



Evaluation of Alternative Harvest Control Rules for New England Groundfish

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Gulf of Maine
Research Institute

Science. Education. Community.

Acknowledgements



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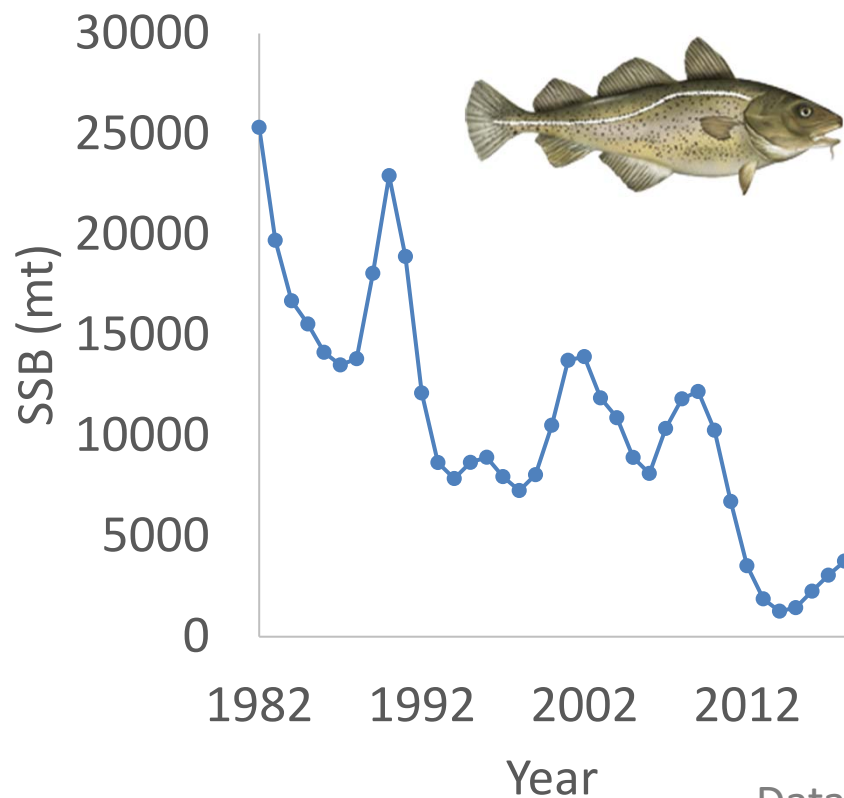


Outline

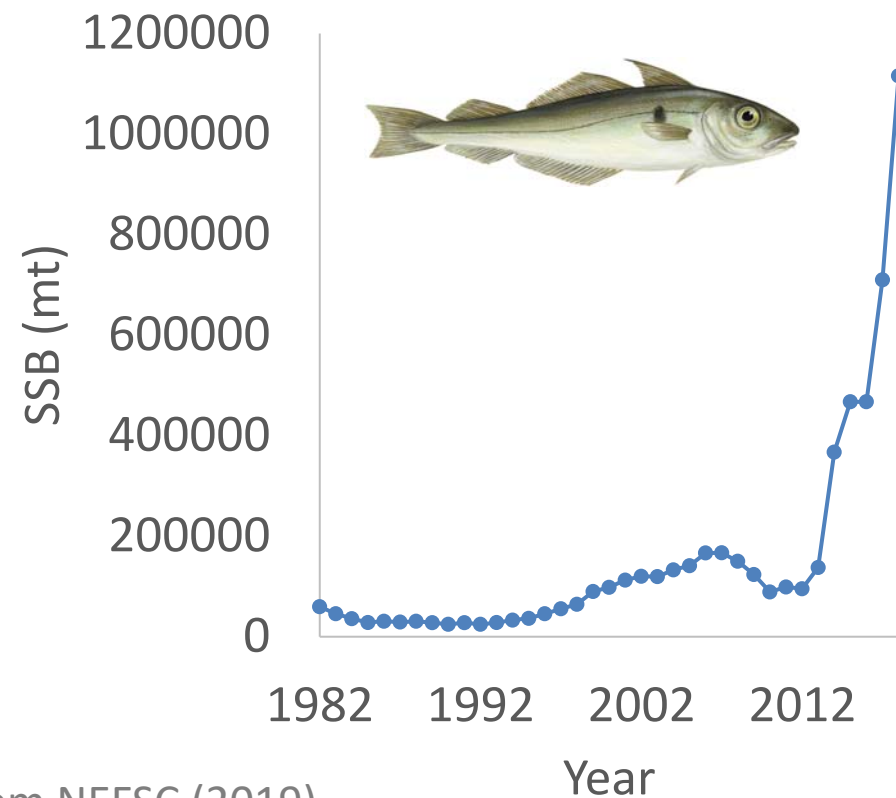
1. Rationale
2. Objectives
3. Simulation tool
4. Research questions
5. Approach
6. Preliminary results
7. Next steps

New England Groundfish

- Performance of the current groundfish management procedure and possible alternatives have not been simulation tested.
 - Groundfish stocks at very different stock status levels.
 - Changes with policy since implementation of ABC control rule.
 - Issues with management performance.

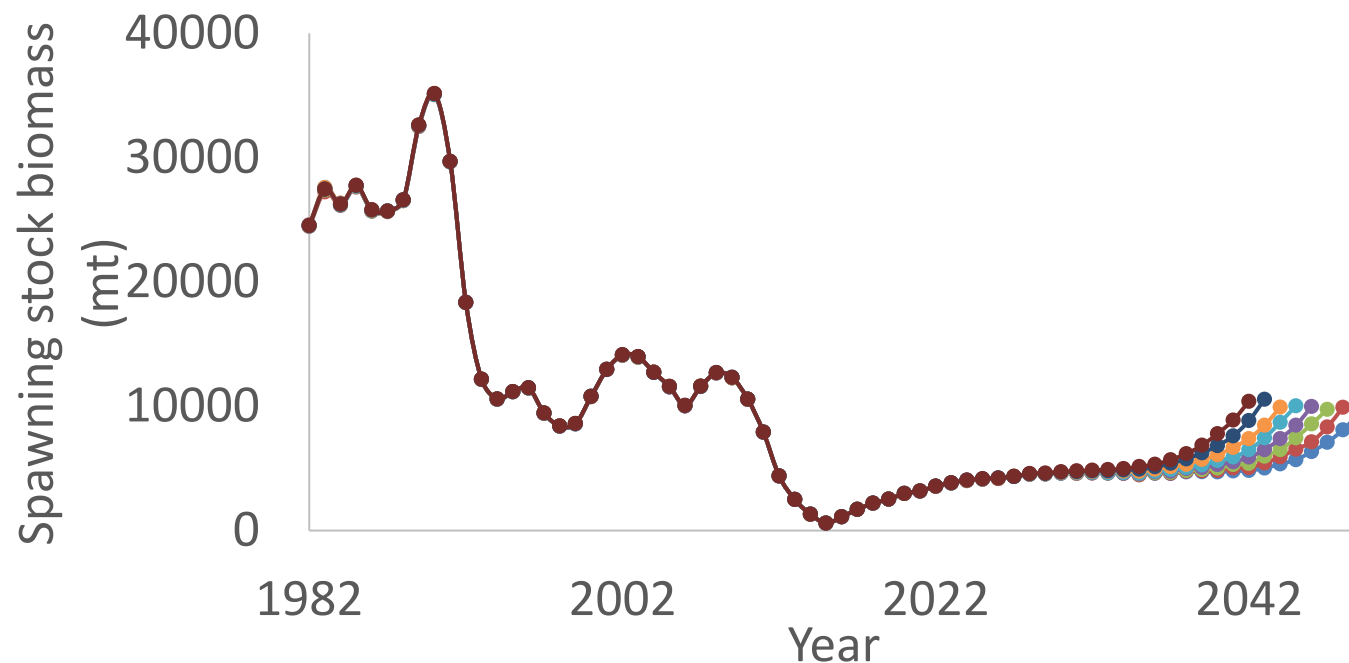


Data from NEFSC (2019)



Retrospective patterns

- Several New England groundfish assessments have major retrospective patterns (inconsistencies of recent estimates after adding another year of data to the assessment)
 - Large source of uncertainty
 - May be caused by not accounting for changes in stock dynamics
 - Can lead to inappropriate fishery management



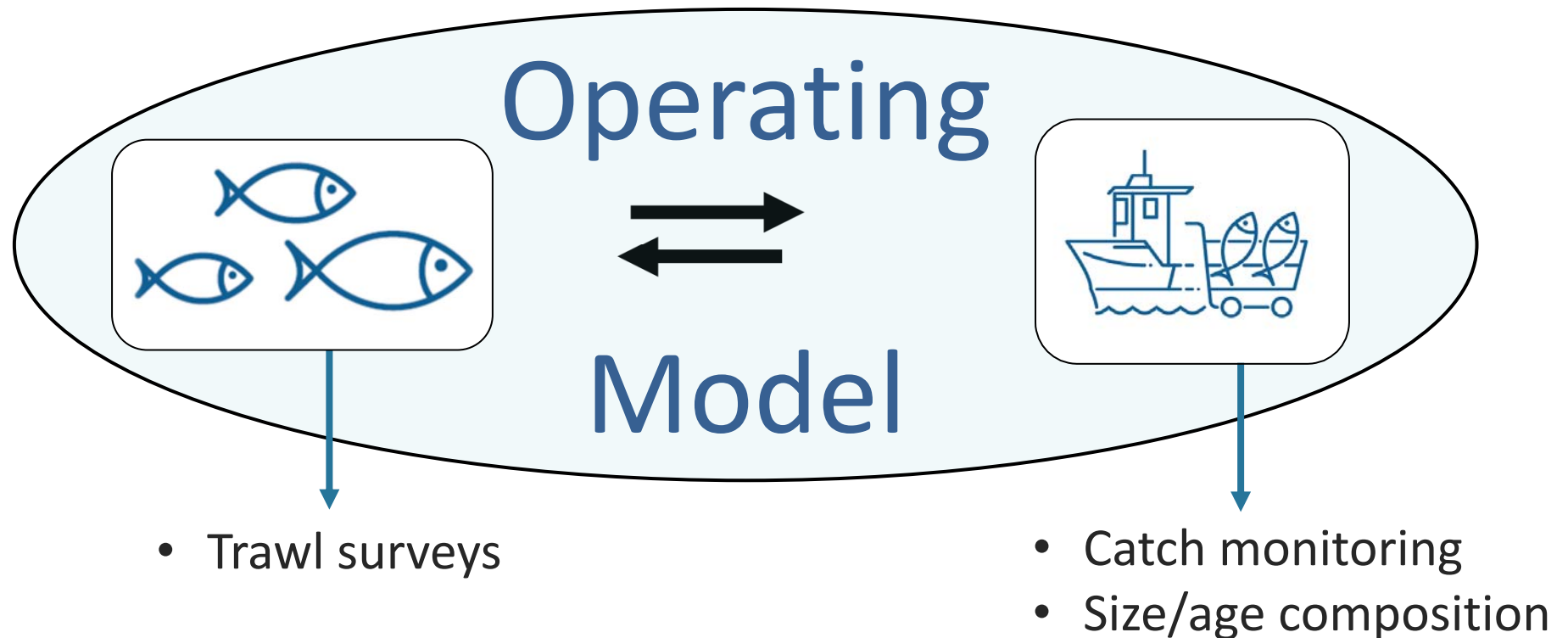
Objective

The goal of this analysis is to evaluate the performance of alternative harvest control rules for groundfish species using a management strategy evaluation model framework.

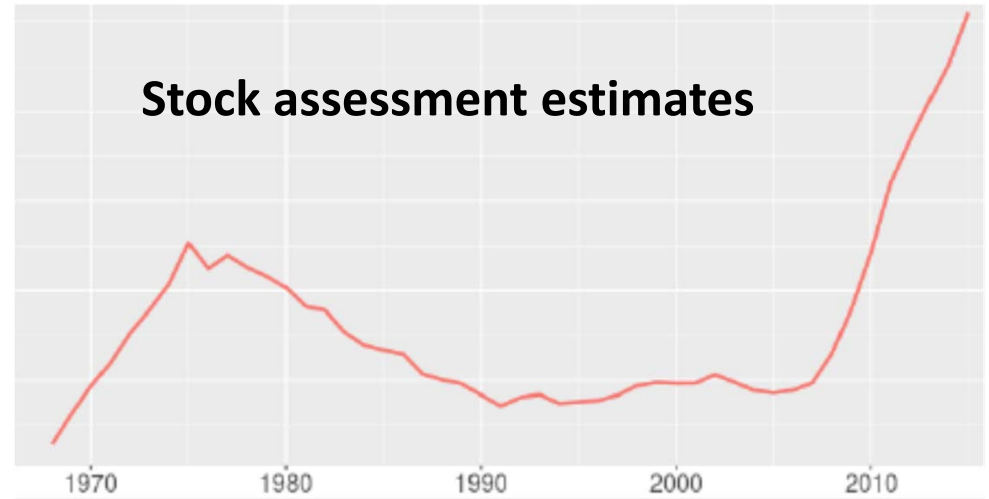
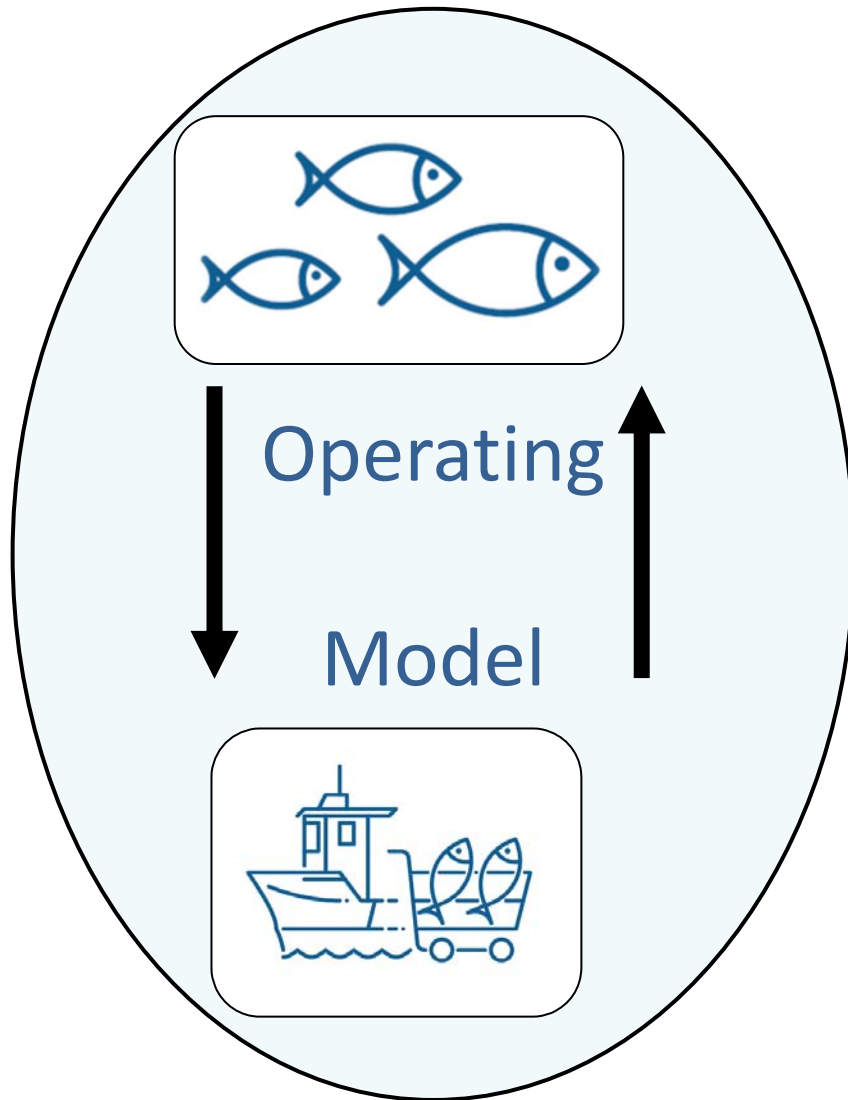
Objectives:

1. Development of a suite of groundfish operating models that span a range of conditions.
2. Mis-specification of operating and estimation models to generate retrospective patterns.
3. Design and simulation testing of alternative HCRs.

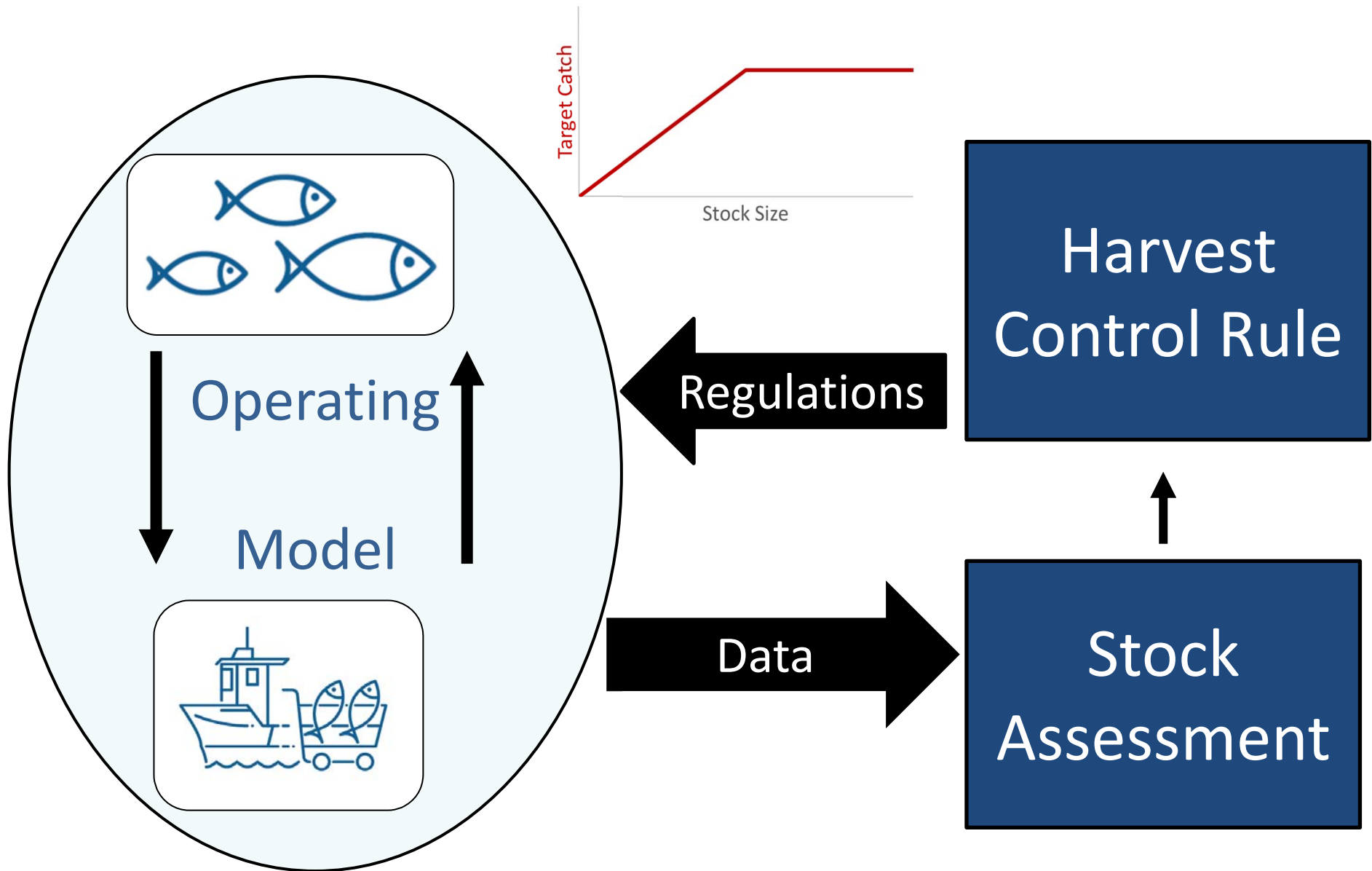
Simulation Testing Framework



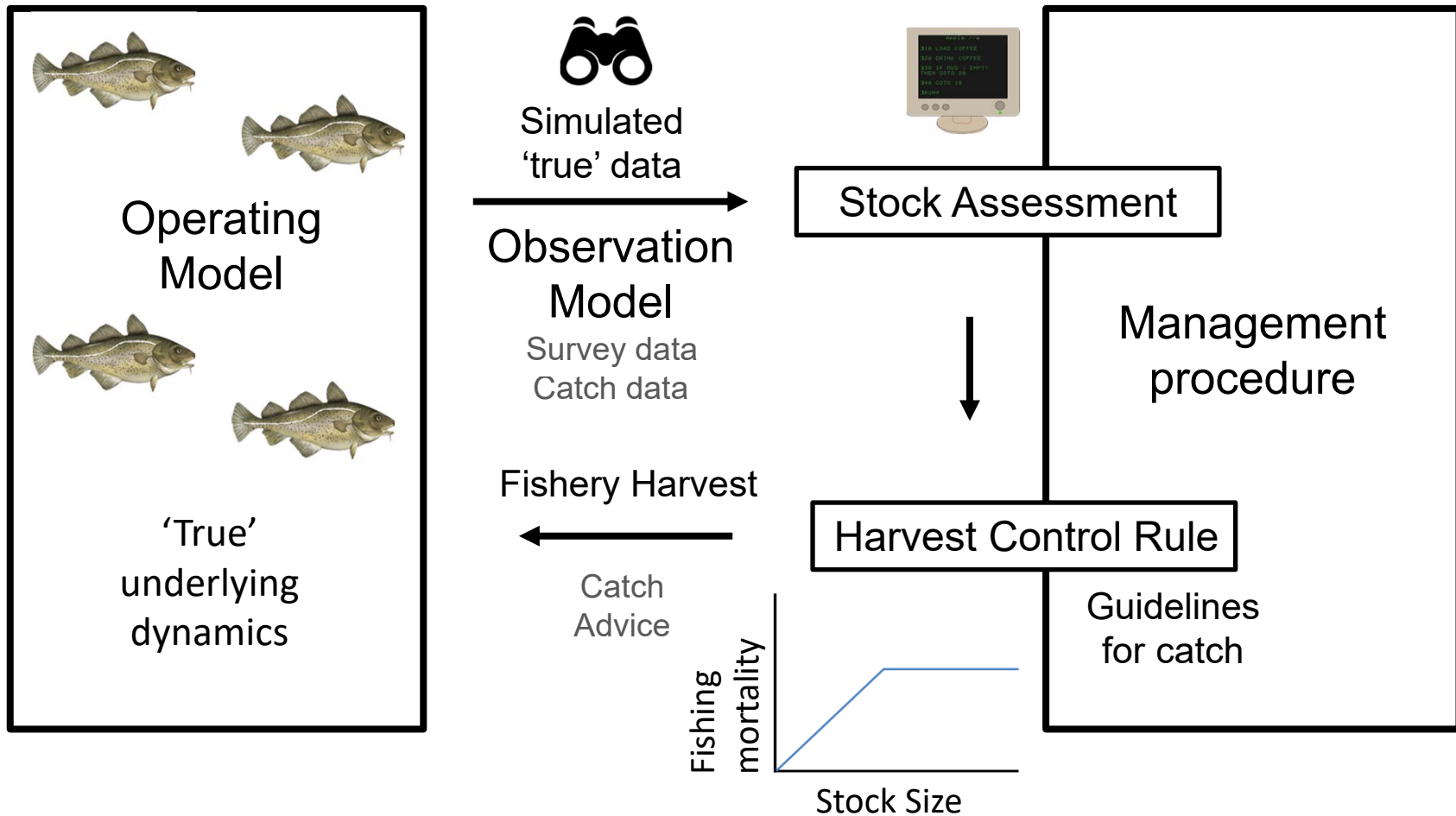
Simulation Testing Framework



Simulation Testing Framework



Simulation Testing Framework



This is the same closed-loop modeling framework used in Management Strategy Evaluation.



Research Questions

- How do alternative harvest control rule perform under characteristic conditions of groundfish stocks?
 - Stock status: overfished and overfishing is occurring.
 - Stock status: not overfished and no overfishing.
 - Stock assessment misspecification and retrospective patterns.
- When retrospective patterns exist, do rho-adjustments result in better performance than no rho-adjustments?



Approach

1. Groundfish operating models that span a range of conditions

Overfished and undergoing overfishing: Gulf of Maine cod



- Base case (constant natural mortality and moderate productivity)
- Increased natural mortality
- Low productivity

Not overfished or undergoing overfishing: Georges Bank haddock



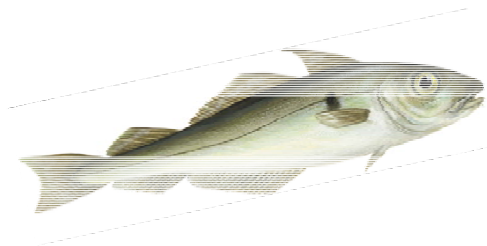
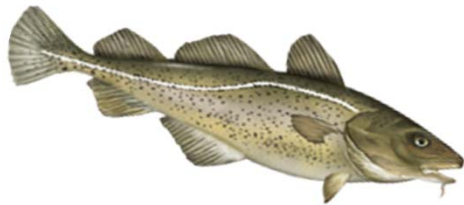
- Base case



Approach

2. Mis-specification of operating and estimation models to generate retrospective patterns

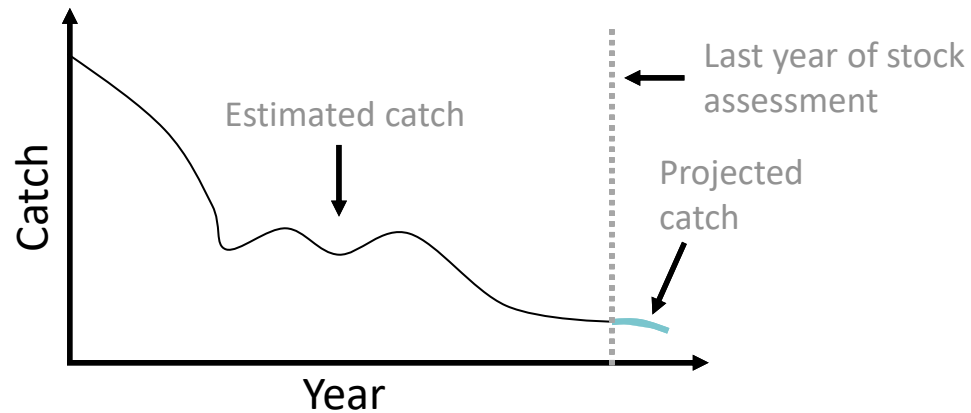
- Incorrect natural mortality assumption
- Incorrect observation of catch
- Incorrect observation of recruitment events



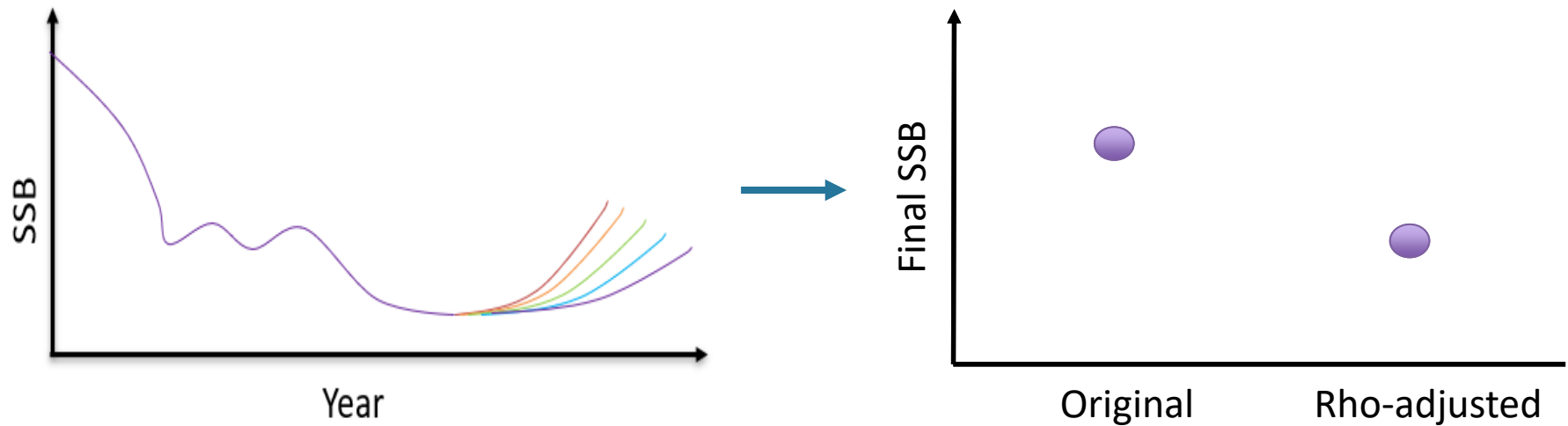
Approach

3. Emulate current groundfish stock assessment methods

- Two-year projections



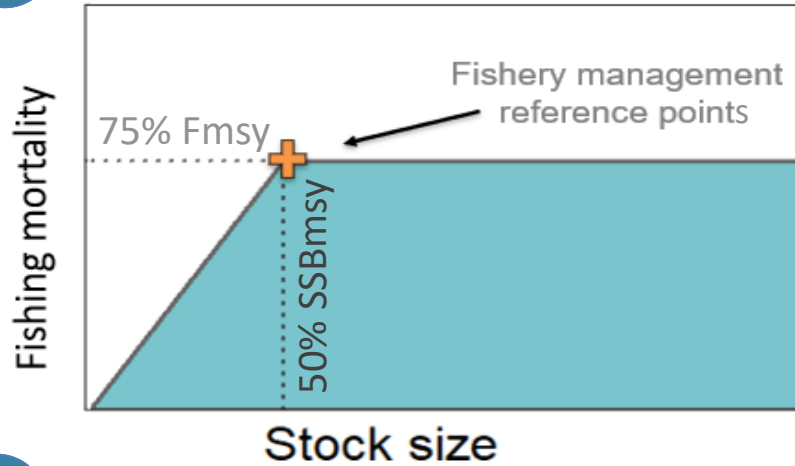
- Rho-adjustments



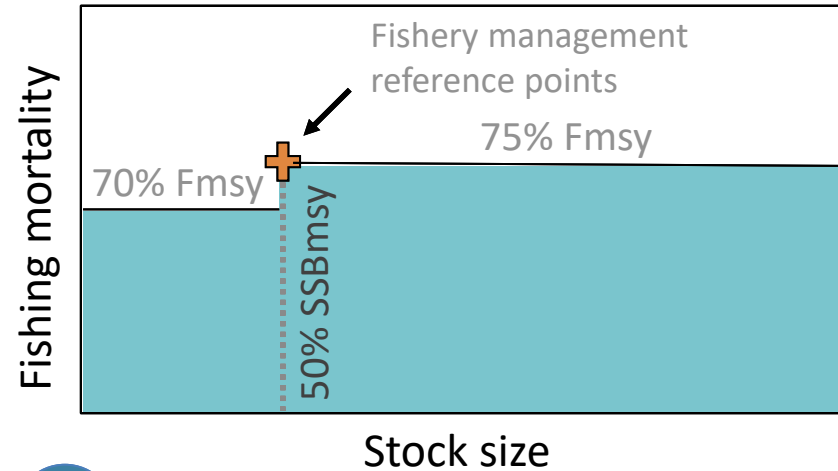
Approach

4. Design and simulation testing of alternative HCRs

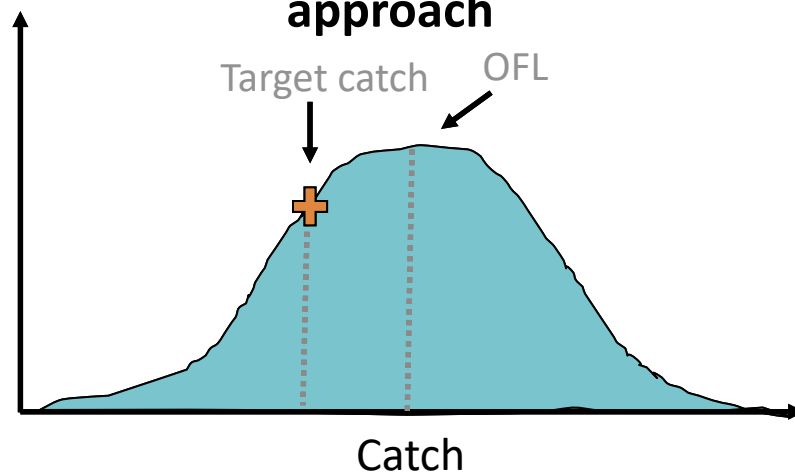
1 Ramped HCR



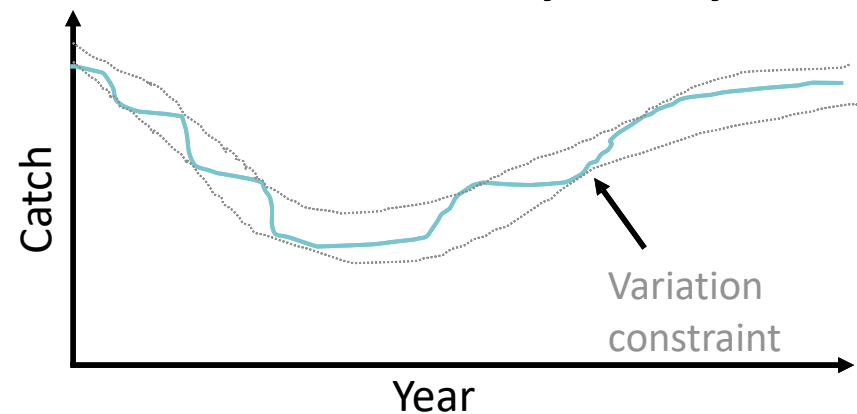
3 Step in fishing mortality HCR



2 Target catch determined from P* approach



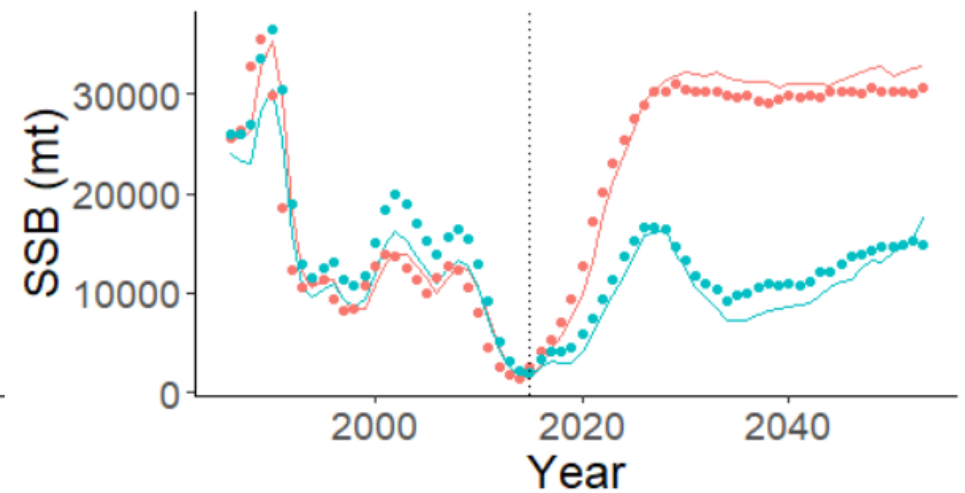
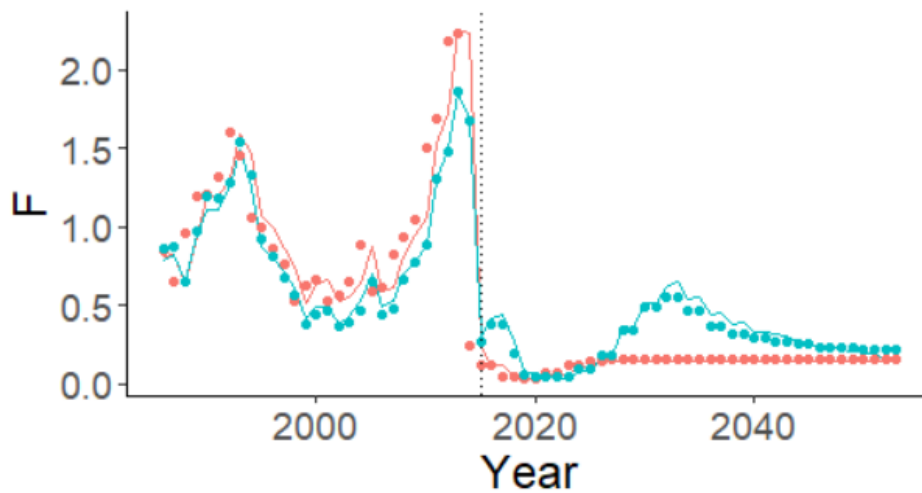
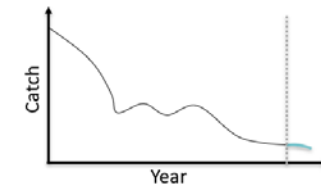
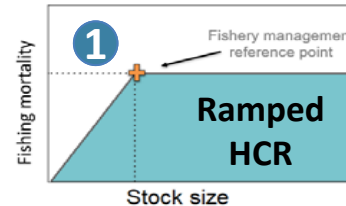
4 1 with constraint on catch variation from year to year



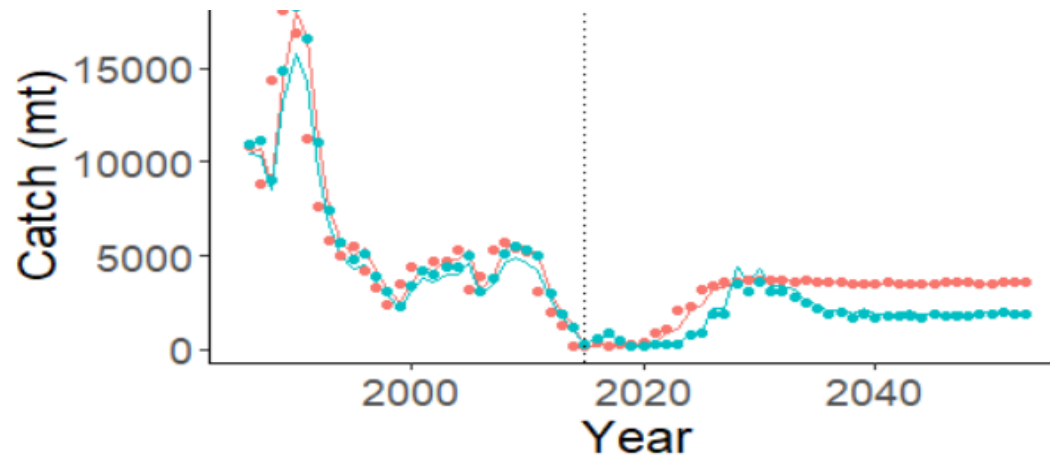
★ All HCRs will have a minimum catch constraint.

Preliminary results

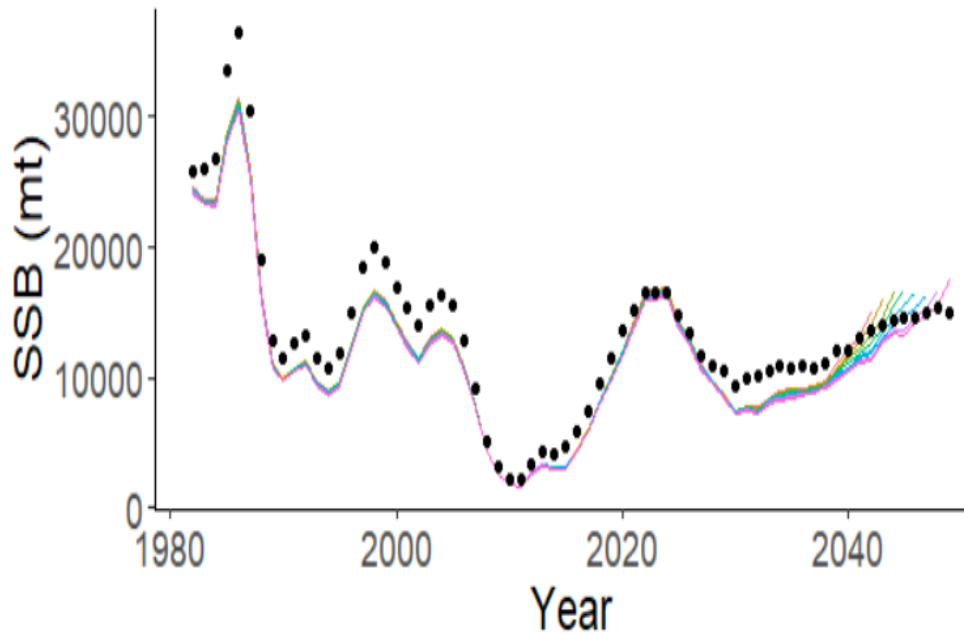
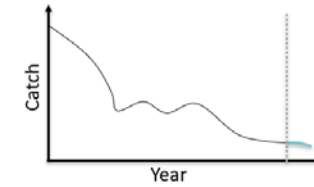
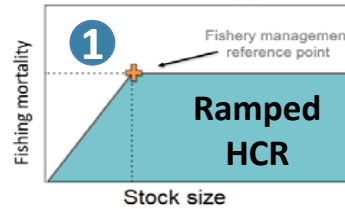
What happens when we assume constant natural mortality when it's increasing?



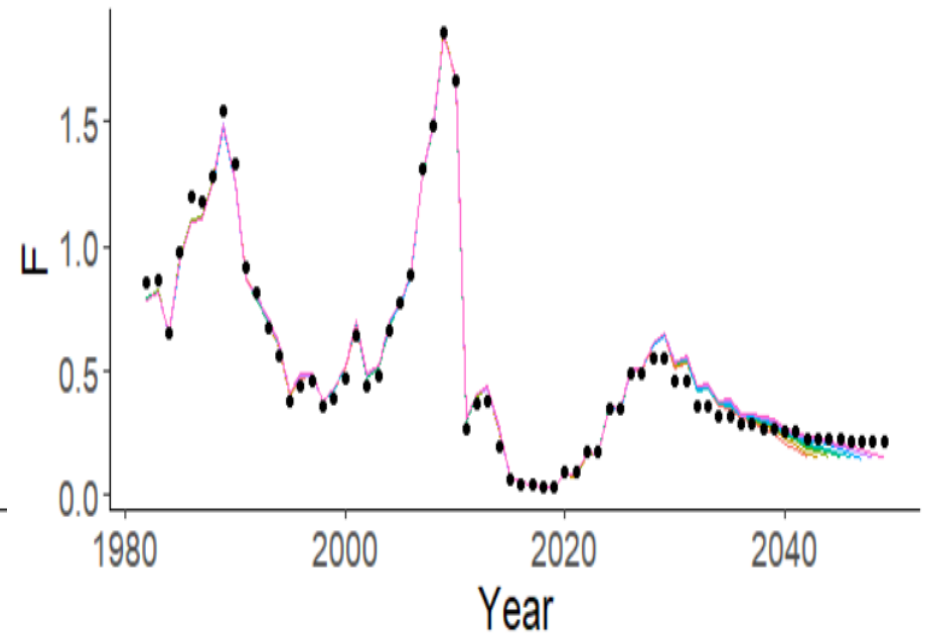
- =Cod base case
- =Cod natural mortality misspecification
- =Observed
- =Estimated



Preliminary results: Retrospective patterns



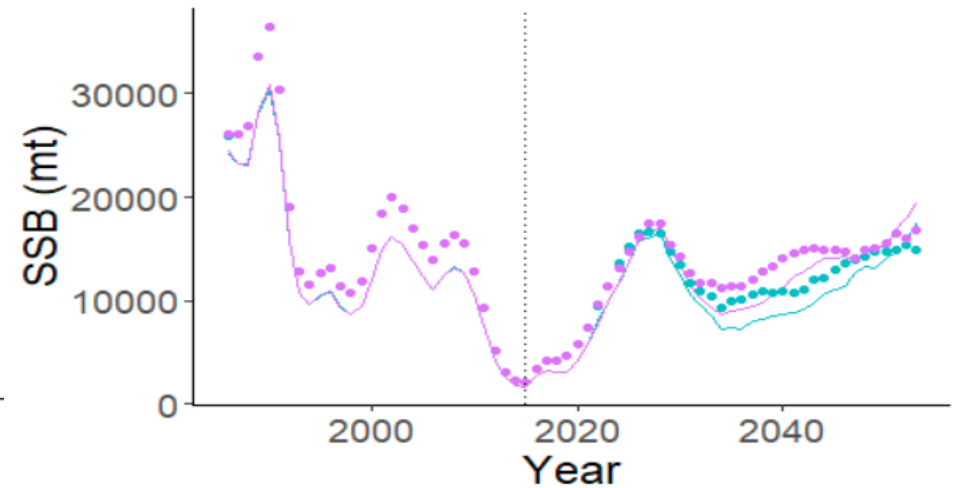
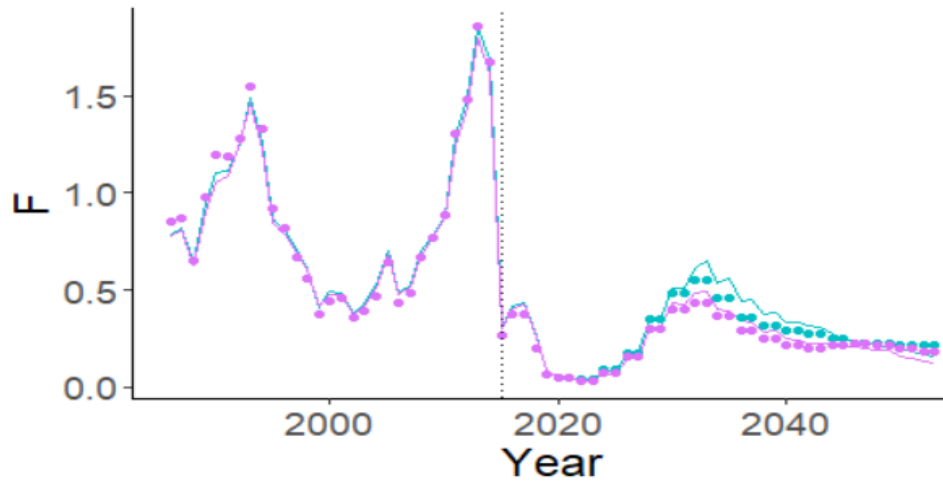
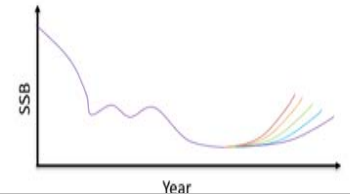
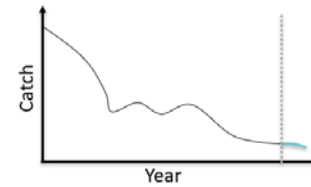
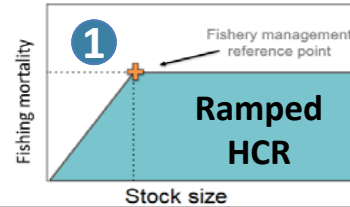
Mohn's Rho= 0.21



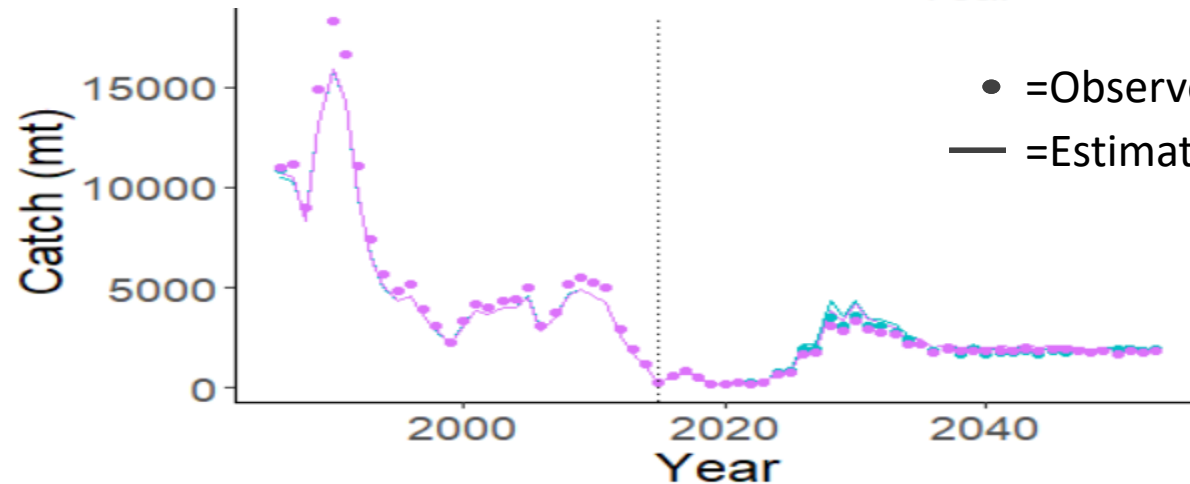
Mohn's Rho= -0.25

Preliminary results

What happens when we apply a rho adjustment?



- =Cod natural mortality misspecification, no rho-adjustment
- =Cod natural mortality misspecification, rho-adjustment



- =Observed
- =Estimated

Preliminary Summary

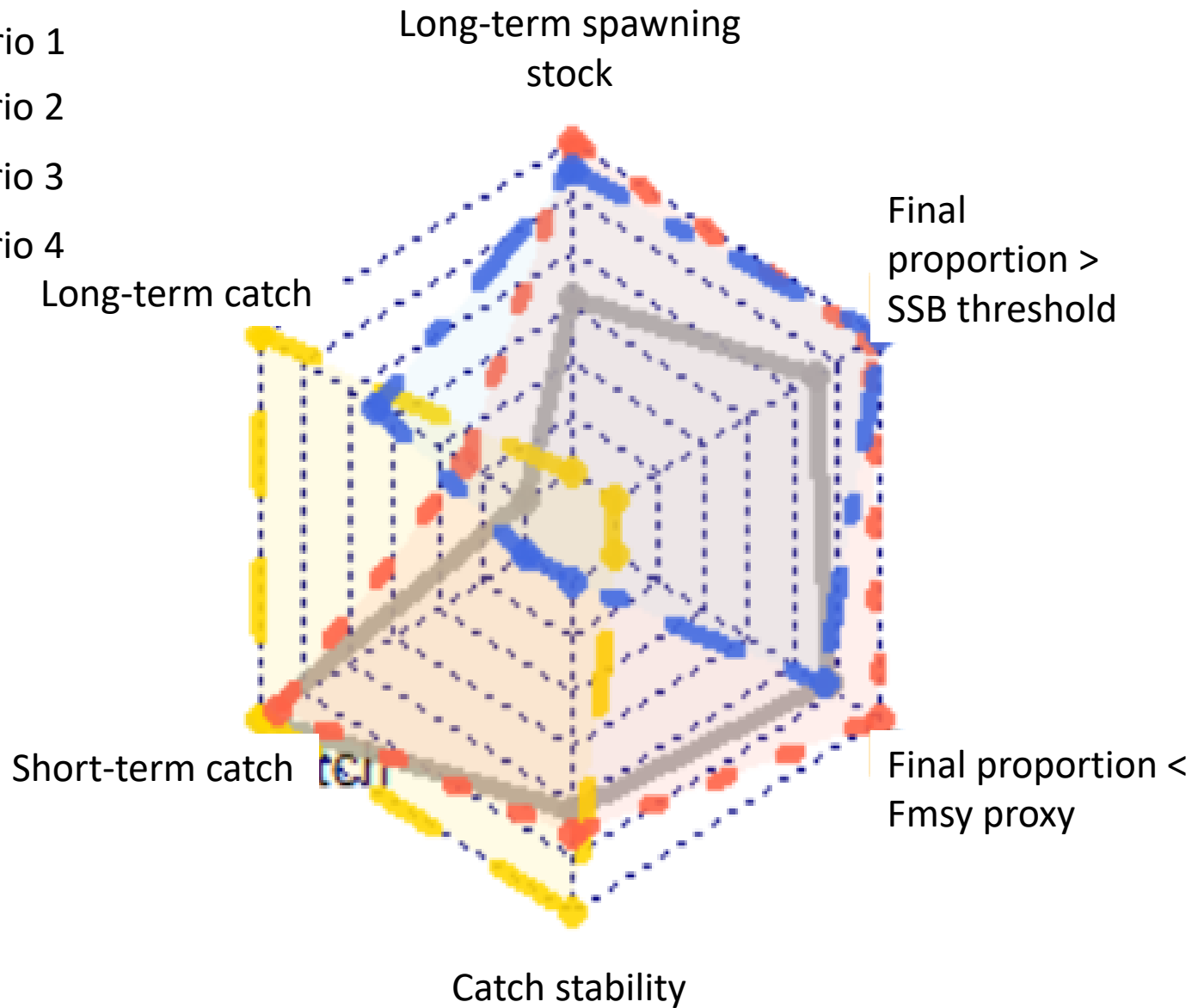
- Ability to simulate different groundfish issues/conditions
- Ability to produce retrospective patterns with stock assessment misspecifications
- Ability to compare effects of misspecifications, projections, rho-adjustments, and HCRs

Next steps

- Simulate other scenarios
- Visualizing results
- Make P^* estimation more efficient
- Outreach
- Advisory panel meeting January 2021

Tradeoff Visualization Idea

- =Scenario 1
- - - =Scenario 2
- - - =Scenario 3
- - - =Scenario 4



Thank you and Questions?

