Introduction

This document presents a summary of the 2017 stock assessments for red drum. These assessments were initially conducted through the Southeast Data, Assessment and Review (SEDAR) process using Stock Synthesis (SS3) models. However, after further review by the Atlantic States Marine Fisheries Commission's Red Drum Technical Committee and Stock Assessment Subcommittee (TC/SAS), the TC/SAS expressed concern over certain assumptions made in the SS3 model. The Committee recommended reverting to the Statistical Catch-at-Age (SCA) model used in the 2009 benchmark assessment as the base model for these new assessments, with the inclusion of updated and additional data collected since the 2009 assessment.

The revised assessments were peer-reviewed by an independent panel of scientific experts through the Commission's peer review process. The assessment represents the latest and best information on the status of Atlantic coast red drum stocks and provide the scientific basis for continued management of the species. The Commission's South Atlantic State/Federal Fisheries Management Board, which oversees red drum management, accepted the assessments for management use in February 2017.

Management Overview

Red drum are managed solely by the Atlantic States Marine Fisheries Commission through Amendment 2 to the Interstate Fishery Management Plan for Red Drum and Addendum I. The Amendment requires states to implement recreational creel and size limits to achieve the fishing mortality target, including a maximum size limit of 27 inches and maintain existing commercial regulations. A harvest moratorium and Presidential Executive Order prevents any harvest or sale of red drum from federal waters (3 – 200 miles from shore). Addendum I includes current information on red drum habitats needed for each life stage (egg, larval, juvenile, sub-adult and adult) and identifies habitats of concern which are especially important as spawning and nursery areas.

What Data Were Used?

The red drum stock assessments used both fishery-dependent and -independent data, including information on red drum biology and life history. Fishery-dependent data come from recreational and commercial fisheries, while fishery-independent data are collected through scientific research and surveys. Red drum are divided into two management areas or stocks along the Atlantic coast, a northern stock (from New Jersey to North Carolina) and a southern stock (from South Carolina to Florida). The stock units are based on differences in life history traits between the two stocks (such as growth rates and maximum observed ages) and information from genetic and tagging studies indicating red drum rarely move between the two regions. Separate assessments were performed for each stock.

Life History

While red drum on the Atlantic coast may be encountered from Massachusetts to Key West, Florida, catches from states north of New Jersey are negligible. Adult red drum spawn at night in the summer and fall in nearshore waters, and juveniles are most abundant in estuarine waters and inlets. Depending on the area, males mature between ages one and four at a size of 20 – 28 inches total length. Females mature between ages three and six at a size of 31 – 36 inches total length. Red drum may live to be 60 years old, reach 60 inches and more than 90 pounds in size. After they mature, they spend less time in estuaries and more time in ocean waters. It is thought fish older than age four spend most of their time in deep offshore waters, where they are less vulnerable to fishing pressure. As a result of this life history pattern and the regulations restricting the harvest of larger fish, there is very little information on the adult portion of the populations.
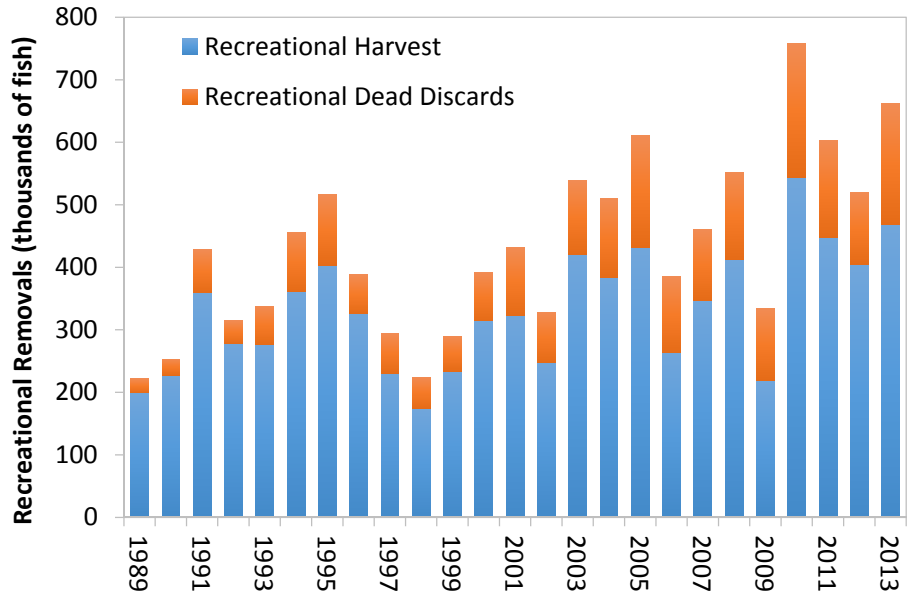
Commercial Data

Since 1988, there have been no commercial landings from the southern stock, as South Carolina and Florida enacted regulations preventing commercial harvest of red drum. Prior to 1988, commercial landings in the southern region mostly came from Florida's gillnet and hook and line fisheries.

In the northern stock, North Carolina accounts for more than 90% of landings in recent years, mostly from gillnets. Commercial removals (harvest plus dead discards) have fluctuated around an average of 63,638 fish per year and showed a large increase in 2013. North Carolina provided on-board observer data that were used to estimate the number of red drum that were discarded from the gillnet fishery; most fish were discarded dead, and the assessment assumed 5% of fish discarded alive died after release.

Biological samples were taken from commercial catch in Florida, North Carolina and Virginia. Fish were measured and weighed, and otoliths (the fish's ear bones) were collected to age them. Samples were used to

Red Drum Southern Stock Fishery Removals

Red Drum Northern Stock Fishery Removals
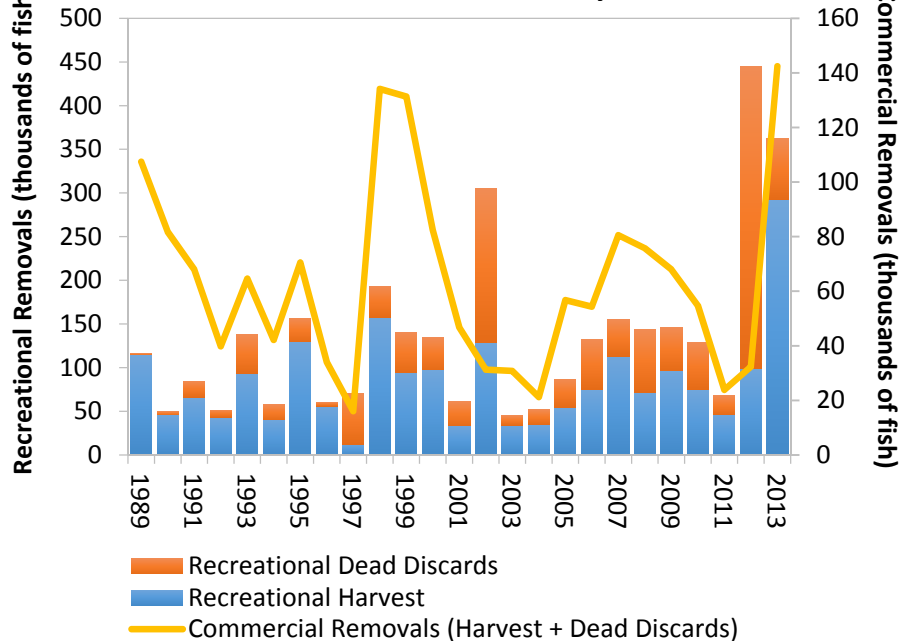
develop age-length keys that predict fish age based on length. Since Florida has not landed red drum commercially since 1988, annual age-length keys characterizing the commercial catch were developed using only data from North Carolina and Virginia, covering the time period from 1989 – 2013. Age-length keys were applied to length frequencies to estimate the number of fish of each age in the commercial catch (catch-at-age).

Recreational Data

Recreational catch information is currently collected by the Marine Recreational Information Program (MRIP). Recreational removals have shown similar fluctuations as those seen in the commercial fishery, but on a much larger scale (average number of recreational removals from 1989 – 2013 was 135,367 fish per year). Removals were also high in 2013 due to the largest recreational harvest in the time series. Most of the recreational harvest occurs in the southern stock, but recreational harvest in the northern stock is regularly two or more times the commercial harvest. The majority of recreational harvests from the northern and southern stocks come from North Carolina and Florida, respectively. Based on several studies of survival rates for fish caught by hook and line, the assessments assumed 8% of recreationally-caught fish released alive died after release.

In both the northern and southern stocks, anglers have released an increasingly large percentage of their catch alive, going from about 4% in 1982 to over 80% in recent years. Due to slot limit regulations, the majority of fish harvested by anglers are ages one to three. Thus, removals due to harvest only describe fish in this age range, but release mortality may apply to any age. In addition to catch information, the assessments also used fishing effort information from MRIP dockside surveys of anglers to calculate the yearly catch-per-unit-effort (CPUE). This annual CPUE was used as a fishery-dependent index to provide information on trends of relative abundance for fish ages one to three in each stock.

A red drum being captured for sampling as part of the Red Dum Longline Survey © Bryan Frazier, SC DNR

Fishery-independent Data

The red drum assessments used a number of different fishery-independent surveys that provide information on trends in relative abundance for different age classes. In the northern stock, the assessment used three fishery-independent surveys from North Carolina: a seine survey that catches young-of-year, a gillnet survey that catches ages one and two, and a longline survey that catches ages seven and older. In the southern stock, the assessment used eight fishery-independent surveys: a Florida small seine survey, a Georgia gill net survey, and a South Carolina stop net survey that catches age one fish; a South Carolina trammel net survey that catches fish up to age two; a

Florida haul seine survey that catches age two and three fish; and longline surveys from Georgia (1 mile sets) and South Carolina (1 mile and 1/3 mile sets) that catches adult red drum ages seven and older.
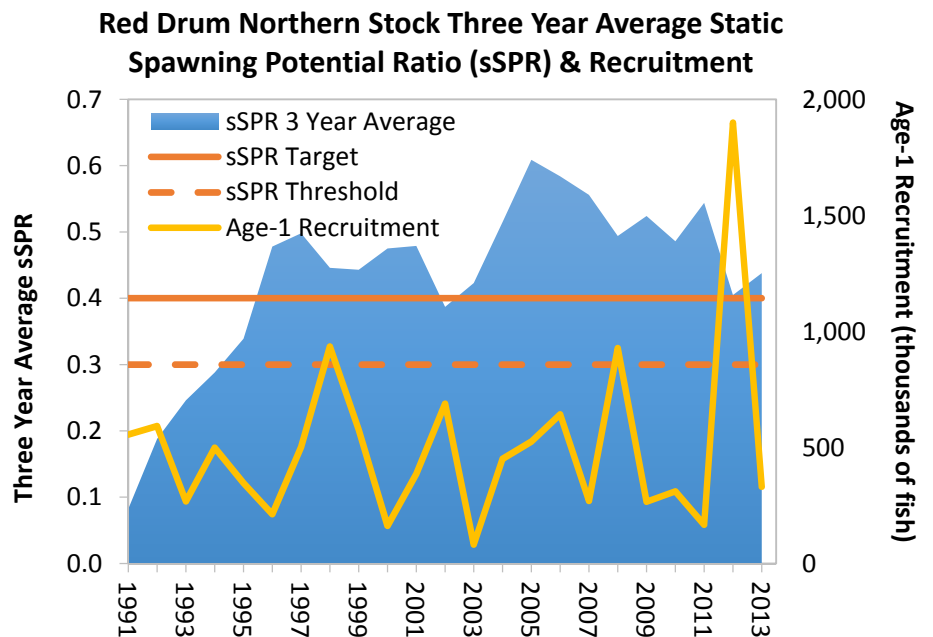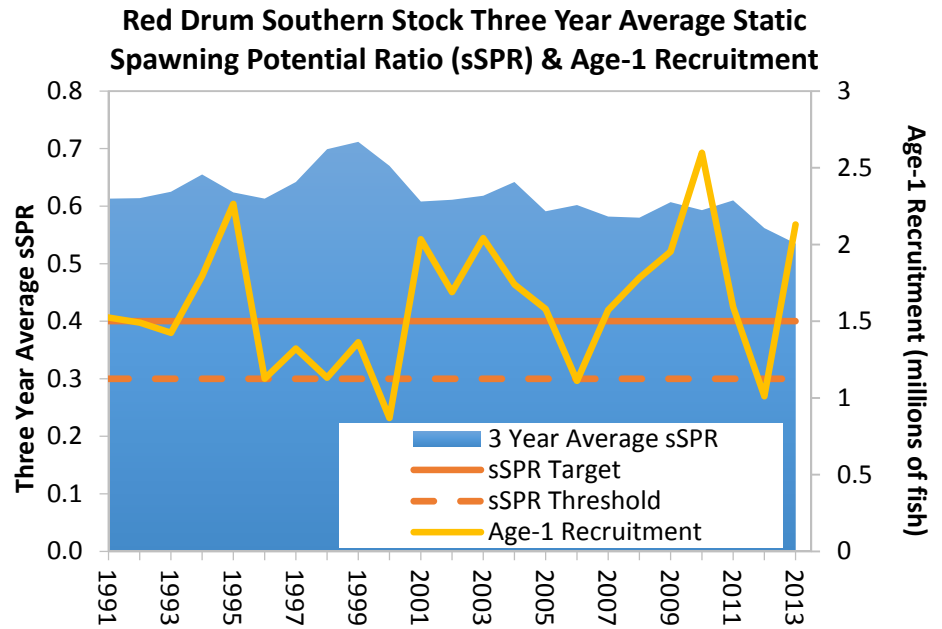
Tagging Data

In the southern stock, tag-recapture data from South Carolina were used to describe the age composition of fish released alive by anglers in South Carolina and Georgia. A previously published tagging study from North Carolina was used to estimate age composition for fish released alive by anglers in Florida, as the North Carolina study was conducted when regulations were similar to Florida's regulations

In the northern region, a 2008 study provided important information used in the assessment about fishing mortality and the age composition of the fish released alive by recreational anglers.

What Models Were Used?

An SCA model was used to assess the red drum stocks. The model combines the catch-at-age data from commercial and recreational fisheries with information from fishery-independent surveys and biological information such as growth rates and natural mortality rates to estimate the abundance and fishing mortality rates of each age class. Because of the limited data on adults, the model groups all fish ages seven and older into a single "plus group." The model, which estimates static spawning potential ratios (sSPR), determines if current fishing mortality rates will likely lead to sustainability over the long-term. For the purposes of these assessments, sSPR is a measure of spawning stock biomass survival when fished at the current year's fishing mortality rate relative to the spawning stock biomass survival if no fishing mortality was occurring. Due to high variability in red drum recruitment between years, a three-year average sSPR was used to determine the status of the stock.

Red Drum Southern Stock Three Year Average Static Spawning Potential Ratio (sSPR) & Age-1 Recruitment

Red Drum Northern Stock Three Year Average Static Spawning Potential Ratio (sSPR) & Recruitment

What is the Status of the Stock?

The assessments determined that overfishing was not occurring for either the northern or the southern stocks. The 2011 to 2013 three-year average sSPR for the northern and southern stocks was 43.8% and 53.5%, respectively, both above the overfishing threshold (30%) and the target (40%) sSPR.

Age-1 recruitment, or the number of fish spawned the previous fall, has shown high annual variability, but without much net increase or decrease since the early 1990s. Because there was so little information on the adult population (age four and older), the assessments could not determine the total abundance of the stocks or whether the stocks were overfished.

Data and Research Needs

More information on the abundance and age composition of the adult population (ages four and older) is critical to improving the red drum stock assessments. Several fishery-independent surveys have been developed since the last assessment. However, longer time series for the surveys are needed, most notably to improve abundance estimation for adult (ages four and older) red drum that are not susceptible to the fishery. Additionally, tagging data were very important to the northern assessment, and similar analyses by tagging programs covering the southern stock could prove beneficial.

Whom Do I Contact For More Information?

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Glossary

Age class: all of the individuals in a stock that were spawned or hatched in the same year. This is also known as the year class.

Catch-at-age: the number of fish of each age that are removed in a year by fishing activity.

Fishing mortality: the instantaneous rate at which fish are killed by fishing

Marine Recreational Information Program (MRIP): a national survey conducted by the National Marine Fisheries Service (NMFS), often in conjunction with state agencies, to collect information on the catch, effort, and length frequencies of marine recreational fisheries

Natural mortality: the instantaneous rate at which fish die because of natural causes (predation, disease, starvation, etc)

Otoliths: the inner ear bones of a fish. They form rings as they grow which can be counted to assign an age to the fish.

Recruitment: A measure of the weight or number of fish that enter a defined portion of the stock, such as the spawning stock or fishable stock.

Static spawning potential ratio (sSPR): the reproductive potential (the amount of eggs or biomass that a fish could produce over its lifetime) of a fished stock compared to the reproductive potential of an unfished stock.

Statistical catch-at-age (SCA) model: an age-structured stock assessment model that works forward in time to estimate population size and fishing mortality in each year. It does not assume that the catch-at-age is known without error.

References

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