



Creating Tools For Ecosystem Management

**Development of a
Multi-Species
Statistical Catch-At-Age Model for a Mid-Atlantic Species
Complex**

Overview

The background of the slide features a soft, artistic illustration of an underwater environment. It includes several fish of different species swimming in the water, and various types of coral and sea anemones on the seabed. The overall color palette is light and natural, with shades of blue, green, and beige.

- **Brief introduction**
- **Context of the current project**
- **Species profiles**
- **Information and output from model**
- **Future scope of work**

Introduction

- **Ecosystem considerations; increasingly called for by industry, managers, public, scientists**
- **Comes from recognizing shortcomings of using a single species view to calculate an optimal yield**
- **The development of new tools to account for the ecosystem when viewing fisheries is necessary**

Context

- **This project has developed a multispecies statistical catch-at-age (SCA) model**
 - **Based on work done at URI for Georges Bank species**
- **A multispecies model already exists for the same suite of species, but exists as a virtual population analysis**
- **Creation of a SCA model allows the addition of uncertainty in the framework**
 - **Particularly important for species with high recreational component and for age structured modeling**
- **This project creates a tool for potential use in ecosystem management**

Striped Bass

- One of the most popular game fish on the east coast (Rhode Island's state fish)
- Top predator, menhaden is critical component of its diet during certain life stages
- Highly migratory
- Fast growing species, 70 lbs record in RI
- Stock status is good but declining



Bluefish

- Another popular game fish on the east coast
- Valued more as sport than food
- Top predator
- Highly migratory
- Fast growing, though does not get as large as striper
- Stock status is good



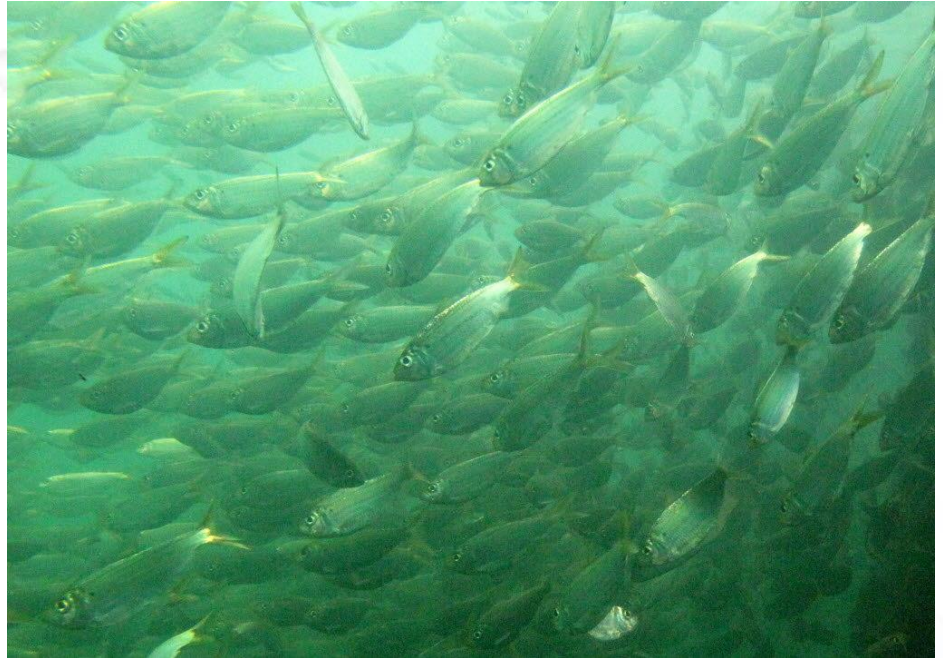
Weakfish

- Another popular game fish on the east coast
- Valued as sport species and food
- Top predator, but is also prey for certain species
- Highly migratory
- Stock status is poor, currently at low abundance



Menhaden

- Important prey species
- Schooling clupeid
- Valued by sport and commercial fishermen
- Highly migratory (FL to ME)
- Stock status is good



Scup

- Important predator and prey species
- Schooling Sparidae, structure oriented
- Valued by sport and commercial fishermen
- Highly migratory
- Stock status is good, about to go in to a benchmark process for 2015

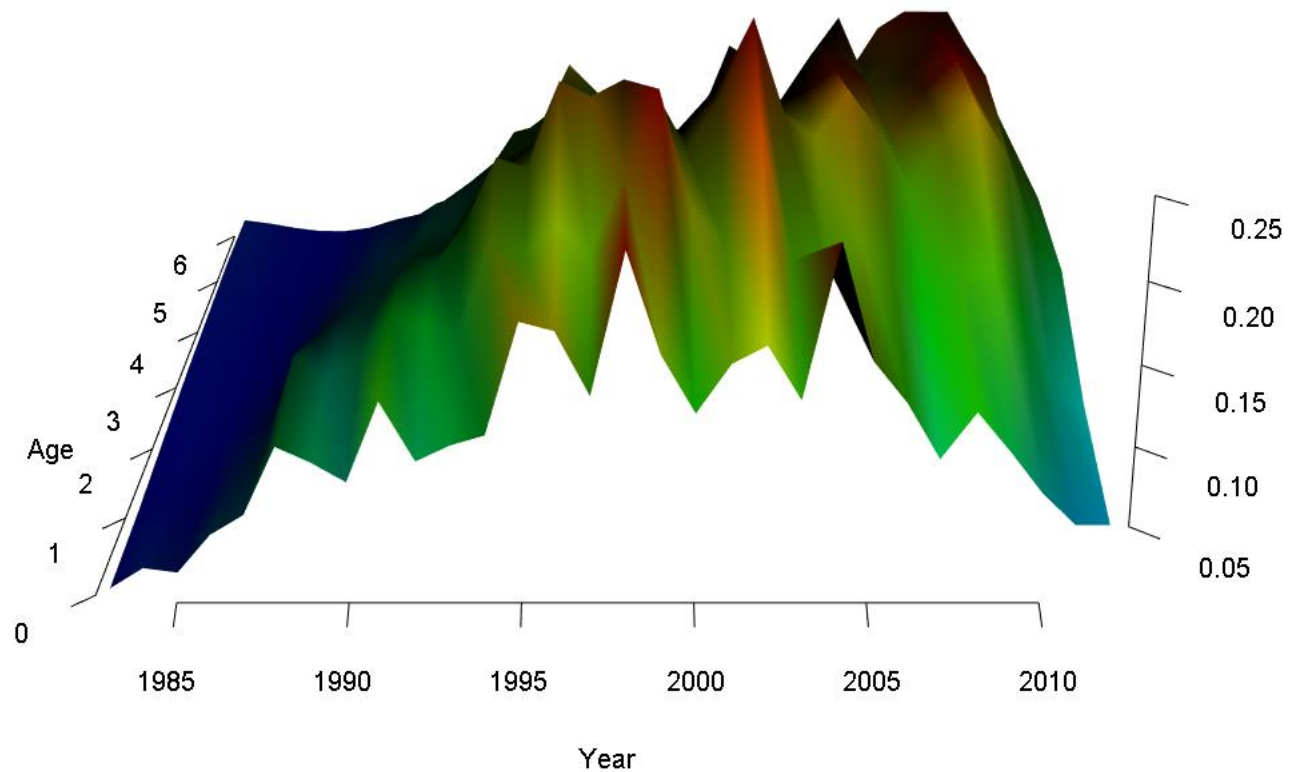


The Model

- **Not much different from existing statistical models**
- **The main difference is the connection between the normal modeling procedures through the use of predation functions**
- **This allows for a dynamic link between what one population is doing, and its effects on other species populations**
 - **E.g. striped bass population increases, they eat a lot of menhaden, menhaden population decreases**
- **The following are some preliminary outputs from the model**

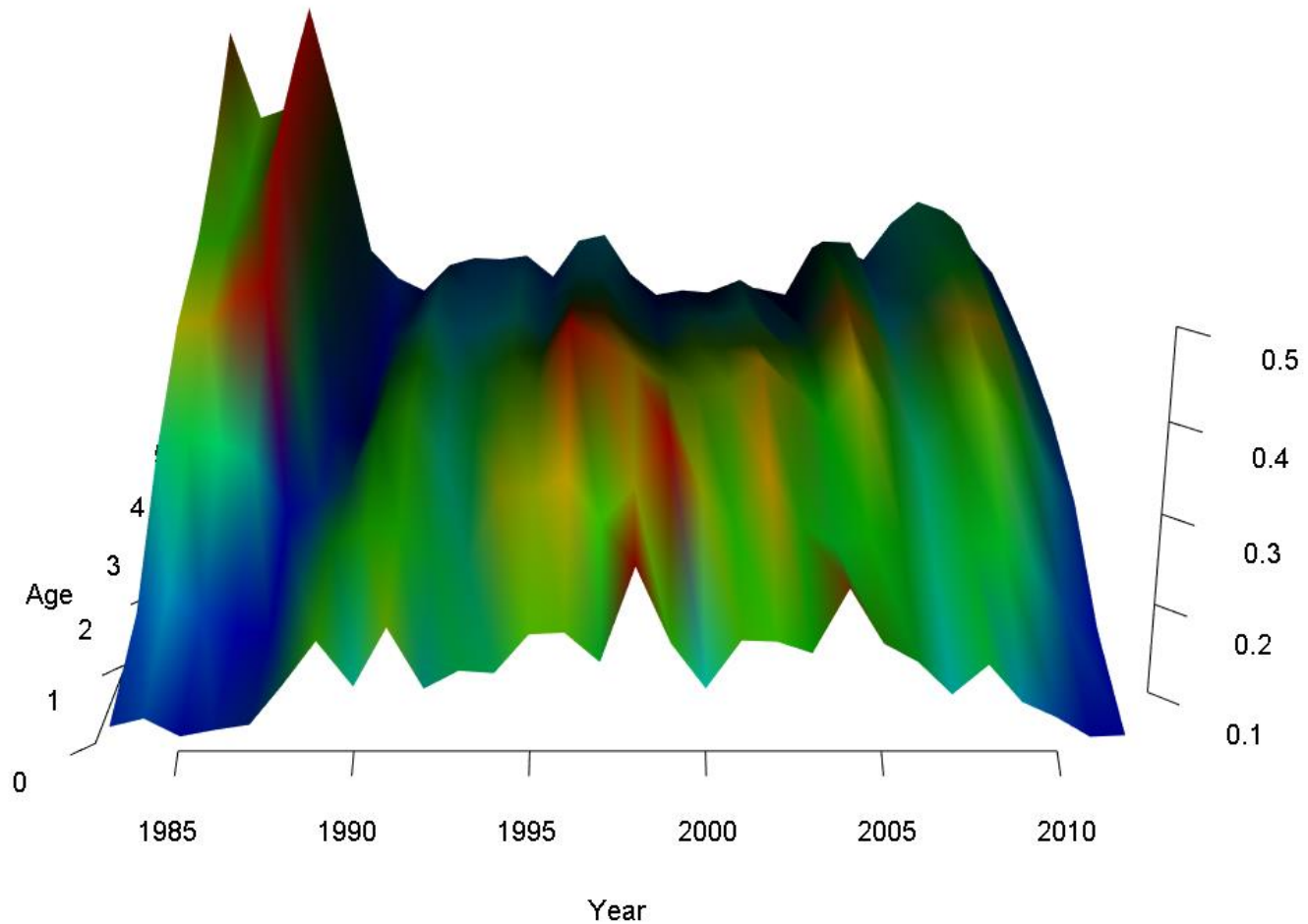
Model Output

Menhaden Predation Mortality by Age and Year - 2 Species Model



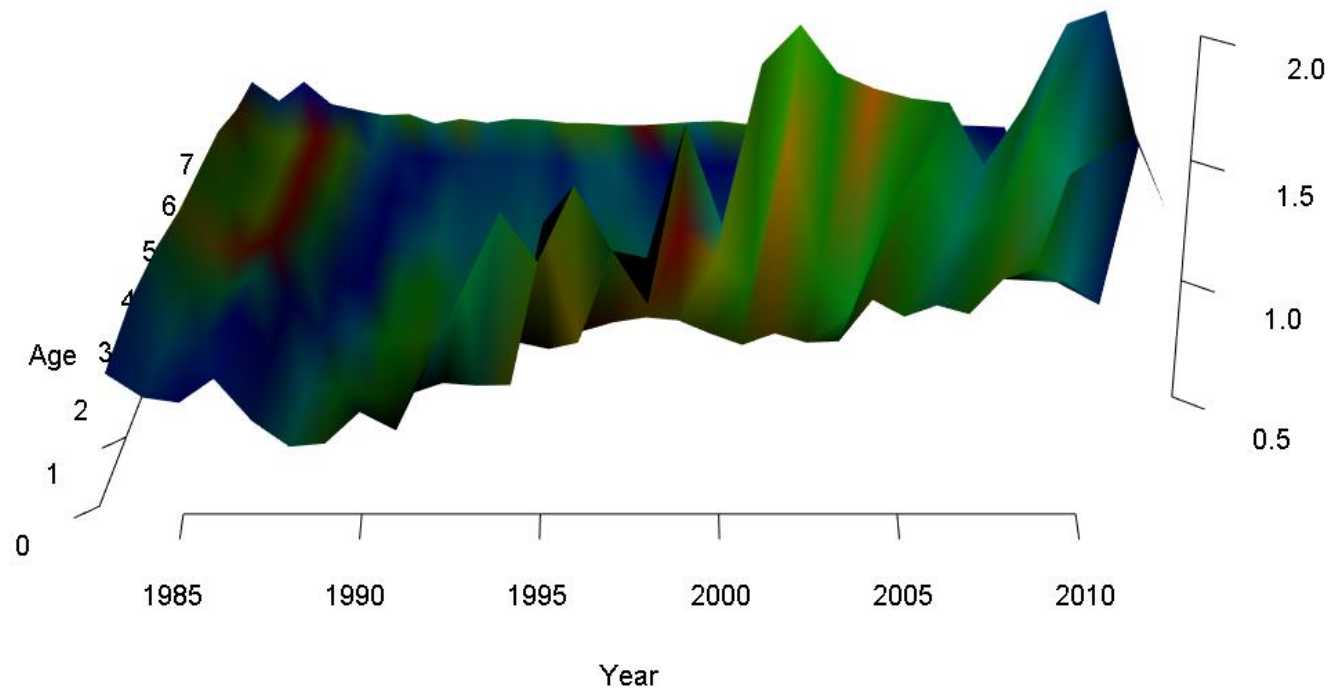
Model Output

Menhaden Predation Mortality by Age and Year - 5 Species Model

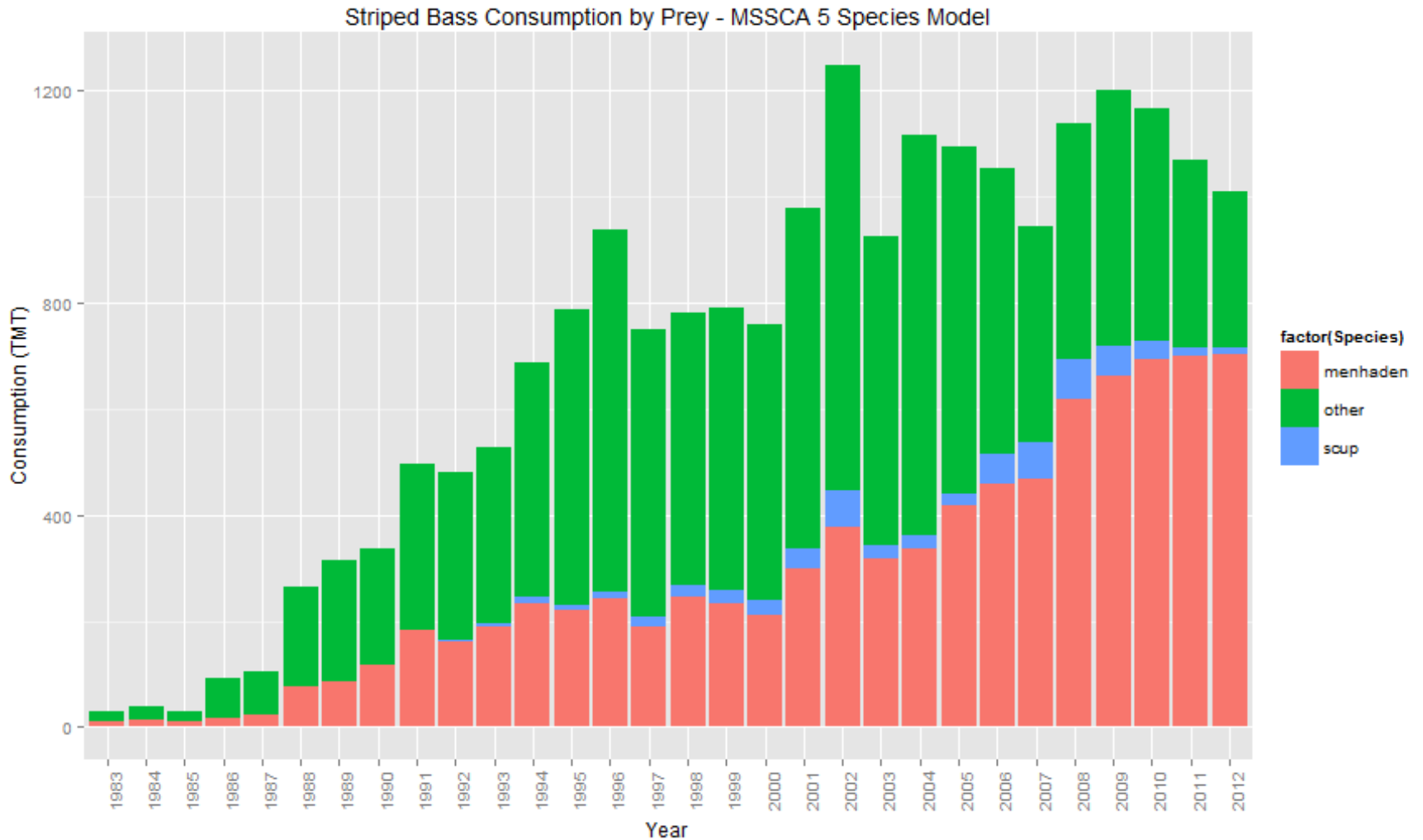


Model Output

Scup Predation Mortality by Age and Year - 5 Species Model



Model Output



Summary

- **This project has created a tool that can be incorporated in to ecosystem based management**
- **This tool is limited, it focuses on one aspect (albeit an important one) of the complex interactions in the ecosystem**
- **Additional structures are needed in the management system to be able to incorporate tools like this**
- **Other uses for the information also exist**
 - **Review as external information by managers**
 - **Can be used directly in single species modeling approaches to help inform time/age varying M**

Future Scope of Work

- Continue working on and perfecting multi- species model
- Continue creating simulation model for projections
- Perfect some modeling functions
- Potentially incorporate prey-dependent predator growth
- Work towards getting the model incorporated into the tools used for management

Acknowledgements

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The Nature
Conservancy



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