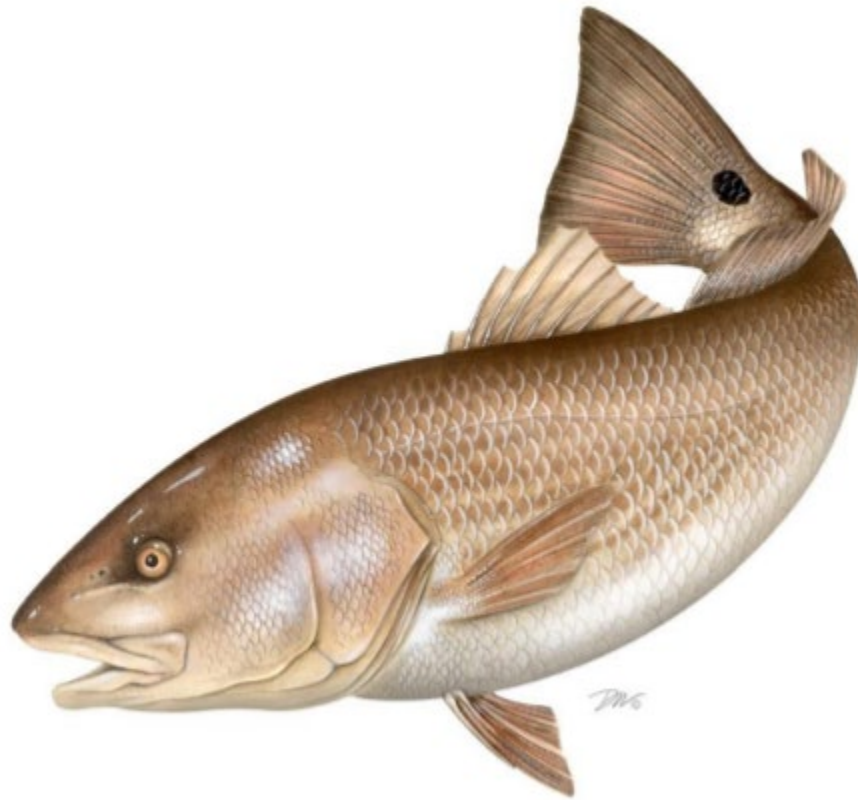


# ATLANTIC STATES MARINE FISHERIES COMMISSION

## REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR RED DRUM  
*(Sciaenops ocellatus)*

2015 FISHING YEAR



Prepared by the Plan Review Team

Approved by the South Atlantic Management Board  
August 2016

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## I. Status of the Fishery Management Plan

<u>Date of FMP Approval:</u>	Original FMP – October 1984
<u>Amendments:</u>	Amendment 1 – October 1991 Amendment 2 – June 2002 Addendum 1 – August 2013
<u>Management Areas:</u>	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
<u>Active Boards/Committees:</u>	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.

ASMFC 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 2015.

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 red drum stock is currently being evaluated in accordance with the 2009 Benchmark Stock Assessment. At present, only an overfishing status can be determined for red drum (SAFMC 2009).

### *Northern Region (NJ-NC)*

Recruitment (age 1 abundance) has varied since 1989 (Figure 1). Abundance of age 1 – 3 red drum increased during 1990 – 2000 and has fluctuated thereafter (Figure 2). The initial increase in abundance of these age groups can be explained by the reduction in exploitation rates early in the time series, followed by relative stability (Figure 3).

The trend in the three-year average sSPR indicates low sSPR early in the time series with increases during 1990 – 1997 and fluctuations thereafter (Figure 4). 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 1989 (Figure 1). Abundance of age 1 – 3 red drum increased during 1989 – 1992, declined during 1992 – 1998, and has fluctuated thereafter (Figure 2). As with the northern stock, the initial increase in abundance of these age groups can be explained by the reduction in exploitation rates early in the time series. Exploitation rates appear to have slightly increased since 1990 (Figure 3).

A high level of uncertainty exists around the sSPR estimates for the southern region. More work is needed to make definitive statements about sSPR, but it is likely that the average sSPR in 2007 was above the overfishing threshold ( $F_{30\%}$ ), although not above the target as was probable in the northern region. The stock is therefore likely not subject to overfishing at this time. Due to the uncertainties, it is not possible to determine status in relation to the target of 40% sSPR.

### *Ongoing 2016 Benchmark Assessment*

The Technical Committee (TC) and Stock Assessment Subcommittee (SASC) is currently working on a new Benchmark Stock Assessment. Given the high level of uncertainty around the sSPR estimates in the 2009 assessment, a primary goal of the current assessment has been to accurately estimate abundance and biomass in order to determine whether or not the stock is overfished and/or overfishing is occurring. In order to achieve this, the SASC decided to switch modeling frameworks and develop a Stock Synthesis model (SS3).

During the transition to SS3, the SASC encountered several challenges in developing SS3 models that estimate plausible stock conditions and dynamics. A specific concern was the lack of stability in both the northern and southern models. These issues persisted through the SEDAR 44 workshop and, as a result, the peer review took on a collaborative approach where panelists reviewed the assessment work to date and provided constructive comments on modifications to the models. The SASC continued work on the stock assessment following the Review Workshop and was able to make significant improvements. Updated work by the SASC was desk reviewed in April 2016. The Peer Review Panel recommended the stock assessment for management and presented to the Board in May 2016. During their review of the assessment, the Board requested additional analysis to ensure the results of the new model are accurate. These analyses include an evaluation of tag return rates in the fishery and continuity models, both of which will be presented to the Board in October 2016.

### **III. Status of the Fishery**

Total red drum landings from New Jersey through the east coast of Florida in 2015 are estimated at 1.62 million pounds (Tables 2 and 3, Figure 5). This is roughly 834,000 pounds less than was landed in 2014 and 1.482 million pounds less than in 2013. 2015 total landings also fall below the previous ten-year (2006-2015) average of 1.89 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 2015, 68% of the total landings came from the southern region where the fishery is exclusively recreational, and 32% from the northern region (Figure 6).

Coastwide commercial landings show no particular temporal trends. In the last 50 years, landings have ranged from approximately 55,000 pounds (in 2004) to 440,000 pounds (in 1950, Figure 5). In 2015, red drum were commercially landed only in Maryland, Virginia, and North Carolina (Table 2). Coastwide commercial harvest slightly increased from 102,949 pounds in 2014 to 141,836 pounds in 2015, with 99% 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 the 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 2.6 million pounds; Figures 5 and 7). Recreational harvest decreased from 641,658 fish (2.3 million pounds) in 2014 to 426,304 fish (1.5 million pounds) in 2015. The 2015 harvest is lower than the 10 year average (2006-2015) for recreational harvest in numbers (504,346) and pounds (1.7 million). Florida anglers landed the largest share of the coastwide recreational harvest in numbers (53%), followed by South Carolina (25%), Georgia (11%), and North Carolina (9%).

Anglers release far more red drum than they keep; the percent of the catch released has been over 80% during the last decade (Figure 7). Recreational releases show an increasing trend over the time series. The proportion of releases in 2015 was 84% (versus 83% in 2014), and the overall number of fish released was 2.2 million in 2015 (Figure 3, Table 5). It is estimated that 8% of released fish die as a result of being caught, resulting in an estimated 175,608 dead discarded fish in 2015 (Table 5). Recreational removals from the fishery are thus estimated to be 601,912 fish in 2015 (Figure 8).

#### **IV. Status of Assessment Advice**

Current stock status information comes from the 2009 benchmark stock assessment (SAFMC 2009) completed by the ASMFC Red Drum Stock Assessment Subcommittee and Technical Committee; peer reviewed by an independent panel of experts at the Southeast Data, Assessment, and Review (SEDAR) 18; and approved by the South Atlantic State-Federal Fisheries Management Board for use in management decisions. Previous interstate management decisions were based on regional assessments conducted by Vaughan and Helser (1990), Vaughan (1992, 1993, 1996), and Vaughan and Carmichael (2000). Several states have also conducted state-specific assessments (e.g., Murphy and Munyandorero 2009; Takade and Paramore 2007).

The 2009 stock assessment uses a statistical catch at age (SCA) model with age-specific data for red drum ages 1 through 7+. This is a change from virtual population analyses used in past assessments, primarily due to their inherent assumption that the catch at age is known without error, whereas there is limited data to describe the catch of red drum early in the time series. Data from 1989-2007 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 SEDAR 18 Review Panel considered the use of an SCA model appropriate given the types of data available for red drum. With certain revisions made to the data and the model

configurations before or at the Review Workshop, the SEDAR 18 Review Panel supported the use of the final model runs. 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 2005 – 2007 average sSPR. For the southern region, the Review Panel agreed that the model was informative of relative (not absolute) trends in age 1 – 3 abundance and exploitation, but not for older age groups. The model was also considered to be informative of relative trends in annual sSPR and the three-year average sSPR, this result being highly conditional on the estimated fishery selectivity pattern. These results for the southern region allow for only general statements on stock status.

The Review Panel accepted the existing threshold and target overfishing benchmarks of 30% sSPR and 40% sSPR for red drum. However, the Review Panel did not consider annual changes in sSPR to be informative and recommended adopting a three-year running mean of estimated annual sSPR as the indicator to compare to the management benchmarks. Because of the high uncertainty in the age 4 – 7+ dynamics, the Review Panel did not see value in attempting to estimate indicators and benchmarks of stock biomass which would be used to measure overfished status.

A new benchmark assessment for red drum was presented to the Board in May 2016. To ensure accuracy of the new model, the Board requested additional analyses. These will be presented to the Board in October 2016.

## **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 2016 reports.

### Fishery Dependent Monitoring

- 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 (2015 n=0). Licensed charter boat captain logbooks are monitored for red drum captures (2015: 16 caught, 2 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 2015.
- Virginia MRC –Volunteer anglers have participated since 1995 in the Virginia Game Fish Tagging Program (2015: 283 fish tagged, 23 reported recaptures). Carcasses collected through the Marine Sportfish Collection Project since 2007 (2015 n=0).
- North Carolina DMF – Commercial cap monitored through trip ticket program; commercially-landed red drum sampled through biological monitoring program since 1982 (2015: 429 fish measured, primarily gill net). North Carolina Red Drum Tagging Program (2015: 2,115 fish tagged, 115 reported recaptures).



- South Carolina DNR –State finfish survey conducted in January and February (2015 n=129, mean catch rate: 2.9 red drum/targeted angler hour). Charter Vessel Trip Reporting (2015 release rate: 93.2%). SC Marine Game Fish Tagging Program studies movement patterns, growth rates, and release-mortality rates (in 2015, 2,089 fish tagged, 445 recaptured). Tournament and freezer fish programs (2015 n=20).
- Georgia CRD – Age, length, and sex data collected through the Marine Sportfish Carcass Recovery Project (2015: 352 red drum).
- Florida FWC –10,807 trip interviews in 2015 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.

#### Fishery Independent Monitoring

- 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 (2015 n=586; CPUE of 4.9, increase from 2014 CPUE of 2.3). Gill net survey in Pamlico Sound since 2001 characterizes size and age distribution, produces abundance index, improves bycatch estimates, and studies habitat usage (2015 CPUE of 2.10, slightly below average). Longline survey since 2007 produces adult index of abundance and tags fish (2015 n=321; CPUE remained stable and near average at 4.5 fish per set).
- South Carolina DNR – Estuarine trammel net survey for subadults (2015 CPUE lowest on record). Electrofishing survey in low salinity estuarine areas for juveniles/subadults (2015 CPUE third lowest on record). Inshore bottom longline survey for biological data and adult abundance index (673 tagged, 119 sampled for age in 2015). Genetic subsampling and tagging conducted during these three surveys.
- Georgia CRD – Estuarine trammel net survey for subadult biological data and abundance index (2015 n = 52). Estuarine gill net survey for young-of-year (YOY) biological data and abundance index (2015 n = 296). Bottom longline survey for adult biological data and abundance index (2015 n = 37).
- 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 (2015 CPUE returned to low 2011-2012 levels after 2013 spike). Haul seine survey in these areas and southern IRL for subadult index (2015 CPUE was lowest on record). 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.

#### *Changes to State Regulations*

A 12,753 pound overage occurred in North Carolina in the 2013/2014 fishing year, resulting in a cap adjustment to 237,247 pounds. Commercial harvest in the 2014/2015 fishing year remained well below the adjusted cap allowance, providing sufficient payback.

### **VII. Implementation of FMP Compliance Requirements for 2015**

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

### **VIII. Recommendations of the Plan Review Team**

#### Management and Regulatory Recommendations

- < 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.

#### Prioritized Research and Monitoring Recommendations (H) =High, (M) =Medium, (L) =Low

##### *Stock Assessment and Population Dynamics*

- < Improve catch/effort estimates and biological sampling from recreational and commercial fisheries for red drum, including increased effort to intercept night fisheries for red drum. (H)
- < Allocate efforts to determine the size and age structure of regulatory discards of live 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. (H)

- < Establish programs to provide on-going estimates of commercial discards and recreational live release 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).

#### *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. (H)
- < Determine if natural environmental perturbations limit recruitment, and if spawning stock size is the cause of recruitment variability (H)
- < Continue tagging studies to determine stock identity, inshore/offshore migration patterns of all life stages (i.e. basic life history info gathering). 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)
- < 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/yearclass strength. (M)
- < 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. (M)

#### *Social*

- < Examine the effectiveness of controlling fishing mortality and minimum size in managing red drum fisheries.
- < Encourage the NMFS to fund socioeconomic add-on questions to the recreational fisheries survey that are specifically oriented to red drum recreational fishing.

#### *Economic*

- < Encourage the NMFS to continue funding socioeconomic add-on questions to the recreational fisheries survey that include data elements germane to red drum recreational fisheries management.
- < Where appropriate, encourage member states to conduct studies to evaluate the economic costs and benefits associated with current and future regulatory regimes impacting recreational anglers including anglers oriented toward catch and release fishing trips.
- < Fully evaluate the efficacy of using cultured red drum to restore native stocks along the Atlantic Coast including risk adjusted cost-benefit analyses.
- < Conduct a special survey and related data analysis to determine the economic and operational characteristics of the "for-hire sector" targeting red drum especially fishing guide oriented businesses in the South Atlantic states.

- < Estimate the economic impacts (e.g. sales, jobs, income, etc.) of recreational red drum fisheries at the state and regional level including the "for-hire sector" (e.g. fishing guides).
- < States with significant fisheries (over 5,000 pounds) should collect socioeconomic data on red drum fisheries through add-ons to the recreational fisheries survey or by other means.

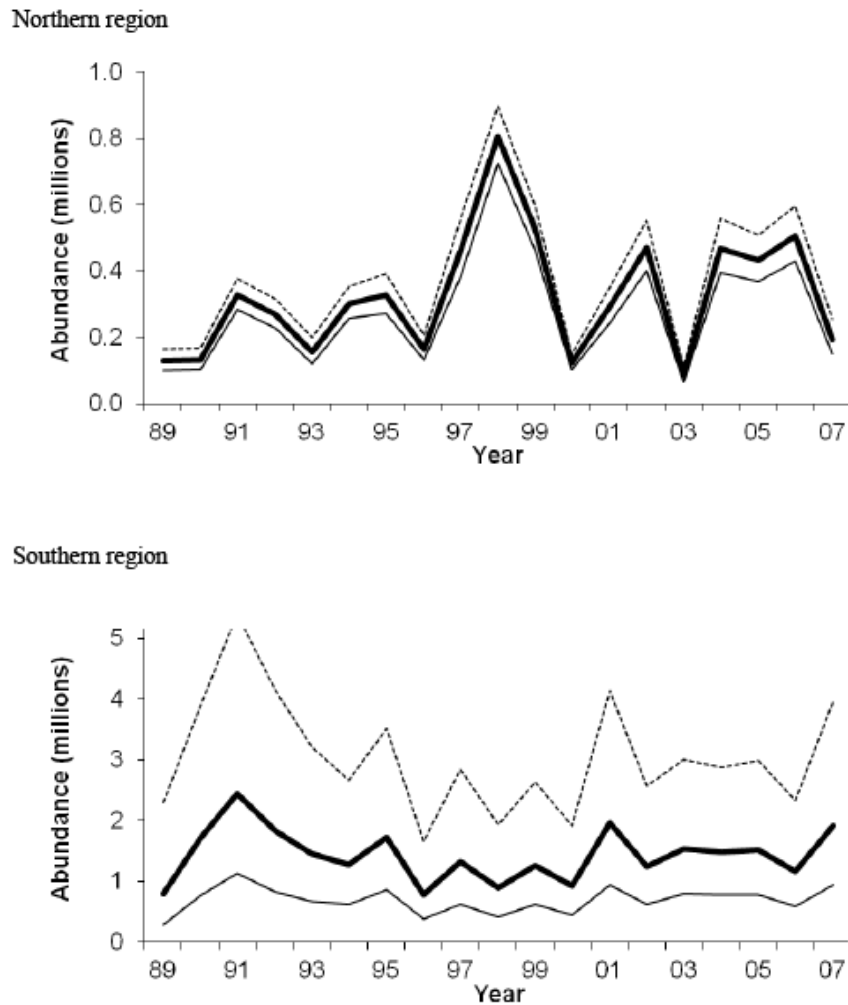
#### *Habitat*

- < 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. (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 the effects of water quality degradation (changes in salinity, DO, turbidity, etc.) on the survival of red drum eggs, larvae, post-larvae, and juveniles. (M)
- < Quantify relationships between red drum production and habitat. (L)
- < Determine methods for restoring red drum habitat and/or improving existing environmental conditions that adversely affect red drum production. (L)

## **IX. References**

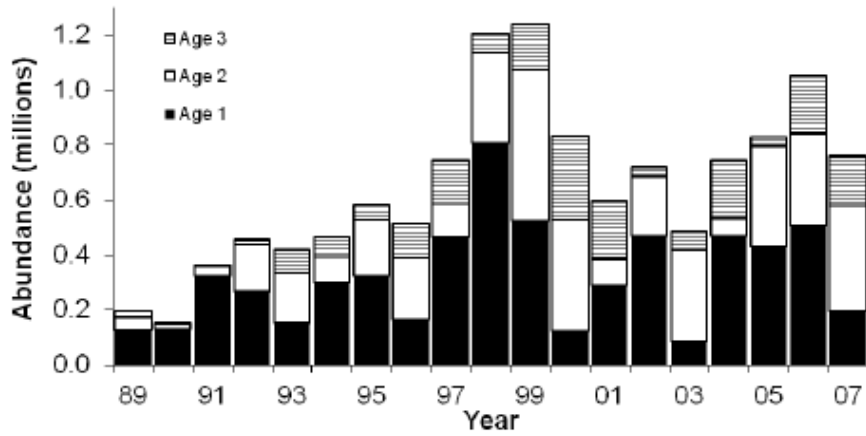
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## X. Figures

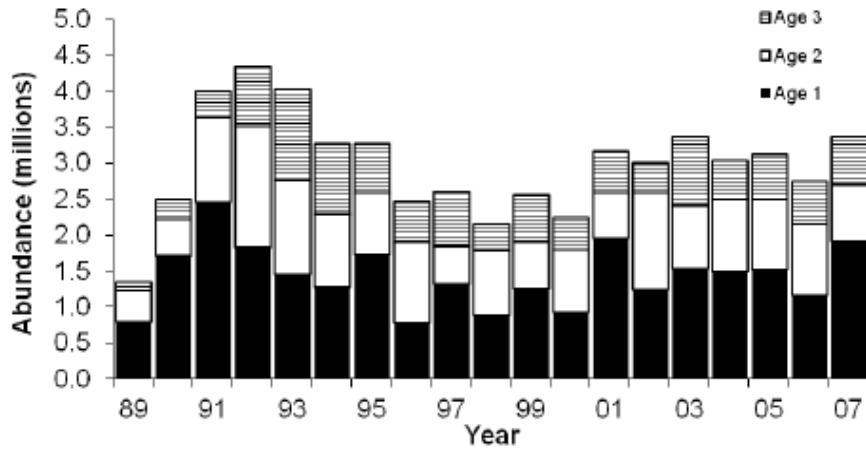


**Figure 1. Estimated recruitment (age-1 abundance, heavy solid line) and  $\pm 1.96$  standard errors for the northern and southern regions during 1989-2007 (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.**

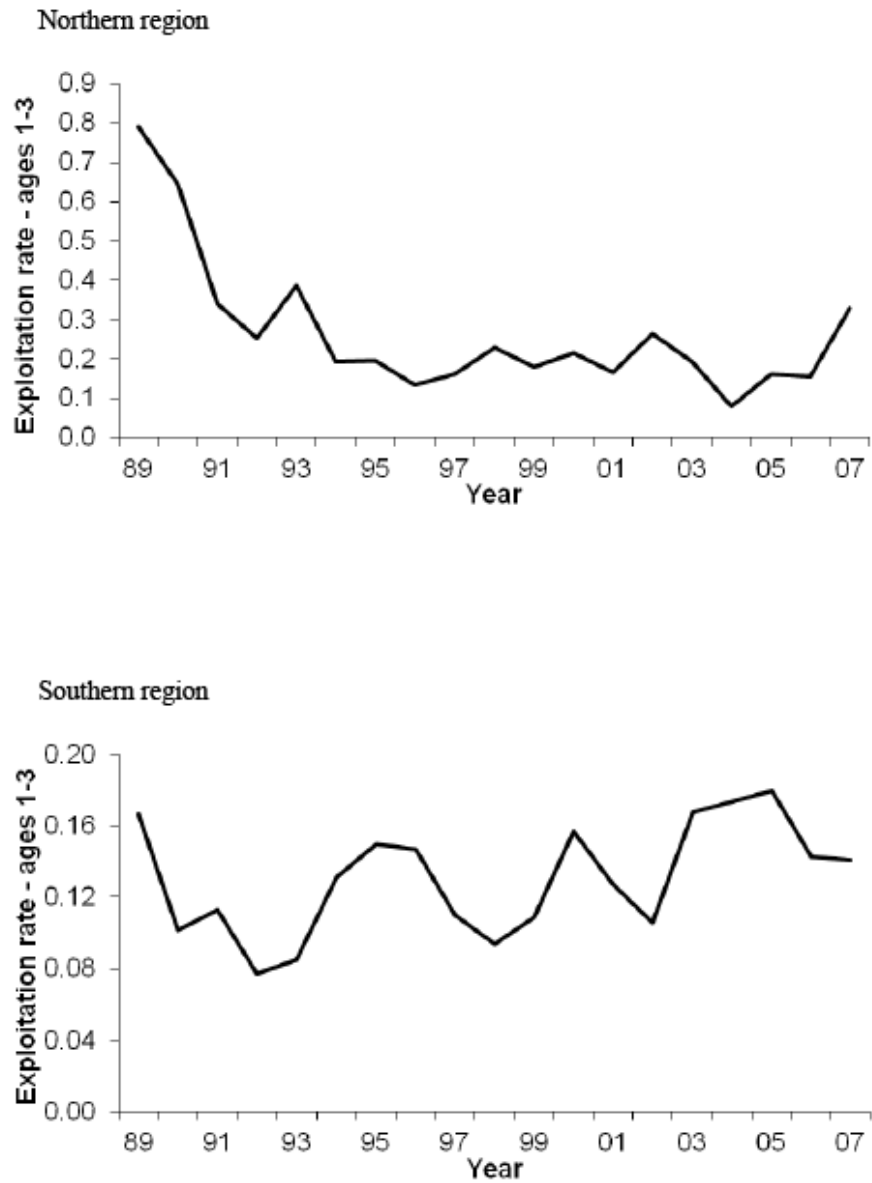
Northern region



Southern region



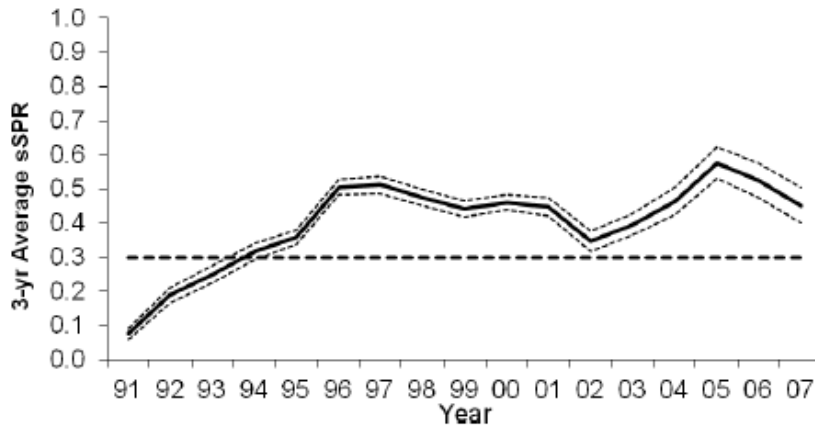
**Figure 2. Estimates of abundance of red drum ages 1-3 in the northern and southern regions during 1989-2007** (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.



**Figure 3. Estimated annual exploitation rate for red drum ages 1-3 in the northern and southern regions during 1989-2007** (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.



Northern region



Southern region

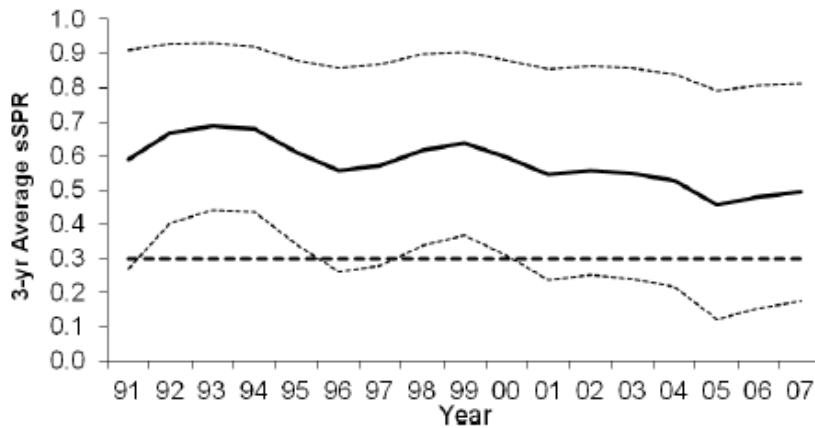
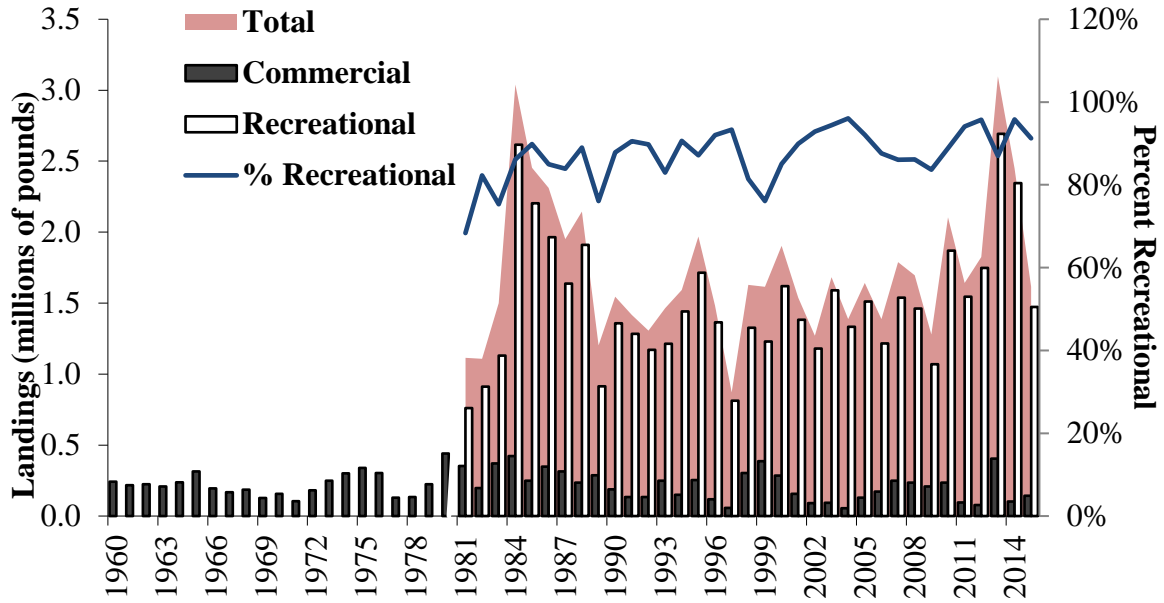
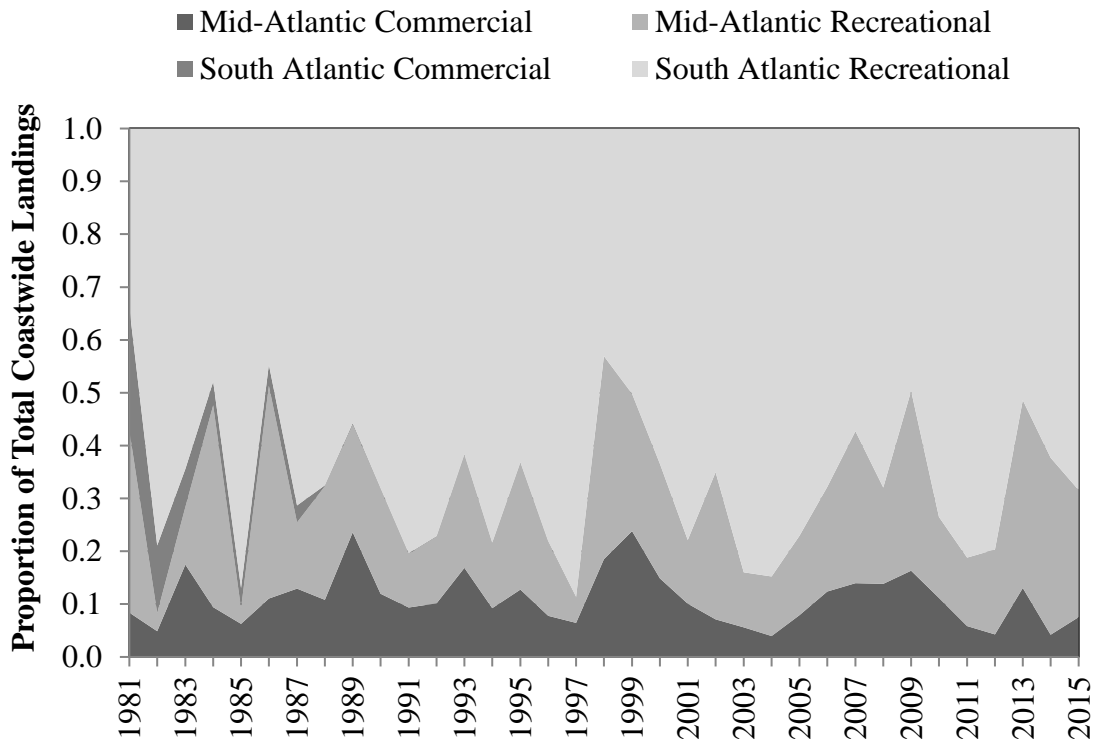


Figure 4. Northern and southern region estimates of three-year average static spawning potential ratio with  $\pm 1.96$  standard errors (dashed lines) during 1991-2007. Three-year averages include current and previous two years' sSPR estimates. The heavy dashed line shows the 30% overfishing threshold (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.



**Figure 5. 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 6. Proportion of regional, sector-specific landings to total coastwide landings (pounds).** See Tables 2 and 3 for data sources.

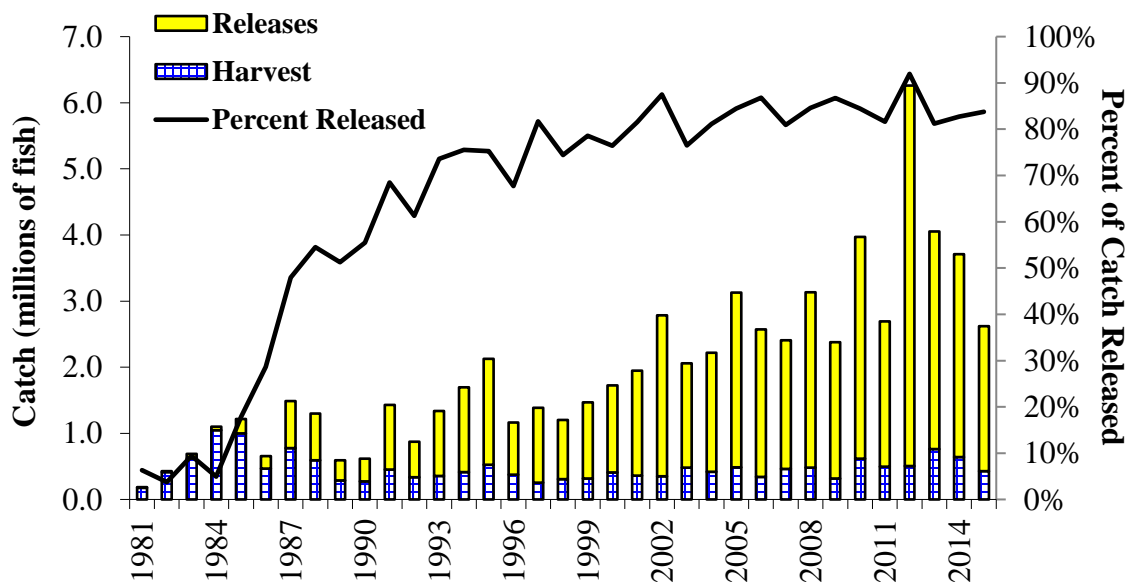


Figure 7. Recreational catch (harvest and alive releases) of red drum (numbers) and the proportion of catch that is released. See Tables 4 and 5 for values and data sources.

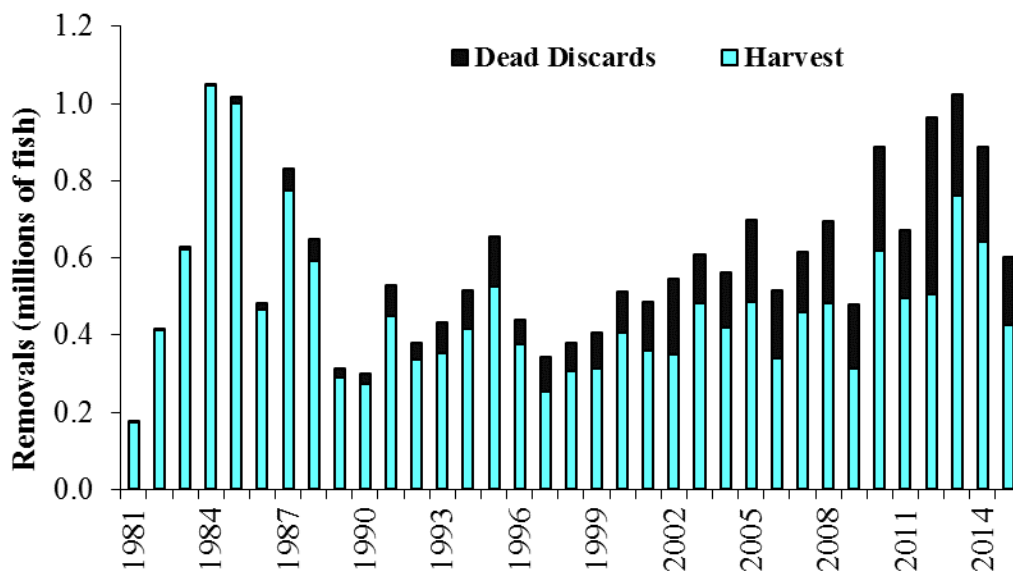


Figure 8. Recreational removals (harvest and dead discards) of red drum (numbers). Dead discards are estimated by applying an 8% discard mortality rate to alive releases. See Tables 4 & 5 for values and data sources.

**XI. Tables**

**Table 1. Red drum regulations for 2015.** 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.

<b>State</b>	<b>Recreational</b>	<b>Commercial</b>
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, 1981-2015.** (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD and ACCSP, Arlington, VA, except where noted below)

Year	NJ	DE	MD	PRFC	VA	NC	SC	GA	FL	Total
1981					200	93,420		261	258,374	352,255
1982					1,700	52,561	2,228	251	139,170	195,910
1983			100		41,700	219,871	2,274	1,126	105,164	370,235
1984					2,600	283,020	3,950	1,961	130,885	422,416
1985					1,100	152,676	3,512	3,541	88,929	249,758
1986			1,000		5,400	249,076	12,429	2,939	77,070	347,914
1987					2,600	249,657	14,689	4,565	42,993	314,504
1988			8,100	2	4,000	220,271		3,281	284	235,938
1989			1,000	86	8,200	274,356	165	3,963		287,770
1990			29	86	1,481	183,216		2,763		187,575
1991			7,533	3,808	24,771	96,045		1,637		133,794
1992			1,087	196	2,352	128,497		1,759		133,891
1993			55		8,637	238,099		2,533		249,324
1994			859		4,080	142,119		2,141		149,199
1995			6		2,992	248,122		2,578		253,698
1996			215		2,006	113,338		2,271		117,830
1997			22	4	3,820	52,502		1,395		57,743
1998	311		336		6,456	294,366		672		302,141
1999	241	6	504	186	10,856	372,942		1,115		385,850
2000			843	10	11,512	270,953		707		284,025
2001	*	*	727	191	4,905	149,616		*		155,439
2002	*	*	1,161	285	7,361	81,370		*		90,177
2003	*	*	631	47	2,716	90,525		*		93,919
2004	12	*	12	*	638	54,086		*		54,748
2005	*	*	37	51	527	128,770		*		129,385
2006	*	*	8	2	2,607	169,206		*		171,823
2007	*	*	90	58	6,372	243,658		*		249,747
2008	*	*	40	69	4,585	229,809		*		234,503
2009	129	*	*	157	8,315	200,296		*		208,909
2010	*	*	19	22	3,634	231,828		*		235,503
2011				3	4,369	91,980				96,352
2012	7,971		334	81	2,609	66,519				77,514
2013	176	0	2,730	268	28,766	371,949				403,889
2014	55	0	298	3	11,999	90,594		0	0	102,949
2015	*	0	*	*	664	140,889				141,836

\* Notes: NJ landings from SAFIS, 2004-present; MD landings from state reporting program, 1991-present; PRFC landings from agency reporting program, 1988-present; VA landings from state reporting program, 1996-present; NC landings from state reporting program, 1994-present; GA landings from state reporting program, 2000-present, \* indicates confidential landings because less than three dealers reported.

**Table 3. Recreational landings (pounds) of red drum by state, 1981-2015.** (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981			4,370	347,939	31,519	50,230	9,442	317,963	761,463
1982					37,511	340,686	52,150	480,676	911,023
1983			3,018	51,299	109,540	222,691	67,298	675,924	1,129,770
1984				1,285	1,160,539	183,282	294,583	976,971	2,616,660
1985					70,677	1,532,316	185,887	414,176	2,203,056
1986			754,161	145,517	31,594	498,586	173,837	360,725	1,964,420
1987				44,332	200,729	913,639	250,795	227,222	1,636,717
1988				9,030	451,974	1,050,049	385,860	12,507	1,909,420
1989			2,348	27,236	214,849	396,771	127,245	146,064	914,513
1990			2,679		302,994	631,819	161,712	258,569	1,357,773
1991			5,635	30,582	108,268	284,290	337,207	516,999	1,282,981
1992				55,324	109,134	411,484	198,751	396,555	1,171,248
1993				45,505	266,459	282,614	328,245	290,930	1,213,753
1994				3,684	192,060	314,632	353,616	578,412	1,442,404
1995				66,270	405,620	417,595	300,337	525,231	1,715,053
1996				1,512	204,556	396,394	164,756	596,483	1,363,701
1997				1,810	39,077	296,155	129,836	345,390	812,268
1998				34,861	591,428	129,619	84,348	487,091	1,327,347
1999				92,794	326,303	103,777	166,630	540,310	1,229,814
2000				95,596	316,029	93,043	228,965	885,447	1,619,080
2001				51,890	132,578	188,198	155,854	853,714	1,382,234
2002		860	15,154	155,212	182,225	103,831	170,572	551,128	1,178,982
2003				57,213	118,808	449,399	234,865	729,446	1,589,731
2004				32,415	124,264	312,569	296,777	566,508	1,332,533
2005				7,624	239,694	298,600	177,169	788,993	1,512,080
2006		2,064		21,039	251,735	160,760	143,699	636,742	1,216,039
2007				209,248	305,664	152,190	197,510	674,463	1,539,075
2008				72,510	236,744	254,305	244,594	652,613	1,460,766
2009				148,573	286,702	165,874	125,499	343,359	1,070,007
2010				40,323	281,587	451,144	319,427	776,346	1,868,827
2011					212,245	441,833	229,214	662,811	1,546,103
2012	0	396	26,788	27,422	238,310	368,445	107,368	978,727	1,747,456
2013	0	7,153	6,367	411,236	676,050	236,887	129,279	1,226,481	2,693,453
2014	0	0	0	221,280	598,166	242,371	154,332	1,129,663	2,345,812
2015	0	0	0	29,339	154,496	269,787	97,690	922,065	1,473,377

**Table 4. Recreational landings (numbers) of red drum by state, 1981-2015.** (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981			601	49,630	15,054	27,319	6,323	75,244	174,171
1982					16,445	160,760	30,757	204,401	412,363
1983			2,413	32,940	81,528	104,806	56,854	344,513	623,054
1984				1,457	108,787	129,547	258,188	549,381	1,047,360
1985				0	22,077	530,110	183,837	265,185	1,001,209
1986			12,804	28,139	17,501	193,188	102,279	113,440	467,351
1987				2,186	61,100	522,420	138,062	51,225	774,993
1988				4,311	142,626	287,916	147,042	9,542	591,437
1989			1,014	12,007	62,359	127,492	51,557	34,748	289,177
1990			1,279	0	33,149	118,666	76,304	44,280	273,678
1991			2,745	17,119	38,658	125,833	162,802	102,727	449,884
1992				13,275	23,593	112,534	83,861	104,265	337,528
1993				14,005	49,493	119,189	105,710	65,140	353,537
1994				1,378	28,953	129,515	134,214	120,938	414,998
1995				3,665	88,593	202,430	134,915	96,927	526,530
1996				572	36,746	130,649	60,251	146,823	375,041
1997				1,920	8,749	129,022	39,041	75,235	253,967
1998				13,070	114,638	46,509	24,929	107,982	307,128
1999				12,425	64,739	44,069	67,283	126,180	314,696
2000				22,603	61,618	37,217	94,144	191,070	406,652
2001				6,967	23,142	61,420	90,376	177,633	359,538
2002		275	5,521	49,795	42,541	41,190	90,993	119,010	349,325
2003				13,607	25,481	162,484	122,259	159,331	483,162
2004				5,005	30,017	107,803	138,893	136,728	418,446
2005				2,766	51,807	130,655	105,655	195,550	486,433
2006		468	6,362	12,665	55,714	48,703	68,813	145,860	338,585
2007				46,405	66,789	72,261	113,237	161,427	460,119
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	995				45,143	161,503	106,962	180,001	494,604
2012		296	17,869	28,149	52,948	121,068	45,766	238,191	504,287
2013		1,686	2,134	124,156	164,217	97,387	73,826	297,527	760,933
2014	0	0	0	53,545	116,921	103,892	91,764	275,536	641,658
2015	0	0	2	7,792	36,704	106,620	48,172	227,014	426,304

**Table 5. Recreational alive releases and dead discards (numbers) of red drum by state, 1981-2015.** Dead discards are estimated based on an 8% release mortality rate. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD.)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total	Dead Discards
1981					2,230	417		9,042	11,689	935
1982						2,496	3,377	10,172	16,045	1,284
1983					1,866	6,751	1,417	54,723	64,757	5,181
1984					2,931	0	4,232	47,196	54,359	4,349
1985				1,115		16,688	6,315	193,399	217,517	17,401
1986				7,595		24,018	56,045	100,095	187,753	15,020
1987					18,499	82,595	234,676	377,959	713,729	57,098
1988				3,958	24,874	269,176	177,319	233,988	709,315	56,745
1989			2,918	7,038	7,566	42,824	71,162	172,303	303,811	24,305
1990			0	934	12,452	102,611	156,263	68,667	340,927	27,274
1991			4,432	14,461	121,178	99,968	92,803	645,773	978,615	78,289
1992	301			15,383	60,230	46,269	128,066	284,893	535,142	42,811
1993				50,434	182,301	146,324	140,386	465,656	985,101	78,808
1994				10,684	107,662	324,706	146,039	691,261	1,280,352	102,428
1995				33,560	164,520	362,844	356,618	683,706	1,601,248	128,100
1996				2,424	35,752	176,517	71,983	500,374	787,050	62,964
1997		2,571		109,754	259,570	175,772	22,736	560,559	1,130,962	90,477
1998			2,768	93,660	199,701	84,274	33,882	481,009	895,294	71,624
1999			2,148	232,893	247,146	87,776	18,586	565,981	1,154,530	92,362
2000			1,458	196,541	203,967	94,050	129,190	693,152	1,318,358	105,469
2001				30,365	238,552	221,045	249,892	850,044	1,589,898	127,192
2002		1,388	18,412	801,239	640,857	142,931	168,902	663,879	2,437,608	195,009
2003		731	2,935	43,379	75,561	430,052	272,897	748,765	1,574,320	125,946
2004				33,777	181,252	438,173	141,972	1,006,814	1,801,988	144,159
2005				28,351	378,541	493,595	334,521	1,405,967	2,640,975	211,278
2006		875	12,357	185,859	510,264	539,936	136,306	847,269	2,232,866	178,629
2007				110,566	416,352	436,797	225,985	758,684	1,948,384	155,871
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	0	5,873	280,000	2,503,237	1,533,006	543,618	90,237	799,428	5,755,399	460,432
2013	0	407	2,207	220,305	654,030	673,377	198,722	1,541,541	3,290,589	263,247
2014	0	41	273	114,305	383,421	635,152	285,770	1,648,723	3,067,685	245,415
2015	0	0	774	25,835	334,510	571,433	168,338	1,094,215	2,195,105	175,608