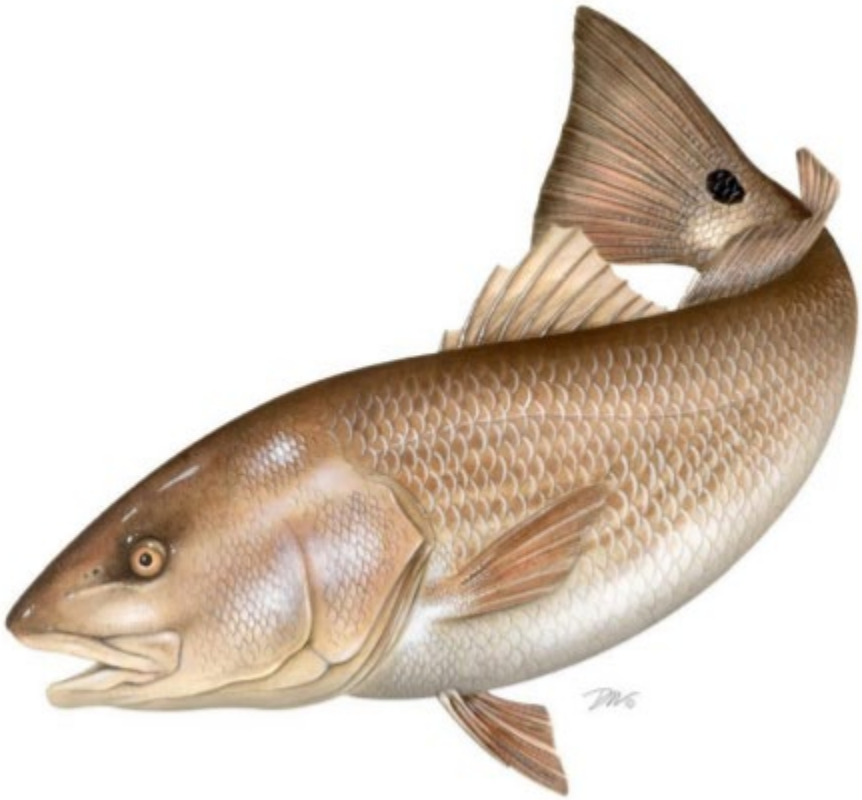
ATLANTIC STATES MARINE FISHERIES COMMISSION

REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR RED DRUM
(Sciaenops ocellatus)

2017 FISHING YEAR



Prepared by the Plan Review Team

Approved by the South Atlantic Management Board
August 2018

Table of Contents

I. Status of the Fishery Management Plan

Date of FMP Approval:	Original FMP – October 1984
Amendments:	Amendment 1 – October 1991 Amendment 2 – June 2002 Addendum 1 – August 2013
Management Areas:	The Atlantic coast distribution of the resource from New Jersey through Florida Northern: New Jersey through North Carolina Southern: South Carolina through the east coast of Florida
Active Boards/Committees:	South Atlantic State/Federal Fisheries Management Board, Red Drum Technical Committee, Stock Assessment Subcommittee, Plan Development Team, Plan Review Team, South Atlantic Species Advisory Panel

The Atlantic States Marine Fisheries Commission (ASMFC) adopted an Interstate Fishery Management Plan (FMP) for Red Drum in 1984. The original management unit included the states from Maryland to Florida. In 1988, the Interstate Fisheries Management Program (ISFMP) Policy Board requested that all Atlantic coastal states from Maine to Florida implement the plan's recommended management regulations to prevent development of northern markets for southern fish. The states of New Jersey through Florida are now required to follow the FMP, while Maine through New York (including Pennsylvania) are encouraged to implement consistent provisions to protect the red drum spawning stock.

In 1990, the South Atlantic Fishery Management Council (Council) adopted a FMP for red drum that defined overfishing and optimum yield (OY) consistent with the Magnuson Fishery Conservation and Management Act of 1976. Adoption of this plan prohibited the harvest of red drum in the exclusive economic zone (EEZ), a moratorium that remains in effect today. Recognizing that all harvest would take place in state waters, the Council FMP recommended that states implement measures necessary to achieve the target level of at least 30% escapement.

Consequently, ASMFC initiated Amendment 1 in 1991, which included the goal to attain optimum yield from the fishery over time. Optimum yield was defined as the amount of harvest that could be taken while maintaining the level of spawning stock biomass per recruit (SSBR) at or above 30% of the level which would result if fishing mortality was zero. However, a lack of information on adult stock status resulted in the use of a 30% escapement rate of sub-adult red drum to the off-shore adult spawning stock.

Substantial reductions in fishing mortality were necessary to achieve the escapement rate; however, the lack of data on the status of adult red drum along the Atlantic coast led to the adoption of a phase-in approach with a 10% SSBR goal. In 1991, states implemented or maintained harvest controls necessary to attain the goal.

As hoped, these management measures led to increased escapement rates of juvenile red drum. Escapement estimates for the northern region of New Jersey through North Carolina (18%) and the southern region of South Carolina through Florida (17%) were estimated to be above the 10% phase-in goal, yet still below the ultimate goal of 30% (Vaughan and Carmichael 2000). North Carolina, South Carolina, and Georgia implemented substantive changes to their regulations from 1998-2001 that further restricted harvest.

The Council adopted new definitions of OY and overfishing for red drum in 1998. Optimum yield was redefined as the harvest associated with a 40% static spawning potential ratio (sSPR), overfishing as an sSPR less than 30%, and an overfishing threshold as 10% sSPR. In 1999, the Council recommended that management authority for red drum be transferred to the states through the Commission's Interstate Fishery Management Program (ISFMP) process. This was recommended, in part, due to the inability to accurately determine an overfished status, and therefore stock rebuilding targets and schedules, as required under the revised Sustainable Fisheries Act of 1996. The transfer necessitated the development of an amendment to the interstate FMP in order to include the provisions of the Atlantic Coastal Fisheries Cooperative Management Act.

ASFMC adopted Amendment 2 to the Red Drum FMP in June 2002 (ASMFC 2002), which serves as the current management plan. The goal of Amendment 2 is to achieve and maintain the OY for the Atlantic coast red drum fishery as the amount of harvest that can be taken by U.S. fishermen while maintaining the sSPR at or above 40%. There are four plan objectives:

- Achieve and maintain an escapement rate sufficient to prevent recruitment failure and achieve an sSPR at or above 40%.
- Provide a flexible management system to address incompatibility and inconsistency among state and federal regulations which minimizes regulatory delay while retaining substantial ASMFC, Council, and public input into management decisions; and which can adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by area.
- Promote cooperative collection of biological, economic, and sociological data required to effectively monitor and assess the status of the red drum resource and evaluate management efforts.
- Restore the age and size structure of the Atlantic coast red drum population.

The management area extends from New Jersey through the east coast of Florida, and is separated into a northern and southern region at the North Carolina/South Carolina border. The sSPR of 40% is considered a target; an sSPR below 30% (threshold level) results in an overfishing determination for red drum. Amendment 2 required all states within the management unit to implement appropriate recreational bag and size limit combinations needed to attain the target sSPR, and to maintain current, or implement more restrictive, commercial fishery regulations. All states were in compliance by January 1, 2003. See Table 1 for state commercial and recreational regulations in 2017.

Following the approval of Amendment 2 in 2002, the process to transfer management authority to ASMFC began, including an Environmental Assessment and public comment period. The final rule became effective November 5, 2008. It repeals the federal Atlantic Coast Red Drum Fishery Management Plan and transfers management authority of Atlantic red drum in the exclusive economic zone from the South Atlantic Fishery Management Council to the Atlantic States Marine Fisheries Commission.

The Board approved Addendum I to Amendment 2 in August 2013. The Addendum revised the habitat section of Amendment 2 to include current information on red drum spawning habitat and life-stages (egg, larval, juvenile, sub-adult, and adult). It also identified and described the distribution of key habitats and habitats of concern.

II. Status of the Stocks

The 2017 Red Drum Stock Assessment and Peer Review Report indicate overfishing is not occurring for either the northern or southern stock of red drum (ASMFC 2017). The assessment was unable to determine an overfished/not overfished status because population abundance could not be reliably estimated due to limited data for the older fish (ages 4+).

Northern Region (NJ-NC)

Recruitment (age 1 abundance) has varied annually with a large peak occurring in 2012 (Figure 1). The trend in the three-year average sSPR indicates low sSPR early in the time series with increases during 1991 – 1997 and fluctuations thereafter (Figure 2). The average sSPR has been above the overfishing threshold ($F_{30\%}$) since 1994, and at or above the target ($F_{40\%}$) since 1996, except during one year (2002). Fishing pressure and mortality appear to be stabilized near the target fishing mortality. The average sSPR is also likely above the target benchmark.

Southern Region (SC-FL)

Recruitment (age 1 abundance) has fluctuated without apparent trend since 1991 (Figure 1). A high level of uncertainty exists around the three-year average sSPR estimates for the southern region. While the 3-year average sSPR estimate in 2013 was above both the target ($F_{40\%}$) and the overfishing threshold ($F_{30\%}$), indicating that overfishing is not occurring, the high level of uncertainty around this estimate indicates that this conclusion should be considered with extreme caution (Figure 2).

III. Status of the Fishery

In July, 2018, the Marine Recreational Information Program (MRIP) updated recreational catch estimates based on the mail-based Fishing Effort Survey (FES). Previous estimates were made based on the Coastal Household Telephone Survey (CHTS). As current management is based on the most recent stock assessment (2017), which used CHTS-based estimates, these estimates will continue to be used until another stock assessment is conducted. Figure 7 shows coastwide recreational landings including estimates using both the previous CHTS and FES calibrations for comparison, but other figures, tables, and text will only show data based on the CHTS calibration. Data based on either survey can be referenced at: https://www.st.nmfs.noaa.gov/st1/recreational/queries/.

Total red drum landings from New Jersey through the east coast of Florida in 2017 are estimated at 2.15 million pounds (Tables 2 and 3, Figure 3). This is roughly 100,000 pounds less than was landed in 2016. 2017 total landings are above the previous ten-year (2008-2017) average of 2.01 million pounds. The commercial and recreational fisheries harvested 9% and 91% of the total, respectively. The southern region includes South Carolina through Florida's east coast, while the northern region includes New Jersey through North Carolina. In 2017, 56% of the total landings came from the southern region where the fishery is exclusively recreational, and 44% from the northern region (Figure 4).

Coastwide commercial landings increased significantly this year, but show no long-term temporal trends. In the last 50 years, landings have ranged from approximately 54,000 pounds (in 1997) to 440,000 pounds (in 1980, Figure 3). In 2017, red drum were commercially landed only in Maryland, Virginia, and North Carolina (Table 2). Coastwide commercial harvest increased from 78,785 pounds in 2016 to 194,449 pounds in 2017, with 96% harvested by North Carolina. Historically, North Carolina and Florida shared the majority of commercial harvest, but commercial harvest has been prohibited in Florida under state regulation since January 1988. South Carolina also banned commercial harvest and sale of native caught red drum beginning in 1987, and in 2013 Georgia designated Red Drum Gamefish status, eliminating commercial harvest and sale.

In North Carolina, a daily commercial trip limit and an annual cap of 250,000 pounds with payback of any overage constrain the commercial harvest. Unique to this state, the red drum fishing year extends from September 1 to August 31. In 2008, the Board approved use of this 2008 fishing year to monitor the cap. During the 2009/2010 and the 2013/2014 fishing years, North Carolina had overages of 25,858 pounds and 12,753 pounds, respectively. The commercial harvest for each following fishing year remained well below the adjusted cap allowance, providing sufficient payback.

Recreational harvest of red drum peaked in 1984 at 1.05 million fish (or 2.6 million pounds; Tables 3 and 4). Since 1988, the number has fluctuated without trend between 250,000 and 760,000 fish (800,000 to 2.7 million pounds; Figures 3 and 5). Recreational harvest decreased from 591,333 fish (2.2 million pounds) in 2016 to 541,670 fish (2.0 million pounds) in 2017. The 2017 harvest is greater than the 10-year average (2008-2017) for recreational harvest in numbers (538,441) and pounds (1.8 million). Florida anglers landed the largest share of the coastwide recreational harvest in numbers (40%), followed by North Carolina (21%), Virginia (18%), and South Carolina (14%).

Anglers release far more red drum than they keep; the percent of the catch released has been over 80% during the last decade (Figure 5). Recreational releases show an increasing trend over the time series that has plateaued from around the early 2000s to the present. The proportion of releases in 2017 was 85% (versus 81% in 2016), and the overall number of fish released was 3.0 million in 2017 (Figure 5, Table 5). It is estimated that 8% of released fish die as a result of

being caught, resulting in an estimated 241,665 dead discarded fish in 2017 (Table 5). Recreational removals from the fishery are thus estimated to be 783,335 fish in 2017 (Figure 6).

IV. Status of Assessment Advice

Current stock status information comes from the 2017 stock assessment (ASMFC 2017) completed by the ASMFC Red Drum Stock Assessment Subcommittee (SAS) and Technical Committee (TC), peer reviewed by an independent panel of experts through ASMFC's desk review process, and approved by the South Atlantic State-Federal Fisheries Management Board for use in management decisions. Previous interstate management decisions were based on the last coastwide assessment, SEDAR 18 (SAFMC 2009), and prior to 2009, decisions were based on regional assessments conducted by Vaughan and Helser (1990), Vaughan (1992, 1993, 1996), and Vaughan and Carmichael (2000) that reflected the current stock structure, two stocks divided at the North Carolina-South Carolina border. Several states have also conducted state-specific assessments (e.g., Murphy and Munyandorero 2009; Takade and Paramore 2007 [update of Vaughan and Carmichael 2000]).

The 2017 stock assessment uses a statistical catch at age (SCA) model with age-specific data for red drum ages 1 through 7+. This model is similar to that used in the 2009 assessment, with data updated through 2013. Data from 1989-2013 were included from the following sources: commercial and recreational harvest and discard data, fishery-dependent and -independent biological sampling data, tagging data, and fishery-independent survey abundance data.

The Peer Review Panel considered the use of an SCA model appropriate given the types of data available for red drum. For the northern region, the Review Panel agreed that the model was informative of age 1-3 abundance and exploitation rates, but not for older age groups. The model was also found to be informative of annual trends in sSPR and the 2011-2013 average sSPR. For the southern region, the Review Panel agreed that estimates of age 7+ fish seemed to be more consistent with the population biology, leading to a large fraction of biomass being unavailable to exploitation. For both regions, most of the sSPR is contained within the larger, fully mature, age 7+ fish, thus even a small increase in fishing mortality on older red drum (due to harvest or other factors) could quickly lead to a decrease in sSPR and overfishing.

V. Status of Research and Monitoring

No monitoring or research programs are annually required of the states except for the submission of a compliance report. The following fishery-dependent (other than catch and effort data) and fishery-independent monitoring programs were reported in the 2017 reports.

<u>Fishery Dependent Monitoring</u>

- Delaware DFW – Commercial monitoring through mandatory logbook reports.
- Maryland DNR – Commercial pound nets sampled bi-weekly in the Chesapeake Bay from late spring through summer (2017 n=19). Only three of the 24 years of sampling exceeded 20 fish, and no red drum were encountered in ten of the survey years. Seafood dealer sampling was conducted (2017 n=2). Licensed charter boat captain logbooks are monitored for red drum captures (2017: 48 caught, 17 harvested).

- PRFC – Red drum are harvested incidentally in the commercial pound net and haul seine fisheries. The mandatory commercial harvest daily reporting system, which collects harvest and discards/releases, reported zero red drum released in 2017.
- Virginia MRC – Volunteer anglers have participated since 1995 in the Virginia Game Fish Tagging Program (2017: 1,436 fish tagged, 125 reported recaptures). Carcasses collected through the Marine Sportfish Collection Project since 2007 (2017 n=37).
- North Carolina DMF – Commercial cap monitored through trip ticket program; commercially-landed red drum sampled through biological monitoring program since 1982 (2017: 673 fish measured, primarily gill net).
- South Carolina DNR – State finfish survey conducted in January and February (2017 n=198 caught and 49 harvested, mean catch rate: 1.92 red drum/targeted angler hour). Charter Vessel Trip Reporting (2017 caught: 55,712; release rate: 93.5%). SC Marine Game Fish Tagging Program studies movement patterns, growth rates, and release-mortality rates (in 2017 fish tagged: 4,564; recaptured: 660). SCDNR Sub-Adult Red Drum Tagging Program tags fish caught by the SCDNR electrofishing and trammel net fishery-independent surveys and other fishery-independent sampling efforts (in 2017 fish tagged: 1,191; recaptured: 348). SCDNR Adult Red Drum Tagging Program tags fish caught by the SCDNR inshore fisheries research section longline fishery-independent survey (in 2017 tagged: 409; recaptured: 22). Tournament and freezer fish programs (2017 n=26).
- Georgia CRD – Age, length, and sex data collected through the Marine Sportfish Carcass Recovery Project (2017 n=644 red drum).
- Florida FWC – 7,817 trip interviews in 2017 collected data on total-catch rates and sizes (through MRIP).
- NMFS – Length measurements and recreational catch, harvest, release, and effort data are collected via the Marine Recreational Information Program.

<u>Fishery Independent Monitoring</u>

- New Jersey DFW – Five annual nearshore trawl surveys conducted since 1988, in January/February, April, June, August, and October. Length and weight data, and catch per unit effort (CPUE) in number of fish per tow and biomass per tow recorded for all species. Only two red drum were caught in entire time series (single tow, 2013).
- North Carolina DMF – Seine survey since 1991 produces age-0 abundance index (2016 n=326; CPUE of 2.72, decrease from 2016 CPUE of 5.93). Gill net survey in Pamlico Sound since 2001 characterizes size and age distribution, produces abundance index, improves bycatch estimates, and studies habitat usage (2017 CPUE of 4.12, above long-term average). Longline survey since 2007 produces adult index of abundance and tags fish (2017 n=337; CPUE slightly below long-term average at 4.68 fish per set).
- South Carolina DNR – Estuarine trammel net survey for subadults (2017 CPUE below 10-year average). Electrofishing survey in low salinity estuarine areas for juveniles/subadults (2017 CPUE above 10-year average). Inshore bottom longline survey for biological data and adult abundance index (409 tagged, 84 sampled for age in 2017). Genetic sub-sampling and tagging conducted during these three surveys.
- Georgia CRD – Estuarine trammel net survey for subadult biological data and abundance index (2017, both areas n=146). Estuarine gill net survey for young-of-year (YOY)

biological data and abundance index (2017 both areas n=600). Bottom longline survey for adult biological data and abundance index (2017 n=119 in GA, 9 in NE FL).

- Florida FWC-FWRI – Two seine surveys in northern Indian River Lagoon (IRL) and lower St. Johns River (SJR) for YOY (< 40 mm SL) abundance indices (2017 CPUE higher than 2016). Haul seine survey in these areas and southern IRL for subadult index (2017 CPUE lower than 2016). Age and length data collected during surveys.

VI. Status of Management Measures and Issues

Fishery Management Plan

Amendment 2 was fully implemented by January 1, 2003, providing the management requirements for 2010. Requirements include: recreational regulations designed to achieve at least 40% sSPR, a maximum size limit of 27 inches or less, and current or more stringent commercial regulations. States are also required to have in place law enforcement capabilities adequate to successfully implement their red drum regulations. In August 2013, the Board approved Addendum I to Amendment 2 of the Red Drum FMP. The Addendum revises the habitat section of Amendment 2 to include the most current information on red drum spawning habitat for each life stage (egg, larval, juvenile, sub-adult, and adult). It also identifies the distribution of key habitats and habitats of concern, including potential threats and bottlenecks.

De Minimis Requests

New Jersey and Delaware requested *de minimis* status through the annual reporting process. While Amendment 2 does not include a specific method to determine whether a state qualifies for *de minimis*, the PRT chose to evaluate an individual state's contribution to the fishery by comparing the two-year average of total landings of the state to that of the management unit. New Jersey and Delaware each harvested zero percent of the two-year average total landings. *De minimis* status does not exempt either state from any requirement; it may exempt them from future management measures implemented through addenda to Amendment 2, as determined by the Board.

VII. Implementation of FMP Compliance Requirements for 2017

The PRT finds that all states have implemented the requirements of Amendment 2.

VIII. Recommendations of the Plan Review Team

<u>Management and Regulatory Recommendations</u>

< Consider approval of the *de minimis* requests by New Jersey and Delaware.

< Support a continued moratorium of red drum fishing in the exclusive economic zone.

< Populate the SAS to address assessment recommendations from the Peer Reviewers of the last assessment and the Red Drum TC.

<u>Prioritized Research and Monitoring Recommendations</u> (H) = High, (M) = Medium, (L) = Low

Stock Assessment and Population Dynamics

- Implement surveys (e.g. logbooks, electronic methods, etc.) in each state throughout the management unit to determine the length composition (and age data, if possible) of recreational discards (B2) of red drum. This information has been highlighted as the single largest data gap in previous assessments. (H)
- Further study is needed to determine discard mortality estimates for the Atlantic coast, both for recreational and commercial gears. Additionally, discard estimates should examine the impact of slot-size limit management and explore regulatory discard impacts due to high-grading. Investigate covariates affecting discard mortality (e.g., depth, size, seasonality), and explore methods of determining *in situ* mortality (as opposed to tank studies) and mitigating mortality (e.g. gear types, handling methods, use of descending devices on adults). (H)
- Improve catch/effort estimates and biological sampling from recreational and commercial fisheries for red drum, including increased intercepts of night fisheries for red drum. (H)
- Expand biological sampling based on a statistical analysis to adequately characterize the age/size composition of removals by all statistical strata (gears, states, etc.). (H)
- Each state should develop an on-going red drum tagging program that can be used to estimate both fishing and natural mortality and movements. This should include concurrent evaluations of tag retention, tagging mortality, and angler tag reporting rates. The importance of each state's tagging data to the assessment should be evaluated, including analysis of historical tagging data to determine if existing and historic recreational data sources (e.g., tagging) can be used to evaluate better B2 selectivities. (H)
- Establish programs to provide ongoing estimates of commercial and recreational discard mortality using appropriate statistical methods. Discard estimates should examine the impact of slot-size limit management and explore regulatory discard impacts due to high-grading. (M)
- Evaluate the broader survey needs to identify gaps in current activities and provide for potential expansion and/or standardization between/among current surveys. (M)
- Review all available stock structure data (genetics, tagging, etc.) to determine stock structure and most appropriate management boundaries. (M)

Biological

- Explore methods to effectively sample the adult population in estuarine, nearshore, and open ocean waters, such as in the ongoing red drum long line survey, and to determine the size, age and sex composition of the adults. (H)
- Continue genetic analyses (i.e., SC DNR analyses) to evaluate stock structure and mixing and temporal changes in genetic composition of the red drum population and other applications. (H)
- Refine maturity schedules on a geographic basis. Thoroughly examine the influence of size and age on reproductive function. Investigate the possibility of senescence in female red drum. Archive histological specimens across sizes to look for shifts in maturity schedules and make regional comparisons. Standardize histology reading methods of slides across states conducting such studies. (For reference, see SEDAR 44-DW02). (H)

- Determine habitat preferences, environmental conditions, growth rates, and food habits of larval and juvenile red drum throughout the species range along the Atlantic coast. Assess the effects of environmental factors on stock density/year class strength. Determine whether natural environmental perturbations affect recruitment and modify relationships with spawning stock size. (H)
- Continue tagging studies to determine stock identity, inshore/offshore migration patterns of all life stages (i.e. basic life history research). Specific effort should be given to developing a large-scale program for tagging adult red drum. (M)
- Fully evaluate the effects and effectiveness of using cultured red drum to facilitate higher catch rates along the Atlantic coast. (M)
- Conduct a tagging study using emerging technologies (i.e., acoustic tagging, satellite tagging, genetic tags) to evaluate stock mixing and identify movement of sub-adult fish transitioning to maturity. (M-L)
- Otolith microchemistry analysis should be considered for exploring links between sub-adult estuarine habitats and adult stock structure. (L)

Social (Unless otherwise indicated, the collection of sociological and/or economic data, also sometimes collectively described as "socioeconomic data," would be based on Atlantic Coastal Cooperative Statistics Program [ACCSP] standards.)

- Encourage the NMFS to fund socioeconomic add-on questions to the recreational fisheries survey that are specifically oriented to red drum recreational fishing. (H)
- States with significant fisheries (over 5,000 pounds) should periodically (e.g. every five years) collect socioeconomic data on red drum fisheries through add-ons to the recreational fisheries survey or by other means. (H)
- Using a human dimension analysis perspective, explore Atlantic red drum historical catch-release trends and explanatory factors such as the possible impacts of changes in recreational fishing technology and/or angler behavior on red drum catchability and selectivity over time. (H)
- Conduct applied research to evaluate the various projected (forecasted) social impacts on red drum fishery stakeholders of possible regulatory options (e.g. changing minimum sizes, etc.). (M)

Economic

- Using available secondary data and other information, develop models to estimate the local (community), state and regional level economic impacts (e.g. sales, jobs, income, etc.) of recreational red drum fisheries-related activities including the for-hire sector component (e.g. fishing guides). (H)
- Where appropriate, encourage individual member states to conduct studies to project and evaluate the estimated comparable net economic values associated with current and possible future regulatory regimes that could impact red drum recreational anglers, including those preferring catch and release fishing. (M)
- Using risk adjusted benefit-cost analysis protocols, project the estimated public sector-oriented net economic values over a time for various cultured red drum stocking scenarios compared to possible changes in other fishery management alternatives. (M)

< Encourage NOAA Fisheries to periodically conduct special surveys and related data analysis to determine the economic and operational characteristics of the recreational fishing for-hire component targeting red drum, especially fishing guide-oriented businesses in the South Atlantic states. (M)

Habitat

< Identify spawning areas of red drum in each state from North Carolina to Florida so these areas may be protected from degradation and/or destruction. Explore relationships between spawning activity (e.g. spawning sounds) and environmental parameters (e.g. temperature). (H)
< Identify changes in freshwater inflow on red drum nursery habitats. Quantify the relationship between freshwater inflows and red drum nursery/sub-adult habitats. (H)
< Determine the impacts of dredging and beach re-nourishment on red drum spawning and early life history stages. (M)
< Investigate the concept of estuarine reserves to increase the escapement rate of red drum along the Atlantic coast. (M)
< Identify impacts of water quality, environmental, and ecosystem changes on red drum stock dynamics for potential incorporation into stock assessment models. (M)
< Quantify relationships between red drum production and habitat and implications for future management planning. (L)
< Determine methods for restoring red drum habitat and/or improving existing environmental conditions that adversely affect red drum production. (L)

IX. References

Atlantic States Marine Fisheries Commission (ASMFC). 2002. Amendment 2 to the Interstate Fishery Management Plan for Red Drum. ASMFC, Washington, DC, Fishery Management Report No. 38, 141 p.

ASMFC. 2017. Red Drum Stock Assessment and Peer Review Report. Atlantic States Marine Fisheries Commission, Stock Assessment Report, 126 p.

Murphy, MD and J. Munyandorero. 2009. An assessment of the status of red drum in Florida through 2007. Florida Fish and Wildlife Commission Fish and Wildlife Research Institute, St. Petersburg, In-House Report 2008-008, 106 p.

South Atlantic Fishery management Council (SAFMC). 2009. Southeast Data, Assessment and Review 18, Stock Assessment Report, Atlantic Red Drum. North Charleston, SC. 544 p.

Takade, H and L Paramore. 2007. Stock Status of the Northern Red Drum Stock. North Carolina Division of Marine Fisheries. In-House Report, 60 p.

Vaughan, DS. 1992. Status of the red drum stock of the Atlantic coast: Stock assessment report for 1991. NOAA Tech. Mem. NMFS-SEFC-297. 58 p.

Vaughan, DS. 1993. Status of the red drum stock of the Atlantic coast: Stock assessment report for 1992. NOAA Tech. Mem. NMFS-SEFC-313. 60 p.

Vaughan, DS. 1996. Status of the red drum stock of the Atlantic coast: Stock assessment report for 1995. NOAA Tech. Mem. NMFS-SEFC-380. 50 p.

Vaughan, DS and JT Carmichael. 2000. Assessment of Atlantic red drum for 1999: northern and southern regions. NOAA Tech. Mem. NMFS-SEFSC-447, 54 p. + app. U.S. DOC, NOAA, Center for Coastal Fisheries and Habitat Research, Beaufort, NC.

Vaughan, DS and JT Carmichael. 2001. Bag and size limit analyses for red drum in northern and southern regions of the U.S. South Atlantic. NOAA Tech. Mem. NMFS-SEFSC-454, 37 p. U.S. DOC, NOAA, Center for Coastal Fisheries and Habitat Research, Beaufort, NC.

Vaughan, DS and TE Helser. 1990. Status of the red drum stock of the Atlantic coast: Stock assessment report for 1989. NOAA Tech. Mem. NMFS-SEFC-263. 117 p.

X. Figures

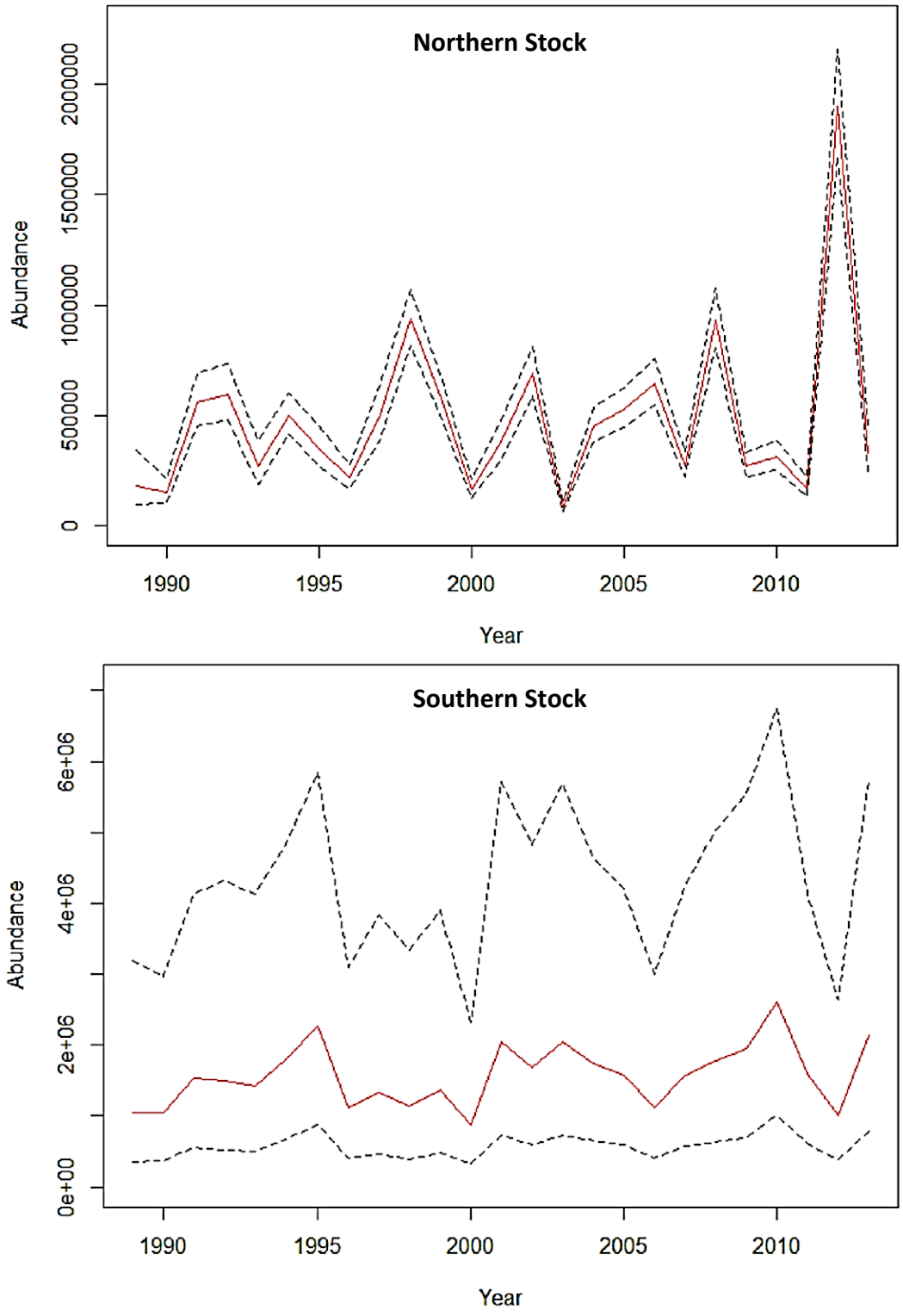


Figure 1. Predicted recruitment (age-1 abundance, red lines) with 95% confidence intervals (dashed black lines) for the northern (top) and southern (bottom) regions (Source: ASMFC 2017).

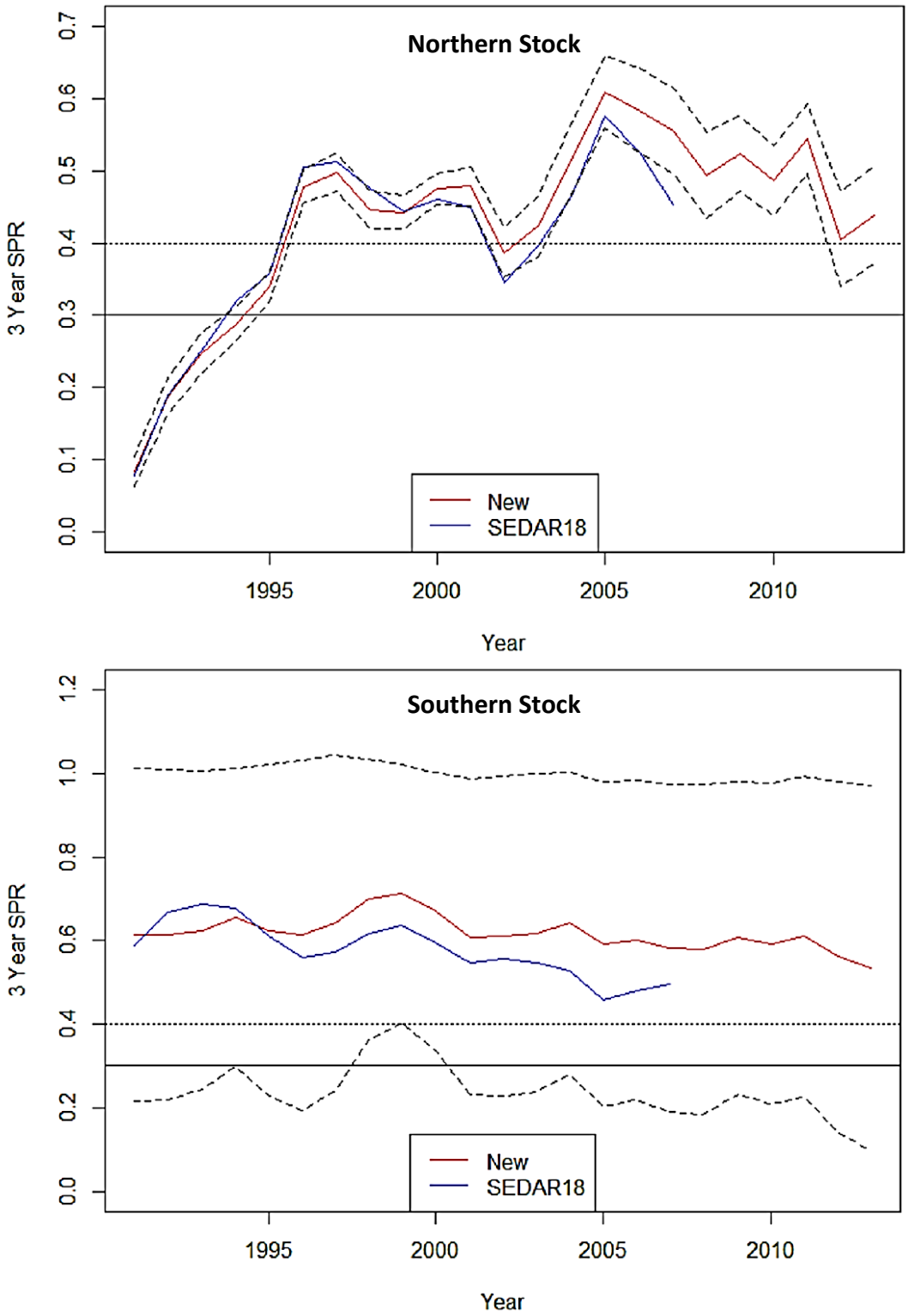


Figure 2. Three year average sSPR (red lines) for the northern (top) and southern (bottom) stocks with 95% confidence intervals (dashed black lines). Point estimates from the previous benchmark assessment (SEDAR18) are included for comparison. The target sSPR (dotted black line) is 40% and the threshold sSPR (solid black line) is 30% (Source: ASMFC 2017)**.**

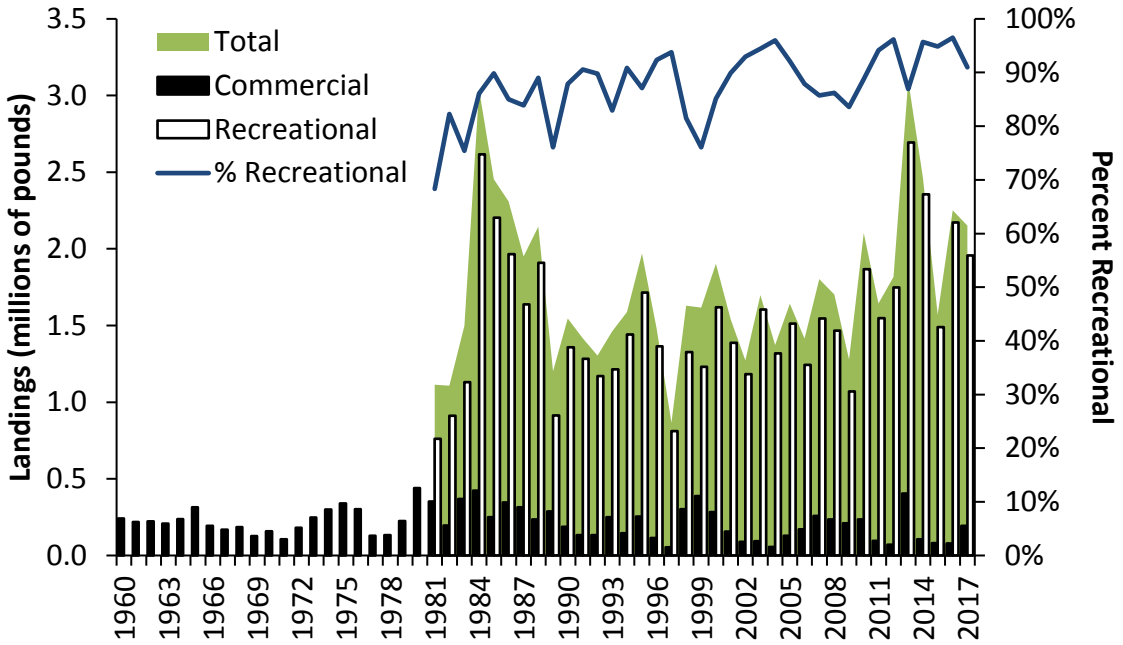


Figure 3. Commercial and recreational landings (pounds) of red drum. Recreational data not available prior to 1981. See Tables 2 and 3 for values and data sources.

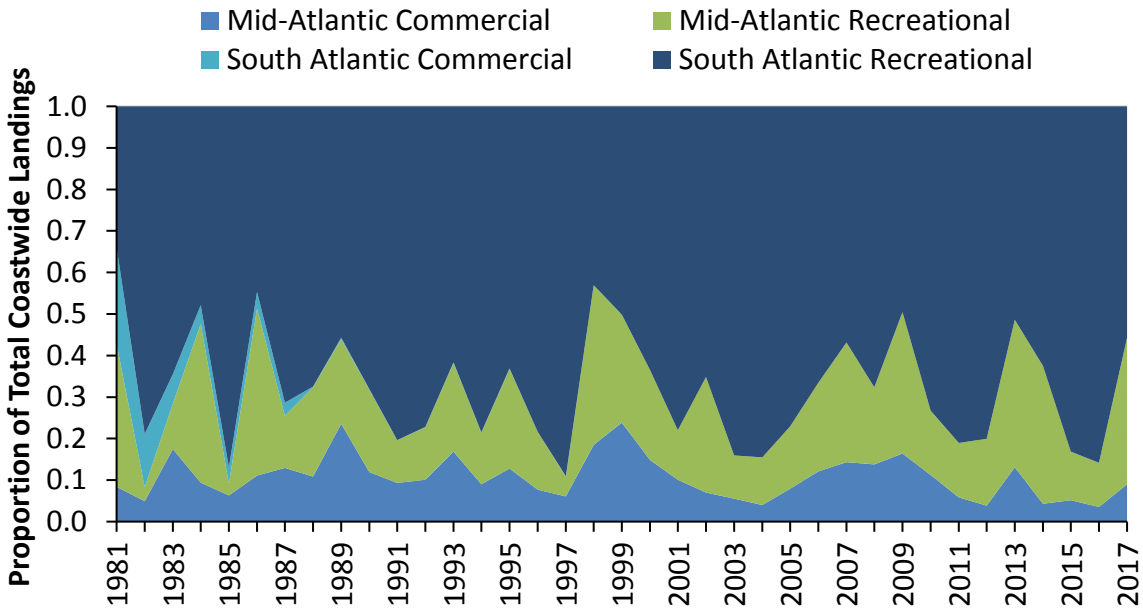


Figure 4. Proportion of regional, sector-specific landings to total coastwide landings (pounds). See Tables 2 and 3 for data sources.

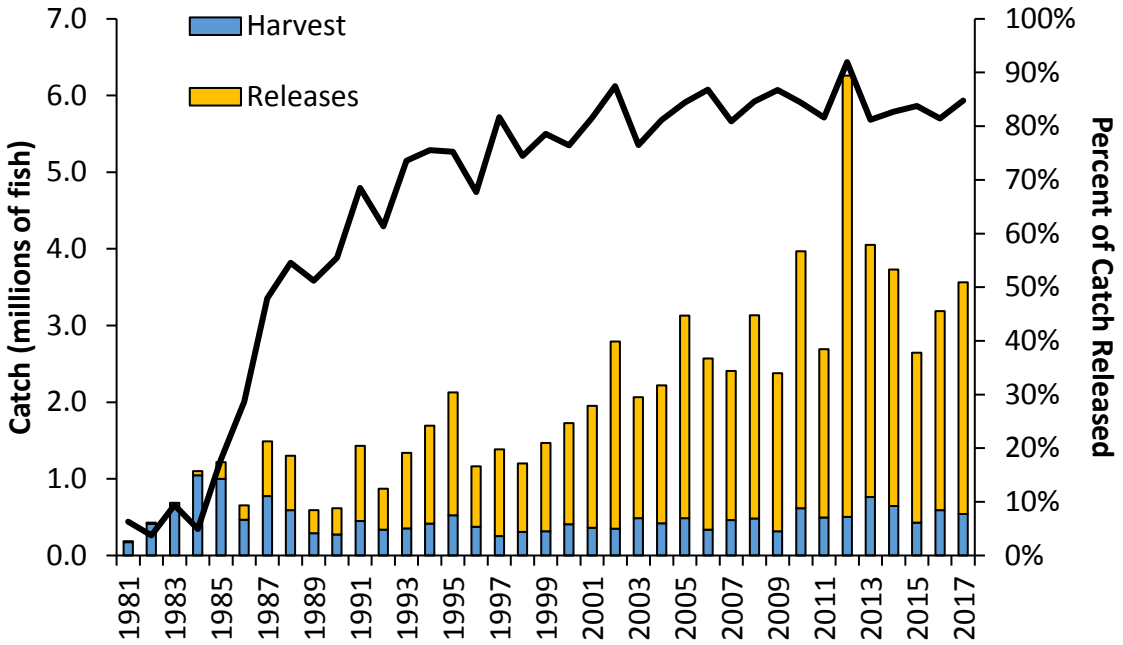


Figure 5. Recreational catch (harvest and alive releases) of red drum (numbers) and the proportion of catch that is released. See Tables 4 and 5 for values and data sources.

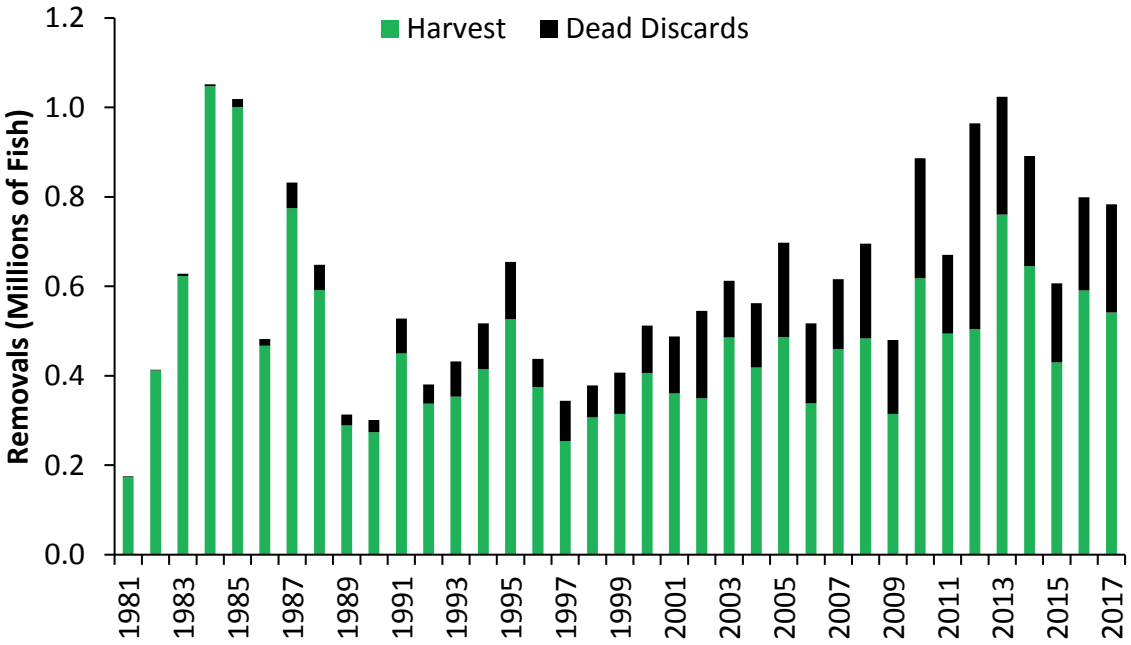


Figure 6. Recreational removals (harvest and dead discards) of red drum (numbers). Dead discards are estimated by applying an 8% discard mortality rate to alive releases. See Tables 4 & 5 for values and data sources.

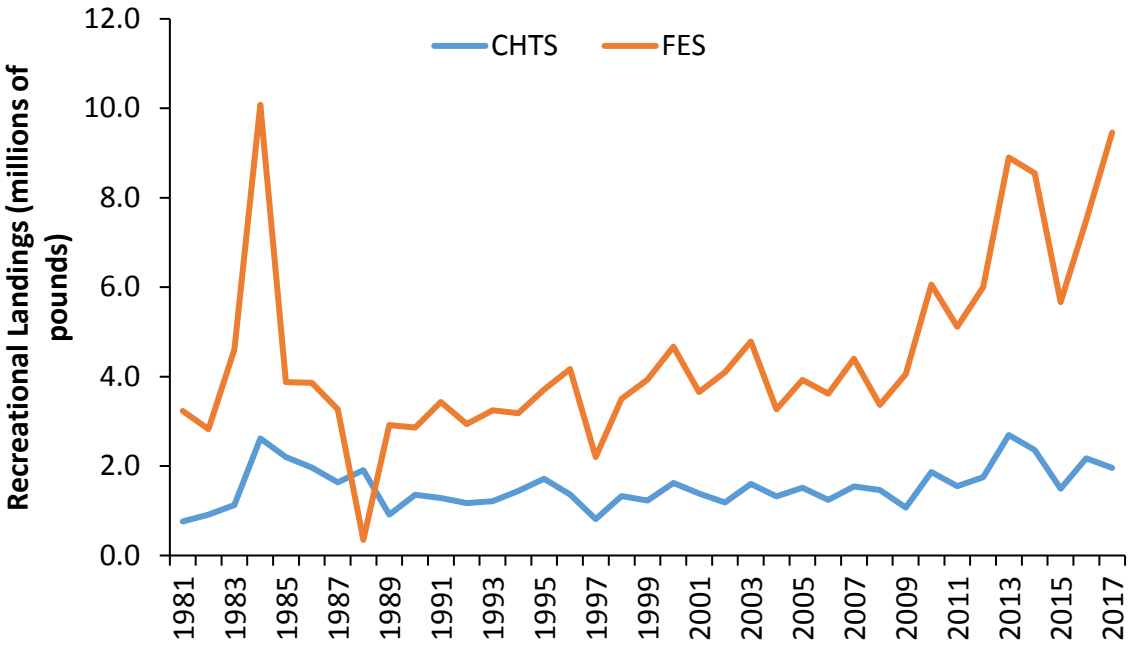


Figure 7. Coastwide comparison of MRIP recreational landings estimates for red drum based on the Coastal Household Telephone Survey (CHTS) and the mail-based Fishing Effort Survey (FES), 1981-2017. FES-calibrated estimates will be used for red drum management once a new stock assessment that incorporates the estimates is completed. (Source: personal communication with MRIP, 2018).

XI. Tables

Table 1. Red drum regulations for 2017. The states of New Jersey through Florida are required to meet the requirements in the FMP; states north of New Jersey are encouraged to follow the regulations. All size limits are total length.

State	Recreational	Commercial
NJ	18" - 27", 1 fish	18" - 27", 1 fish
DE	20" - 27", 5 fish	20" - 27", 5 fish
MD	18" - 27", 1 fish	18" - 25", 5 fish
PRFC	18" - 25", 5 fish	18" - 25", 5 fish
VA	18" - 26", 3 fish	18" - 25", 5 fish
NC	18" - 27", 1 fish	18" - 27"; 250,000 lb harvest cap with overage payback (150,000 lbs Sept 1- April 30; 100,000 lbs May 1-Aug 31); harvest of red drum allowed with 7 fish daily trip limit; red drum must be less than 50% of catch (lbs); small mesh (<5" stretched mesh) gill nets attendance requirement May 1 - November 30. Fishing year: September 1 – August 31.
SC	15" - 23", 3 fish. Gigging allowed March-November	Gamefish Only
GA	14" - 23", 5 fish	Gamefish Only
FL	18" - 27", Northern Region- 2 fish; Southern Region- 1 fish	Sale of native fish prohibited

Table 2. Commercial landings (pounds) of red drum by state, 2008-2017. (Source: personal communication with ACCSP, Arlington, VA, for years prior to 2017 and state compliance reports for 2017, except as noted below.)

Year	NJ	DE	MD	PRFC	VA	NC	SC	GA	FL	Total
2008			*	69	5,138	229,809		*		235,016
2009	*		*	157	9,296	200,296		*		209,749
2010			*	22	3,966	231,828		*		235,816
2011				3	4,397	91,980		*		96,380
2012	*		334	81	2,786	66,519				69,720
2013	*	0	2,752	268	30,137	371,949				405,106
2014	*	0	298	3	14,733	90,647				105,681
2015	0	0	*	0	761	80,282				81,043
2016	0	0	*	0	1,898	76,977	0	0	0	78,875
2017	*	0	1,015	0	6,971	186,463	*	0	0	194,449

Notes: PRFC landings from agency reporting program; * indicates confidential landings.

Table 3. Recreational landings (pounds) of red drum by state, 2008-2017. (Source: personal communication with MRIP for years prior to 2017 and state compliance reports for 2017)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
2008				84,491	231,551	251,930	247,442	651,672	1,467,086
2009				147,444	288,958	165,892	126,196	341,384	1,069,874
2010				43,126	283,286	447,895	318,264	773,783	1,866,354
2011	2,421				212,245	441,834	229,214	662,811	1,548,524
2012		396	26,788	27,446	238,312	369,333	107,368	978,727	1,748,369
2013		7,153	6,205	410,917	676,050	236,887	129,279	1,226,481	2,692,970
2014				221,685	596,447	242,371	154,332	1,141,154	2,355,988
2015				29,339	154,496	269,787	97,690	939,007	1,490,319
2016				9,682	230,473	144,859	153,368	1,634,141	2,172,523
2017	0	0	1,887	354,719	402,390	278,006	128,973	790,449	1,956,423

Table 4. Recreational landings (numbers) of red drum by state, 2008-2017. (Source: personal communication with MRIP for years prior to 2017 and state compliance reports for 2017)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
2008				20,847	50,809	119,471	133,107	159,246	483,480
2009				38,670	57,543	70,326	68,857	79,635	315,031
2010				11,076	64,024	172,708	194,826	175,828	618,462
2011	955				45,143	161,503	106,962	180,001	494,564
2012		296	17,869	28,159	52,948	121,068	45,766	238,191	504,297
2013		1,686	2,083	124,088	164,218	97,386	73,827	297,527	760,815
2014				53,672	116,601	103,892	92,869	278,037	645,071
2015				7,792	36,704	106,620	48,172	230,397	429,685
2016				3,510	62,105	62,816	74,702	388,200	591,333
2017			634	70,725	101,473	115,132	66,987	289,056	541,670

Table 5. Recreational alive releases and dead discards (numbers) of red drum by state, 2008-2017. Dead discards are estimated based on an 8% release mortality rate. (Source: personal communication with MRIP for years prior to 2017 and state compliance reports for 2017)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total	Dead Discards
2008		75	217	236,787	658,887	552,217	313,743	889,550	2,651,476	212,118
2009			14,754	178,396	429,776	751,123	167,704	521,659	2,063,412	165,073
2010			2,182	28,580	635,876	786,452	483,650	1,414,115	3,350,855	268,068
2011				61,330	207,697	664,291	213,781	1,051,143	2,198,242	175,859
2012		5,876	280,171	2,503,456	1,533,010	543,618	90,237	799,428	5,755,796	460,464
2013		407	2,207	220,305	654,030	673,377	198,722	1,541,541	3,290,589	263,247
2014		41	273	116,215	382,663	635,836	290,101	1,659,671	3,084,800	246,784
2015			779	25,835	334,510	571,433	168,338	1,114,355	2,215,250	177,220
2016		968	15,414	49,819	825,046	337,852	160,031	1,207,481	2,596,611	207,729
2017			6,066	266,236	643,418	581,270	240,613	1,283,206	3,020,809	241,665