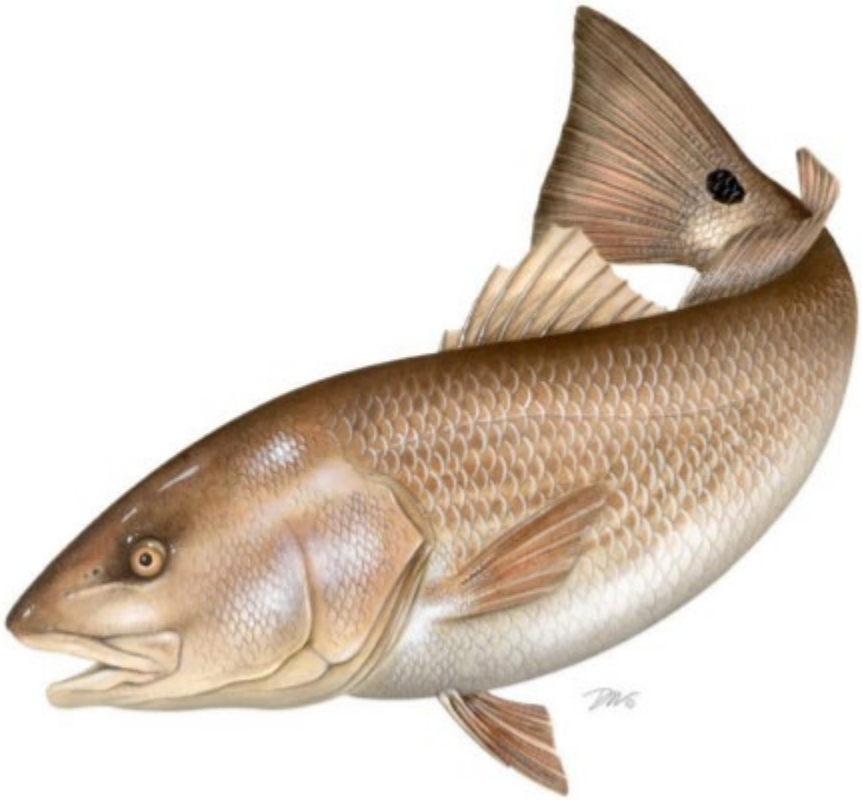
ATLANTIC STATES MARINE FISHERIES COMMISSION

REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR RED DRUM
(Sciaenops ocellatus)

2010 FISHING YEAR



Prepared by the Plan Review Team

Approved by the South Atlantic Management Board
Approved August 2011

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I. Status of the Fishery Management Plan

Date of FMP Approval:	Original FMP – October 1984
Amendments:	Amendment 1 – October 1991 Amendment 2 – June 2002
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, Stock Enhancement Subcommittee; 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 Florida to Maryland. In 1988, the Interstate Fisheries Management Program (ISFMP) Policy Board requested that all states from Florida to Maine implement the plan's recommended management regulations to prevent development of northern markets for southern fish. All Atlantic coastal states Florida through New Jersey are now required to implement the provisions of the FMP, while New York through Maine (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 an 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 provide the target level of at least 30% escapement.

Consequently, the ASMFC updated the interstate FMP in 1991 with Amendment 1, 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 spawning stock biomass per recruit (SSBR) level at or above 30% of the level that would result if fishing mortality were zero. However, the lack of adequate information on the status of the adult stock 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, because of a lack of data on the status of adult red drum along the Atlantic coast, a phase-in approach with a 10% SSBR goal was adopted. States were recommended to implement or maintain harvest controls necessary to attain the goal. All states in the management unit north of Florida modified regulations and/or commercial quotas to reach this goal. Florida maintained its strict regulations that were thought to exceed the target escapement rate. The harvest regulations remained unchanged from 1992-1998, except in Florida where regulations were relaxed somewhat by opening the previously closed March-May period.

As hoped, these management measures led to increased escapement rates of juvenile red drum. Escapement estimates for a northern region from New Jersey through North Carolina (18%) and a southern region from South Carolina through the east coast of Florida (17%) were estimated to be above the 10% phase-in goal, yet still below the ultimate goal of 30% (Vaughan and Carmichael 2000). These regions were based on stock identity, mark-recapture experiments, life history, habitat preferences, human dimensions of the fisheries, and management goals. North Carolina, South Carolina, and Georgia implemented substantive changes to their regulations from 1998-2001 that further restricted the harvest of red drum.

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 threshold overfishing as 10% sSPR. A year later, the Council also recommended that management authority for red drum be transferred to the states through the Commission's Interstate Fishery Management Program (ISFMP) process. One reason the Council recommended this transfer to the ASMFC was 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 management transfer would necessitate the development of an amendment to the interstate FMP, in order to include the provisions of the Atlantic Coastal Fisheries Cooperative Management Act.

The 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.
- To 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 with the division occurring 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.

All states in the management area were required (rather than recommended as in previous versions of the plan) to implement appropriate recreational bag and size limit combinations needed to attain the target sSPR. Amendment 2 also required all states to maintain their current, or implement more restrictive, commercial fishery regulations. The states implemented the

provisions of Amendment 2 by January 1, 2003. See Table 1 for state commercial and recreational regulations in 2010.

Following the approval of Amendment 2 in 2002, the process was begun to transfer management authority, including an Environmental Assessment and public comment period. The final rule for the transfer of management authority became effective November 5, 2008. It repeals the federal Atlantic Coast Red Drum Fishery Management Plan and transfers the management authority of Atlantic red drum in the exclusive economic zone from the South Atlantic Fishery Management Council, in cooperation with the Mid-Atlantic Fishery Management Council, under the Magnuson-Stevens Conservation and Management Act to the Atlantic States Marine Fisheries Commission under the Atlantic Coastal Fisheries Cooperative Management Act, as requested by the Councils and the Commission.

II. Status of the Stocks

At present, only overfishing status can be determined for red drum (SAFMC 2009). The threshold (below which the stock is experiencing overfishing) and the target fishing mortality rates are those that achieve 30 % and 40 % sSPR, respectively. The three-year average sSPR is compared to these reference points. The stock is assessed by region.

Northern Region

Recruitment (age 1 abundance) has fluctuated widely and without apparent trend since 1989 (Figure 1). Abundance of age 1 – 3 red drum increased during 1990 – 2000 after which it fluctuated widely (Figure 2). The initial increase in abundance of these age groups can be explained by the reduction in exploitation rates in the early part of the time series with relative stability since then (Figure 3).

The trend in the three-year average sSPR indicates low sSPR at the start of 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 with the exception of one year (2002) has been at or above the target ($F_{40\%}$) since 1996. Fishing pressure and mortality appear to be stable and holding near the target fishing mortality. There is a high probability that the stock is not subject to overfishing. The average sSPR is also likely above the target benchmark. Fishing mortality could be allowed to increase relative to the overfishing threshold, but the level of risk associated with any increase should be considered and reviewed in conjunction with Addendum II's goal of maintaining a 40% SPR.

Southern Region

The relative trend in recruitment (age 1 abundance) has fluctuated without apparent trend since 1989 (Figure 1). The relative trend in 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 in the early part of the time series. There appears to have been a slight increase in exploitation rates since 1990 (Figure 3). This is reflected in the long-term decline in the relative trend of the three-year average sSPR since 1990 (Figure 4).

There is a high level of uncertainty 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 likely 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.

III. Status of the Fishery

Total red drum landings from New Jersey through the east coast of Florida in 2010 are estimated at 2.1 million pounds (Tables 2 and 3, Figure 5). This represents a 36% increase from the total harvest in 2009 (which declined 15% from 2008), and nearly a 26.5% increase from the previous ten-year (2000-2009) average. The commercial and recreational fisheries harvested 11 and 89% of the total, respectively. In 2010, 71% of the total landings came from the South Atlantic region, where the fishery is almost exclusively recreational, and 29% from the Mid-Atlantic region, which was approximately 1/3 commercial and 2/3 recreational (Figure 6).

Few commercial landings of red drum have been recorded in states north of Maryland (Table 2). Coastwide commercial landings show no particular temporal trends, ranging from approximately 55,000 to 440,000 pounds annually over the last 50 years (Figure 5). The greatest harvest was taken in 1980, and the lowest in 2004. In 2010, coastwide commercial harvest increased from 202,908 pounds in 2009 to 235,174 pounds, the majority (99%) from North Carolina (Table 2). Historically, the major commercial harvesters were North Carolina and Florida. However, commercial harvest has been prohibited in Florida under state regulation since January 1988. South Carolina also banned the commercial harvest or sale of native caught red drum beginning in 1987.

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. The red drum fishing year in North Carolina extends from September 1 to August 31 (all other states operate on a calendar year). In 2008, the Management Board approved using the fishing year to monitor the cap. During the 2009/2010 fishing year, North Carolina had an overage of 25,858 lbs. The 2010/2011 fishing cap is set at 224,142 lbs to correct for the overage.

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 530,000 fish (800,000 to 1.7 million pounds; Figures 5 and 7). Recreational harvest increased from 400,340 fish (1.3 million pounds) in 2009 to 728,509 fish (1.9 million pounds) in 2010. The 2010 harvest represents a 45% increase in numbers (40% increase in pounds) from the previous ten year (2000-2009) average. Georgia anglers landed the largest share of the coastwide recreational harvest in numbers (39%), followed by South Carolina (24%), Florida (22%), North Carolina (11%), and Virginia (3%). Anglers release far more of the red drum they catch than they keep; the percent of the catch released is generally over 80% during the last decade (Figure 7). Recreational releases show an increasing trend over the time series. Although the proportion of releases declined in 2010 to 80% (versus 85% in 2009), the overall number of fish released increased to an estimated 3.6 million fish, a 28% increase from 2009 (Figure 3, Table 5). It is estimated that 8% of released fish die as a result of being caught, resulting in an estimated

233,601 dead discarded fish in 2010 (Table 5). Recreational removals from the fishery are thus estimated to be 962,110 fish in 2010 (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+. The Stock Assessment Subcommittee decided to move away from virtual population analyses used in past assessments primarily because of the assumption inherent in these models 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 available for the years 1989 through 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 static spawning potential ratio (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.

V. Status of Research and Monitoring

There are no monitoring or research programs required annually 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 2011 reports.

Fishery Dependent Monitoring

- Maryland DNR – Samples commercial pound nets once every other week in the Chesapeake Bay from late spring through summer (2010: 0 fish). Dealer sampling of red drum initiated in 2009 (2010: 0 fish). Monitors the number of sportfishing citations issued for large red drum releases (2010: 26 entries). Monitors licensed charter boat captain logbooks for red drum captures (2010: 65 harvested, 51 released).
- Virginia MRC – Samples commercially landed red drum through its biological monitoring program (2010: 31 fish). Coordinates volunteer angler tagging of red drum via the Virginia Game Fish Tagging Program that began in 1995 (2010: 1,885 fish tagged, 274 reported recaptures). Collects carcasses through the Marine Sportfish Collection Project (2010: 30 fish).
- North Carolina DMF – Samples commercially-landed red drum through its biological monitoring program (2010: 1,134 fish, primarily gill net).
- South Carolina DNR – Conducts a state finfish survey for catch, effort, and length data (2010: targeted trips=427, catch n=1,901). Monitors charterboat trip reports for catch and effort data (2010: release rate=92.6%). Runs a cooperative public tagging program to study movement patterns, growth rates, and release-mortality rates (2010: 349 fish tagged, 63 recaptured). Collects data from a carcass collection program.
- Georgia CRD – Collects age, length, and gender data through the Marine Sportfish Carcass Recovery Project (2010: 1,333 red drum).
- Florida FWC – Conducts a random survey of licensed anglers on the sizes of kept and released fish (2002-2009: 101 lengths collected from 139 trips).
- NMFS – Collects recreational catch, harvest, release, and effort data, and length measurements via the Marine Recreational Fisheries Statistics Survey.

Fishery Independent Monitoring

- North Carolina DMF - Conducts a seine survey to produce an age-0 abundance index (2010: n=561; CPUE increase of over 2-fold to 4.7 but still lower than long-term mean). Conducts a gill net survey in Pamlico Sound to characterize size and age distribution, produce an abundance index, improve bycatch estimates, and study habitat usage (2010: n= 639; CPUE decrease to 2.39); DMF conducts a longline survey to produce an adult index of abundance and tag fish (2010: n=388; CPUE: slight decrease to 5.53 fish per set).
- South Carolina DNR – Conducts an estuarine trammel net survey for subadults (CPUE: slight increase since 2007). Conducts an electrofishing survey in low salinity estuarine areas for juveniles and sub-adults (CPUE: general increase since 2007). Conducts an inshore bottom longline survey for biological data and an abundance index of adults (2010 CPUE: decrease to 0.97 fish per set). Tags fish caught in each of these surveys (42,944 fish from trammel nets since 1991 (2010 n = 2,704); 5,268 fish from electrofishing since 2001 (2010 n = 555); 3,391 fish from longline since 1994 (2010 n = 283)).
- Georgia CRD – Conducts an estuarine trammel net survey for subadult biological data and an abundance index (2010: n=150; CPUE increase in Wassaw estuary to 1.18 and increase

in Altamaha river delta to 2.08). Conducts an estuarine gill net survey for young-of-year biological data and an abundance index (2010: n=216; CPUE increase in Wassaw estuary to 4.32 and increase in Altamaha river delta to 3.17). Conducts a survey to determine the age structure of the adult stock on five year intervals (next sampling in 2012). Conducts a bottom longline survey for an adult biological data and an abundance index (2010: n=25; CPUE increase to 0.31 fish per set).

- Florida FWC-FWRI – Conducts two seine surveys in the northern Indian River Lagoon (IRL) and the lower reaches of the St. Johns River (SJR) for young-of-the-year (< 40 mm SL) abundance indices (CPUE: decrease in 2010 in IRL; relatively constant since 2007 although large decrease in 2010 in SJR). FWC-FWRI conducts a haul seine survey in these areas and the southern IRL for a subadult index (CPUE: increasing trend since 2004 in the northern and southern IRL before dropping to lower levels in 2009 and 2010; fluctuating with an increasing trend since 2004 in SJR). Age and length data are collected during surveys (2010: 640 lengths from 183 meter haul seines, 465 otoliths from sampled fish).

Ageing Workshop

A Red Drum Ageing Workshop was held in October 2008. The Red Drum Technical Committee indicated the need for such as workshop prior to the 2009 stock assessment to standardize the otolith sectioning and ageing procedures and the current age dataset. Representatives from Virginia, North Carolina, South Carolina, Georgia, Florida, the National Marine Fisheries Service, and the Gulf Council participated in the workshop. In addition to improving the age dataset for the ongoing assessment, the resulting standardized ageing procedures will be published in an ASMFC reference document by the end of 2011 for future users.

VI. Status of Management Measures and Issues

Fishery Management Plan

Amendment 2 was fully implemented by January 1, 2003 and provided 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 for successfully implementing their red drum regulations. No additional amendments or addenda are under development.

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 the two states' contribution to the fishery by comparing each state's two-year average of combined commercial and recreational landings to that of the management unit. New Jersey and Delaware harvested 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 Management Board.

Changes to State Regulations
North Carolina's commercial season and trip limit were modified through the proclamation authority of the NCDMF Director in response to high landings during the 2009/2010 fishing year. The fishery was briefly closed April 13 to April 30, 2010, and the 2010/2011 cap was reduced to 224,142 to account for the 25,858 lb overage in 2009/2010. Otherwise there were no changes to state regulations in 2010.

No state indicated any planned regulatory changes in 2011, although Florida will be updating its regional assessment by late summer 2011, which will be used to determine the regional stock status relative to both Florida's and ASMFC's management targets.

VII. Implementation of FMP Compliance Requirements for 2010

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.
- Based on the stock status, relative to the target
-

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. This should include significant efforts to determine the size and age structure of regulatory discards of live red drum. (H)
- States should maintain annual age-length keys. 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. (M)
- 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. (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

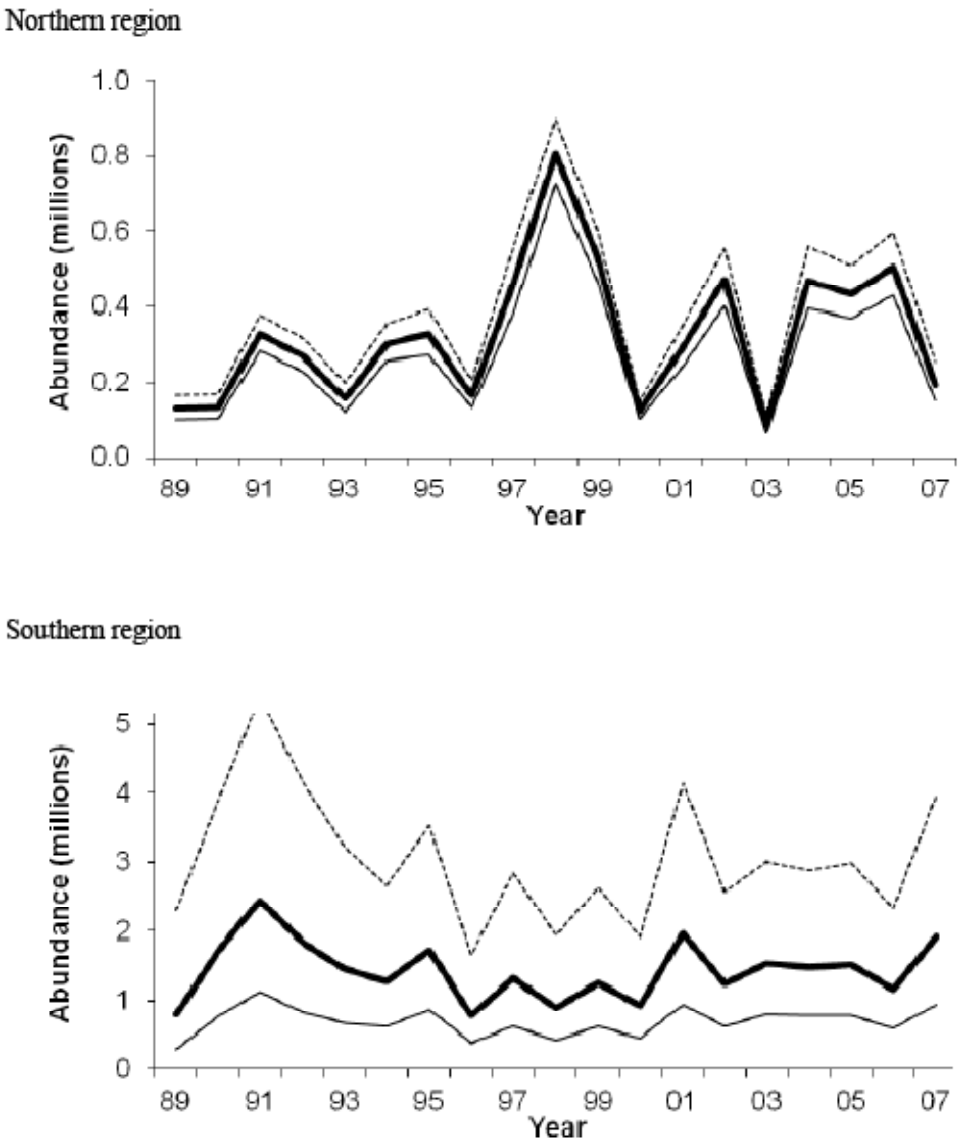


Figure 1. Estimated recruitment (age-1 abundance, heavy solid line) and ± 1.96 standard errors for the northern and southern regions during 1989-2007 (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.

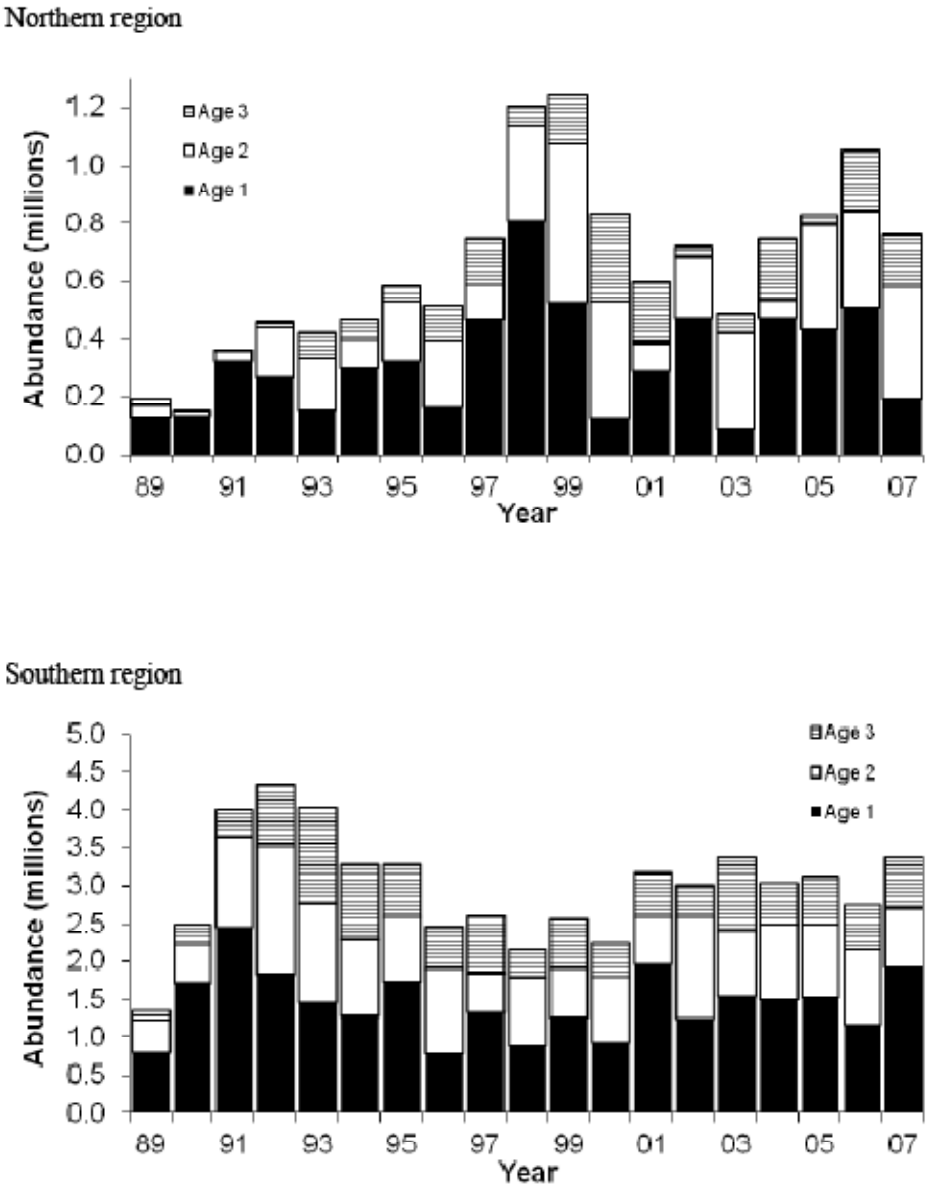


Figure 2. Estimates of abundance of red drum ages 1-3 in the northern and southern regions during 1989-2007 (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.

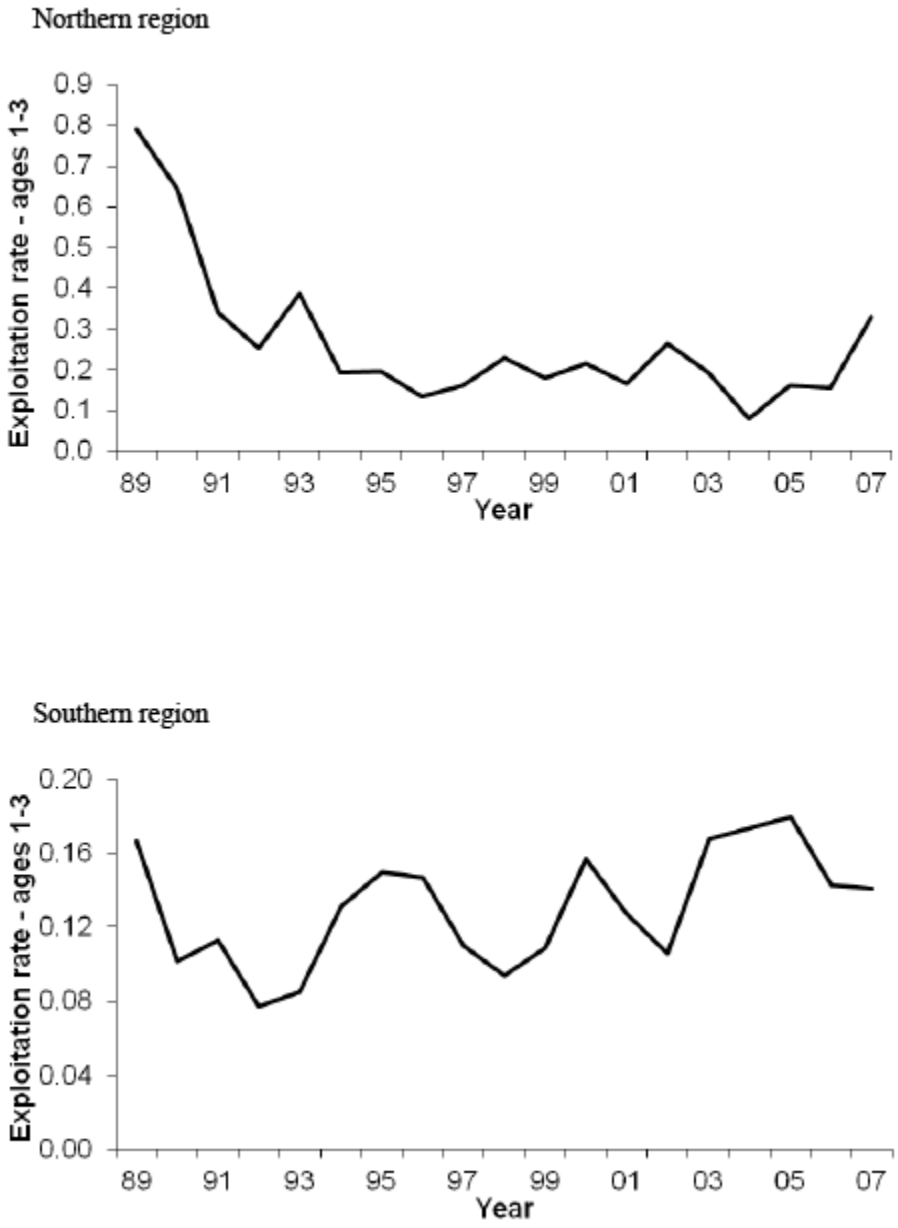
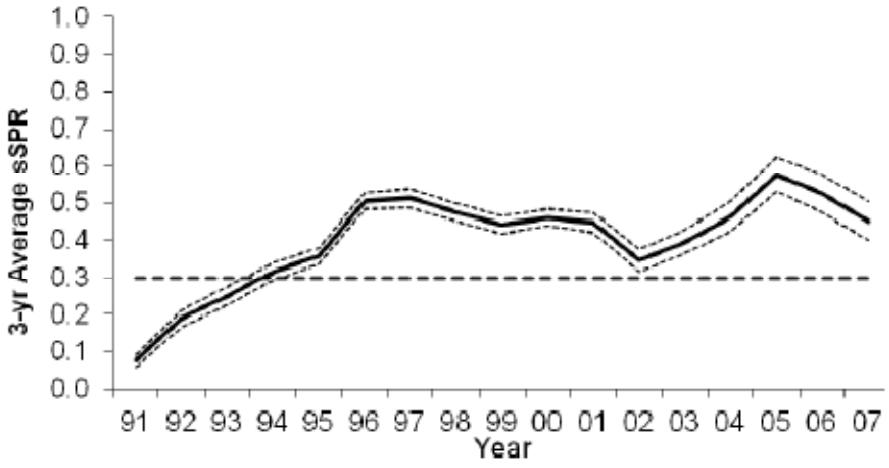


Figure 3. Estimated annual exploitation rate for red drum ages 1-3 in the northern and southern regions during 1989-2007 (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.

Northern region



Southern region

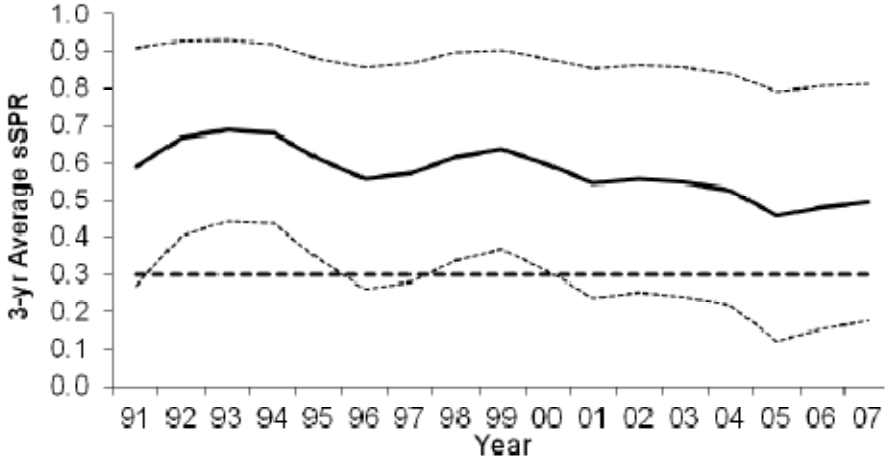


Figure 4. Northern and southern region estimates of three-year average static spawning potential ratio with ± 1.96 standard errors (dashed lines) during 1991-2007. Three-year averages include current and previous two year's sSPR estimates. The heavy dashed line shows the 30% overfishing threshold (Source: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

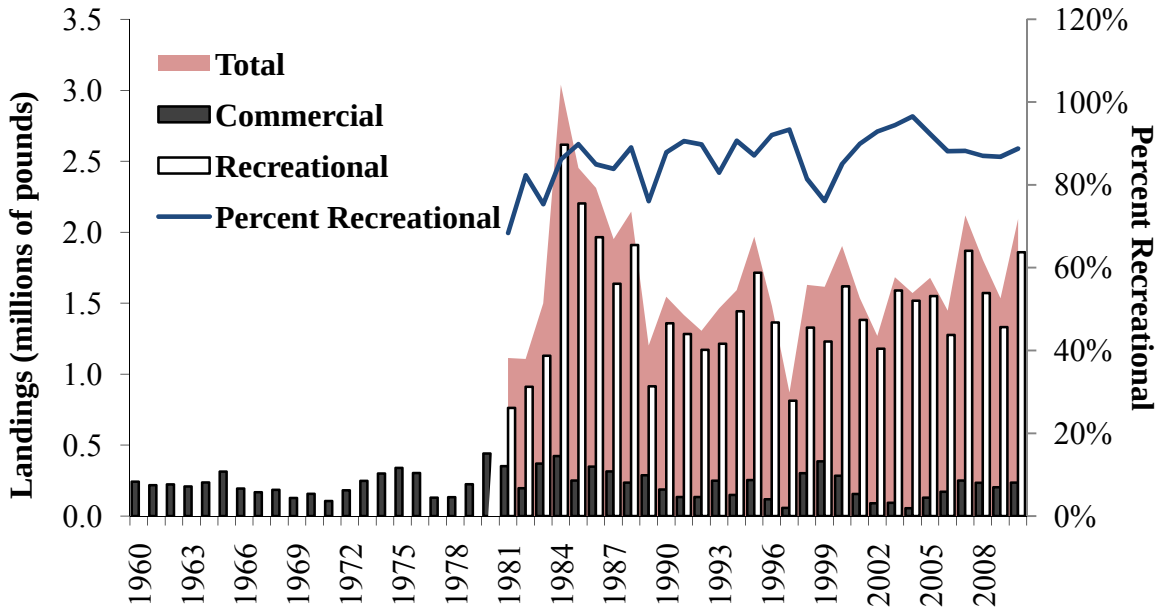


Figure 5. Commercial and recreational landings (pounds) of red drum. Recreational data not available prior to 1981. See Tables 2 and 3 for values and data sources.

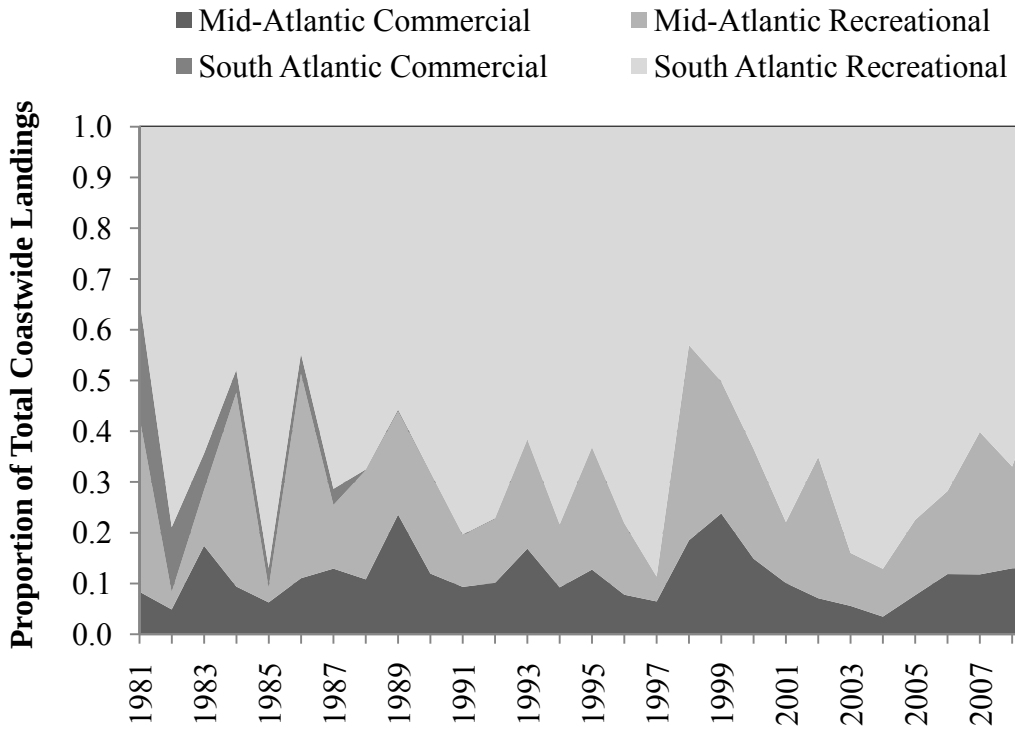


Figure 6. Proportion of regional, sector-specific landings to total coastwide landings (pounds). See Tables 2 and 3 for data sources.

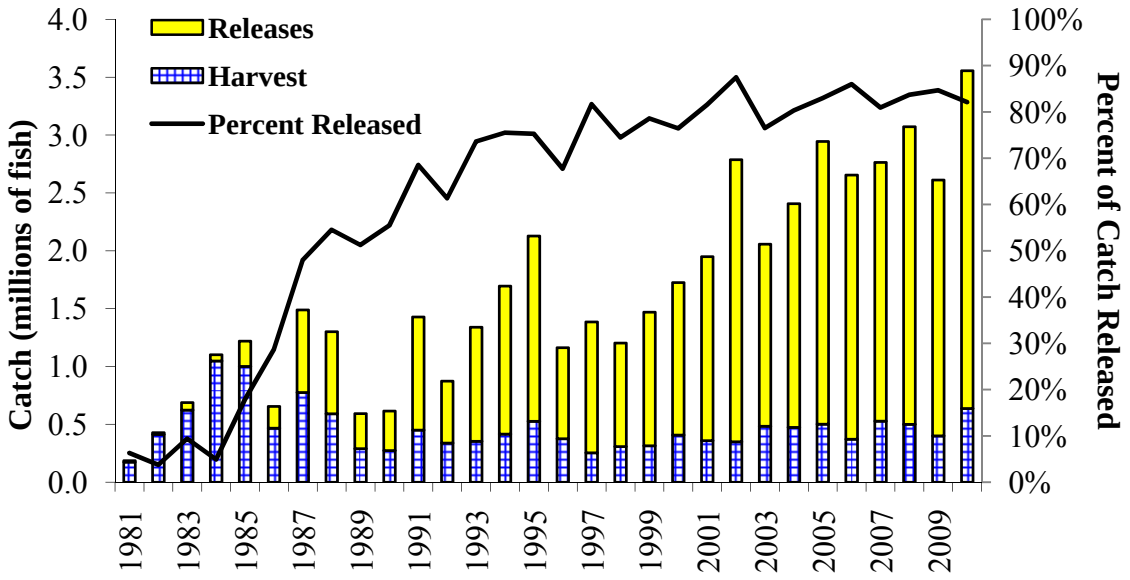


Figure 7. Recreational catch (harvest and alive releases) of red drum (numbers) and the proportion of catch that is released. See Tables 4 and 5 for values and data sources.

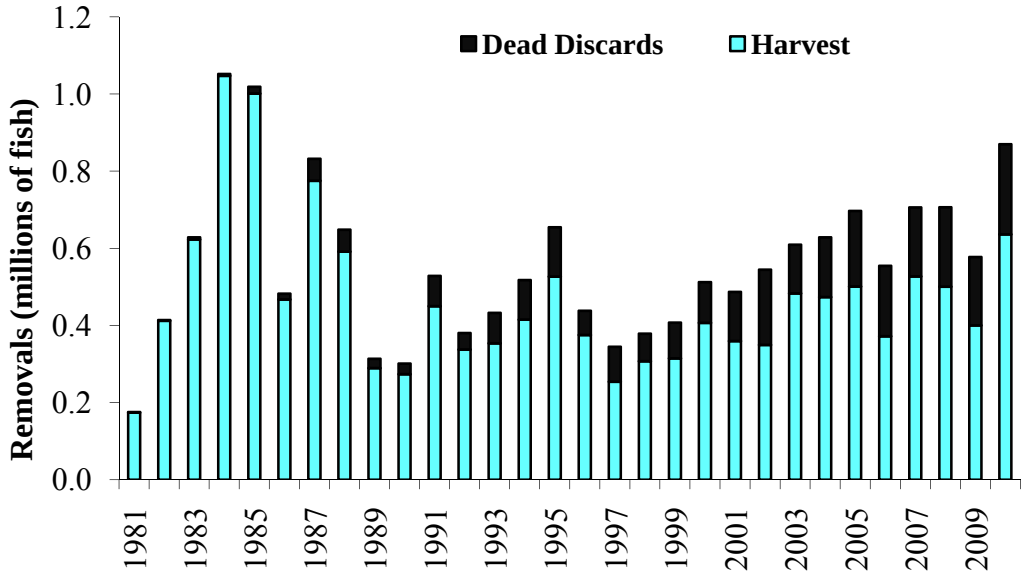


Figure 8. Recreational removals (harvest and dead discards) of red drum (numbers). Dead discards are estimated by applying an 8% discard mortality rate to alive releases. See Tables 4 & 5 for values and data sources.

XI. Tables

Table 1. Red drum regulations for 2010. 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
ME	None	None
NH	14" - 27", 5 fish	14" - 27", 5 fish
MA	14" min	14" min
RI	None	None
CT	≤ 27"	≤ 27"
NY	≤ 27"	≤ 27"
PA	None	None
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" - 26", 3 fish
NC	18" - 27", 1 fish	18" - 27"; 250,000 lb harvest cap with overage payback; 4 and 7 fish daily trip limits during the year (1 fish for hook and line); closed December 1, 2008 – April 31, 2009; red drum must be less than 50% of catch (lbs, excluding menhaden); 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 November - March.	Gamefish Only
GA	14" - 23", 5 fish	14" - 23", 5 fish
FL	18" - 27", 1 fish	Sale of native fish prohibited

Table 2. Commercial landings (pounds) of red drum by state, 1981-2010. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD, 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	310	7,361	81,370		*		90,202
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	243,227		*		249,747
2008			40	69	4,585	229,809		*		234,503
2009	129		12	157	8,314	194,296		*		201,908
2010			19	22	3,373	231,760		*		235,174

* 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, 1981-2010. (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	155,213	182,226	103,830	170,572	551,128	1,178,983
2003				57,214	118,808	449,399	234,865	729,445	1,589,731
2004				33,106	115,056	402,725	288,708	677,736	1,517,331
2005				7,231	242,078	314,184	194,556	791,709	1,549,758
2006		1,466		18,027	217,464	231,238	162,982	644,920	1,276,097
2007				276,316	318,157	249,137	191,549	833,817	1,868,976
2008				100,274	261,968	248,172	267,431	693,016	1,570,861
2009				213,163	358,184	210,557	151,396	398,208	1,331,508
2010				59,282	314,724	412,889	402,492	669,001	1,858,388

Table 4. Recreational landings (numbers) of red drum by state, 1981-2010. (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				5,190	30,315	134,001	140,075	164,170	473,751
2005				2,624	53,268	141,023	107,970	196,235	501,120
2006		901		15,058	51,522	72,488	82,269	149,756	371,994
2007				70,825	65,353	88,221	103,385	199,159	526,943
2008				27,291	56,733	109,332	142,933	164,265	500,554
2009				63,513	73,446	82,855	82,294	98,232	400,340
2010				15,911	70,071	154,036	253,463	142,836	636,317

Table 5. Recreational alive releases and dead discards (numbers) of red drum by state, 1981-2010. 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		86		33,594	194,627	401,234	165,802	1,137,541	1,932,884	154,631
2005				30,968	319,322	491,526	330,581	1,271,041	2,443,438	195,475
2006		1,007	11,282	159,178	461,810	607,379	148,120	893,781	2,282,557	182,605
2007				166,223	444,739	537,007	191,737	897,092	2,236,798	178,944
2008		236	258	237,940	621,609	524,234	365,257	821,996	2,571,530	205,722
2009			7851	224,234	410,202	684,156	237,765	647,583	2,211,791	176,943
2010			1814	42,584	548,411	641,916	532,890	1,152,396	2,920,011	233,601