



This is a review and discussion of the Fish and Wildlife Research Institute's (FWRI) 2012 *Status of Flounder Fishery Resources in Florida*. This report examined three species: southern flounder (*Paralichthys lethostigma*), Gulf flounder (*Paralichthys albigutta*), and summer flounder (*Paralichthys dentatus*). The Florida Fish and Wildlife Conservation Commission (FWC) is the primary managing agency for flounder in Florida. Flounder is both a commercial and a recreational fishery in Florida and is targeted mainly for food.

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## Distribution and Biology

- Common statewide
- Common in nearshore and estuarine waters
- Three primary species with different ranges
  - Gulf, southern, and summer flounder
- Life span:
  - Gulf females: 7 years, males: 11 years
  - Southern females: 7 years, males: 3 years
- Maximum growth:
  - Gulf females: 22 inches, males: 14 inches
  - Southern females: 27 inches, males: <27 inches
- Eat shrimp, fish, and crabs



Flounder are common in nearshore and estuarine waters along the Atlantic coast and in the Gulf of Mexico, and can be found offshore during spawning which occurs in winter. The three primary species have different ranges throughout Florida. Gulf flounder is the only species to range along the entire Florida coast, and is the most commonly caught flounder on the Gulf coast. Southern flounder is the most commonly caught species on the Atlantic coast, and is found north of the Loxahatchee River on the Atlantic coast and north of the Caloosahatchee River on the Gulf coast. Summer flounder, found only in northeast Florida, is only a minor component of the flounder landings. (A fourth species, fringed flounder (*Etropus crossotus*), is also managed by FWC, but cannot be legally harvested because it does not grow to the minimum size limit of 12 inches for flounder. It was not included in the update.)

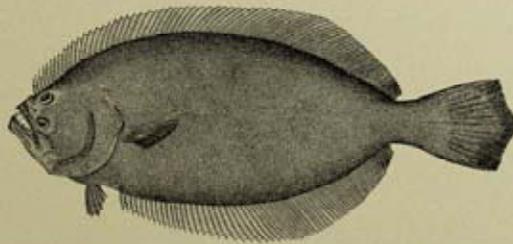
Because summer flounder are only a minor component of the flounder landings in Florida, the remainder of this review will focus on gulf and southern flounder. Female gulf flounder can live up to 7 years and reach 22 inches while males can live to be 11 years old and reach 14 inches. Female southern flounder can live up to 7 years and reach 27 inches while few males live to ages greater than 3 years old and attain smaller sizes than females. Both gulf and southern flounder eat mostly fish, shrimp and crabs.

Photo by Carol Cox

## Current Flounder Regulations

### Statewide

- **Allowable gear:** Spear, gig, hook and line, seine, cast net
- **Minimum size limit:** 12"
- **Recreational daily bag limit:** 10 per harvester per day
- **SPL and RS** required for commercial harvest
- **Commercial daily limit:** None
  - **Incidental bycatch possession limit:** 50 lbs per trip



The FWC regulates four species of Flounder: gulf, southern, summer, and fringed flounders.

The current flounder regulations were established in 1996. Flounder can be harvested with spears, gigs, hook and line, seines, and cast nets. The minimum size limit is 12 inches and recreational harvesters have an aggregate bag limit of ten flounders per person per day. Commercial harvesters with a saltwater products license and a restricted species endorsement do not have a daily limit when fishing with the allowable gears. Commercial fishermen using gears other than those authorized to harvest flounder may land up to 50 lbs of flounder per trip as incidental bycatch. The allowable gears, size limit and daily bag limit apply to all four species statewide.

## 2012 Flounder Fishery Status Update\*

### Update includes

- Biological characteristics
- Fisheries descriptions
- Indices of abundance
- Modeling approaches
  - Models used:
    - Equilibrium spawner-per-recruit analysis
    - Catch-based maximum sustainable yield (MSY) analysis
    - Non-equilibrium surplus production model
  - Landings data used:
    - Commercial landings 1950-2011
    - Recreational landings 1982-2010
- Research recommendations



\* Completed by FWRI staff

In August 2012, FWRI staff completed a fishery update for Florida's flounder stocks. The update included species-specific data and analyses for the two more commonly caught species (gulf and southern flounder).

The update report provides 1) a review of the biological characteristics of gulf, southern, and summer flounders; 2) descriptions of the commercial and recreational fisheries; 3) independent indices of abundance for juveniles and adults; 4) applied modeling approaches to assess the status of the gulf and southern flounder stocks, given available data; and 5) research recommendations.

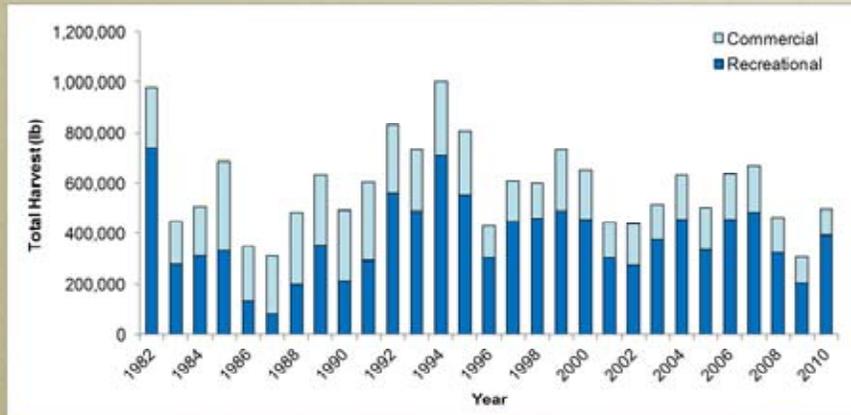
FWRI staff conducted preliminary analyses of the status of the stocks using three assessment models: 1) an equilibrium spawner per recruit analysis; 2) catch-based maximum sustainable yield (MSY) analysis; and 3) non-equilibrium surplus production model. These models are explained in the back of this presentation, but will not be presented unless requested.

The landings data that was used in the models came from both the commercial and recreational fisheries. The commercial fishery included data from 1950 to 2011 and the recreational fishery included data from 1982 to 2010.

This report does not provide a full assessment of the flounder stocks due to the limited data available on the species composition of the catch and the life history traits of various flounders. The research recommendations in the report provides a list of the data needed to conduct a robust stock assessment for Florida flounders.

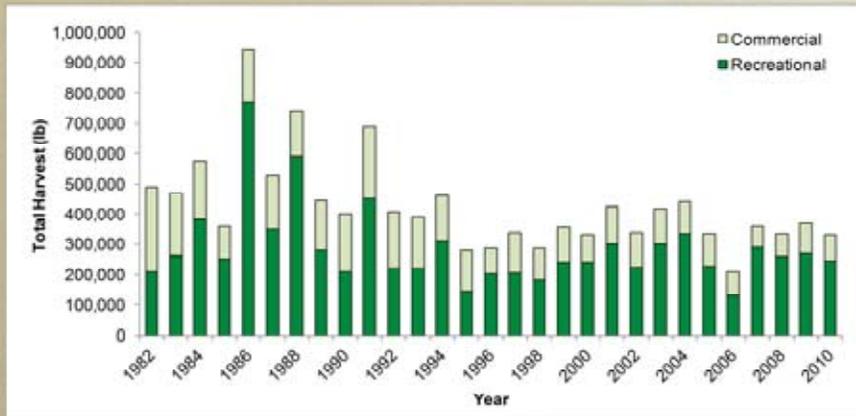
Photo by Carol Cox

## Total Harvest – Atlantic Coast



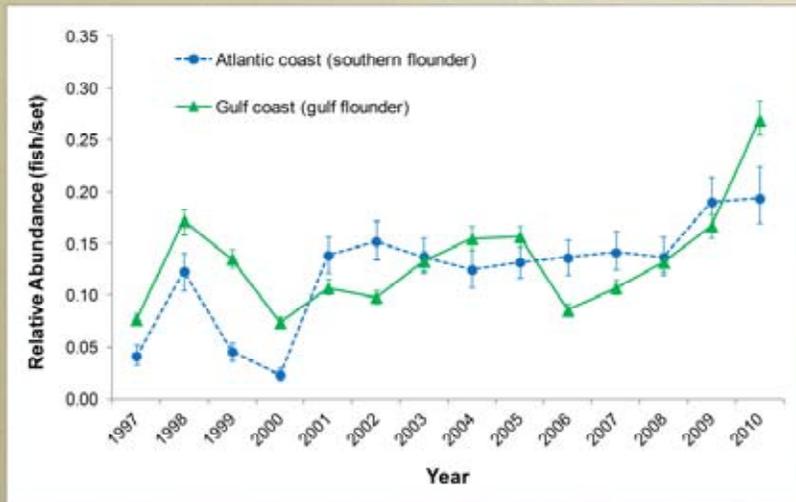
The graph above displays the recreational and commercial harvest for all species of flounder on the Atlantic coast (primarily southern flounder). Landings have been variable, but stable, since the implementation of the Net Limitation Amendment in 1995 and the flounder regulations in 1996.

## Total Harvest – Gulf Coast



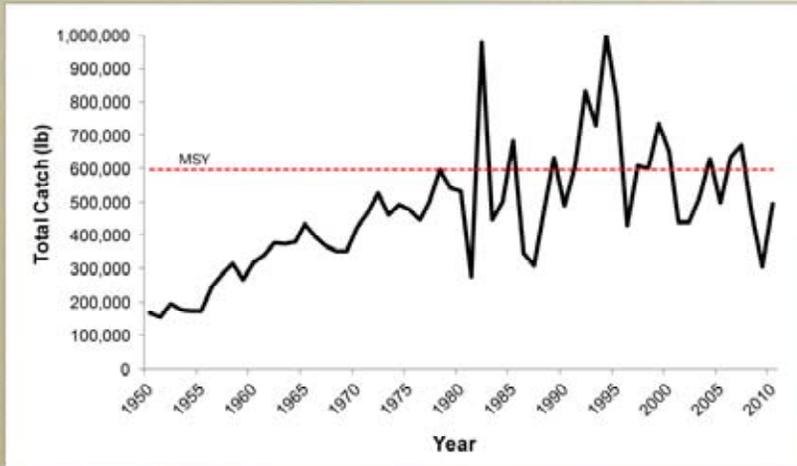
The graph above displays the recreational and commercial harvest for all species of flounder on the Gulf coast (primarily Gulf flounder). Total flounder landings on the Gulf coast have also been stable in recent years, and have remained lower than they were in the years prior to the implementation of the 1995 Net Limitation Amendment and the 1996 flounder regulations.

## Flounder Abundance Indices



Indices of abundance were developed for gulf and southern flounder based on FWRI's fisheries independent research conducted in major bays and estuaries around the state. Very few adult gulf flounder were caught on the Atlantic coast during these surveys, and very few southern flounder were caught on the Gulf coast. Therefore, the graph above depicts the relative abundance of southern flounder on the Atlantic coast, and gulf flounder on the Gulf coast. Relative abundance as shown on the vertical axis represents the average number of adult flounder caught each time the seine was deployed during times of peak flounder abundance. The data suggests the flounder stocks are either stable or improving on both coasts.

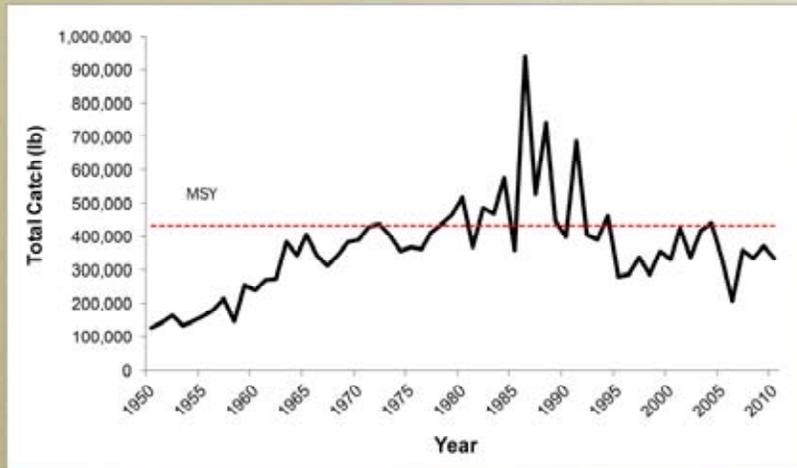
## Model Results – Atlantic Coast



The graph above displays results for the maximum sustainable yield (MSY) analysis for all flounder species on the Atlantic coast. MSY is the largest average catch that can continuously be taken from a stock without negatively affecting the productivity of the stock. For the purpose of these analyses, total catch below the MSY (red line) is considered sustainable.

The catch-based MSY analysis provides an estimate of MSY based on response of the fishery to various levels of harvest. The MSY for flounders on the Atlantic coast was estimated to be about 596,000 pounds. When MSY was exceeded, the catch declined the following year, suggesting harvest in excess of MSY may not be sustainable. However these MSY overruns on the Atlantic coast have been modest in the years since the new regulations were implemented and the catch has been below MSY over the last few years.

## Model Results – Gulf Coast



The graph above displays results for the MSY analysis for all flounder species on the Gulf coast. The MSY for flounders on the Gulf coast was estimated to be about 434,000 pounds. Harvest on the Gulf coast has been consistently at or below MSY since implementation of the 1996 regulations, indicating that the harvest rate is likely sustainable.

## Report Summary

- Landings stable under current regulations
- Adult abundance
  - Southern flounder: Increasing
  - Gulf flounder: Increasing
- MSY not exceeded



In summary, the current management measures appear to be successfully maintaining a sustainable flounder fishery. Statewide commercial and recreational landings have been stable since implementation of the 1996 regulations. Fishery independent data shows that relative abundance for both adult southern and gulf flounder has been increasing in recent years, meaning the numbers of flounder available to the fishery is likely also stable or increasing. Although the MSY analysis indicates the Atlantic fishery may be susceptible to harvest in excess of the estimated MSY, the harvest rate has not exceeded MSY on either coast in recent years.

Photo by Carol Cox

## Upcoming Gulf-wide Assessment

2013

- Gulf States Marine Fisheries Commission
  - Gulf Data, Assessment, and Review (GDAR)



Next year the Gulf States Marine Fisheries Commission (GSMFC) will be conducting a Gulf Data, Assessment, and Review (GDAR) for the gulf and southern flounder stocks in the Gulf of Mexico. The GDAR process will mirror the federal SEDAR process. The process will rely on expertise available in the state marine resource agencies to develop an assessment through a transparent, open process. Data from all Gulf coast states will be used in the assessment. Once completed, the assessment will be incorporated into the Fishery Management Plan (FMP) for use in future management by the five Gulf states.

## Staff Recommendation

### Maintain current regulations

- Current harvest rate is sustainable
- No indication of population decline

### Current regulations are expected to maintain a sustainable fishery



When the current regulations were established in 1996, the goal was to allow flounder harvest at a sustainable level. Because many flounder are caught recreationally at night in Florida, recreational data capture is not as robust as with other species. Future enhancement to the Marine Recreational Information Program will include additional night time data collection. To date, data collection has not resulted in a similar body of data for a complete stock assessment and modeling capability. Projecting the effects of different size limits and bag limits on the flounder fishery is not possible with current data availability. However the update does indicate that flounder harvest is at a sustainable level at the current time.

Staff recommends maintaining the current regulations. The fishery update indicates the current harvest rate is sustainable and there is no indication of population decline. The fishery is not likely overfished or experiencing overfishing on either coast under the current regulations. Therefore, the flounder fishery appears to be responding well to the current regulations stocks based on catch rates, fishery independent data, and the preliminary assessment analyses.

Staff believes that the current regulations are appropriate and will continue to maintain the fishery at a sustainable level.

Photo by Carol Cox

The following slides are considered back up material and are not anticipated to be part of the actual presentation to the Commission



## Models and Analysis

**Spawner Per Recruit Analysis:** relationship between spawning potential ratio (SPR), size limits, and harvest

- SPR compares the spawning ability of a stock in the fished condition to the stocks spawning ability in the unfished condition

**Maximum Sustainable Yield (MSY) Analysis:** estimates the largest average catch that can continuously be taken from a stock

**Surplus Production Model:** determines the optimum level of effort that produces the maximum yield without affecting the long-term productivity of the stock



The equilibrium spawner per recruit analysis is an age-structured model capable of illustrating the relationship between spawning potential ratio (SPR), minimum size limits, and exploitation rates. SPR compares the spawning ability of a stock in the fished condition to the stock's spawning ability in the unfished condition.

The catch-based maximum sustainable yield (MSY) analysis is a simple method for estimating MSY that does not require estimates of abundance that are often uncertain and/or difficult to obtain. MSY is the largest average catch that can continuously be taken from a stock without negatively affecting the productivity of the stock.

Surplus production models are used to describe the dynamics of a fished stock in terms of biomass by using the previous year's biomass, growth in biomass in that year, and catch. This model determines the optimum level of effort that produces the maximum yield without affecting the long-term productivity of the stock.

## Research Recommendations

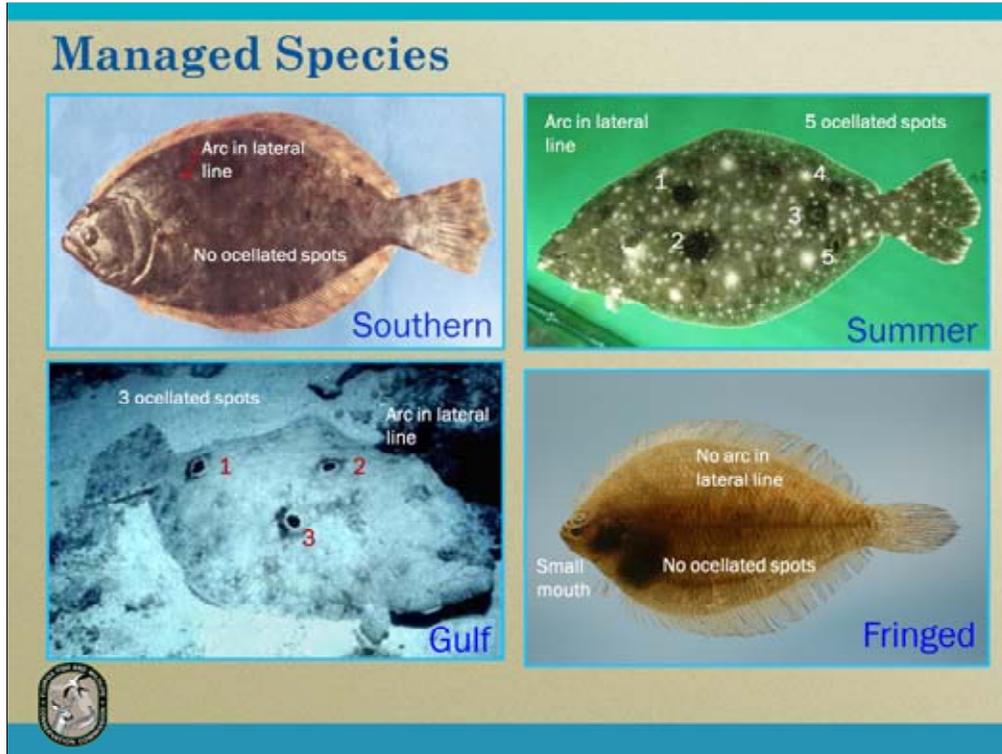
- Identification of unclassified species
- Species-specific age composition
- Life history information for summer and southern flounders
- Mixing rates of southern and summer flounder in northeast Florida
- Effect of environmental factors and habitat condition on distribution and abundance



The report specified research recommendations that would benefit future stock assessments. In order to complete more robust species specific stock assessments, identification of unclassified species needs to be reported in the fishery statistics. Age composition of the catch by species and by gear with sufficient spatial and temporal resolution is also needed for development of age-structured population models. Life history parameters for summer and southern flounders from Florida waters are needed for further development of SPR models. Determining mixing rates of southern and summer flounders in northeast Florida will help refine stock distribution information and validate assumptions on spatially defined fishing effort.

Evaluation of environmental factors and habitat condition affecting species distribution and abundance will allow for these factors to be included in assessments.

Photo by Carol Cox



Four species of flounder are commonly caught in Florida waters: southern flounder, gulf flounder, summer flounder, and fringed flounder. Gulf and southern flounder are by far the most commonly caught species, and one or the other may be encountered statewide.

Image credits: southern flounder (South Carolina DNR; <http://www.dnr.sc.gov>), summer flounder (University of North Carolina, Wilmington; <http://www.uncw.edu>), gulf flounder (Florida Museum of Natural History; <http://www.flmnh.ufl.edu>), and fringed flounder (NOAA; <http://www.photolib.noaa.gov/bigs/fish4244.jpg>)