

Science, Service, Stewardship



Monkfish: A Data Moderate Stock

R. Anne Richards
Fishery Research Biologist
Anne.Richards@noaa.gov

August 2, 2013



**NOAA
FISHERIES
SERVICE**

NOAA



Background - Monkfish

- Distributed from NC through Gulf of Maine
- Jointly managed by **NEFMC** and MAC (FMP 1999)
- Two management areas (not necessarily stocks)
- Fishery developed mid-1980s
- Model-based assessment ≥ 2007
- Current status: Not overfished, overfishing not occurring

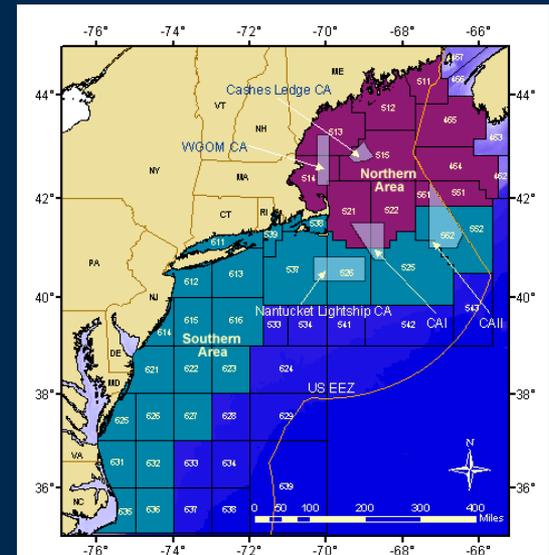


Figure 14.1. Statistical areas used to define the northern and southern goosefish management regions.



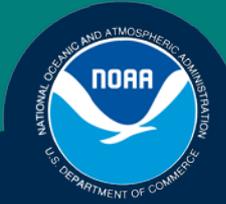
Background – Assessment Model

Assessment: Length-tuned age-based model

SCALE (Statistical Catch At Length)

- Forward projecting
- Age-based model
- Length-tuned
- Designed for ‘data-poor’ assessments





Monkfish Data Needs

By Management Area:

- Total catch (landings + discard)
- Numbers at length in landings
- Numbers at length in discard
- Abundance indices (recruits and adults)
- Numbers at length in population





Monkfish Data Needs

Biological underpinnings

- Growth (length at age)
- Longevity (M)
- Maturity
- Length-weight relation





Data Sources

| Data | Source |
|-----------------------------------------|------------------------------|
| Landings – magnitude | Weigh-out, VTR (area fished) |
| Landings – length composition | Observer data |
| Discard – magnitude | Observer data |
| Discard - length composition | Observer data |
| | |
| Population – abundance, length, biology | NEFSC bottom trawl surveys |
| | Industry-based surveys |
| | NEFSC scallop survey |
| | ASMFC shrimp survey |
| | ME/NH inshore survey |



Sources of Uncertainty





Landings - Uncertainty

Landings uncertainty mostly historical:

- Likely under-reporting prior to 1980s
- No biological sampling until 1994

Contemporary sources:

- Processing at sea – tails, gutted fish - require conversion
- Allocation to management area - VTR





Discards - Uncertainty



- No sampling before 1989
- Sparse sampling some gears, years
- Discard mortality
- Contemporary sampling effort adequate

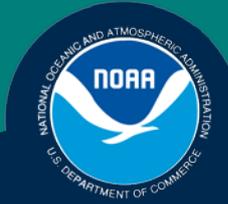


Surveys - Uncertainties

NEFSC Spring and Fall

- Before Bigelow: few monkfish caught (~150 per survey)
- After Bigelow: higher catches, but conversion highly uncertain
- Age structures not collected until 1994





Surveys - Uncertainties



Scallop, shrimp surveys

- Higher catches, but limited geographic coverage

ME-NH inshore survey

- Limited geographic coverage, shorter duration

Industry-based surveys:

- Great for biology, length composition
- Abundance, biomass problematic



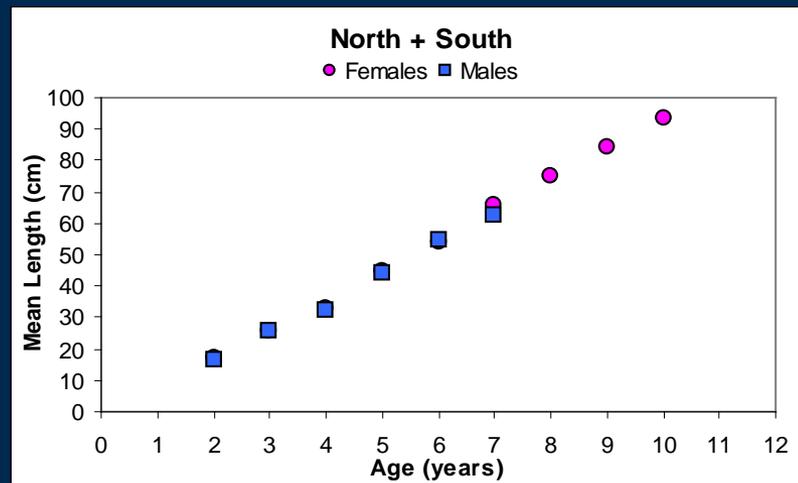
Biology - Uncertainties

Growth:

- Ageing method not validated
- Linear growth pattern suspect

Assumption of M:

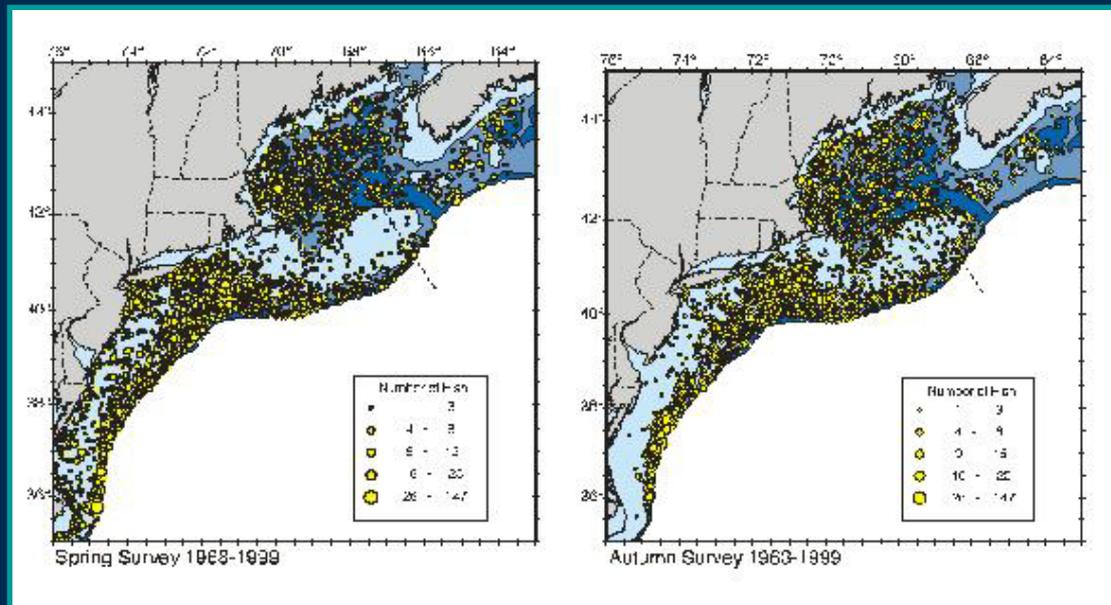
- Based on perceived max age males vs females

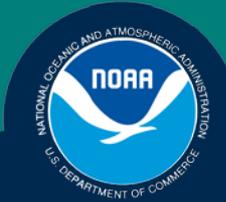




Biology - Uncertainties

- Stock structure
- Movements between management areas





Uncertainty - Monkfish

Impacts on model uncertainty?

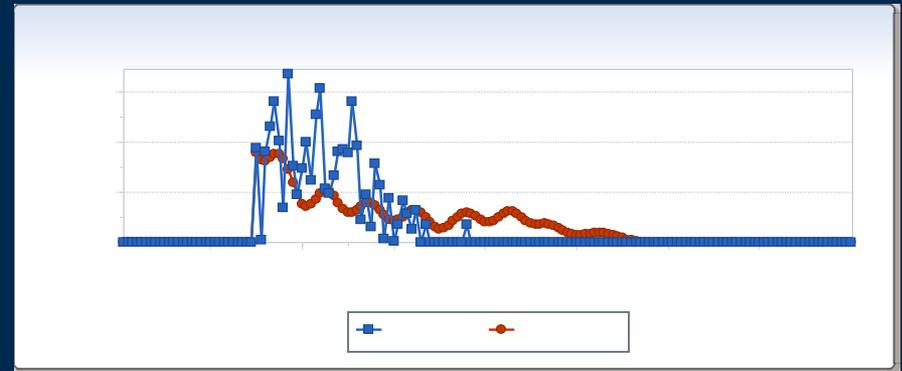
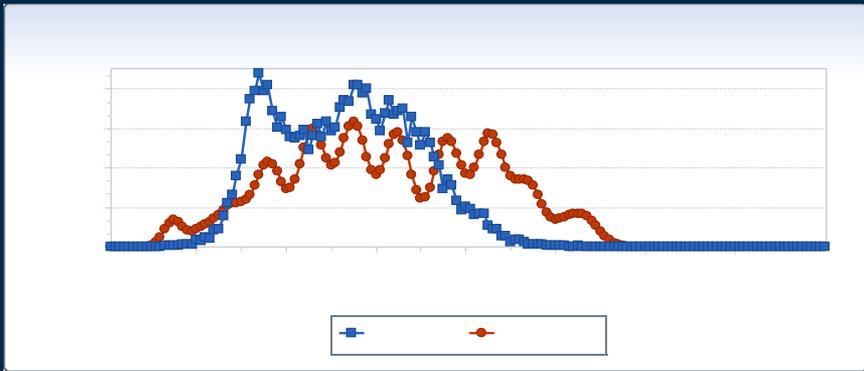
- The most significant data inadequacies for monkfish are either historical or biological
- These types of uncertainties are not reflected in variance estimates of model parameters and outputs





SCALE Model Uncertainty

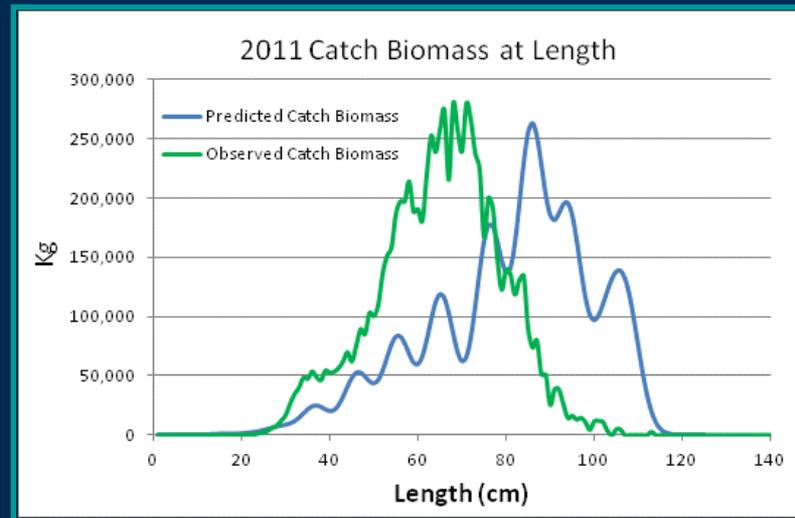
- Poor length frequency fits in some years
 - Patterns suggest problem with growth model

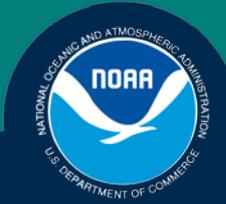




SCALE Model Uncertainty

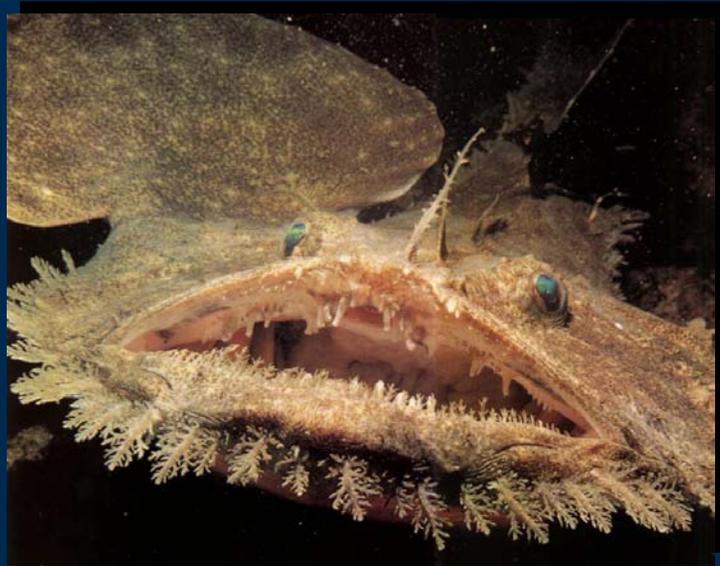
- Overestimation of number of large fish
- Large proportion estimated biomass is in large fish that do not exist in catch





Management

How does assessment uncertainty impact management?





F Reference Points

$F_{MSY}(\text{proxy})$

Fmax from age-based YPR

- Growth
- M

➔ Highly uncertain



HabCam photo, S. Gallagher, WHOI



Biomass Reference Points

B_{target}

Long-term projected B at F_{MSYproxy}

- Based on SCALE model output

➔ Highly uncertain

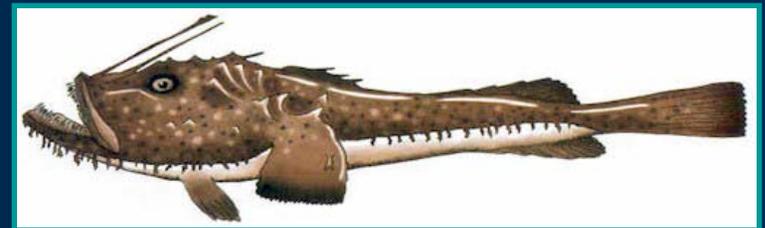


HabCam photo, S. Gallagher, WHOI



Management Buffers

- Probabilistic ABC control rule not used because would ignore true model uncertainty
- OFL very high relative to catch history
- Empirical ABC control rule adopted:
 - F during period of increasing biomass





Management Buffers

- Buffers (2011-2013):
 - OFL-ABC: -61% North, -66% South
 - ABC-ACT: -13.5% North, -6.5% South



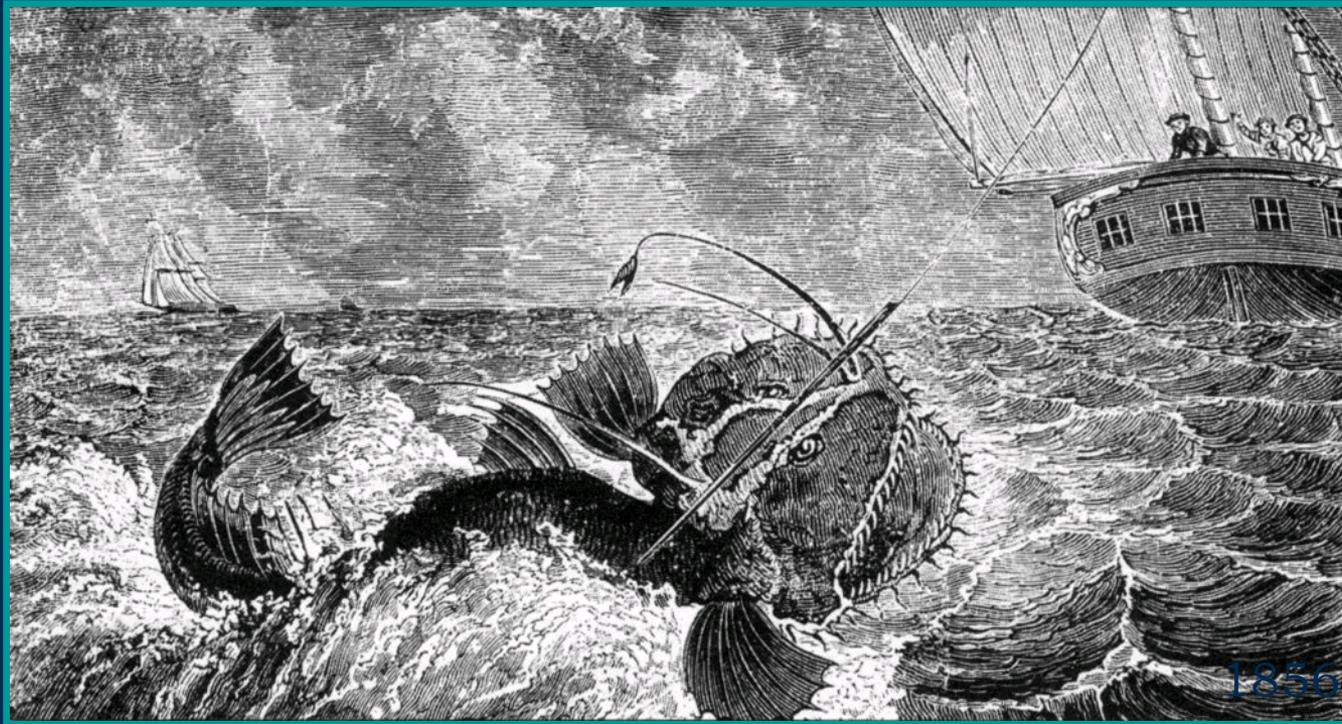


Strengths, Challenges, Proposed Solutions

- Strengths
 - Improved contemporary data
 - Improved catchability in Bigelow Surveys
 - Validation with Industry Surveys
 - Ongoing tagging studies for growth
- Challenges
 - Poor fishery dependent data during the 1980s
 - Incomplete understanding of biology, esp growth, natural mortality
 - SCALE model uncertainty
- Proposed Solutions
 - Complete research on aging and natural mortality



Questions?





Review Panel Conclusions

Major uncertainties but model accepted for determining stock status and catch advice

Key uncertainties remain; updates may be needed, but no benchmark until new info on growth, M etc.

Biomass and catch projections likely are optimistic due to retrospective patterns

Adjustments should be made for retrospective patterns



Review Panel Conclusions

Research recommendations:

- Resolve age, growth, M
- Understand movement between areas
- Develop a one-stock model
- Develop a 2-sex model (dependent on results of growth studies)