Developing Chesapeake Bay-specific abundance estimates for striped bass and spot

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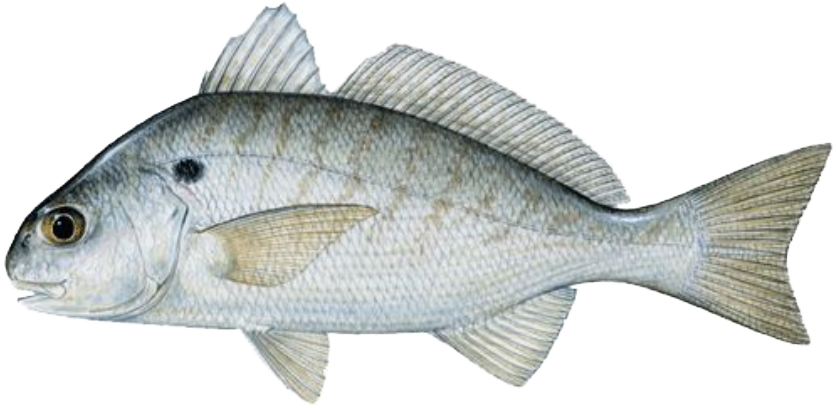


Background

- There is broad interest in understanding the effects of environmental changes on fish and shellfish populations in the Chesapeake Bay

- We lack Bay-wide estimates for most species, which hampers our ability to determine causes of change in the community

Objectives

- Develop spatial models that estimate abundance and mortality rates for striped bass and spot in the Chesapeake Bay,
- Estimate the effects of environmental drivers on population dynamics, and
- Make the estimates publicly available to facilitate other studies

Striped Bass

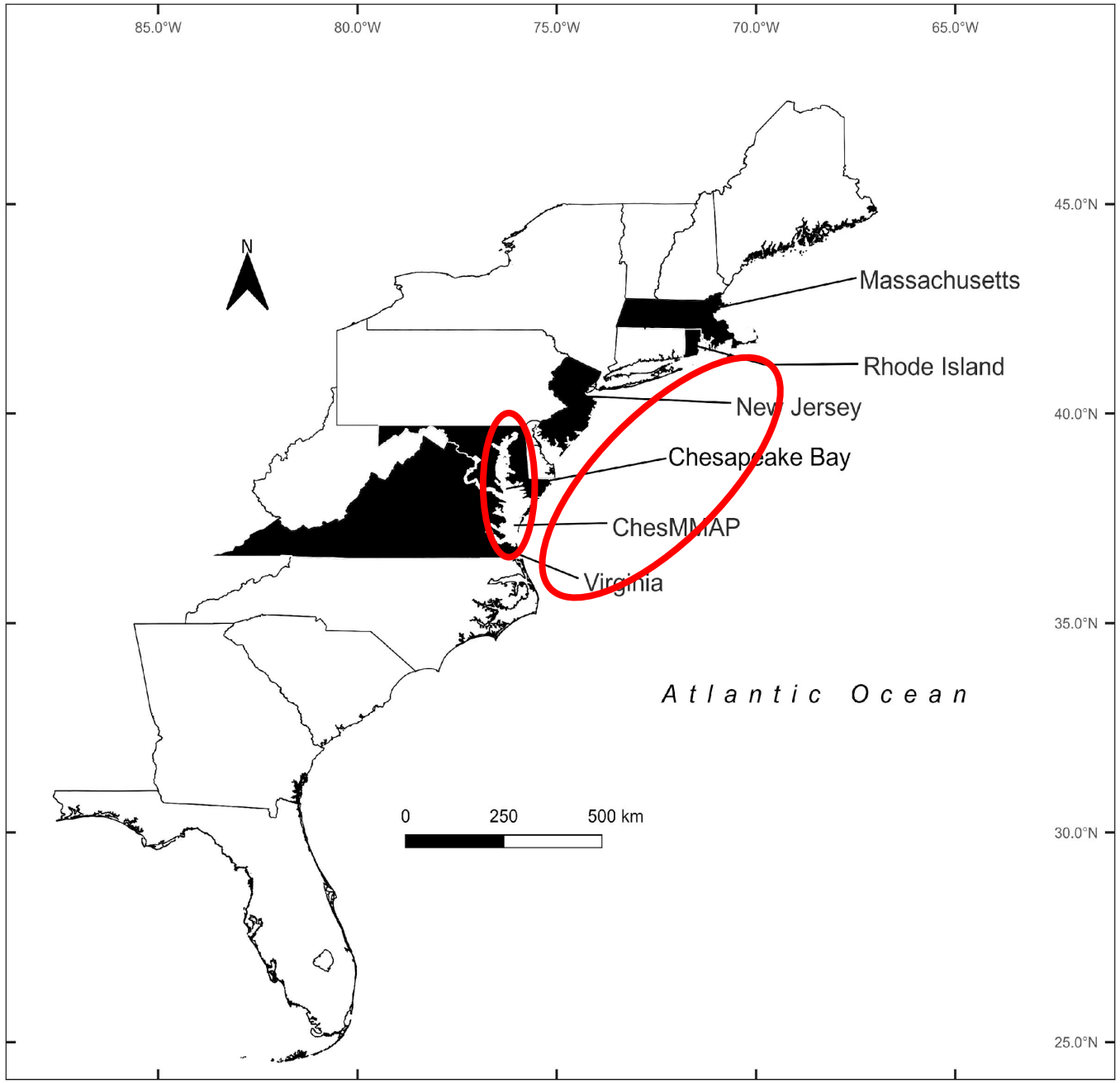
- We are working with the leads of the ASMFC striped bass assessment
- Age-structured spatial model
- Tagging model of movement

Age-structured Model

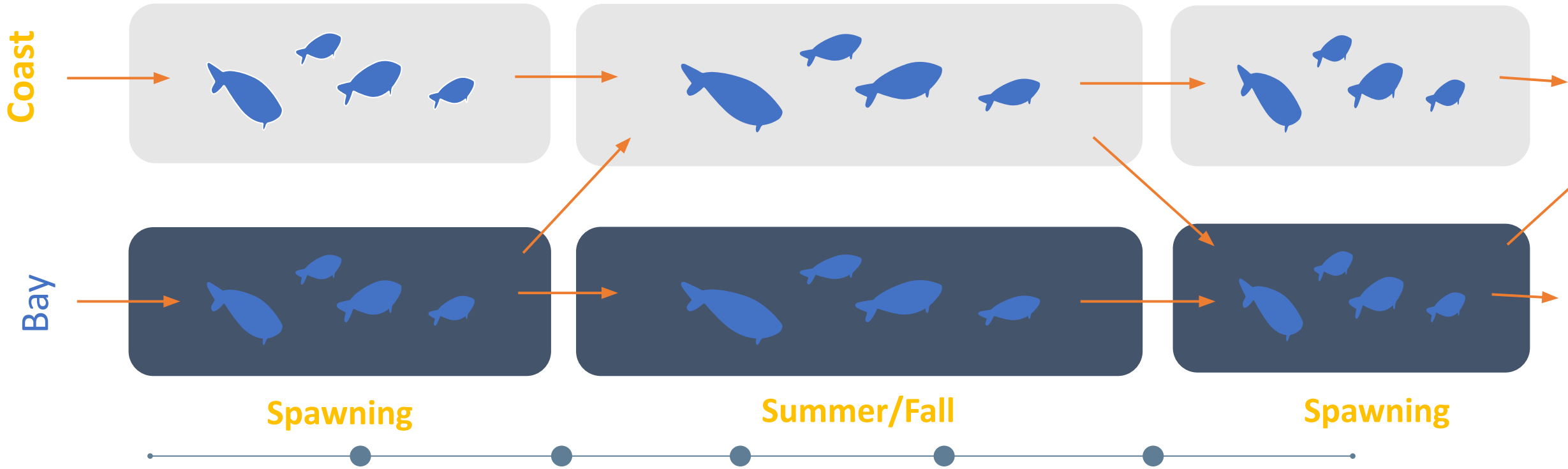
- Spatial statistical catch-at-age model
- 2 stocks and 2 areas
- Use traditional survey and catch data from all the states
- Incorporate conventional and acoustic tagging data
- Accounts for aging error associated with scale aging

Study area

- Two areas:
  - Chesapeake Bay
  - Outside of Chesapeake Bay



Model Structure



Estimated parameters

- Recruitment in each area and abundance in the first year
- Fishing intensity and selectivity for each fishery
- Survey catchability and selectivity
- Movement parameters that describe the proportion of the population in each area during a time-step

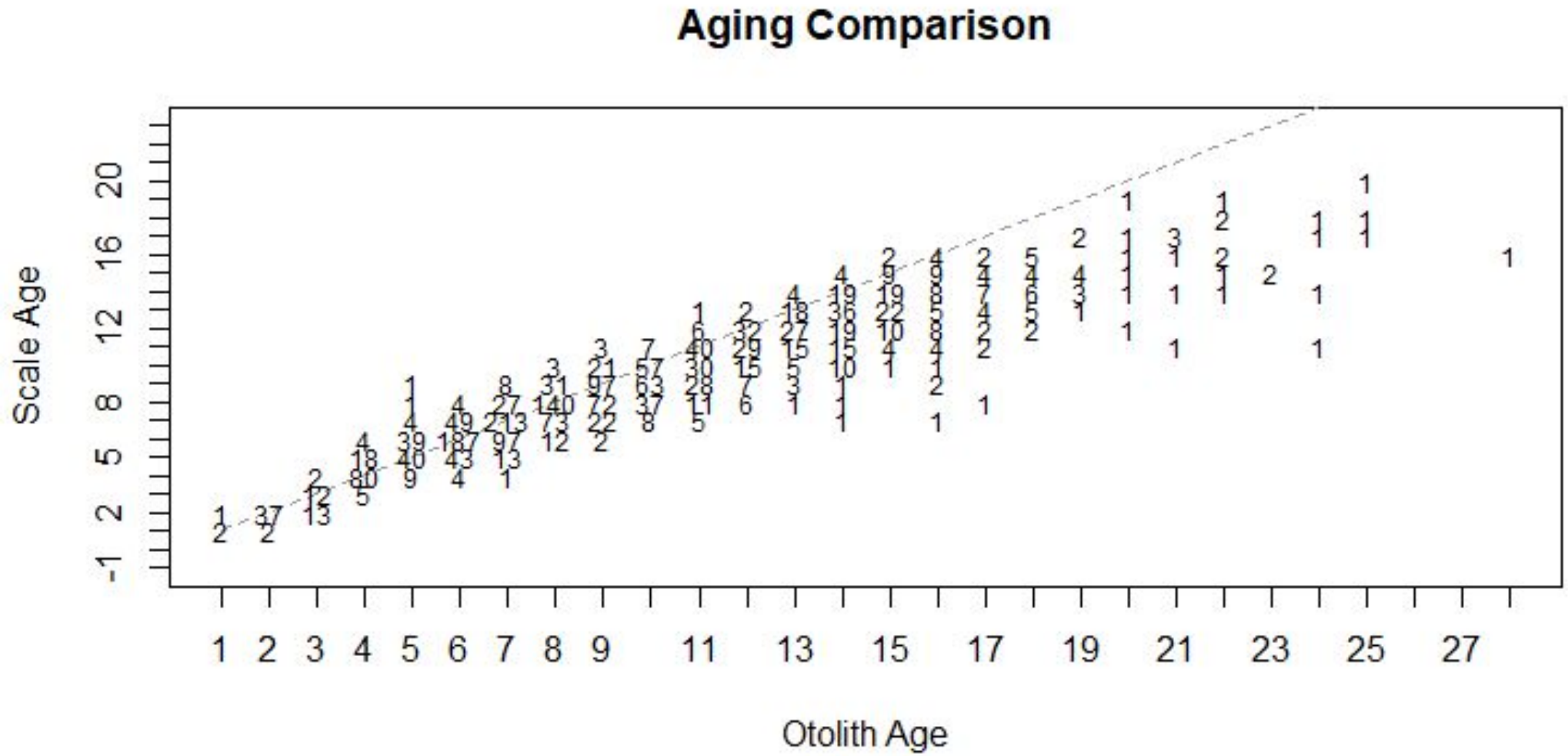
Catch-at-age Data

- Commercial catch-at-age from each state
- Recreational catch-at-age from each state over time (MRIP)
- Catch data sets include dead discards

Indices of abundance

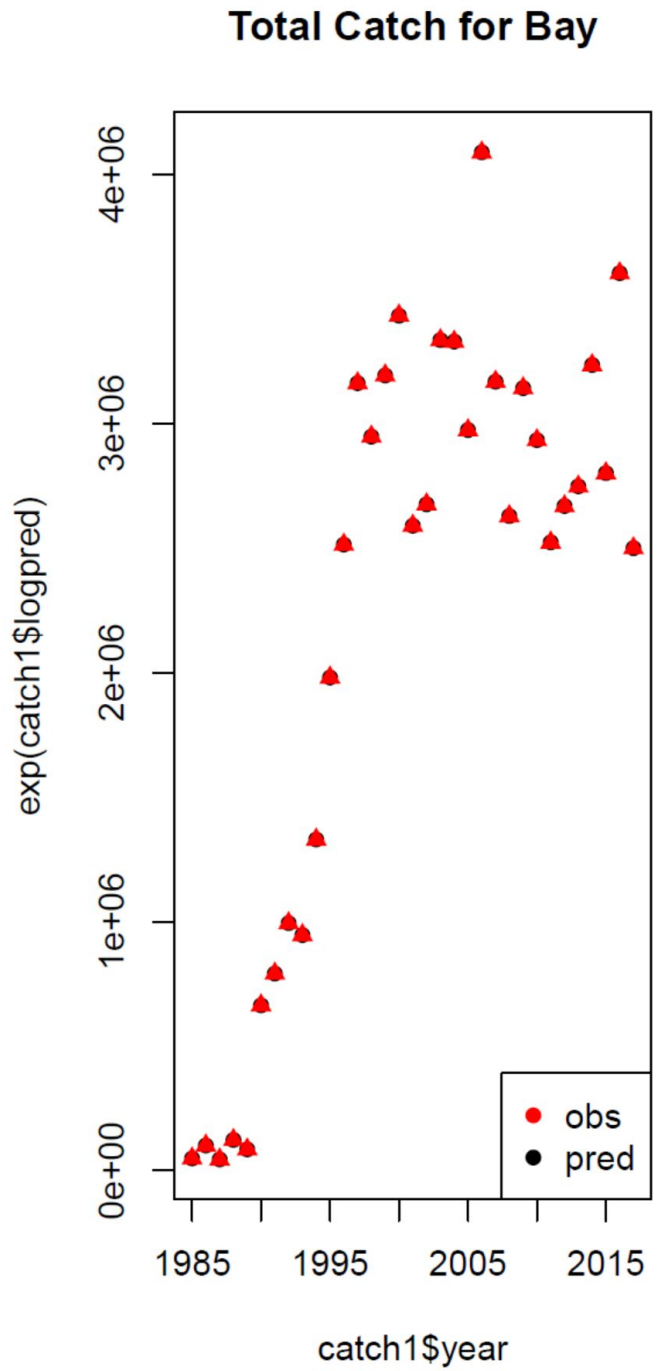
- Multiple ages
  - ChesMMAP
  - Delaware 30 ft
  - Connecticut LIST
  - New Jersey Ocean Trawl
  - New York Ocean Haul
  - Maryland Spawning Survey
  - Delaware Spawning Survey
- Age 0
  - New York
  - New Jersey
  - Maryland/Virginia
- Age 1
  - New York
  - Maryland

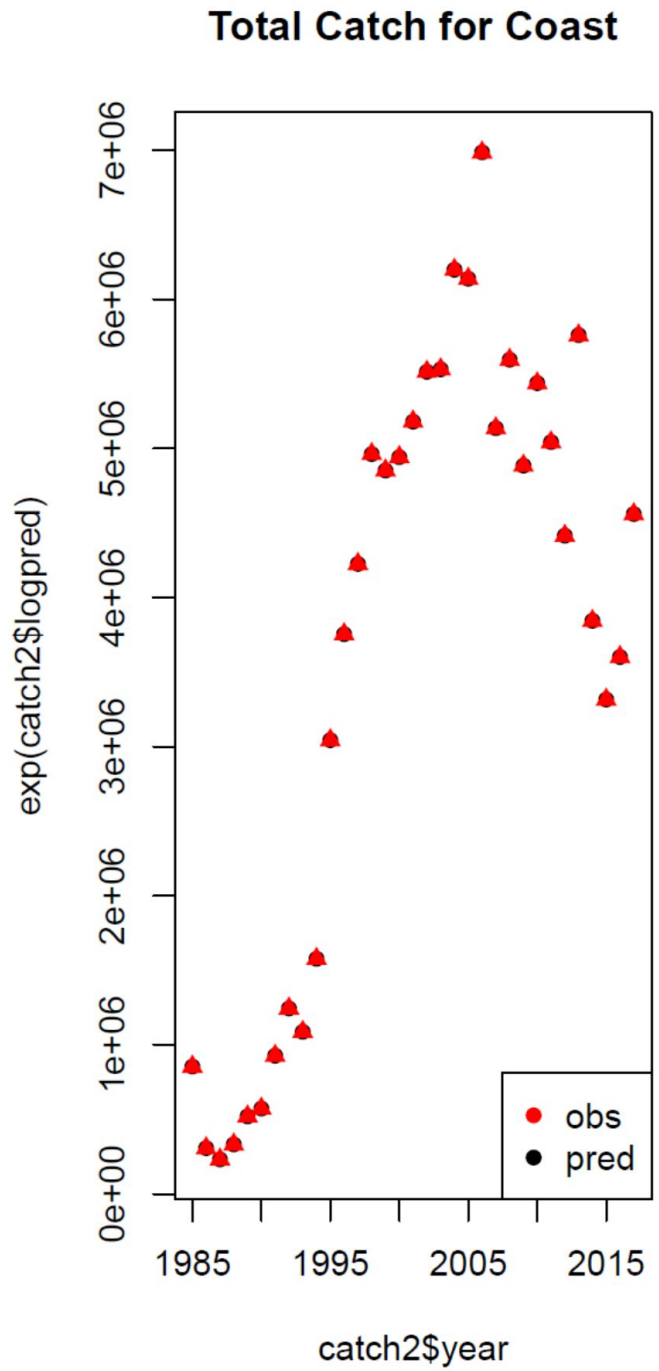
Scale aging error

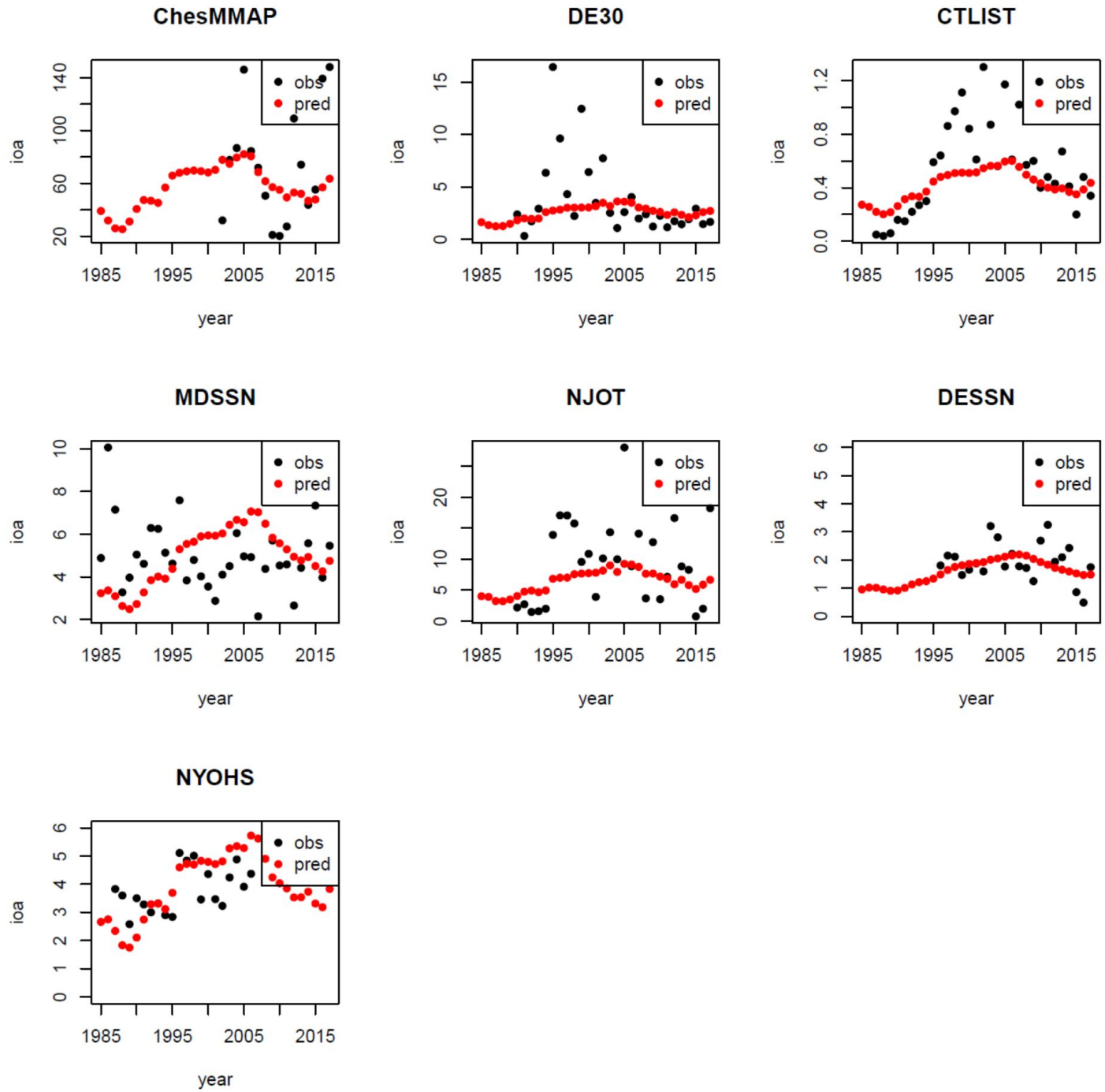


Model to date

- 1985-2017
- Fleets as areas (Chesapeake Bay, rest of the range)
- Model includes aging error
- Currently developing the spatially-explicit version of the model


Total Catch for Bay
exp(catch1$logpred)
0e+00
1e+06
2e+06
3e+06
4e+06
1985
1995
2005
2015
catch1$year
obs
pred


Total Catch for Coast
exp(catch2$logpred)
0e+00
1e+06
2e+06
3e+06
4e+06
5e+06
6e+06
7e+06
1985
1995
2005
2015
catch2$year
obs
pred


ChesMMAP
DE30
CTLIST
MDSSN
NJOT
DESSN
NYOHS
obs
pred
ioa
year
1985
1995
2005
2015

Next steps

- Complete the spatially-explicit model
- Simulation test model performance
- Evaluate environmental effects on striped bass dynamics

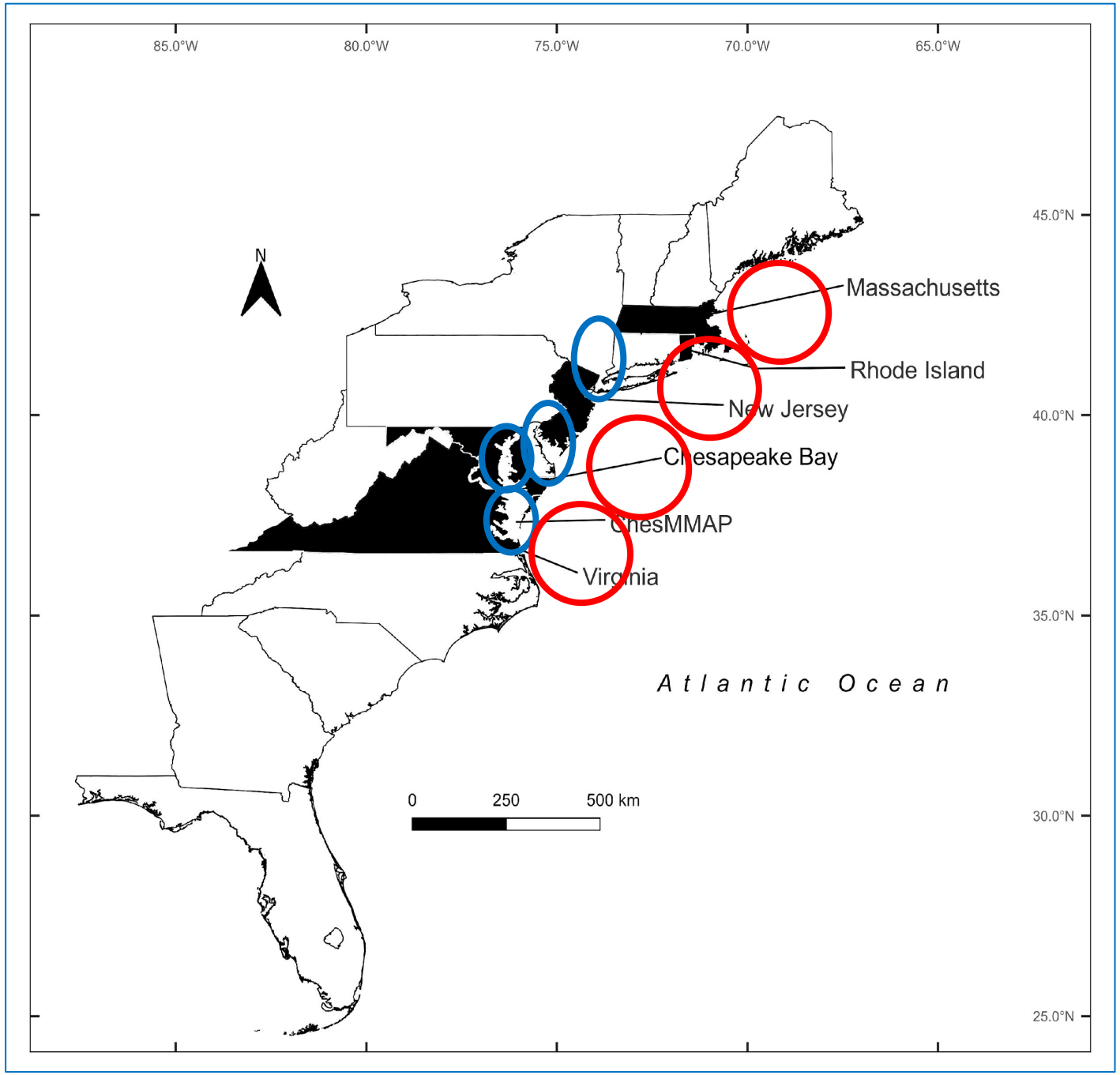
Striped bass tagging model

- ~500,000 striped bass have been tagged with conventional tags
- Tagging models have been applied in the past, but they have not been used to estimate movement rates
- We are implementing a model to estimate movement rates of striped bass from each producer region
- These movement rates will help inform the age-structured model

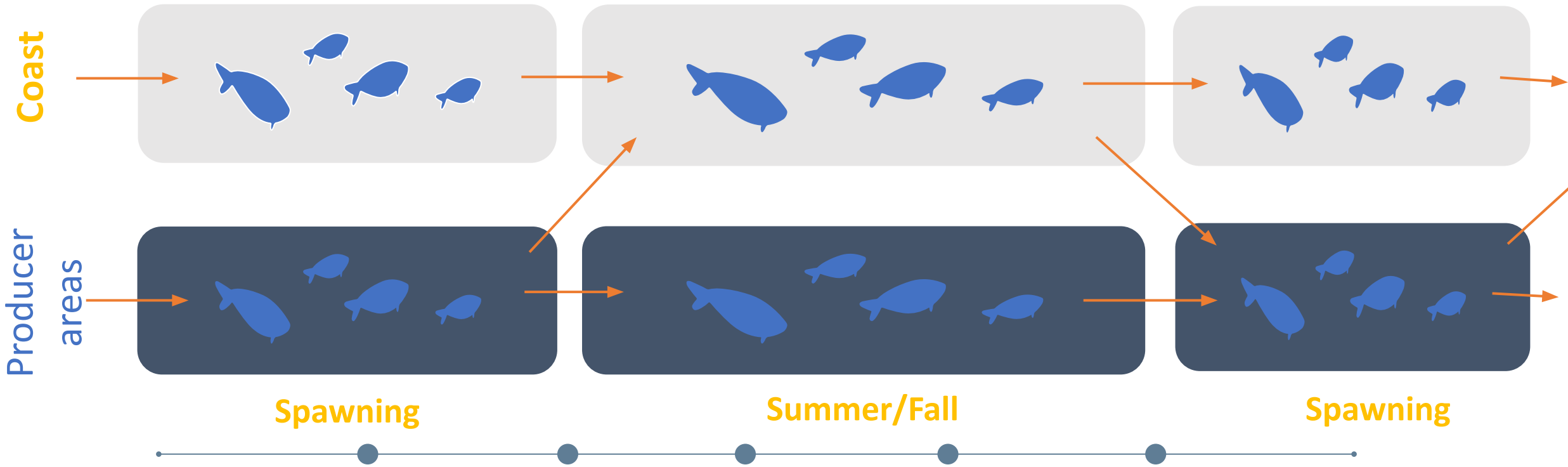
Study area

Producer areas

Migratory areas



Model Structure



Current status

- Model operates on a 2-month time step
- Currently developed for the Virginia producer region
- It’s running as we speak!

Model estimates

- Proportion of the population from each producer region as a function of age and time of year

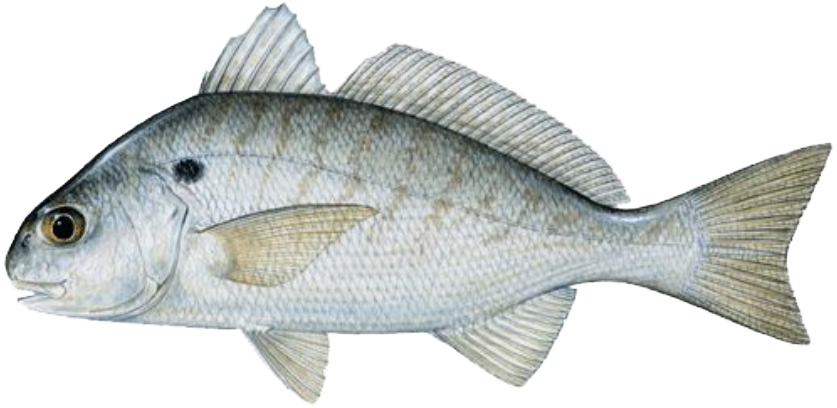
- Fishing mortality rates by location and time of year

Next steps

- Expand the model to all producer regions
- Incorporate acoustic tagging information
- Provide movement parameter estimate for inclusion in the age-structured spatial model

Spot

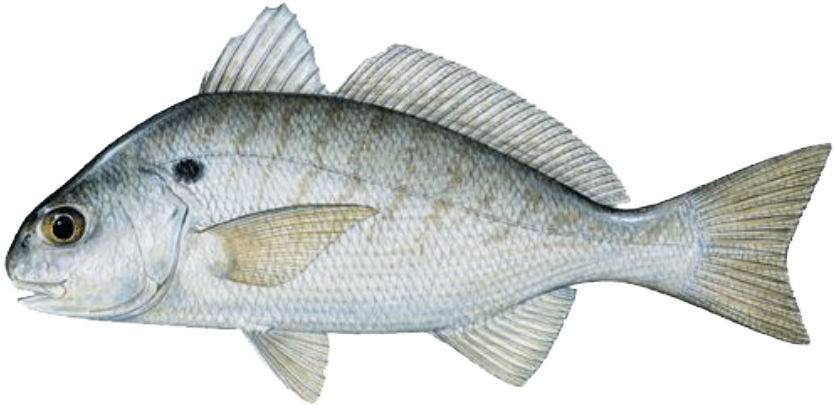
- Spot was selected as our second species spring 2022
- This will allow us to develop a model for an important forage species
- Spot does not currently have an accepted assessment model
- The spot assessment is occurring soon



Spot – next steps

- Submit data requests

- Develop age-structured spatial model (initially will be similar to the striped bass model)



Acknowledgments

- Steering committee
- Gary Nelson and Katie Drew
- Striped bass TC
- Spot TC

- Funding
  - NOAA Chesapeake Bay Office
  - VIMS
  - CBL

- Data
  - North Carolina
  - Virginia
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  - Delaware
  - New Jersey
  - New York
  - Connecticut
  - Rhode Island
  - Massachusetts
  - Dave Secor