



## *Blue Crab Stock Assessment Model*

*DEPARTMENT OF ENVIRONMENTAL QUALITY*

Marine Fisheries

Marine Fisheries Commission | CJ Schlick, PhD | May 23, 2024



# *Blue Crab Life History*

- Maximum size 8.5 inches carapace width
- Maximum age ranges from 5 to 8 years
- Average lifespan 3 years
- Aging of crustaceans difficult due to lack of permanent hard structures
- Mature between 1 to 2 years age
- Mate spring or summer in brackish estuarine waters as female molts into maturity
- Spawning occurs within 2 months after mating



# *NCDMF Stock Assessment History*

## 2018 assessment

- Two-stage model: overfished and overfishing
- Peer review accepted the two-stage model for management
- Used for current management, Amendment 3
- Model used in 2022 update



# *Stock Assessment Two-Stage Model*

- Unit stock: North Carolina
- Two stages: recruits, fully recruited
- Gender: two sexes
- Calendar year: 1995 through 2022
- Natural mortality: sex and stage specific
- Sex ratio: 1:1 for recruits



## *Data Input*

**ABUNDANCE + BIOLOGY + CATCH**



The relative index of the number of crabs in a stock.



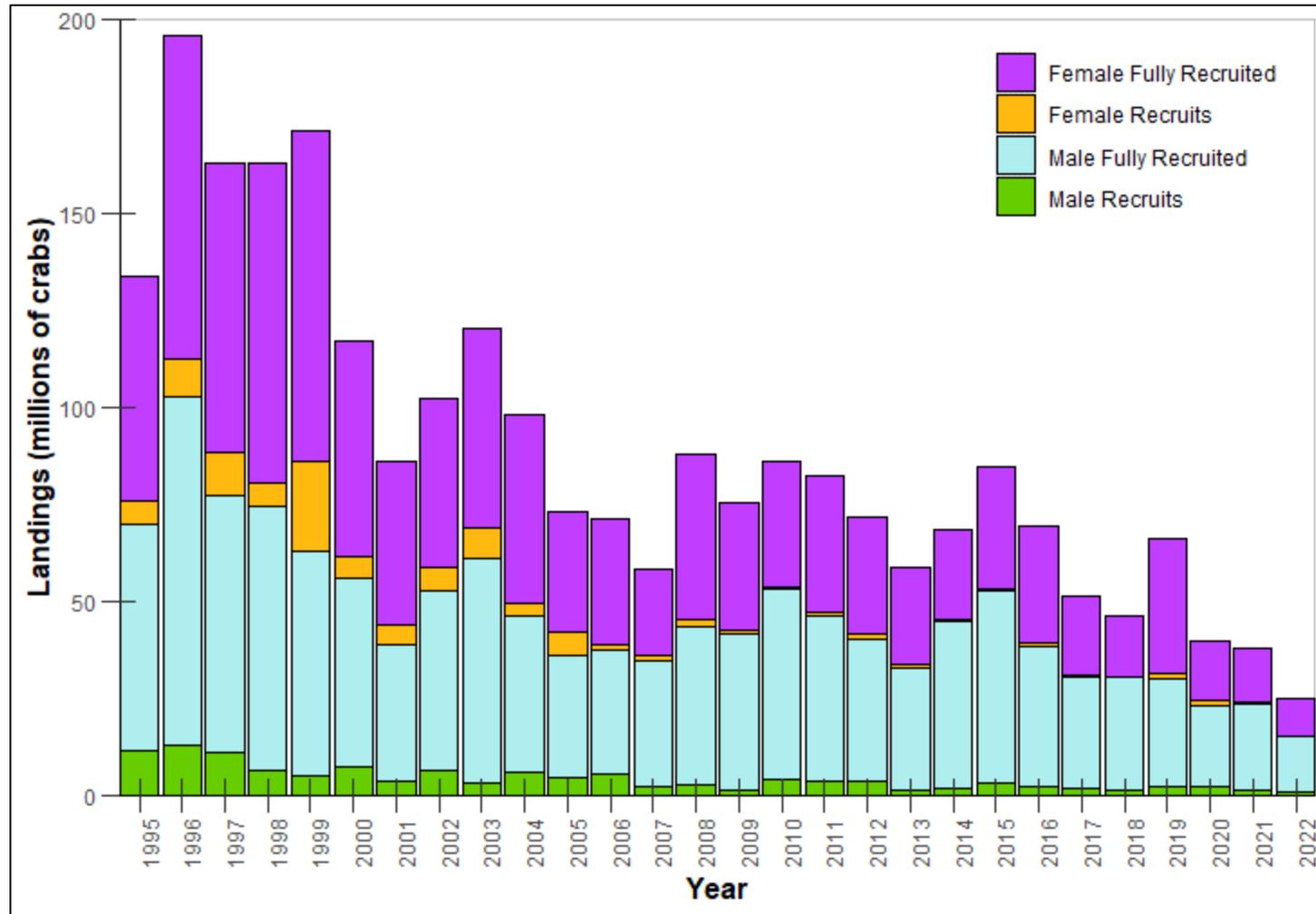
Information on growth, maturity, and natural mortality.



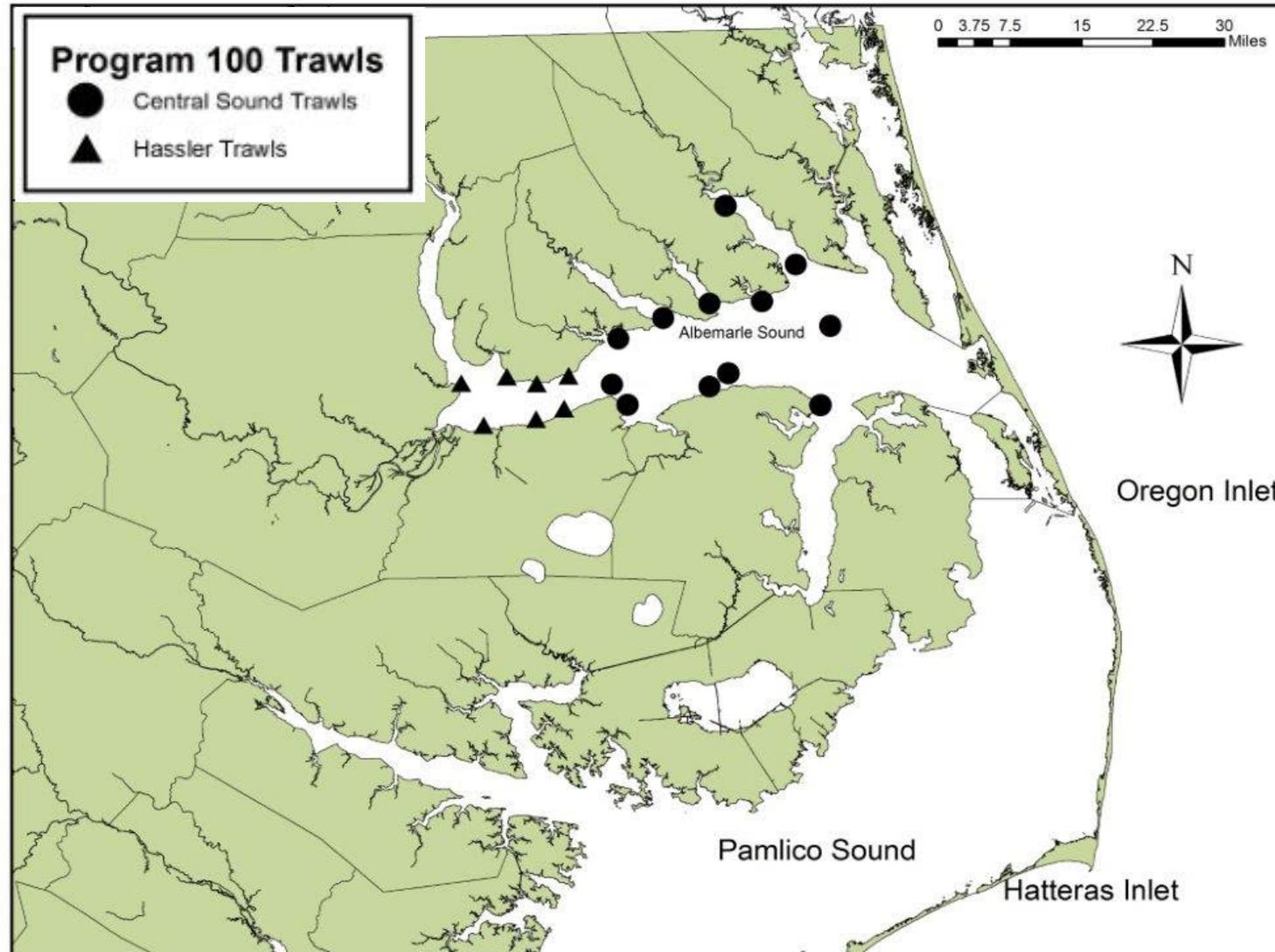
The amount of crabs removed from a stock by commercial fishing.

**= STOCK ASSESSMENT**

# Commercial Catch

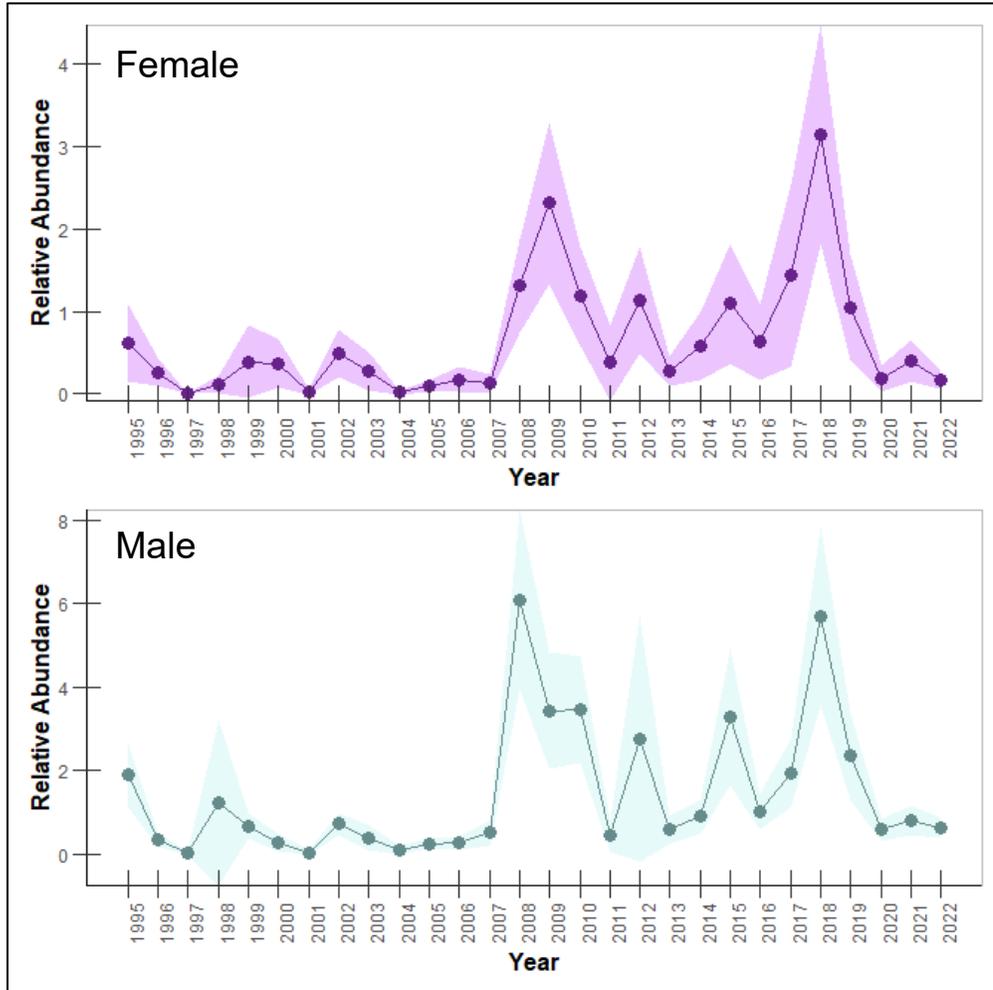


# North Carolina Program 100 Juvenile Anadromous Trawl Survey

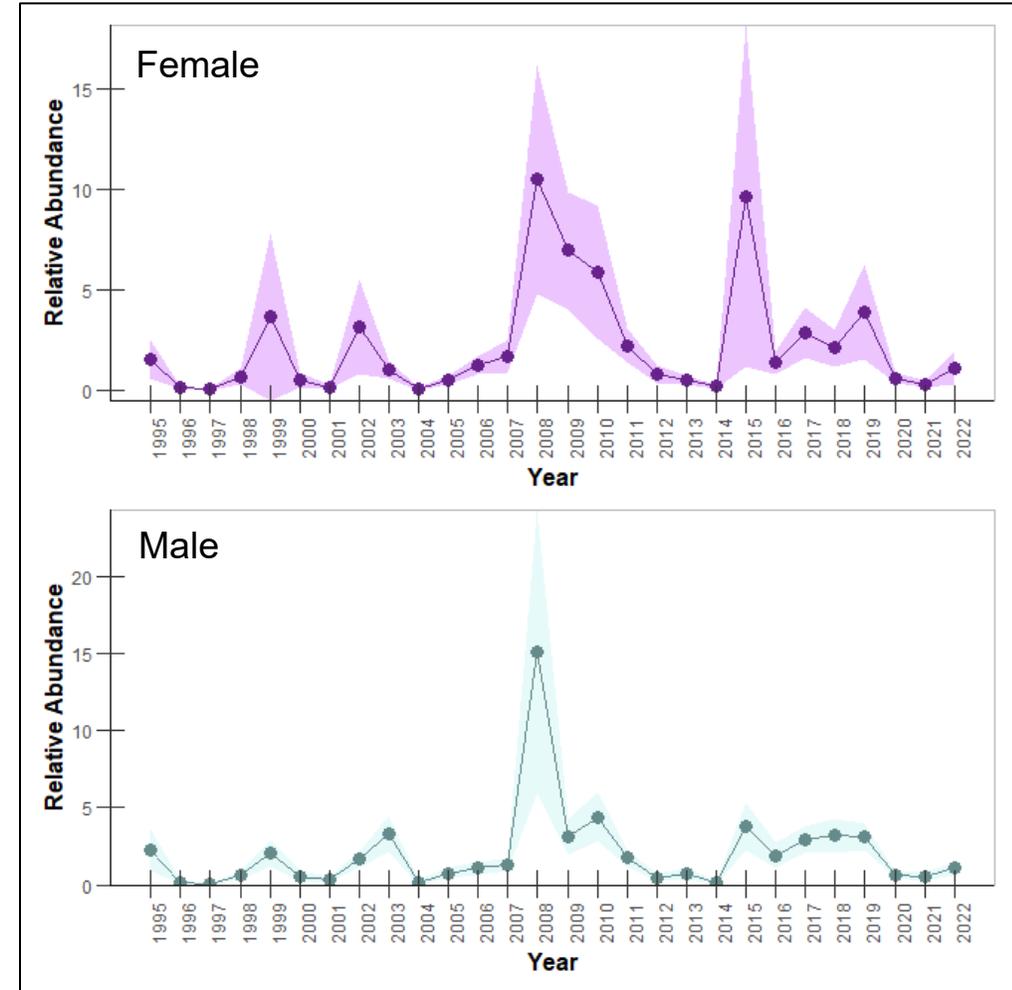


# North Carolina Program 100 Juvenile Anadromous Trawl Survey

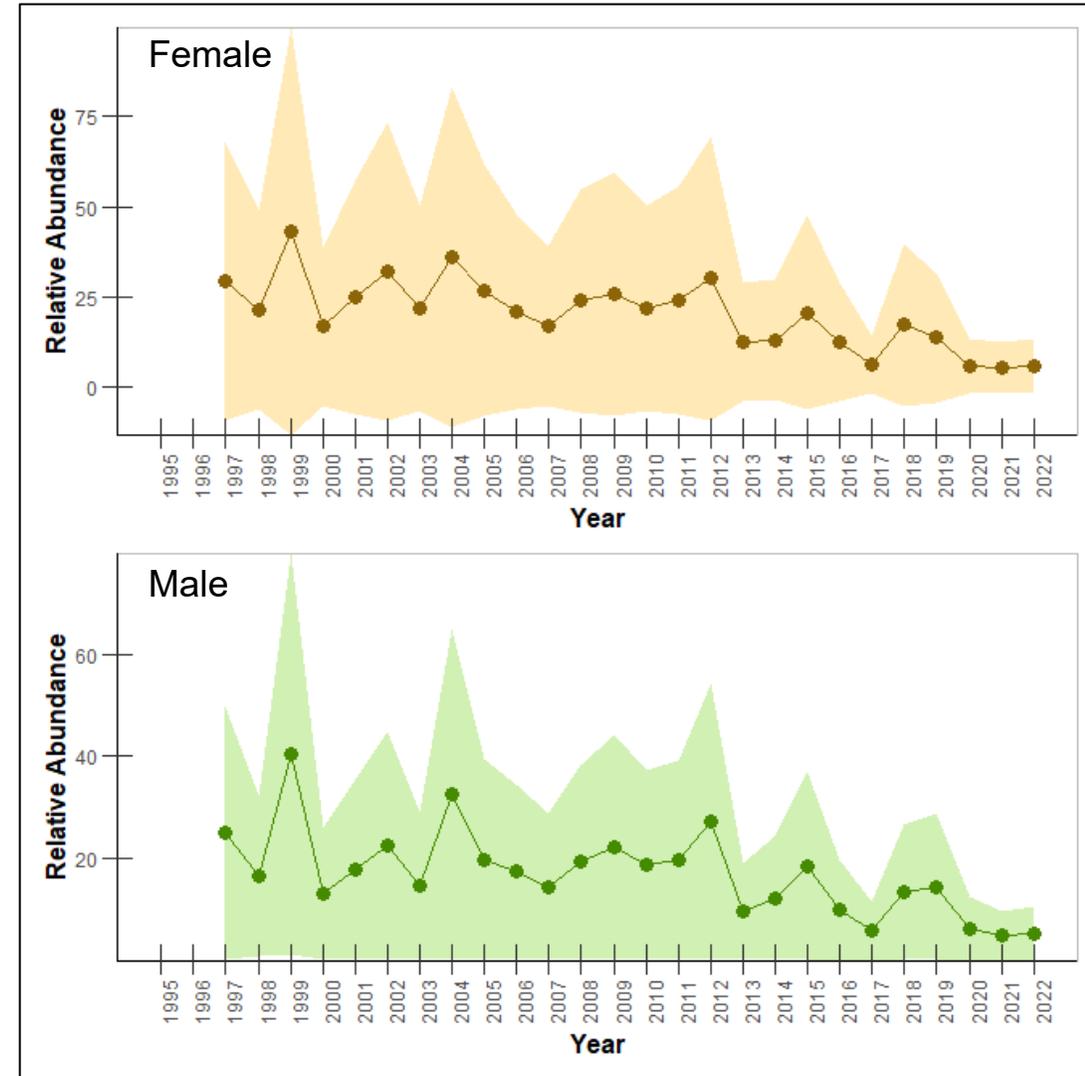
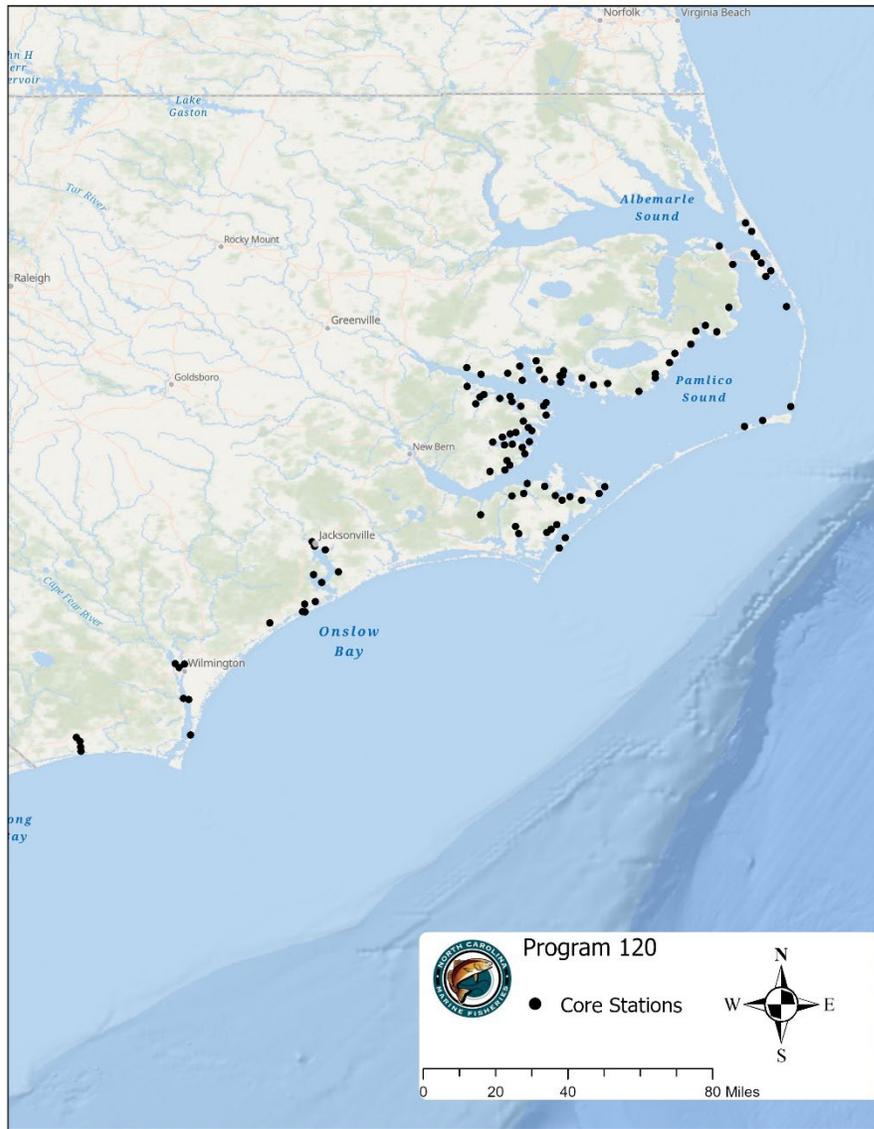
## Summer



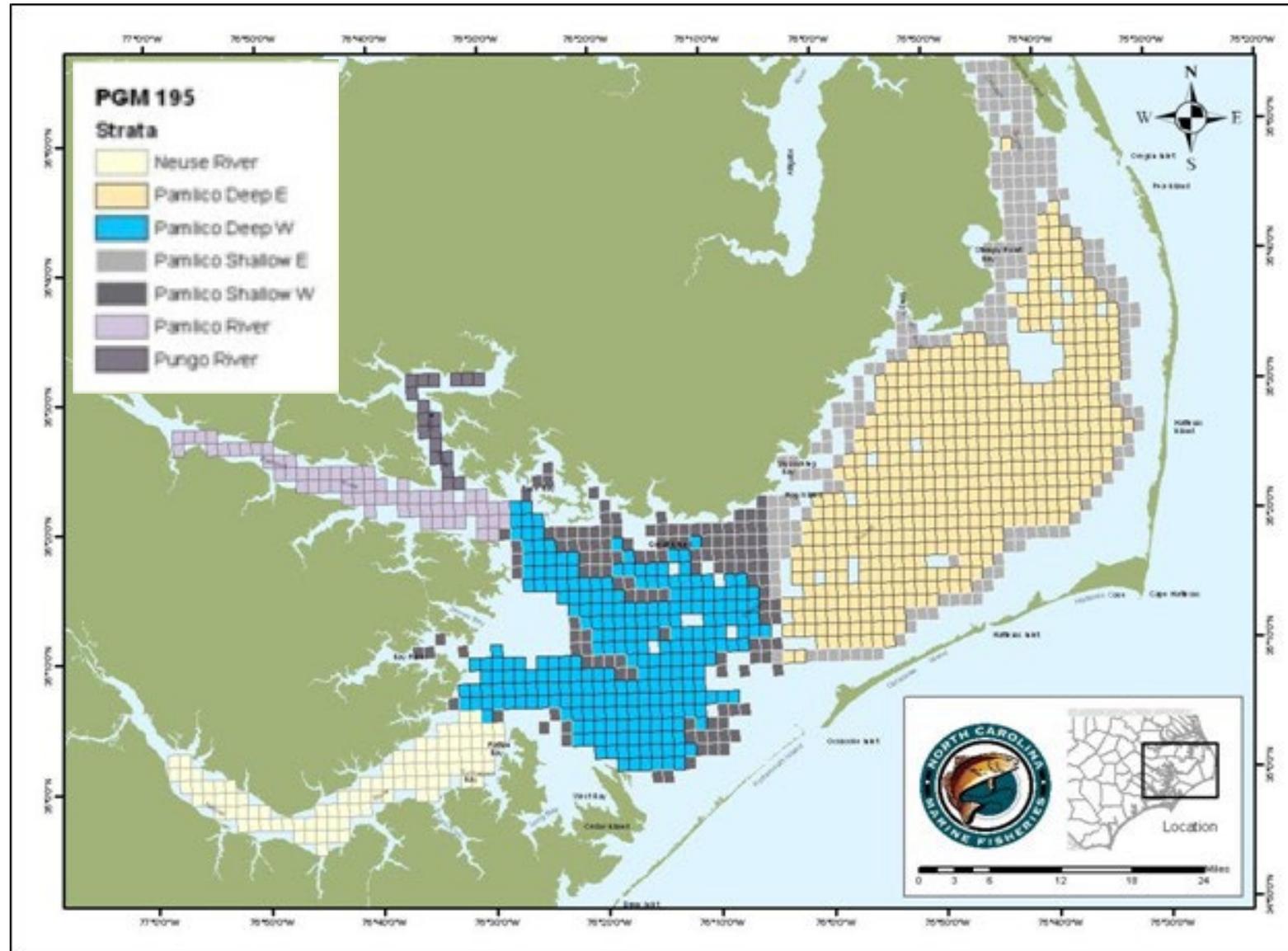
## Fall



# North Carolina Program 120 Estuarine Trawl Survey

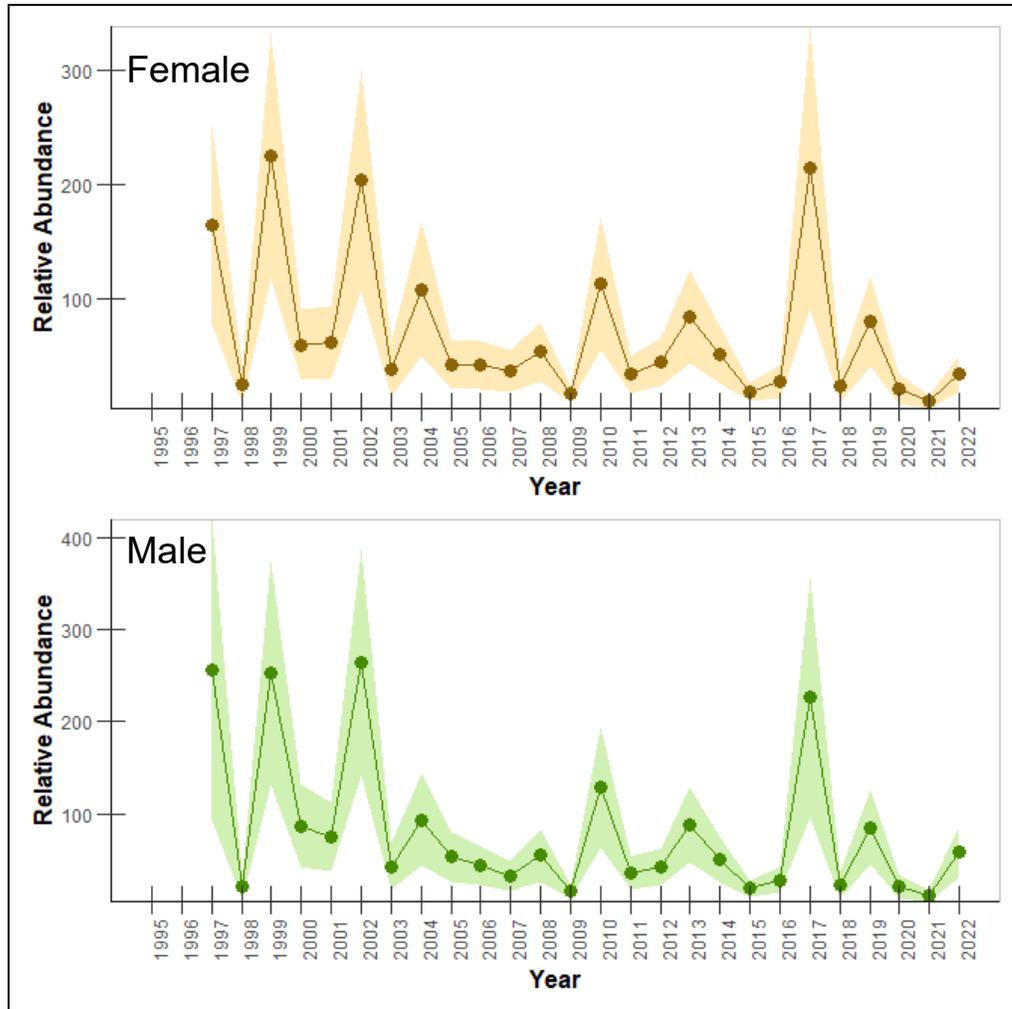


# North Carolina Program 195 Pamlico Sound Survey

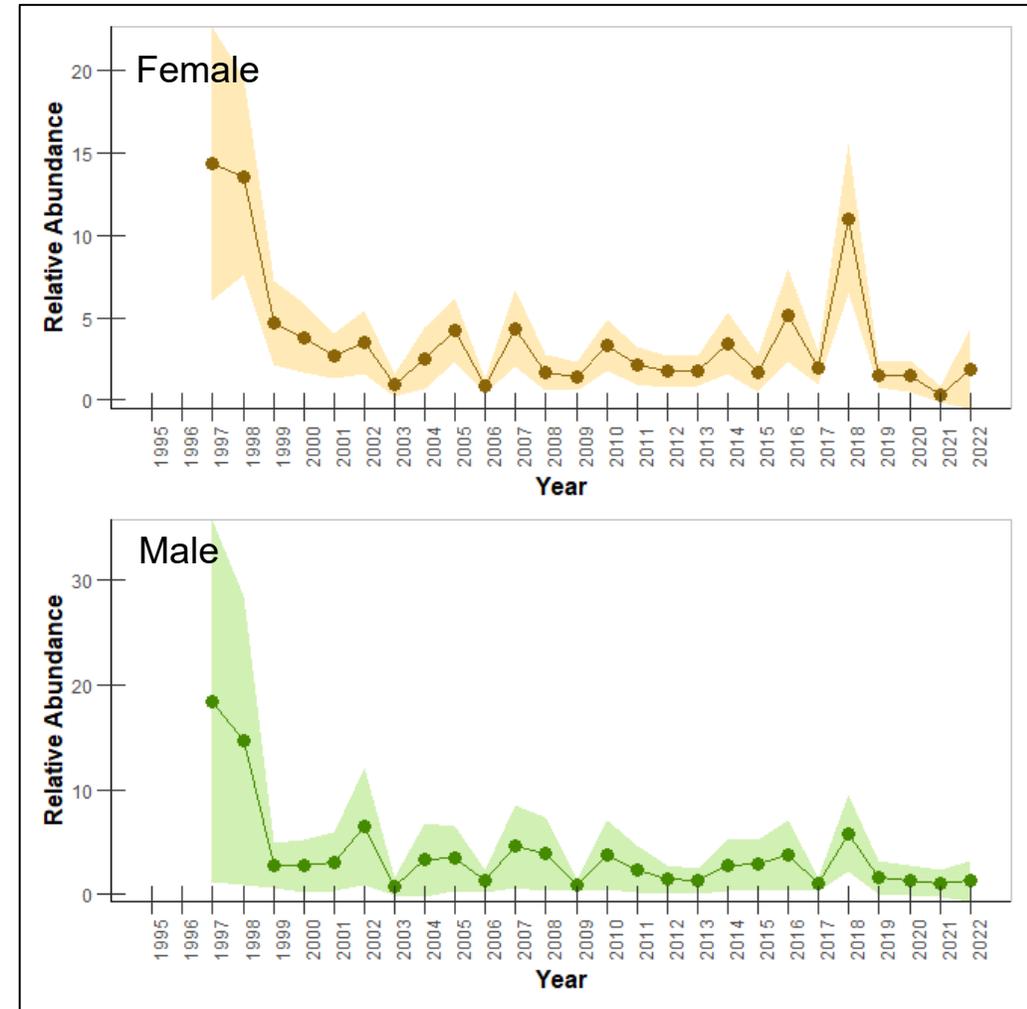


# North Carolina Program 195 Pamlico Sound Survey--Recruits

## June

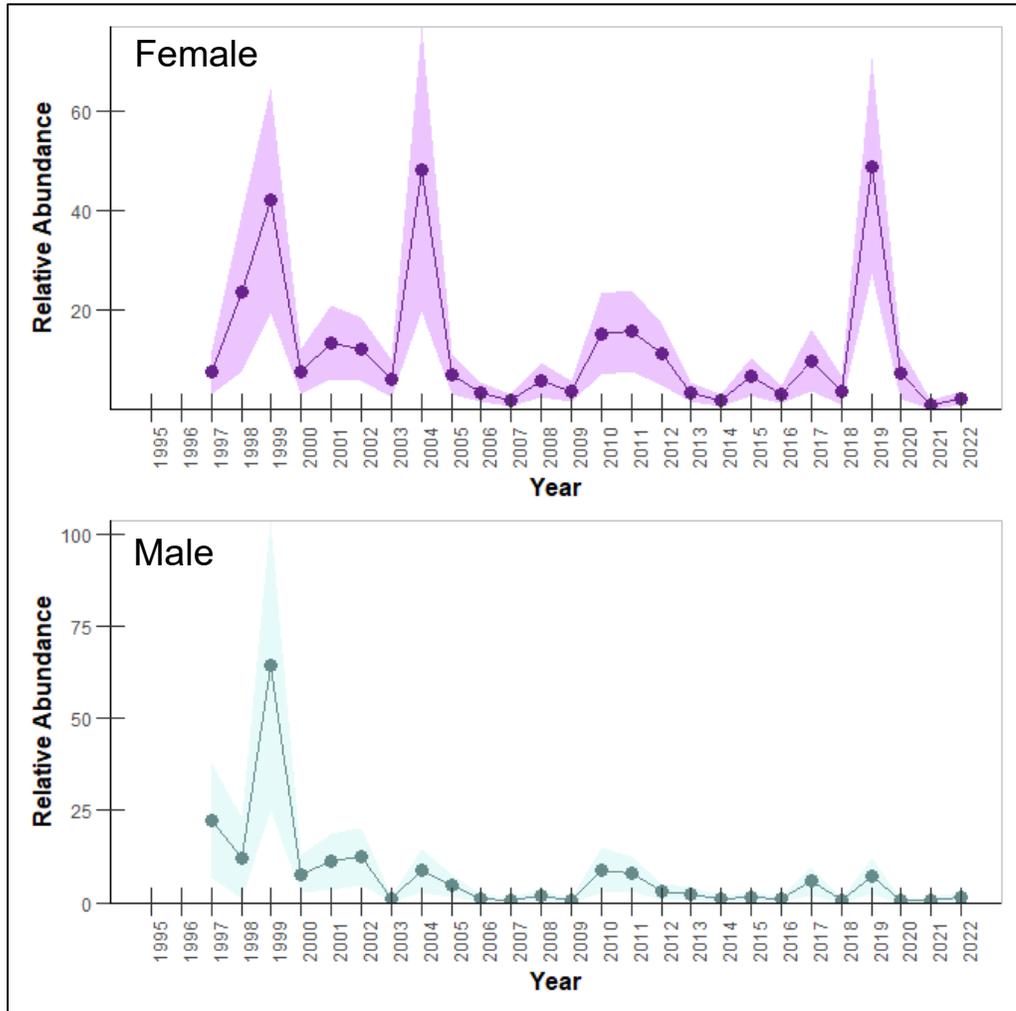


## September

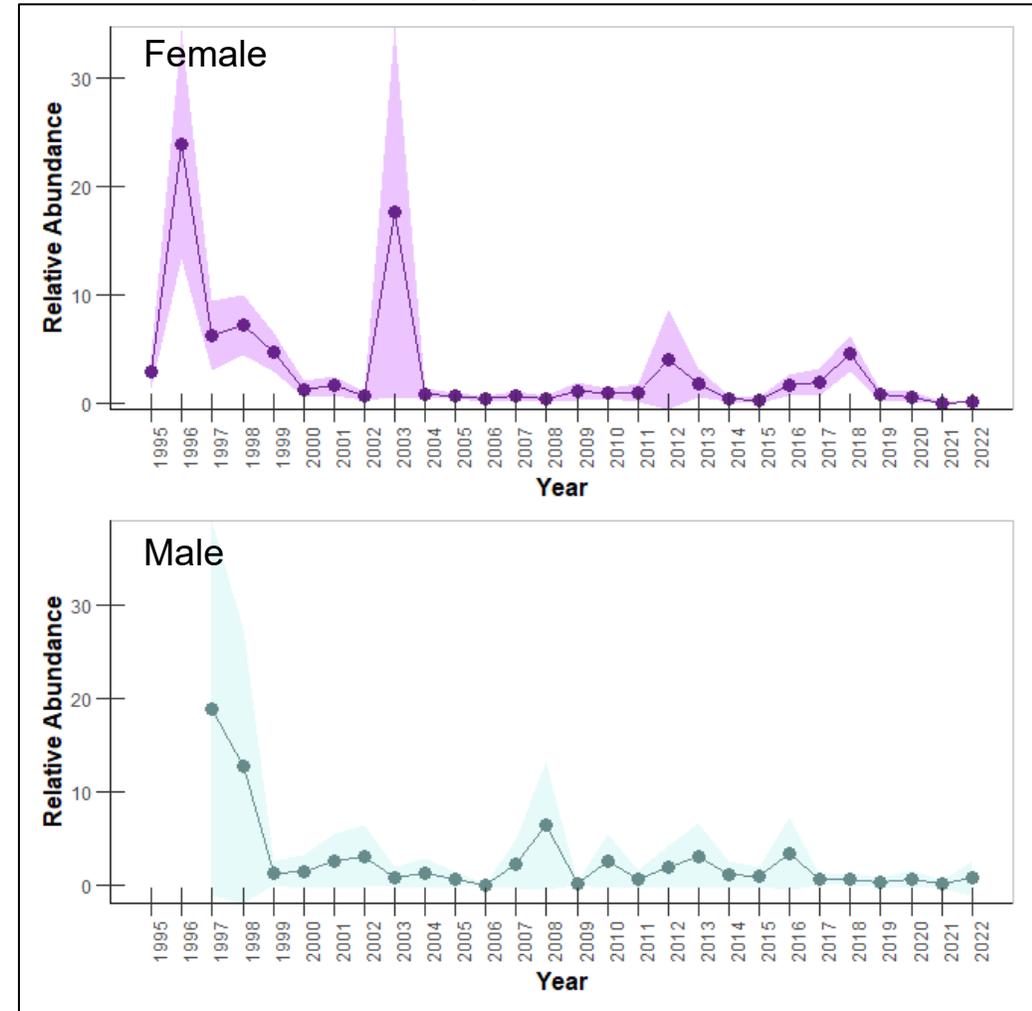


# North Carolina Program 195 Pamlico Sound Survey—Fully Recruited

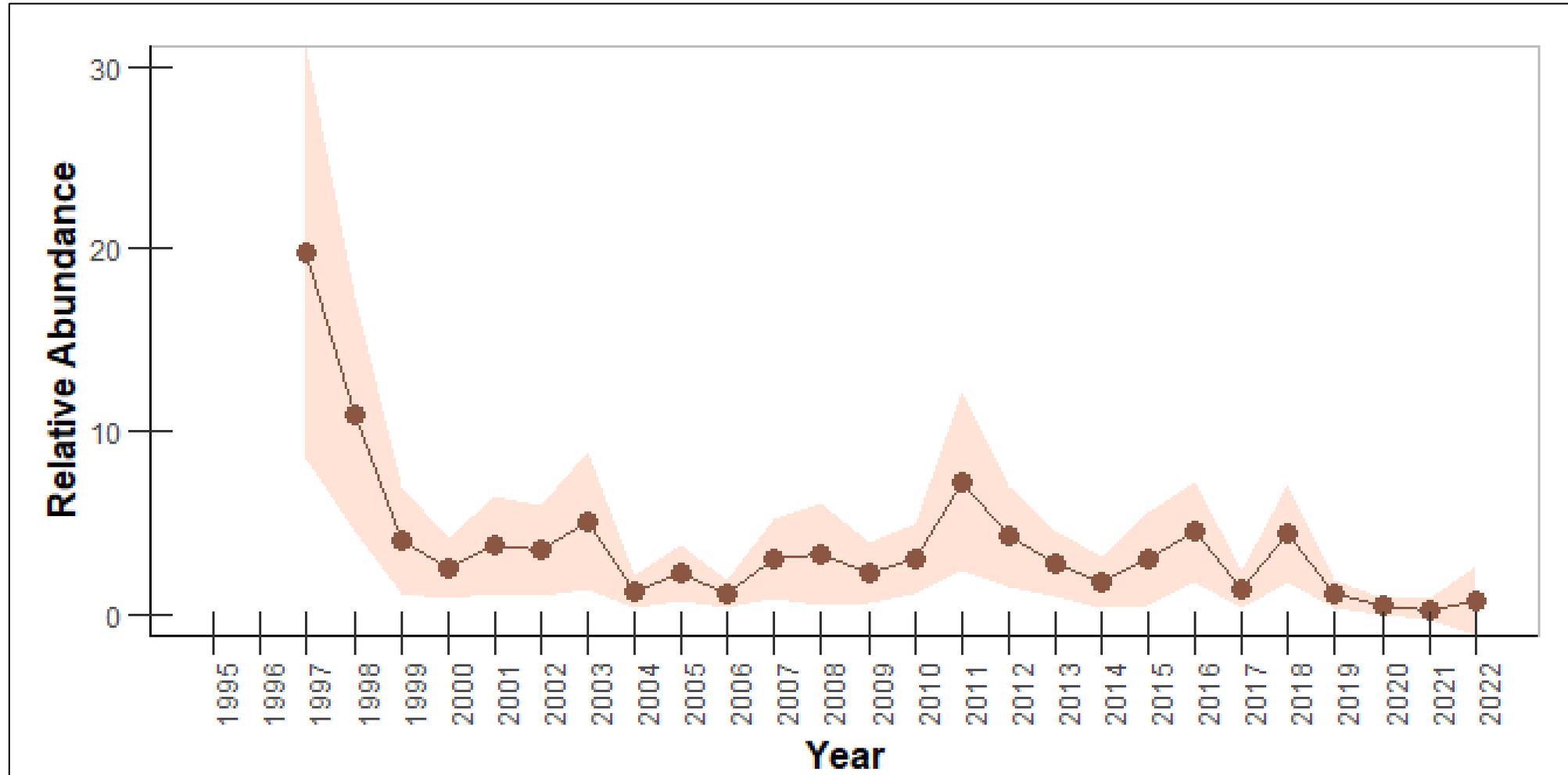
## June



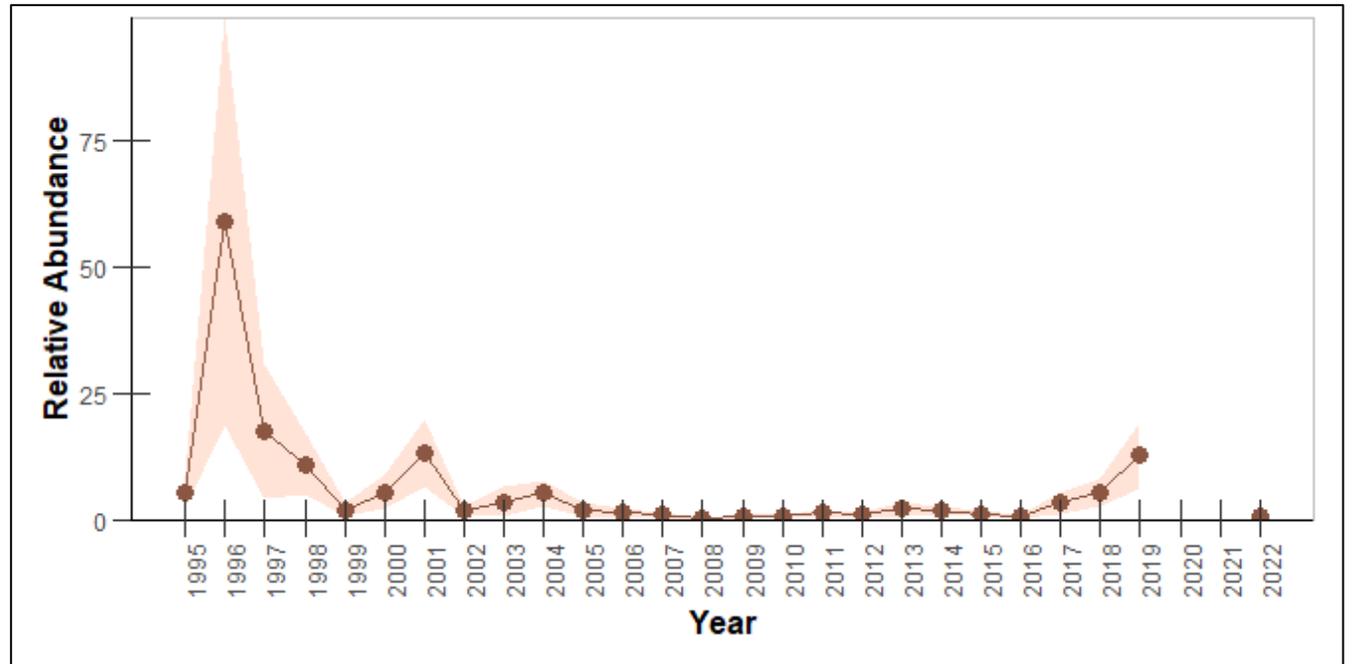
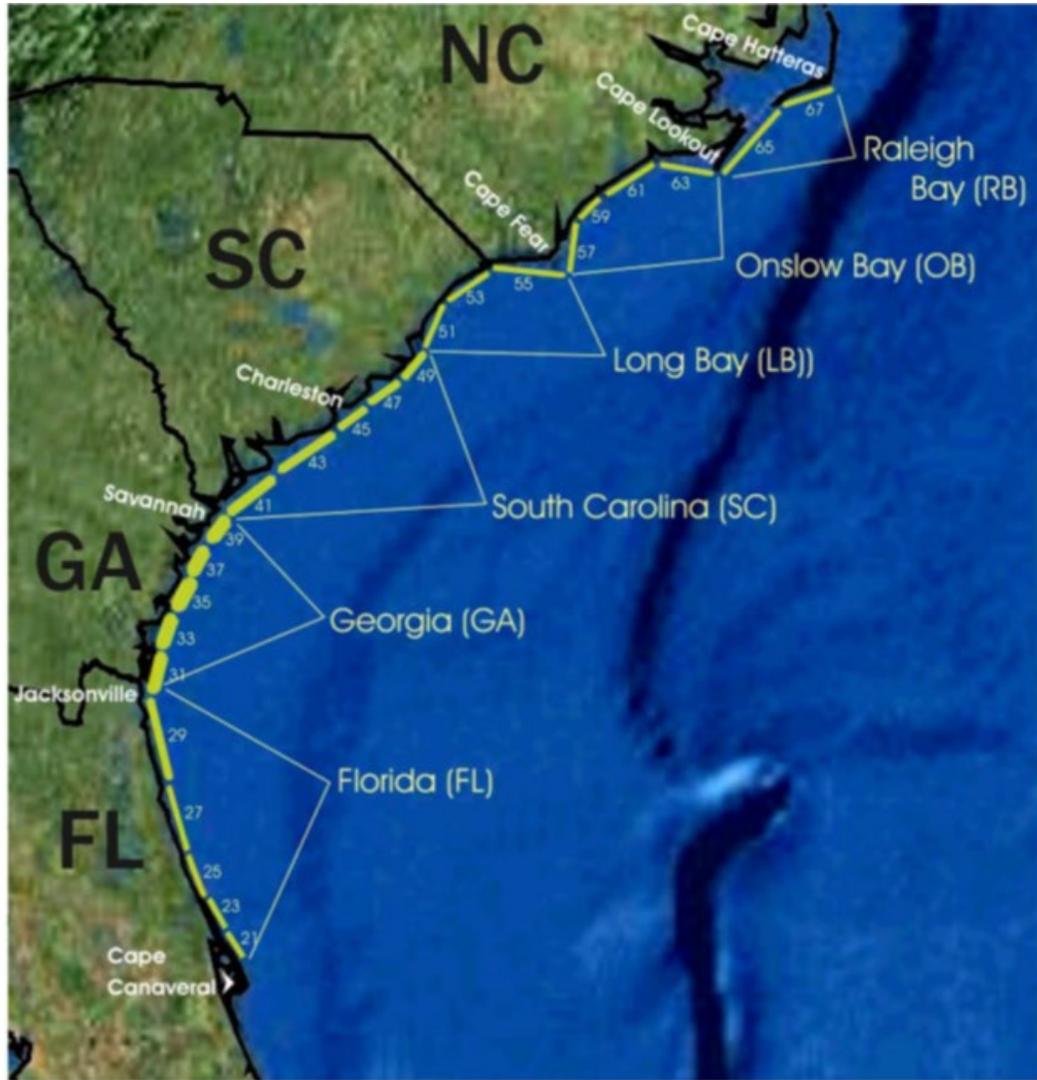
## September



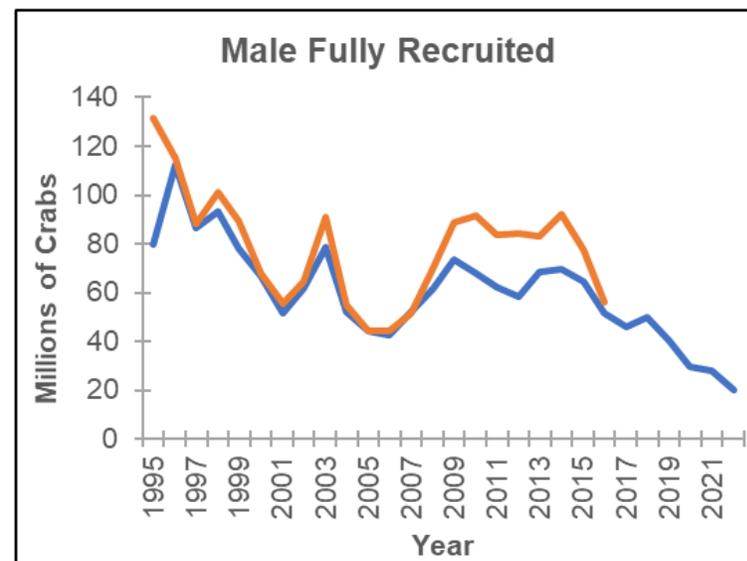
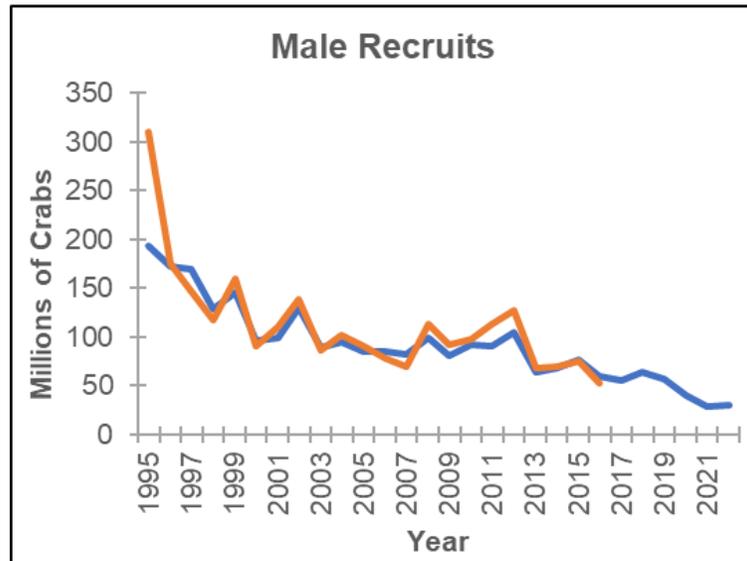
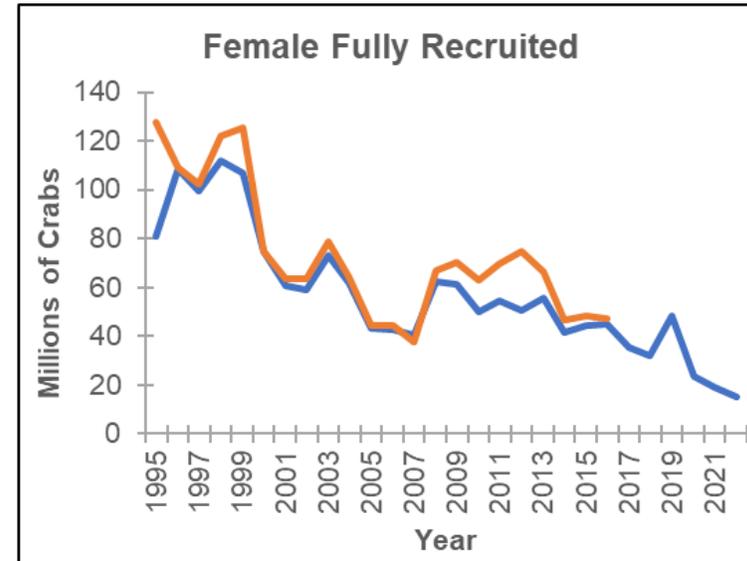
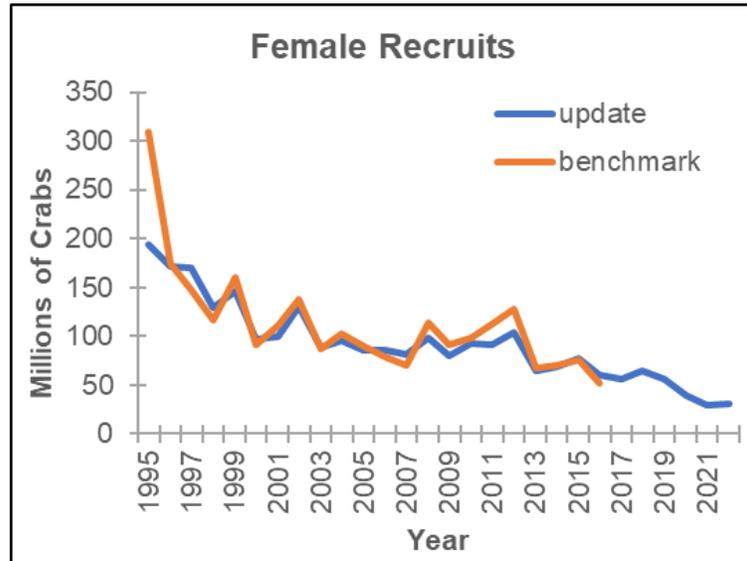
# North Carolina Program 195 Pamlico Sound Survey— Spawners



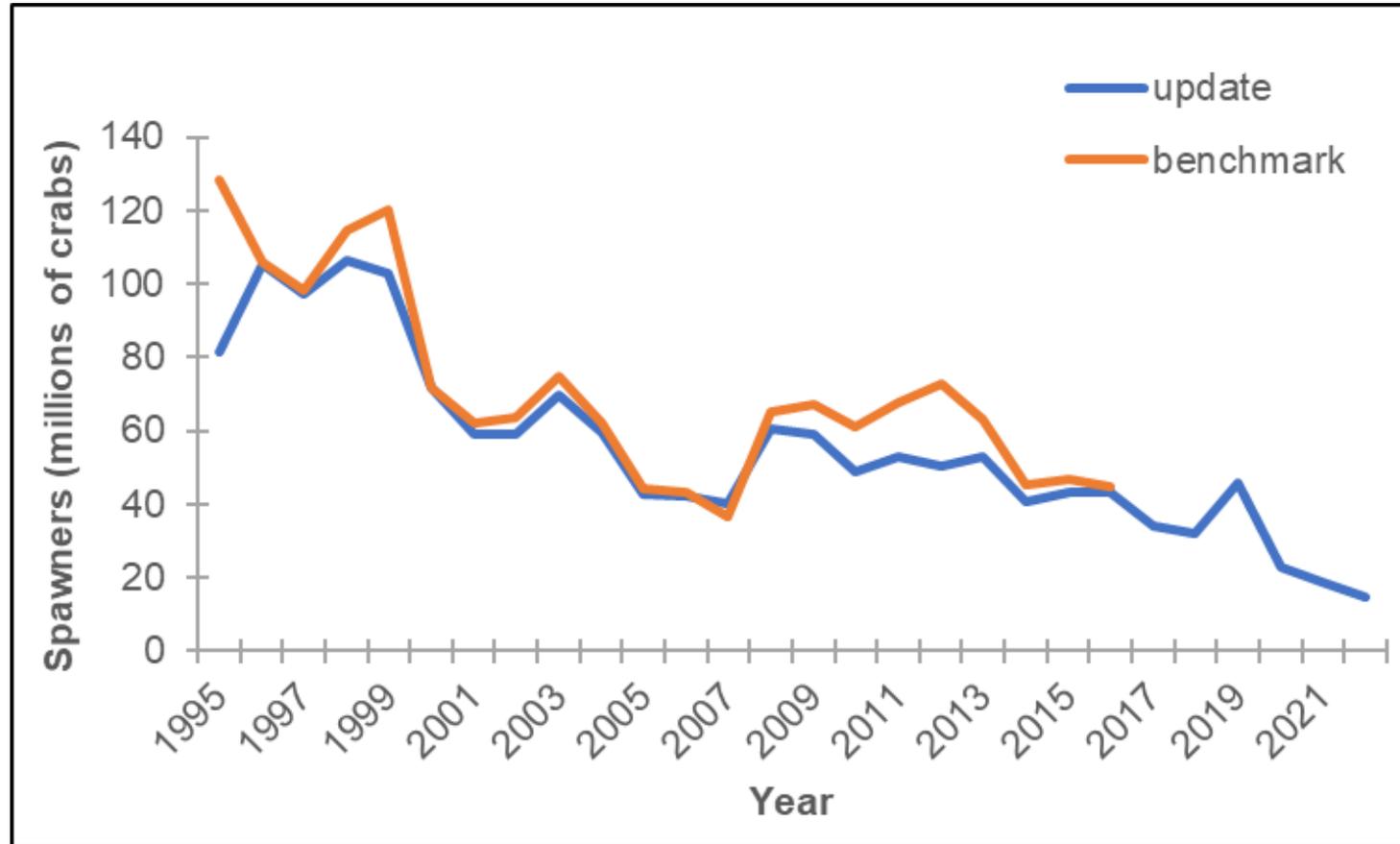
# SEAMAP Coastal Trawl Survey



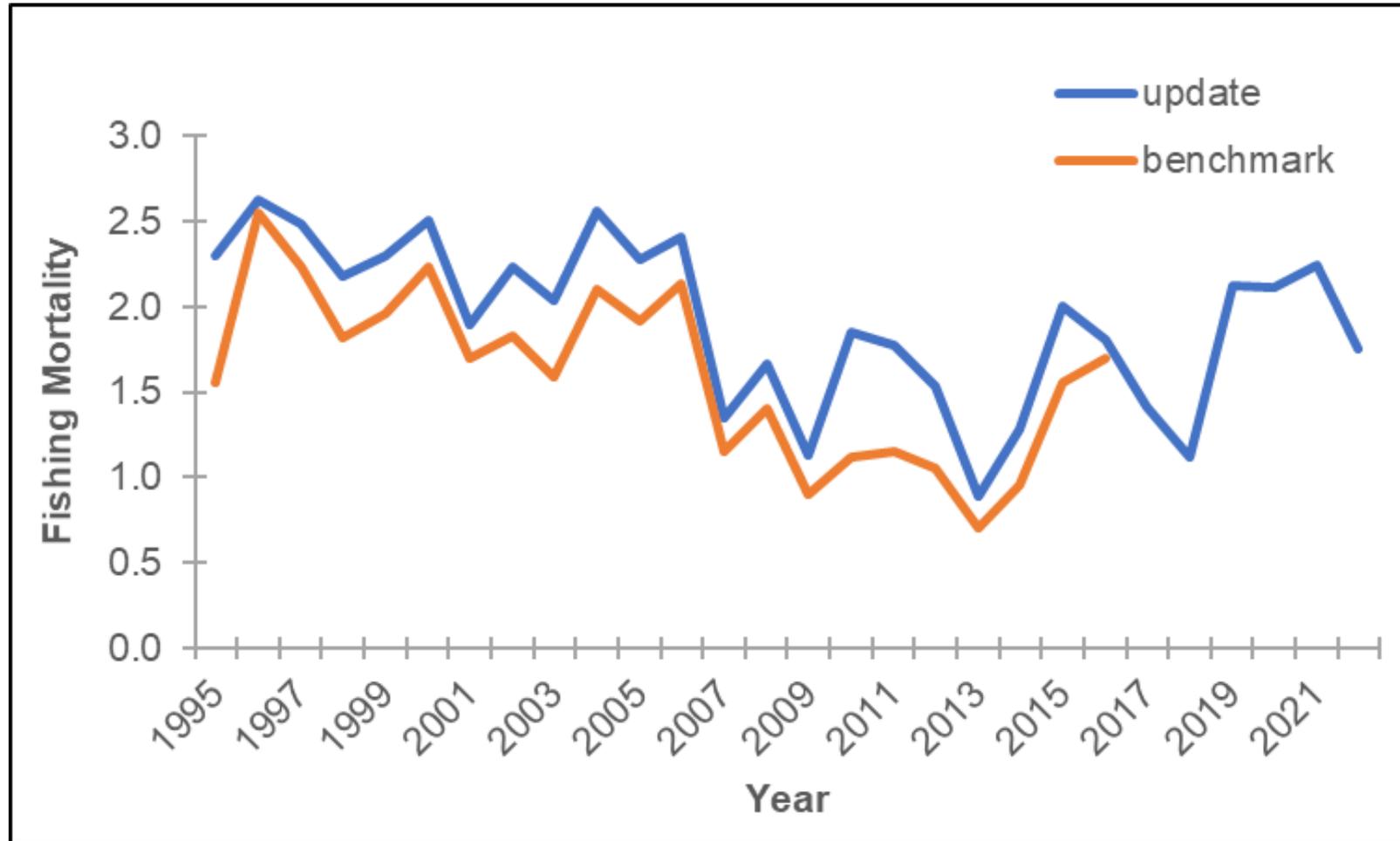
# Results: Estimated Abundance



# *Results: Estimated Spawner Abundance*



# *Results: Estimated Fishing Mortality (F)*



# Reference Points

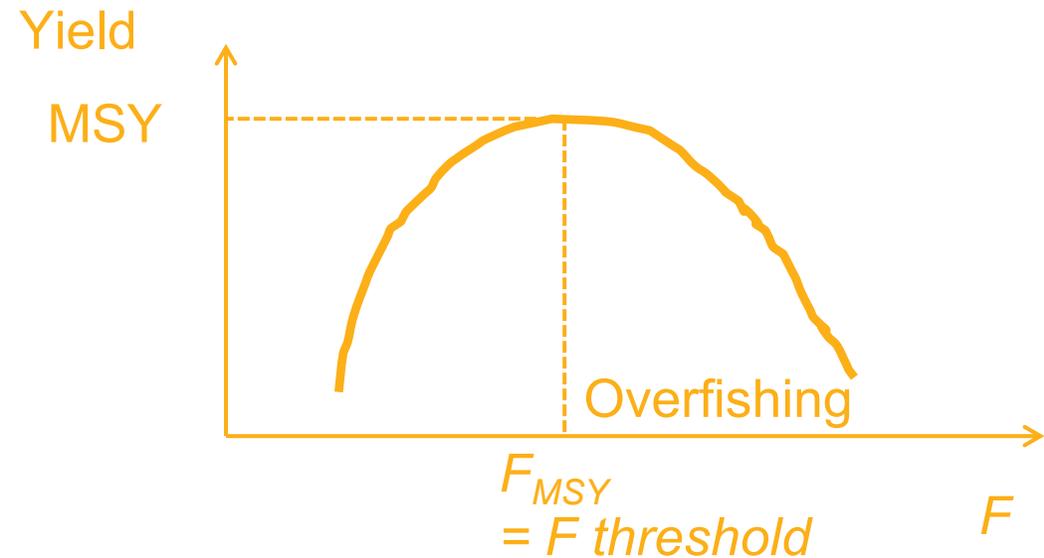
- Maximum sustainable yield (MSY)

## Overfishing

- Threshold: fishing mortality at MSY ( $F_{MSY}$ )
- Target:  $0.75F_{MSY}$
- 2022  $F$  greater than threshold

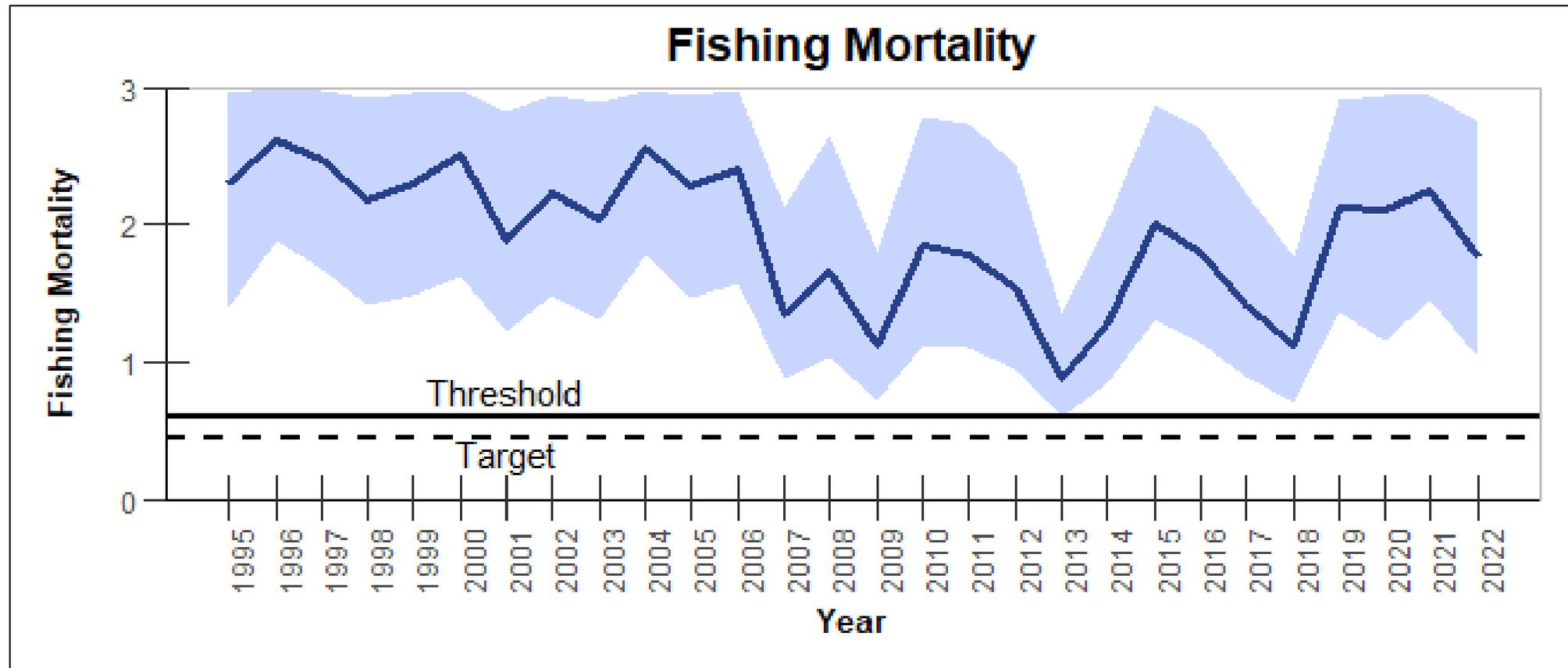
## Overfished

- Threshold: spawner abundance at  $F_{MSY}$
- Target: spawner abundance at  $0.75F_{MSY}$
- 2022 spawner abundance less than threshold



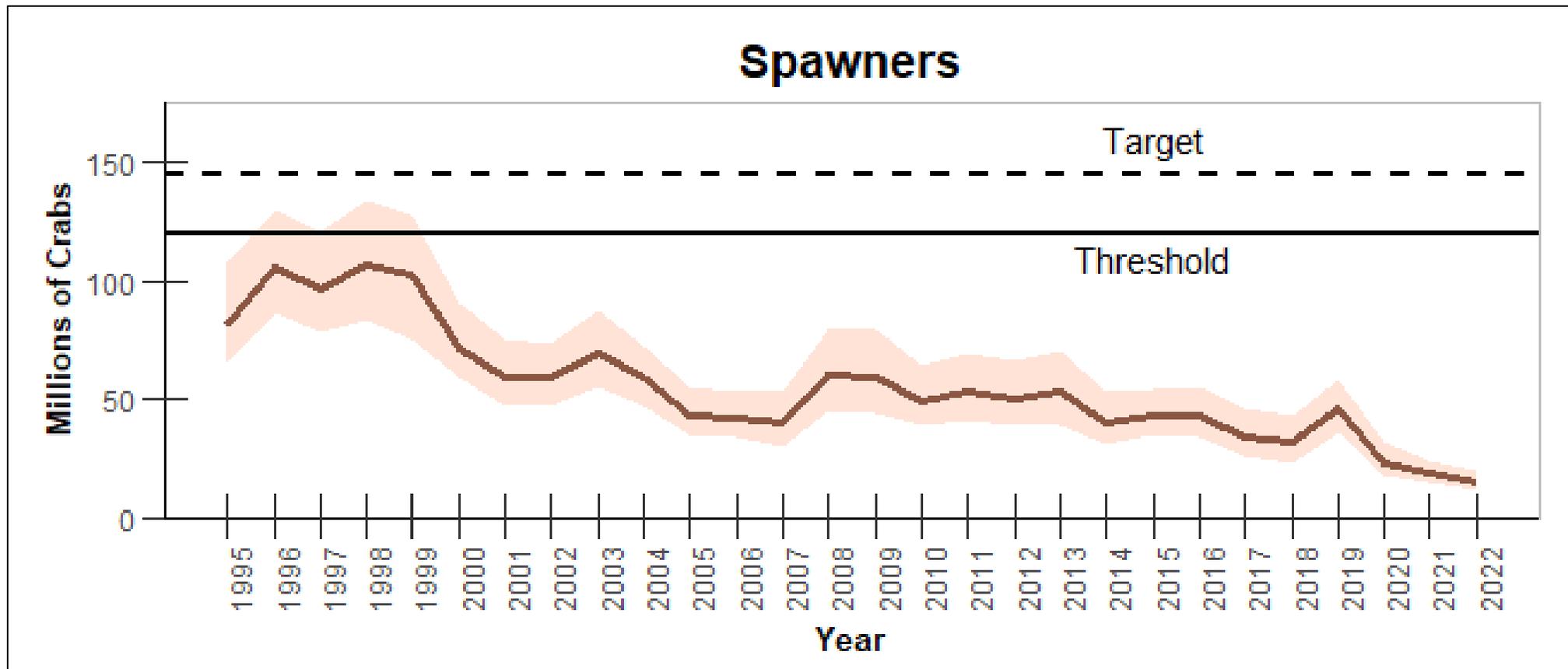
# Reference Points: Fishing Mortality

- **Overfishing** (100% probability)
- 2022 fishing mortality 1.8, which is greater than threshold 0.61



# Reference Points: Spawner Abundance

- **Overfished** (100% probability)
- 2022 spawner abundance 14.8 million, which is less than threshold 120 million



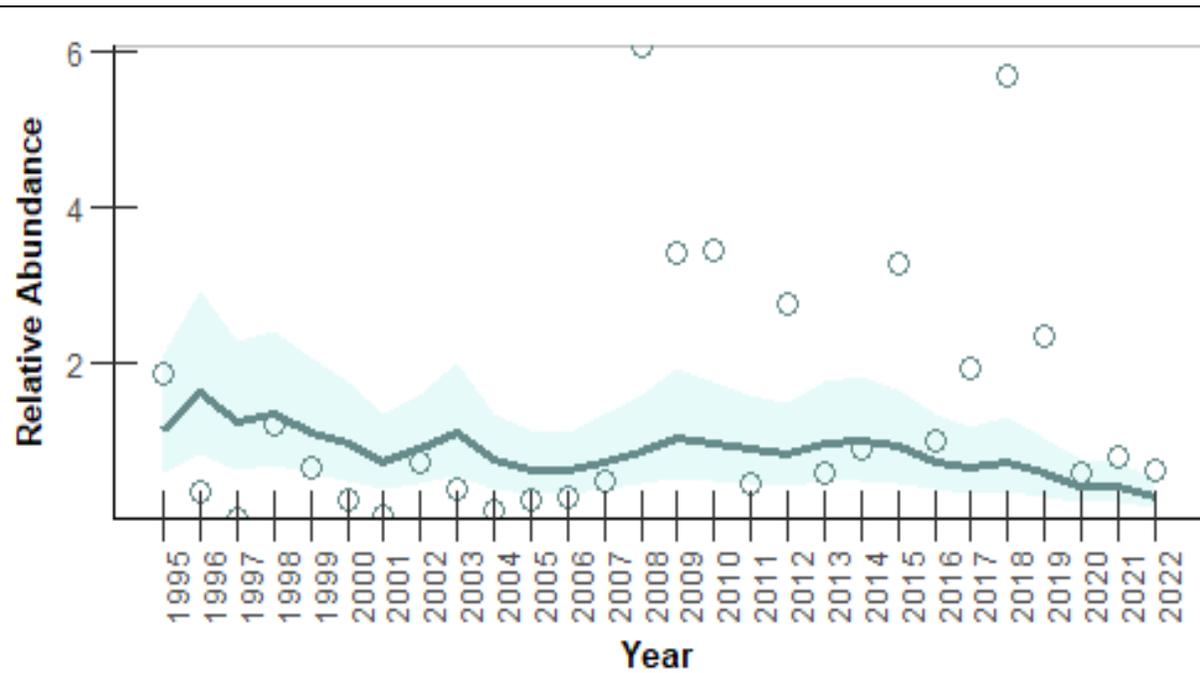
# *Desk Review: December 2023*

## *External Review*

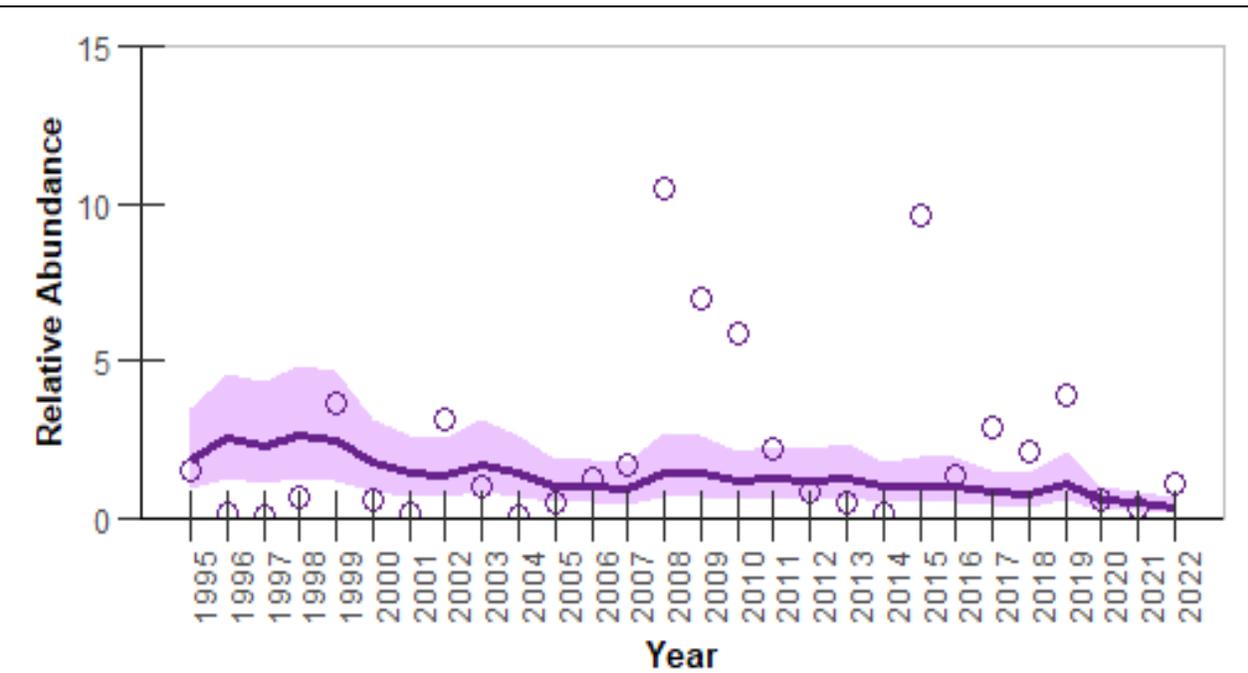
### Major Concerns

- Strong Residual Patterns in the Models Fit to Survey Indices
- Model Specifications

Program 100 Fully Recruited Males

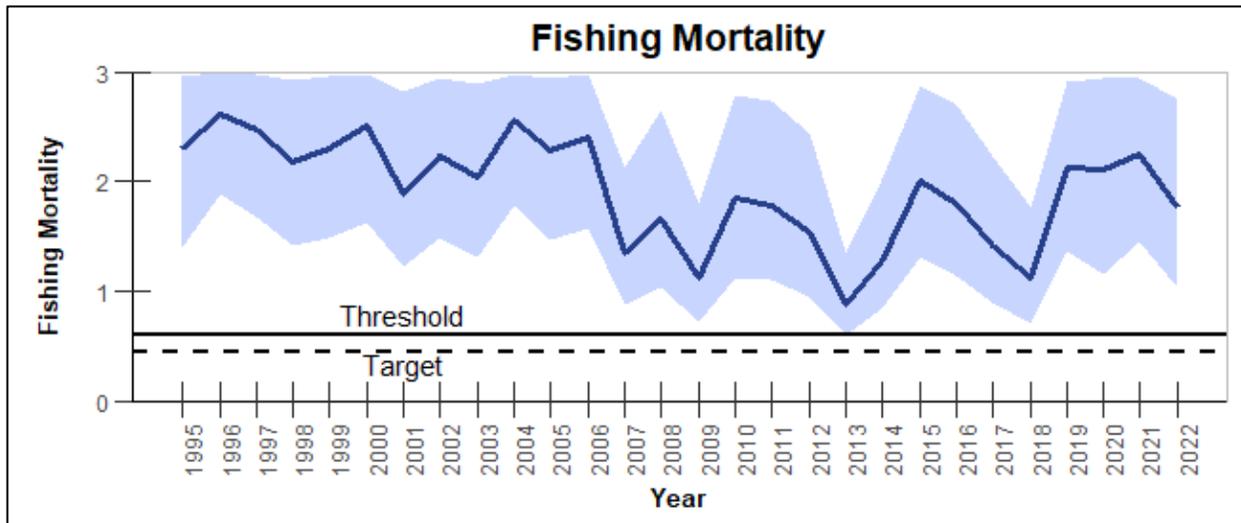
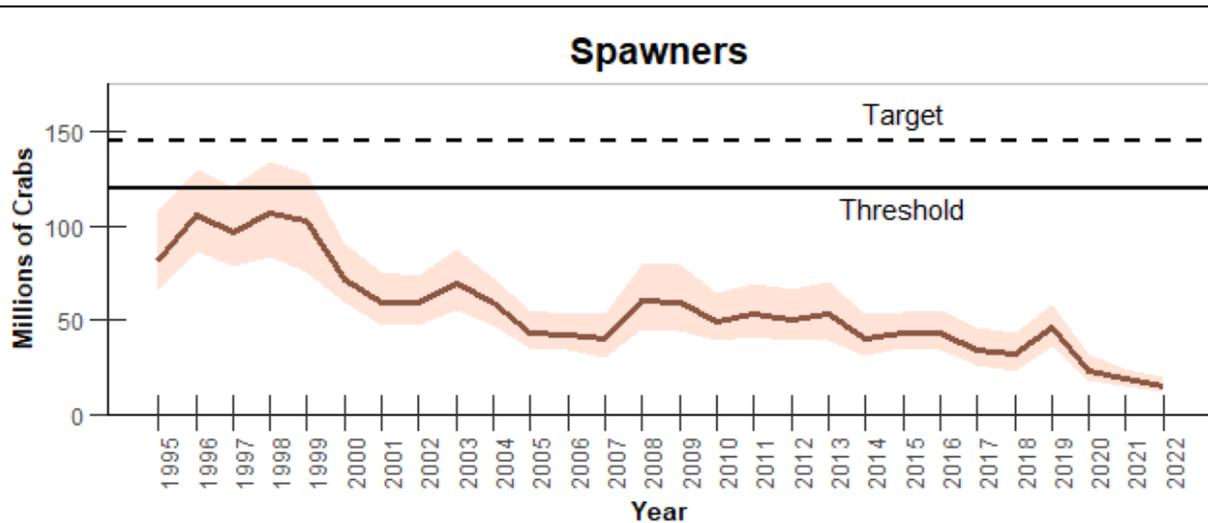
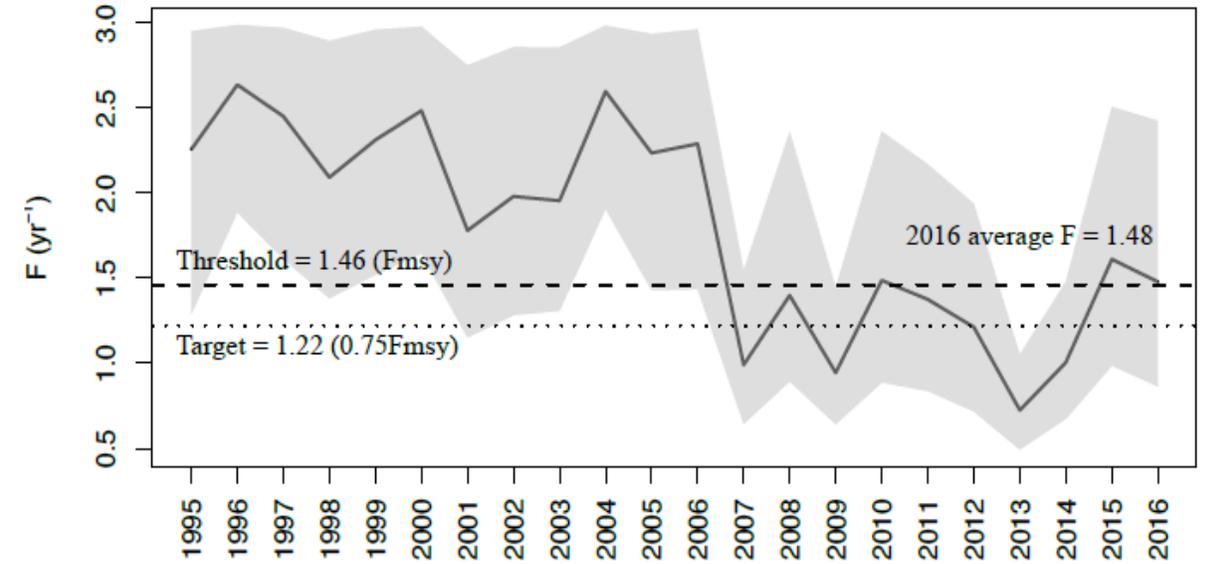
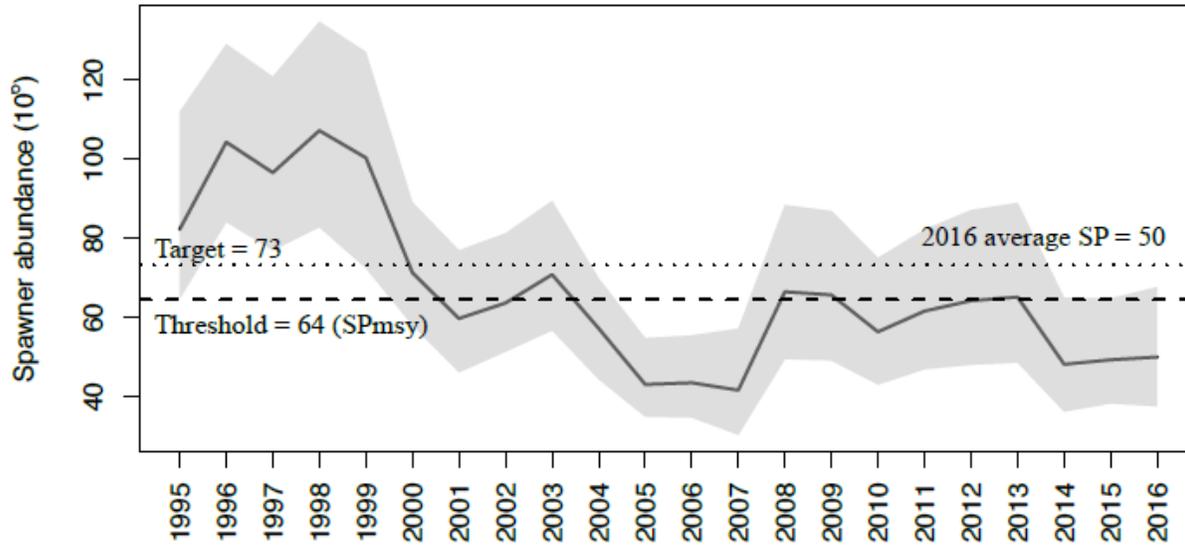


Program 100 Fully Recruited Females



# Desk Review: December 2023

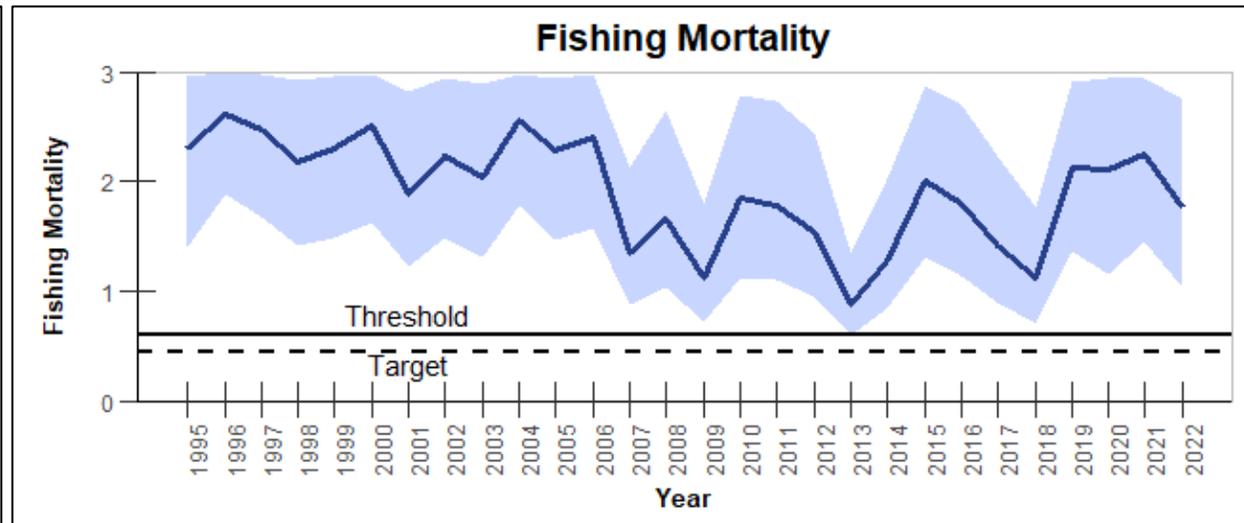
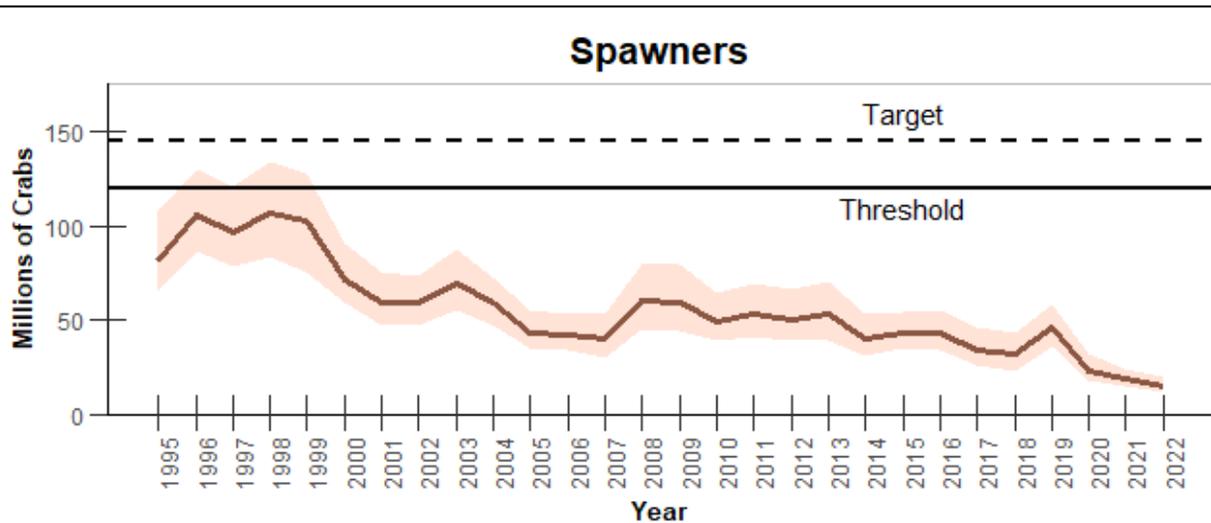
## External Review



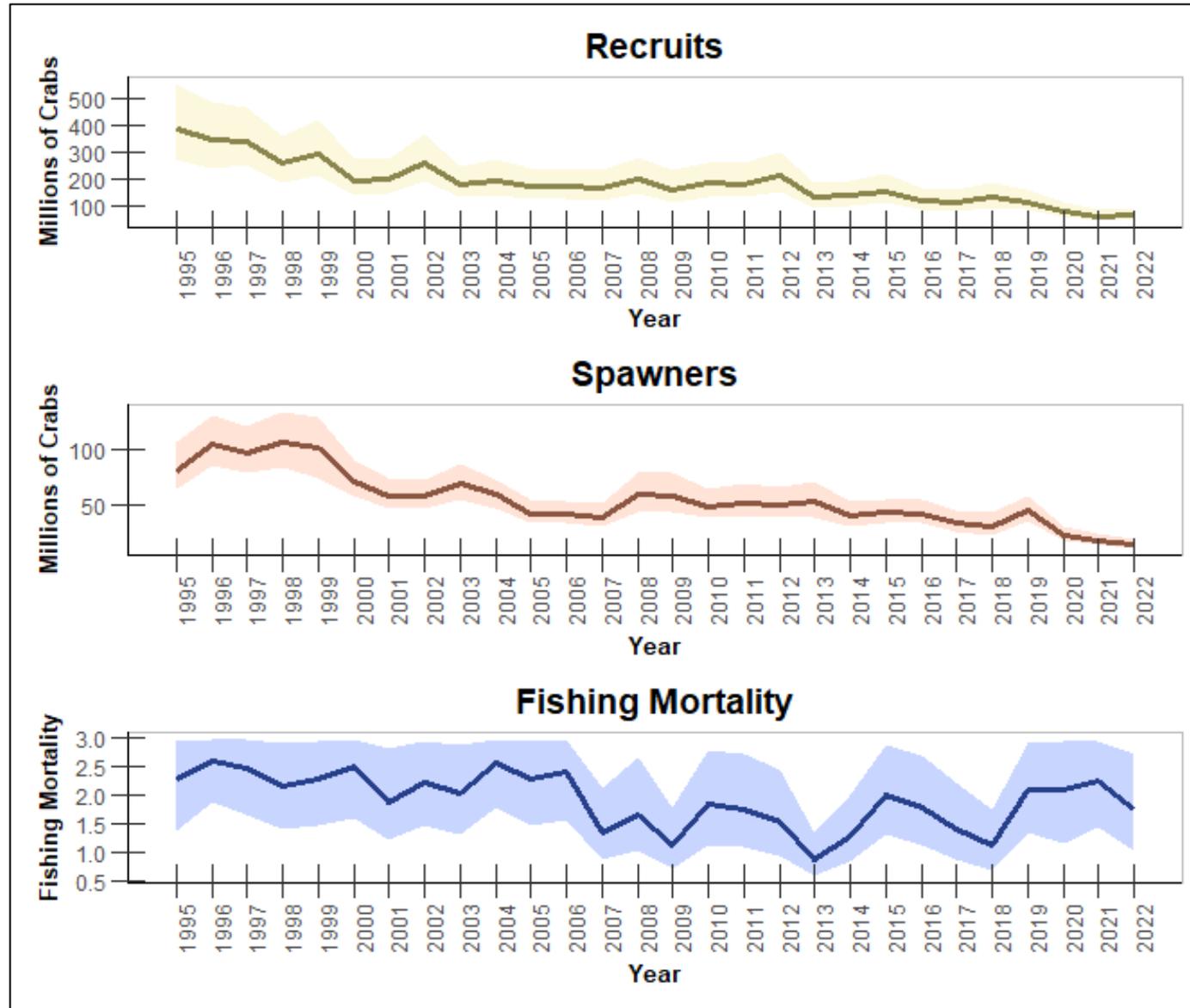
# *Desk Review: December 2023*

## *External Review*

**The recommendations from external review require a benchmark stock assessment to fully complete.**



# Conclusions: Alternate data supports trends



# Questions?

