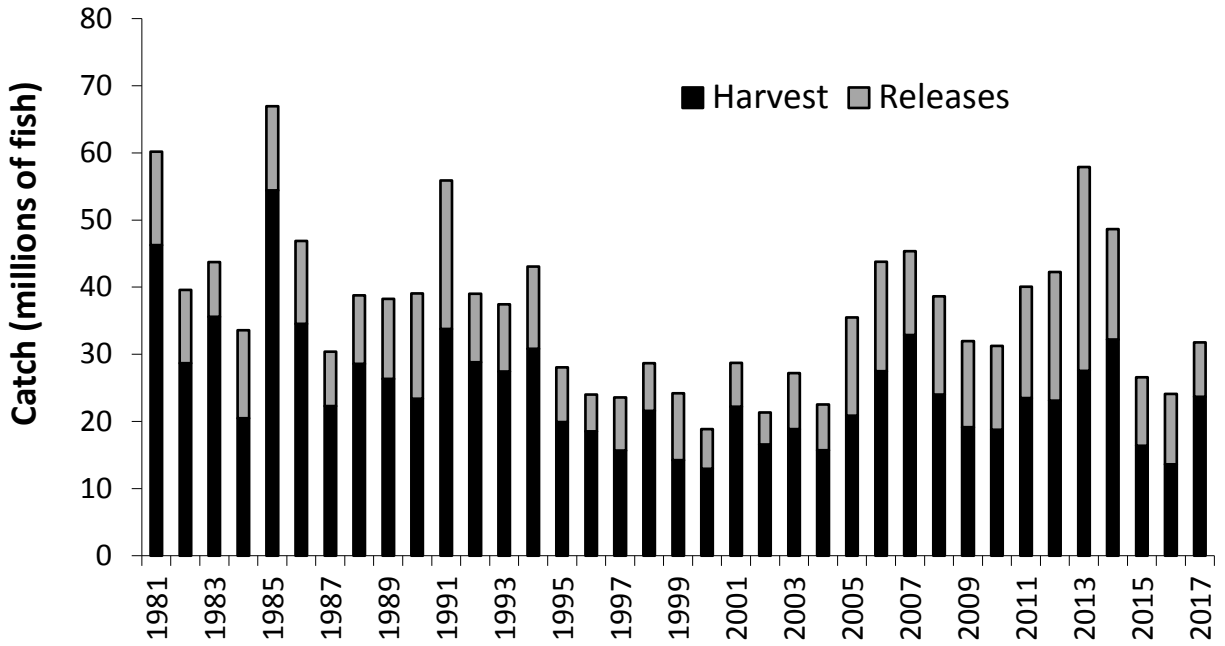


Figure 4. Spot recreational harvest and releases (numbers of fish), 1981-2017. (See Tables 4 and 5 for state-by-state values and data source)



XI. Tables

Table 1. Commercial landings (pounds) of spot by state 1998-2017. (Source: ACCSP for 2016 and earlier for all jurisdictions, except PRFC; annual compliance reports for 2017 and for all PRFC years. “C” values are confidential. Total values adhere to the ACCSP rule of 3, i.e. totals are reflective of the true total if 0 or at least 3 states’ data are confidential in a given year. Otherwise, they are sums of non-confidential data. Data dating back to 1950 are available upon request to ACCSP.)

Year	NY	NJ	DE	MD	PRFC	VA	NC	SC	GA	FL	Total
1998	C	27,582	140,363		117,580	4,170,072	2,396,979	C	C	161,205	7,293,814
1999		7,822	C		108,326	2,860,784	2,262,175	9,393	C	73,018	5,321,517
2000	939	13,852	C		120,642	3,677,628	2,829,843	8,519		57,957	6,709,380
2001	160	20,034	C		176,546	3,131,044	3,093,872	12,950	C	33,029	6,467,635
2002	5,737	1,326	C	132,346	140,776	2,927,729	2,184,032	22,628	C	21,258	5,435,832
2003	35	6,003	C	170,009	227,430	3,258,482	2,043,387	17,059		9,260	5,731,665
2004	C	1,652	58,502	27,131	131,605	4,223,075	2,317,169	2,649	C	C	6,762,028
2005	435	769	157,563	84,841	95,350	3,037,612	1,714,485	10,468		21,154	5,122,676
2006	3,099	C	62,934	27,908	40,777		1,364,743	5,691	C	22,501	1,527,653
2007	1,080	4,474	128,207	387,420	70,514	4,259,469	879,082	6,357		14,334	5,637,154
2008	650	1,942	32,650	121,201	29,835	1,949,319	736,484	1,492	C	9,177	2,882,748
2009	317	34,065	C	522,659	63,470	3,852,408	1,006,500	22,557		22,057	5,524,033
2010	447	6,048	C	587,028	44,025	984,892	572,315	3,957	C	13,420	2,212,132
2011	C	54,890	C	618,569	60,106	3,687,377	936,970	12,162		33,889	5,403,962
2012	90,141	9,935	C		14,563	600,351	489,676	541		36,744	1,241,950
2013	156,751	48,324	C	335,462	41,286	2,044,538	768,592	2,446		31,368	3,428,766
2014	2,112	29,683	C	348,435	148,908	3,843,869	765,824	5,917	C	16,742	5,161,490
2015	901	86	C	96,102	86,972	1,490,127	377,135	1,619		27,969	2,080,911
2016	1,895	131	C	18,105	8,480	276,824	238,003	1,059		82,875	627,373
2017	12,025	132	C	98,551	41,748	1,747,832	413,995	3,200		47,304	2,364,787

Table 2. Commercial landings (pounds) by gear, 2017. (Source: ACCSP, queried 1/23/2019)

Gear	Percent of Total
Gill Nets	76.9%
Haul Seines	11.6%
Fixed Nets	4.9%
Trawls	0.7%
Other	5.9%

Table 3. Recreational harvest (pounds) of spot by state, 1998-2017. (Source: MRIP for 2016 and earlier and annual compliance reports for 2017. Data dating back to 1981 are available upon request to the NMFS Fisheries Statistics Division via MRIP.)

Year	NY	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1998		0	61,241	1,038,494	2,230,087	4,596,119	717,907	10,399	331,113	8,985,360
1999			29,383	433,664	672,145	2,565,546	1,330,640	11,777	767,601	5,810,756
2000	422,177	185,292	57,676	855,429	453,246	2,598,813	263,349	2,011	118,129	4,956,122
2001		0	40,570	631,885	1,106,945	4,519,545	1,031,321	2,056	3,108,708	10,441,030
2002	0	0	14,249	580,663	3,078,818	3,017,466	598,474	7,034	76,717	7,373,421
2003		0	31,512	2,578,935	2,252,373	4,220,534	268,262	11,808	130,752	9,494,176
2004			23,836	645,783	2,276,505	3,682,623	947,770	525	14,051	7,591,093
2005		37,344	157,173	916,127	2,912,952	3,652,186	611,583	1,612	49,310	8,338,287
2006		97,424	83,553	1,880,202	3,607,819	3,995,432	1,077,811	2,945	20,406	10,765,592
2007	1,520	0	135,688	2,037,427	6,358,913	2,737,144	361,821	4,857	121,437	11,758,807
2008		76,291	88,933	1,282,864	3,554,676	1,382,428	1,967,213	6,924	121,834	8,481,163
2009		20,108	85,965	1,753,560	2,806,172	1,427,956	931,316	24,810	87,161	7,137,048
2010		748,219	249,186	1,053,775	1,964,995	1,173,173	654,184	1,011	333,254	6,177,797
2011		532	169,341	732,588	3,437,094	2,201,947	1,118,599	790	358,943	8,019,834
2012	121,071	544,509	80,962	755,265	3,091,344	760,276	1,332,541	305	165,523	6,851,796
2013	18,889	423,887	244,253	720,315	3,443,742	1,789,251	1,708,520	10,525	213,949	8,573,331
2014		27,847	352,714	1,465,861	4,322,812	2,877,483	415,937	15,371	992,221	10,470,246
2015	0	0	30,693	469,462	551,389	833,390	2,539,187	2,573	861,523	5,288,217
2016		678	9,606	278,994	1,211,694	558,799	1,437,534	20,727	102,356	3,620,388
2017	0	1,064	340	1,098,356	5,019,930	909,796	522,645	8,282	76,502	7,636,915

Table 4. Recreational harvest (numbers) of spot by state, 1998-2017. (Source: MRIP for 2016 and earlier and annual compliance reports for 2017. Data dating back to 1981 are available upon request to the NMFS Fisheries Statistics Division via MRIP.)

Year	NY	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1998		0	156,683	2,190,170	5,120,746	11,797,824	1,488,584	35,201	803,642	21,592,850
1999			47,211	1,096,359	1,592,928	5,736,185	3,006,232	33,442	2,717,275	14,229,632
2000	1,633,073	1,109,999	130,952	2,052,259	918,817	6,121,384	642,862	4,890	338,598	12,952,834
2001		0	98,110	1,118,350	2,206,841	10,043,845	2,419,178	4,490	6,292,578	22,183,392
2002	0	0	31,936	1,198,228	5,042,005	8,456,981	1,675,042	16,899	151,200	16,572,291
2003		0	60,290	4,366,894	3,514,148	9,717,824	798,661	26,092	392,575	18,876,484
2004			57,546	1,361,315	3,655,963	7,845,322	2,722,181	2,008	58,797	15,703,132
2005		111,944	355,750	2,580,015	5,896,357	10,105,205	1,663,021	5,506	142,688	20,860,486
2006		269,557	231,384	5,551,380	7,302,441	11,109,551	2,953,296	6,679	57,993	27,482,281
2007	6,894	0	325,832	5,844,870	16,436,803	8,728,295	1,222,271	16,189	283,313	32,864,467
2008		229,692	293,420	3,837,694	8,679,389	3,970,431	6,583,104	20,841	364,584	23,979,155
2009		49,494	251,487	4,588,207	6,906,344	4,197,640	2,826,219	76,258	244,347	19,139,996
2010		2,312,612	727,390	2,839,870	5,630,976	3,830,384	2,521,398	4,584	912,677	18,779,891
2011		1,206	486,289	2,125,025	10,128,581	6,480,714	3,174,678	1,792	1,096,887	23,495,172
2012	168,109	2,189,239	213,687	2,120,554	10,147,723	2,677,082	5,003,162	1,230	590,701	23,111,487
2013	51,903	1,177,944	581,699	2,456,346	11,733,669	6,120,985	4,704,723	41,546	660,760	27,529,575
2014		54,853	590,613	4,396,291	13,652,625	8,343,467	1,258,300	68,852	3,847,994	32,212,995
2015	0	0	90,796	1,352,278	1,731,063	2,572,738	7,538,334	8,489	3,081,786	16,375,484
2016		2,052	29,700	1,145,272	5,279,153	1,928,716	4,974,300	61,252	203,651	13,624,096
2017	0	2,412	1,057	3,287,230	15,944,527	2,418,331	1,897,506	19,789	100,975	23,671,827

Table 5. Recreational releases (numbers) of spot by state, 1998-2017. (Source: MRIP for 2016 and earlier and annual compliance reports for 2017. Data dating back to 1981 are available upon request to the NMFS Fisheries Statistics Division via MRIP.)

Year	NY	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1998		9,905	124,970	1,118,745	2,284,628	2,379,578	828,822	44,821	292,699	7,084,168
1999			42,925	1,029,318	797,043	2,343,795	266,536	57,178	5,433,838	9,970,633
2000	795,301	37,424	75,596	2,129,721	849,286	1,366,746	307,071	33,777	322,453	5,917,375
2001		2,214	29,615	621,743	1,969,205	2,804,349	692,825	31,050	385,697	6,536,698
2002	3,597	5,045	50,479	857,559	1,349,517	1,569,579	520,173	47,684	366,827	4,770,460
2003		181,033	21,340	979,680	2,433,771	2,970,990	529,793	96,655	1,128,260	8,341,522
2004			151,827	967,728	1,942,985	2,899,319	782,477	28,539	57,718	6,830,593
2005		8,039	508,063	4,280,279	4,717,643	4,407,100	369,368	64,607	287,628	14,642,727
2006		242,916	298,640	2,856,990	2,713,689	8,196,592	1,844,278	6,809	157,267	16,317,181
2007	620	246,548	102,551	3,140,908	4,196,638	4,049,250	496,592	41,191	197,640	12,471,938
2008		2,079,566	296,918	3,272,517	3,334,567	3,817,529	828,122	52,261	960,110	14,641,590
2009		55,363	484,590	1,901,445	4,014,169	4,847,202	1,108,458	29,470	367,919	12,808,616
2010		562,172	289,178	2,772,655	4,080,918	3,615,808	577,998	1,193	545,687	12,445,609
2011		1,206	190,002	783,417	7,290,971	4,993,544	1,289,038	23,411	1,989,115	16,560,704
2012	237028	1810472	184,949	3,291,874	6,371,367	2,995,879	673,292	10,110	3,571,066	19,146,037
2013	1,308	2,737,742	537,632	7,620,695	7,549,286	5,513,732	5,891,165	32,719	466,583	30,350,862
2014		34,941	237,395	2,206,814	4,125,116	4,043,710	1,908,552	74,795	3,781,382	16,412,705
2015	1,585	167,129	38,523	642,459	1,896,698	2,984,629	2,818,378	220,253	1,409,895	10,179,549
2016		2,705	16,620	713,418	2,858,405	1,831,415	3,421,589	335,695	1,296,190	10,476,037
2017	72	15,321	11,768	2,287,532	3,335,783	1,902,281	368,988	86,668	79,660	8,088,073