Assessment of alternative management procedures for the US recreational summer flounder fishery

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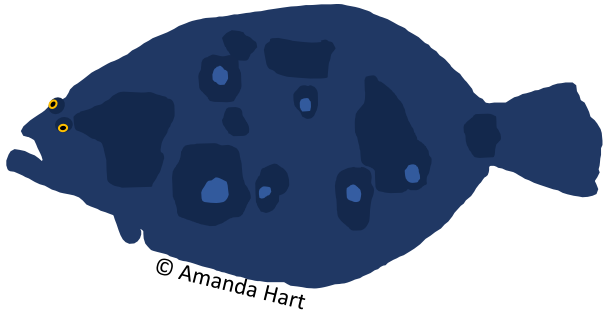
#ICESASC19



Changes in species distributions inflate spatial fisheries governance challenges.

Uncertainty in fisheries governance can be included when evaluating management performance.

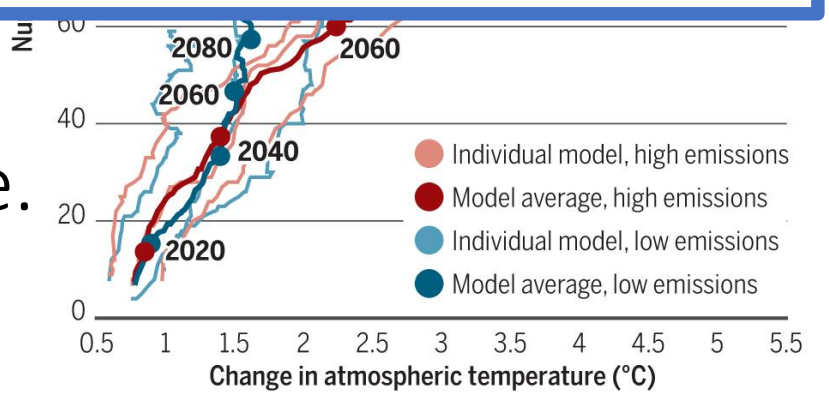
Management Strategy Evaluations focused on impacts of climate change have largely been scientist-driven.

The number of EEZs with new transboundary stocks increases with global temperature

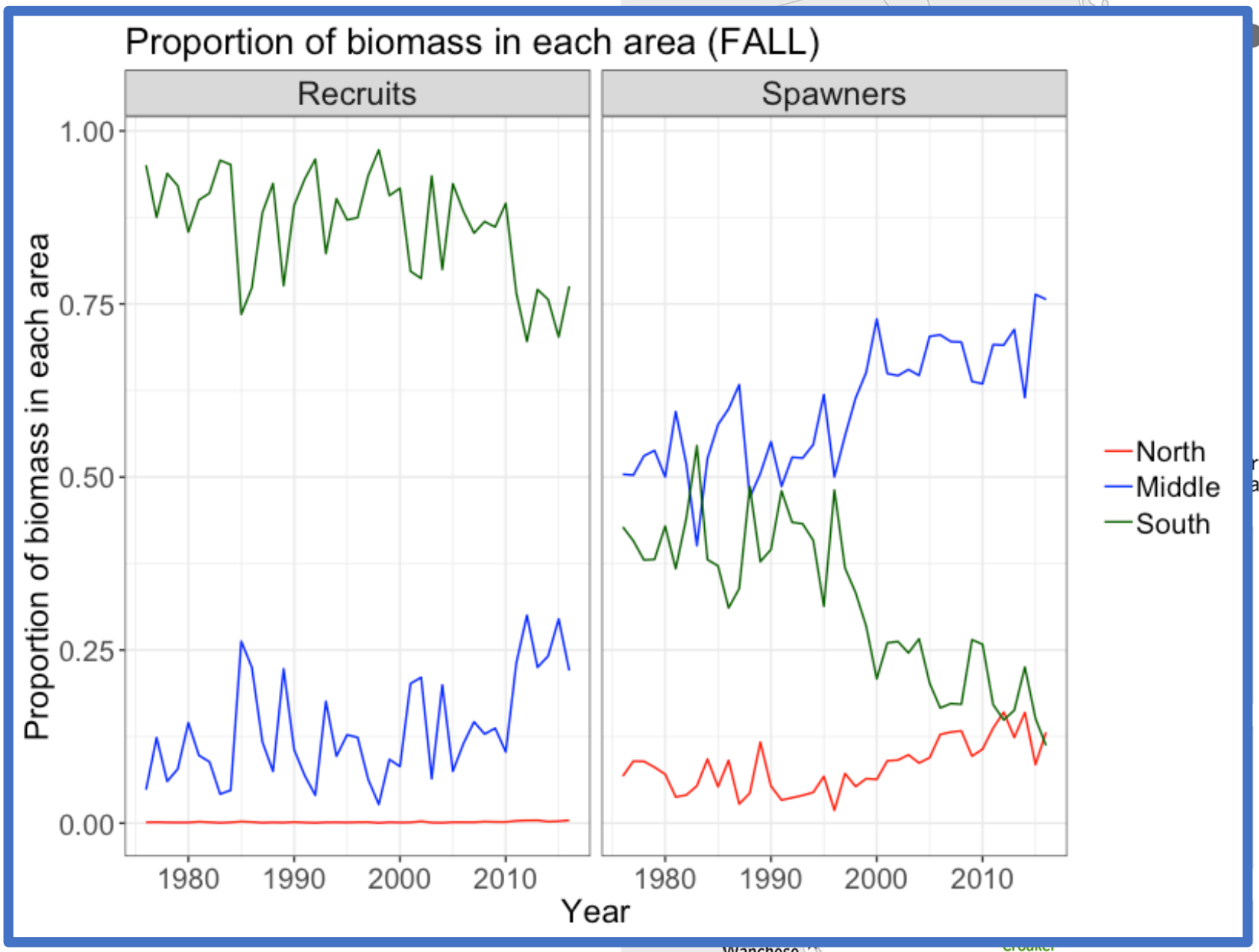
Overview Articles

Integrating Governance and Quantitative Evaluation of Resource Management Strategies to Improve Social and Ecological Outcomes

DEREK R. ARMITAGE, DANIEL K. OKAMOTO, JENNIFER J. SILVER, TESSA B. FRANCIS, PHILLIP S. LEVIN, ANDRÉ E. PUNT, IAN P. DAVIES, JACLYN S. CLEARY, SHERRI C. DRESSEL, R. RUSS JONES, HARVEY KITKA, LYNN CHI LEE, ALEC D. MACCALL, JIM A. MCISAAC, MELISSA R. POE, STEVE REIFENSTUHL, ANDREW O. SHELTON, JÖRN O. SCHMIDT, THOMAS F. THORNTON, RUDI VOSS, AND JOHN WOODRUFF



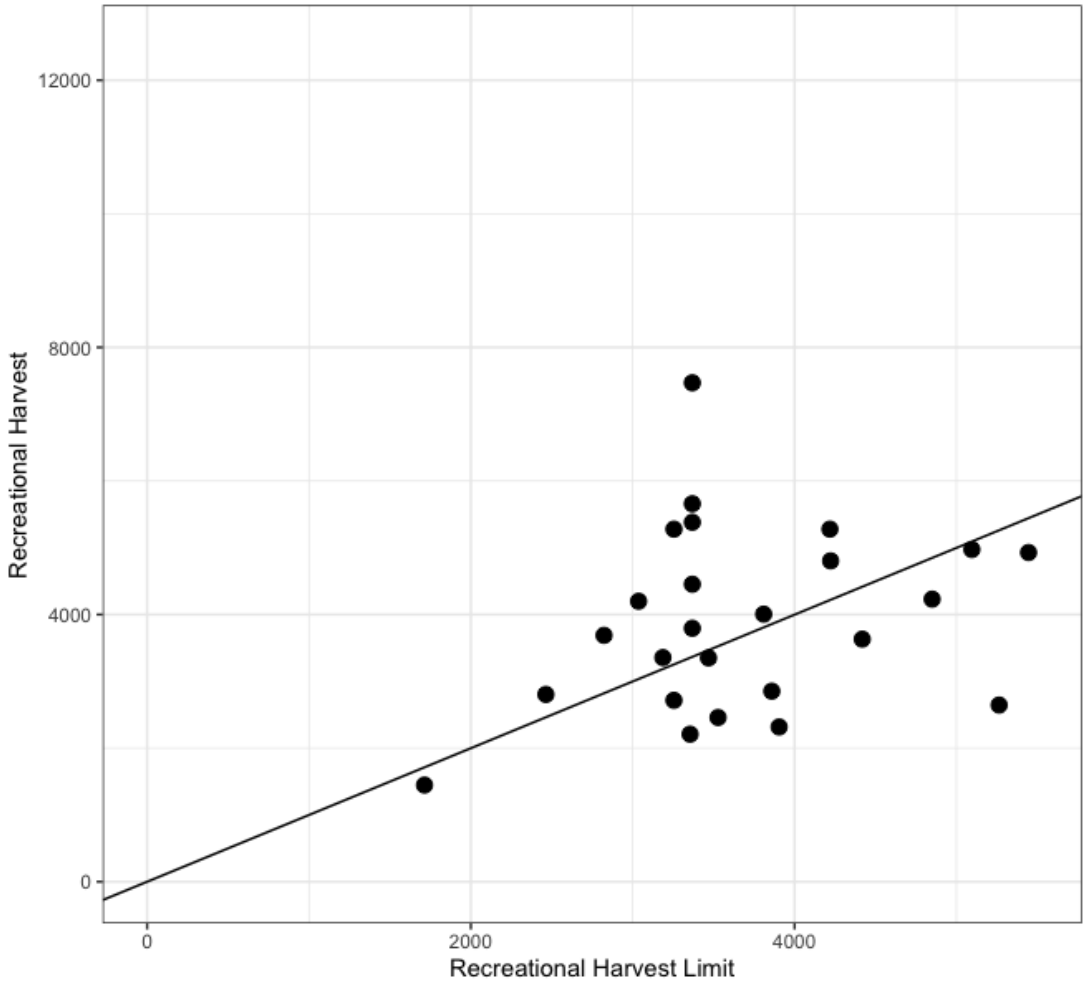
Pinsky et al. 2018. Science.



NEFSC 2019

Kleisner et al. 2017

Current methods to manage recreational harvest have been subject to variability & uncertainty.



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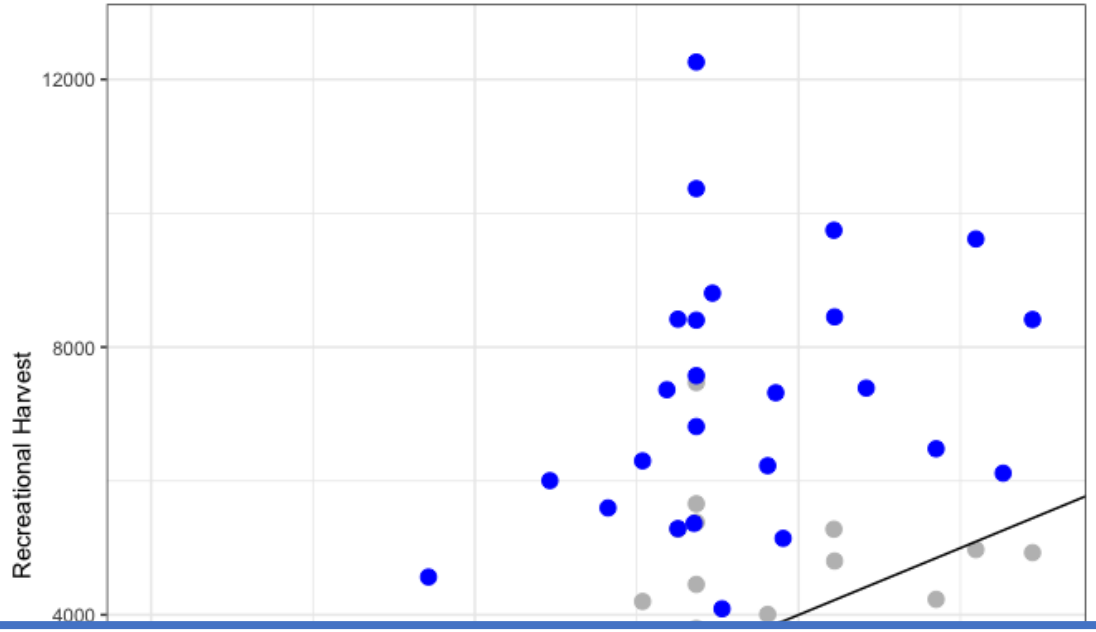


State managers change input controls based on perceived performance from previous year (i.e. assume next year's catch will be similar to this year)

Objectives

Test performance of management approaches for the recreational summer flounder fishery

Show relative value of both current and potential actions for satisfying management objectives:

conservation, yield, stability in regulations

Provide decision support tools to assist in specification setting process for summer flounder

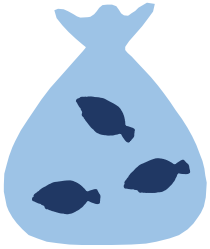
Recreational Fishery Fleet Dynamics Model

Emulate historical responses to regulation changes (how does total catch at size change given adjustments to management measures).

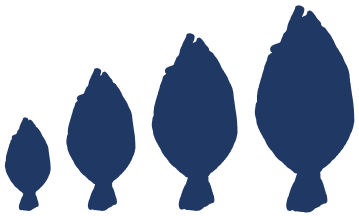
Fit GAMS to available data (MRIP) to construct a set of plausible alternatives for fleet dynamics and associated uncertainty.

Input controls:

Bag size (# fish)



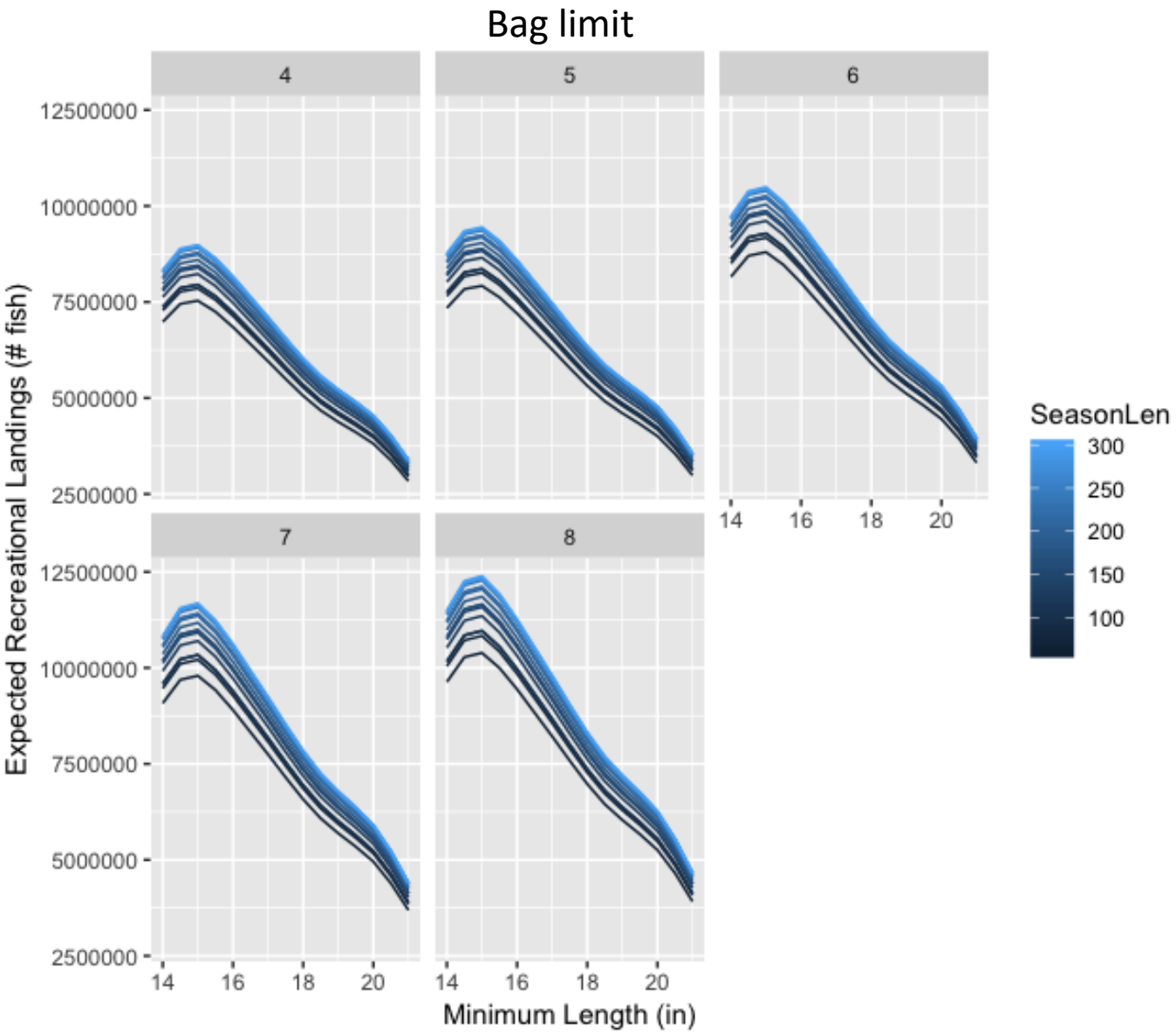
Minimum size (in.)



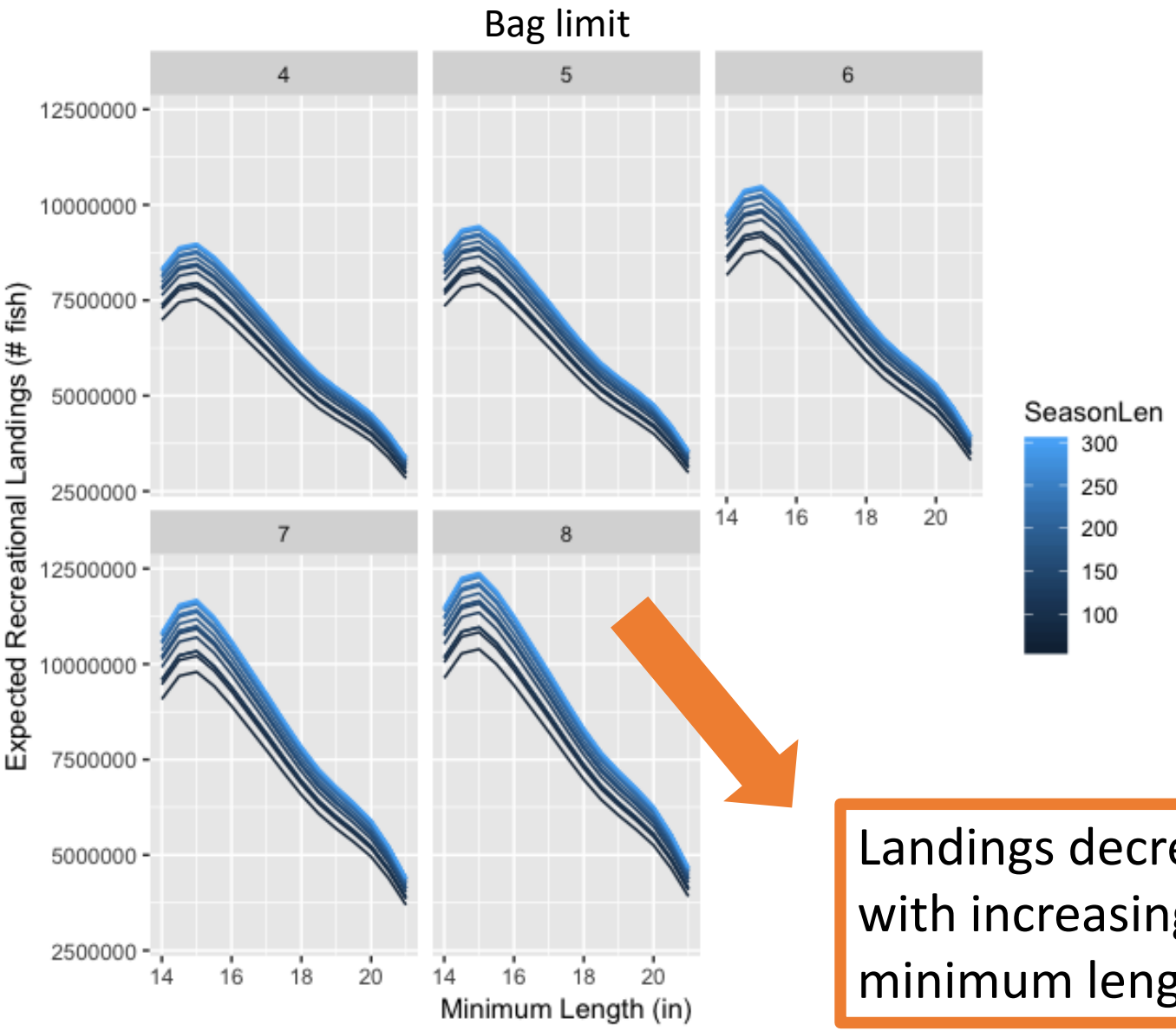
Season length (days)

Calendar						
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Image: Amanda Hart

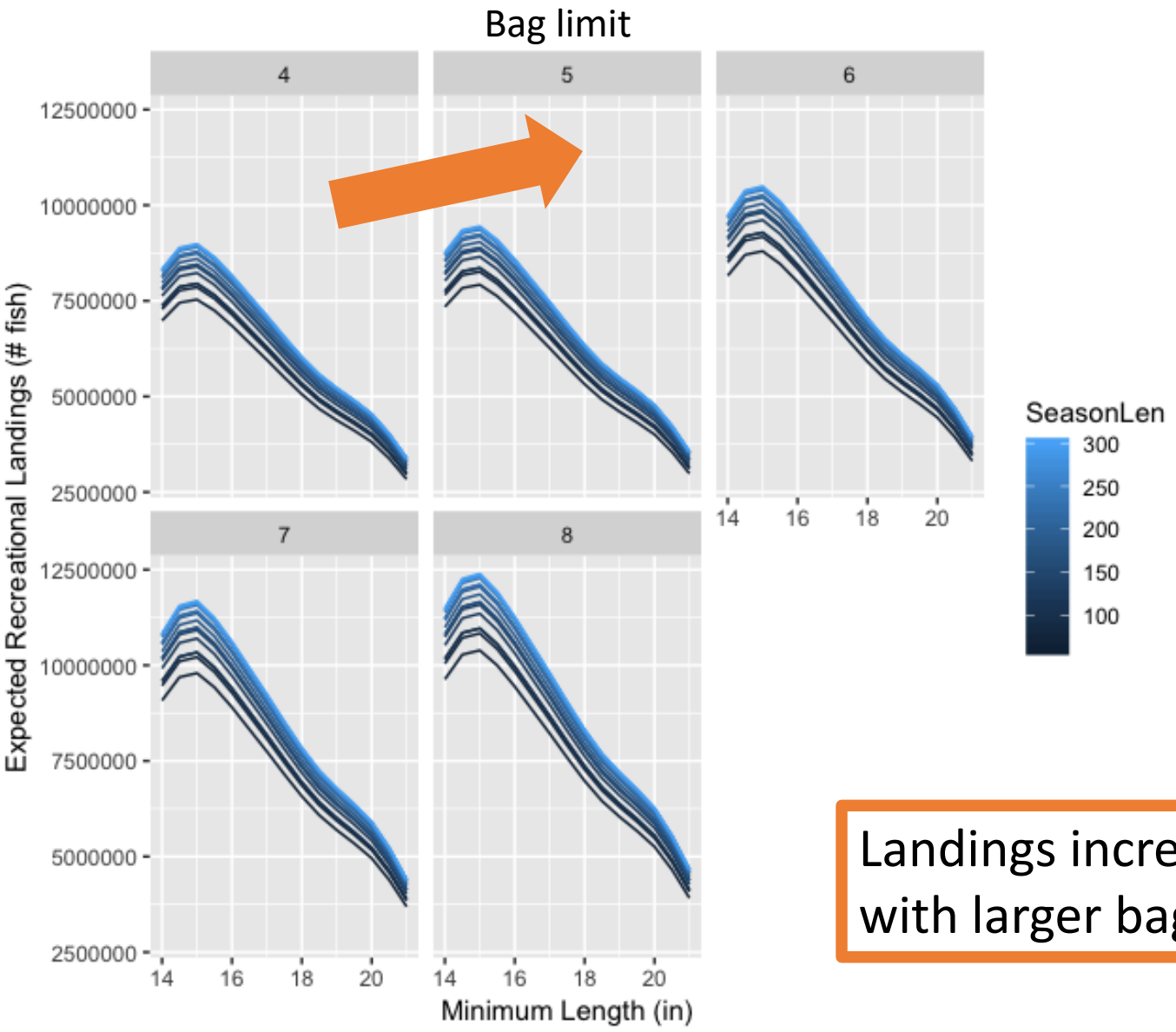


Management model predictions of recreational landings given regulation settings.



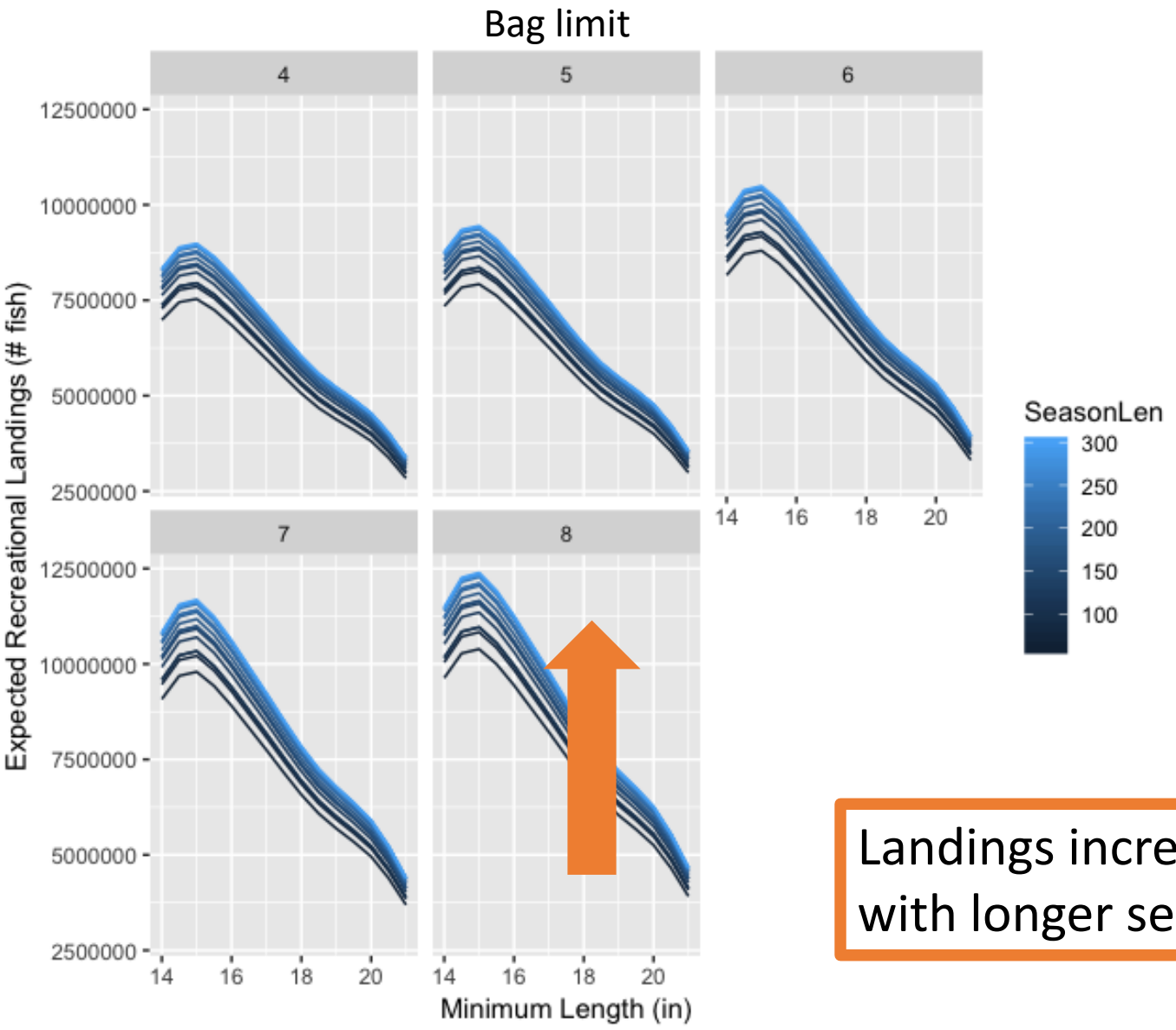
Management model predictions of recreational landings given regulation settings.

Landings decrease with increasing minimum length.



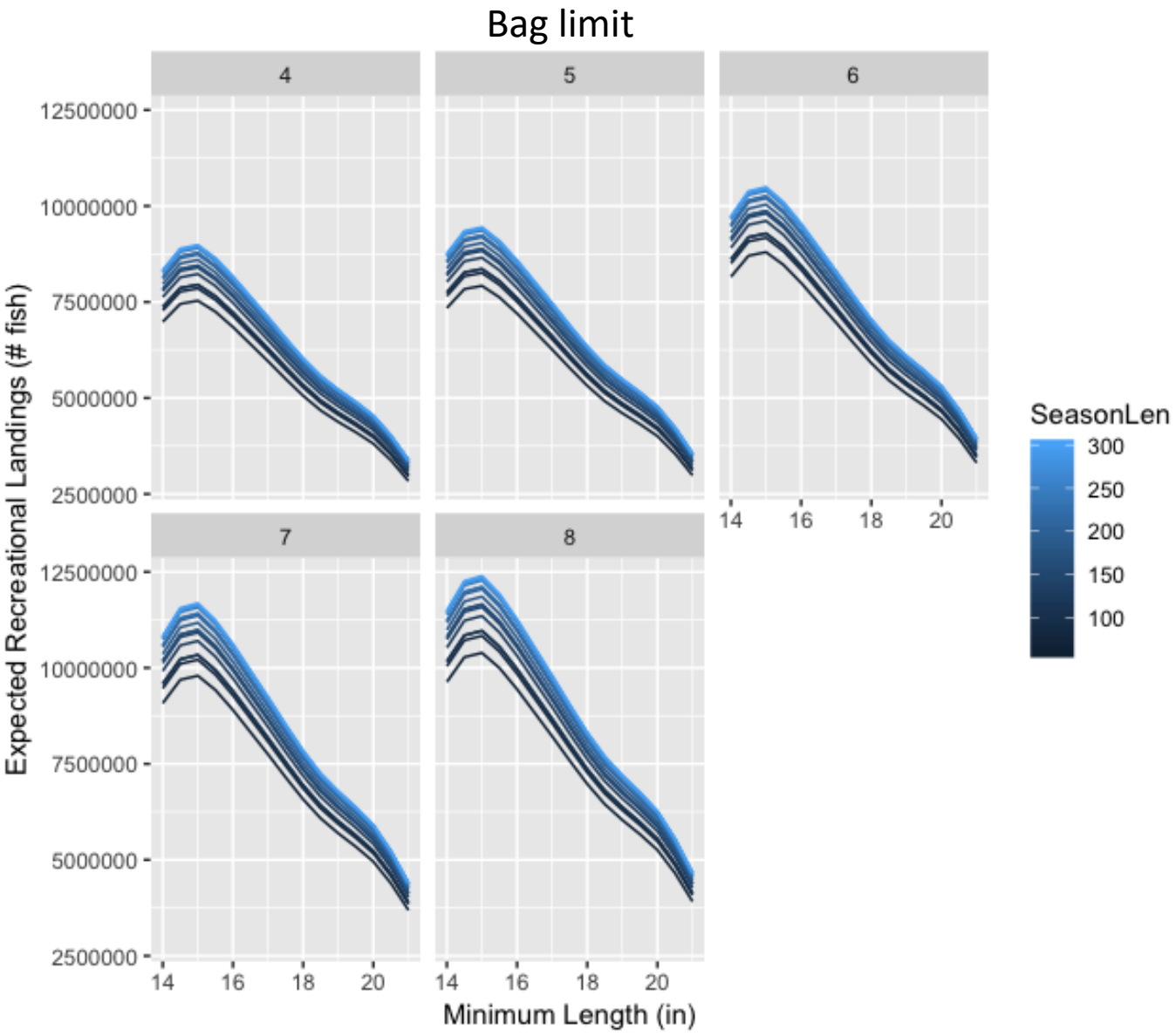
Management model predictions of recreational landings given regulation settings.

Landings increase with larger bag limits.



Management model predictions of recreational landings given regulation settings.

Landings increase with longer seasons



Management Model:

Given a desired target (RHL), what combination of regulation settings are expected to meet that target?

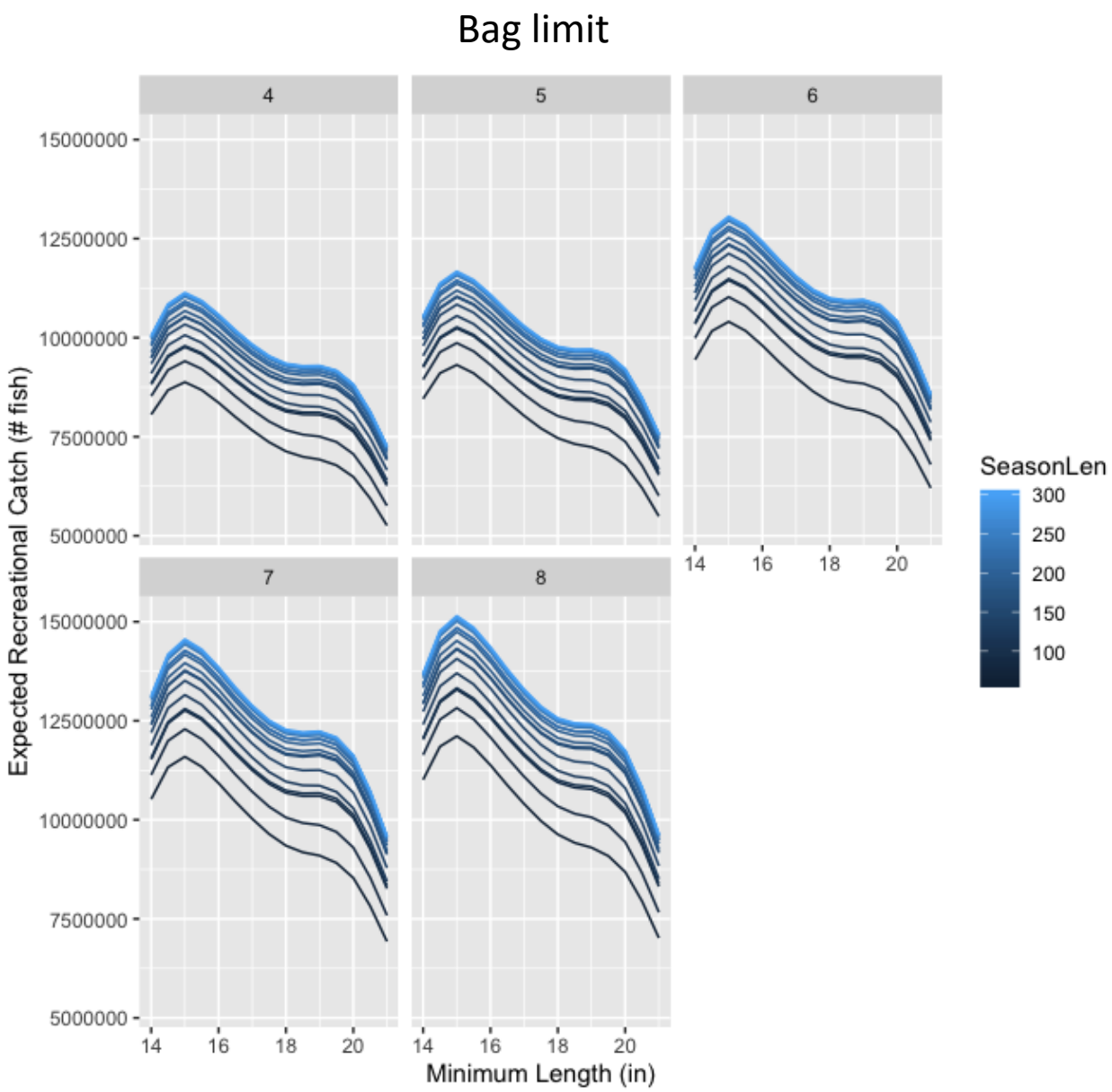
Comparing performance of management alternatives

- *RHL*: adjustments based on last year's recreational landings
- *F-based*: adjustment based on F/F_{TARG} assessment estimate.
- *Uncertainty-based*: no adjustment made if targets are within quantiles of catch / assessment estimates.

Management regulations updated: given a desired target (RHL), what combination of input control settings are expected to meet that target?

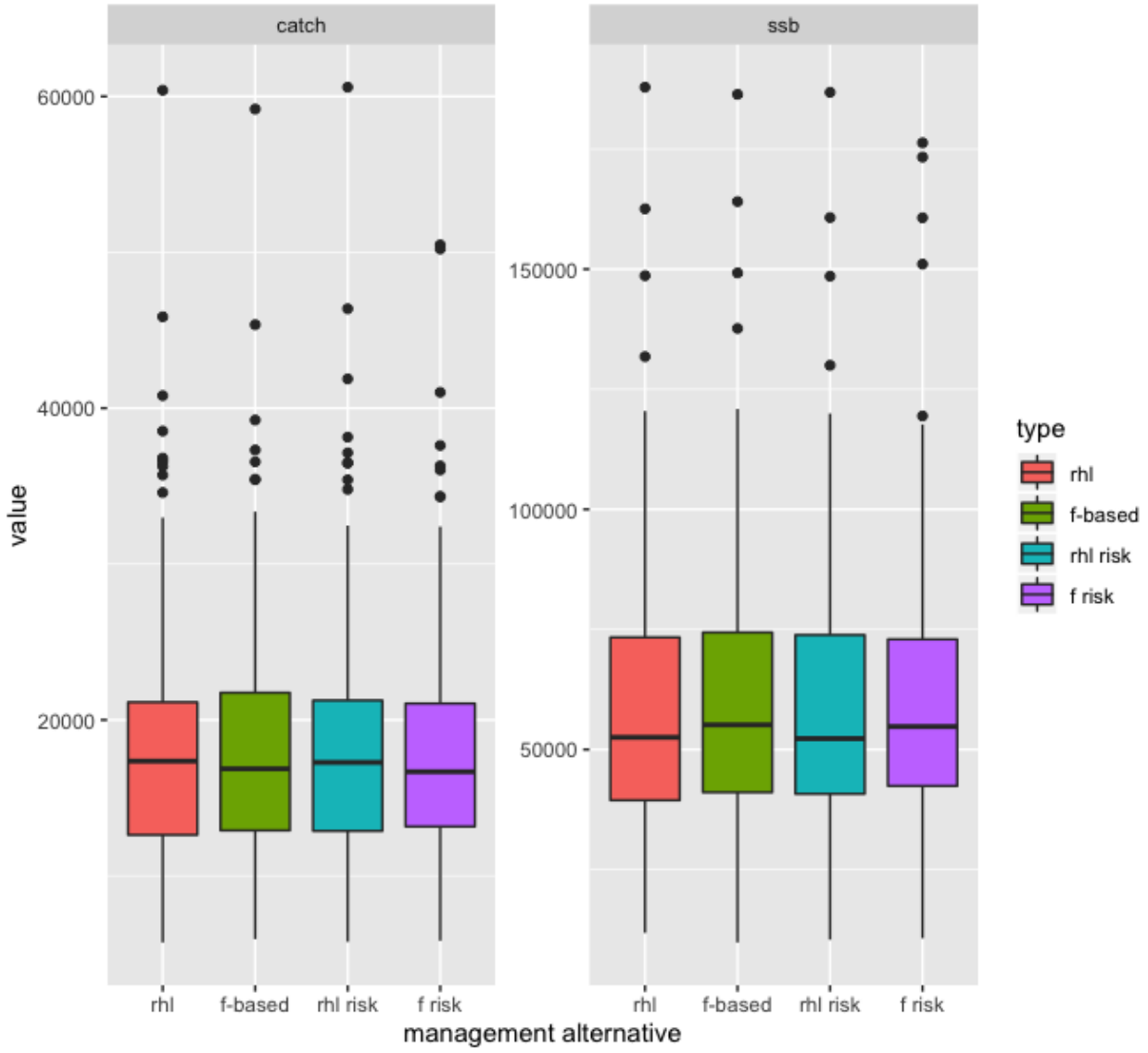
Implementation error

- Realized recreational catch (harvest &discards) updated based on uncertainty around fleet dynamics model given a set of regulations.

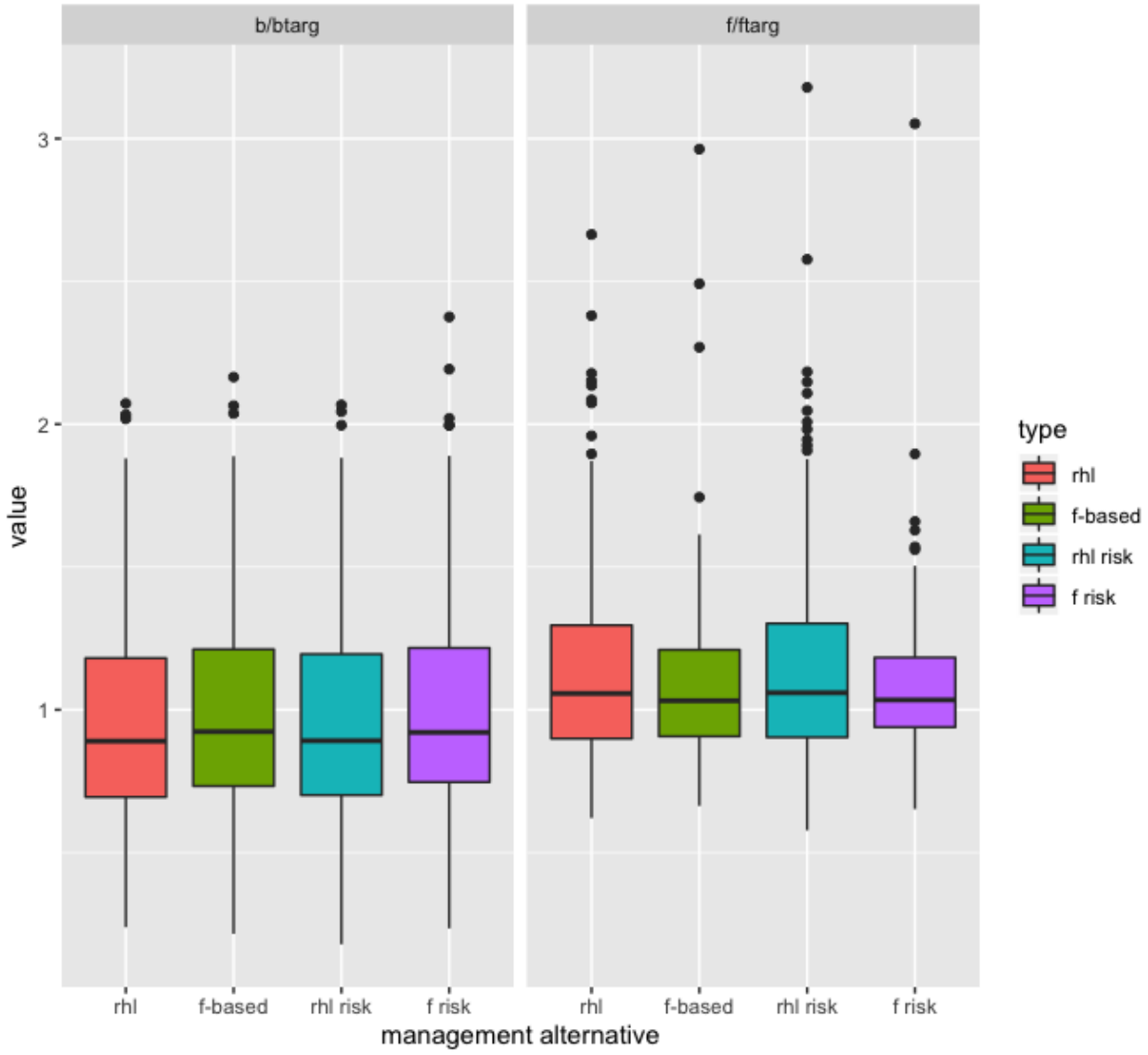


Response of recreational fishery catch to changes in regulations.

Less expected decrease in catch at high minimum size when including discards.

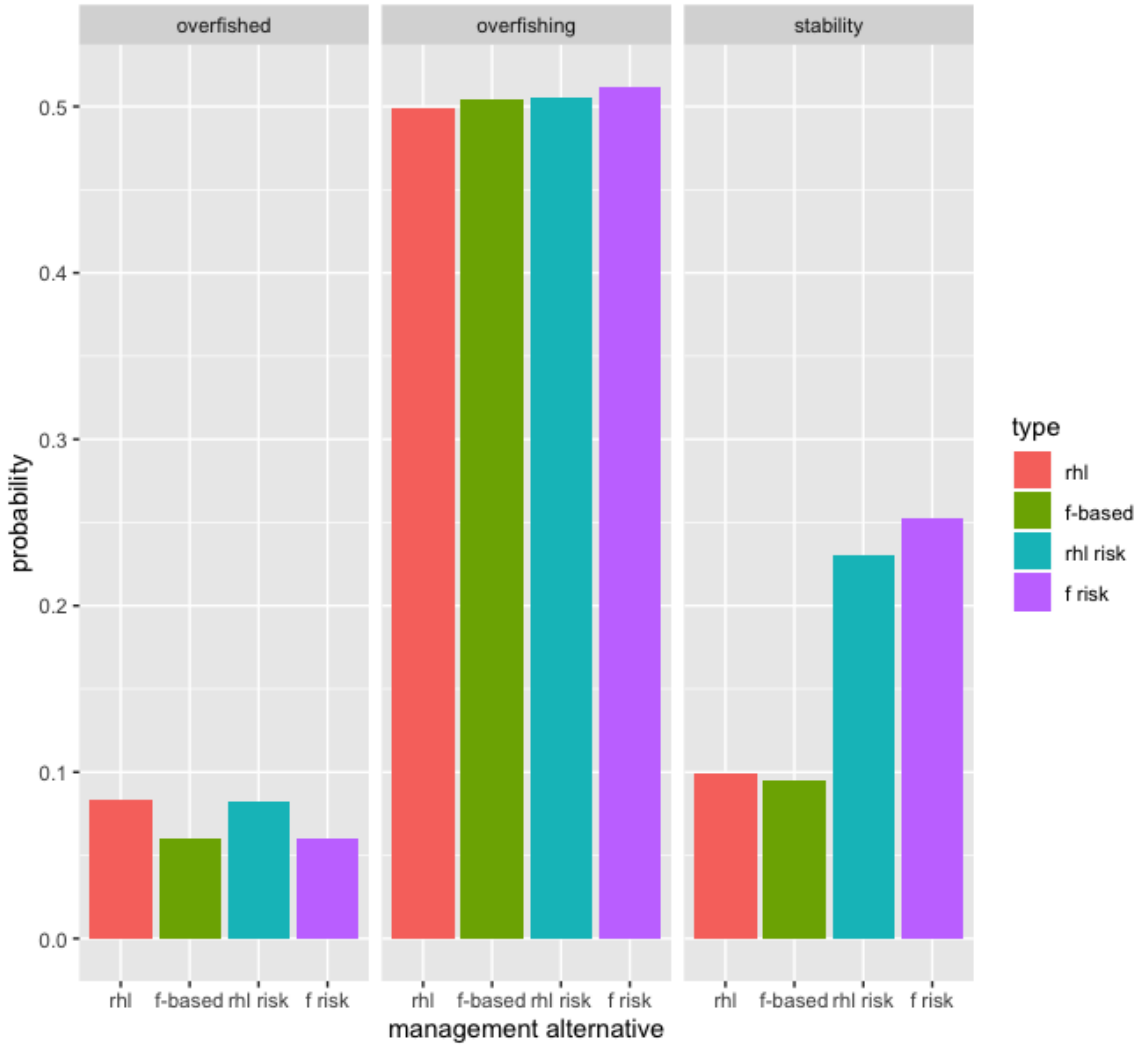


Low sensitivity of long-term yield to regulation method.



Low sensitivity of stock status to regulation method.

Fishing rate more precise using F-based controls.



Similar performance for probabilities of overfishing/ being overfished.

Increased stability in recreational regulations using uncertainty-based methods.

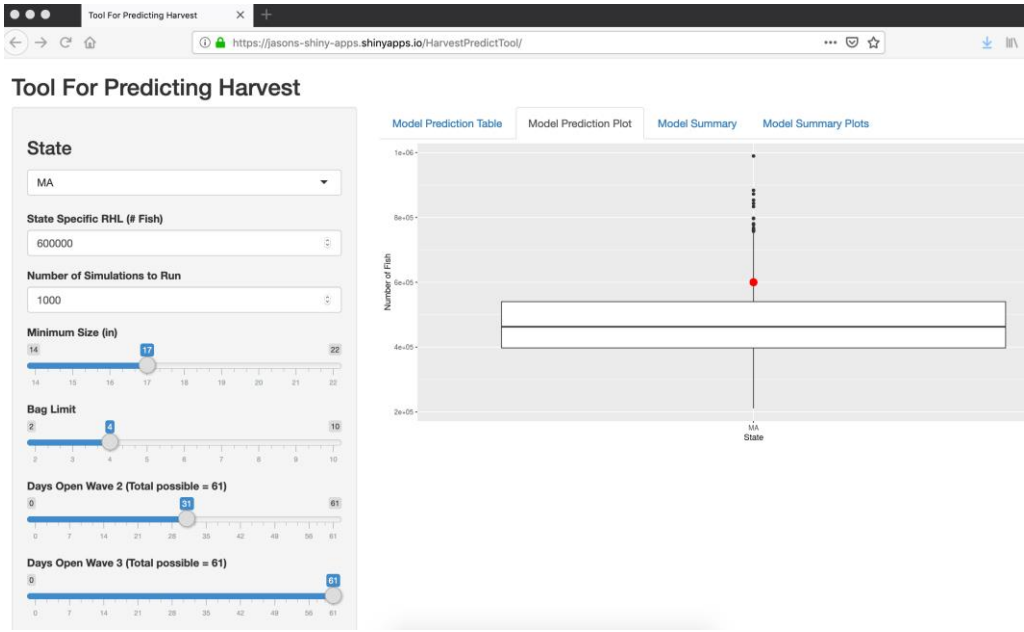
Next Steps:

Testing scope of setting regulations

Interaction of regulations with changing flounder availability

Shiny app for managers:

tiny.cc/HarvestPredictor



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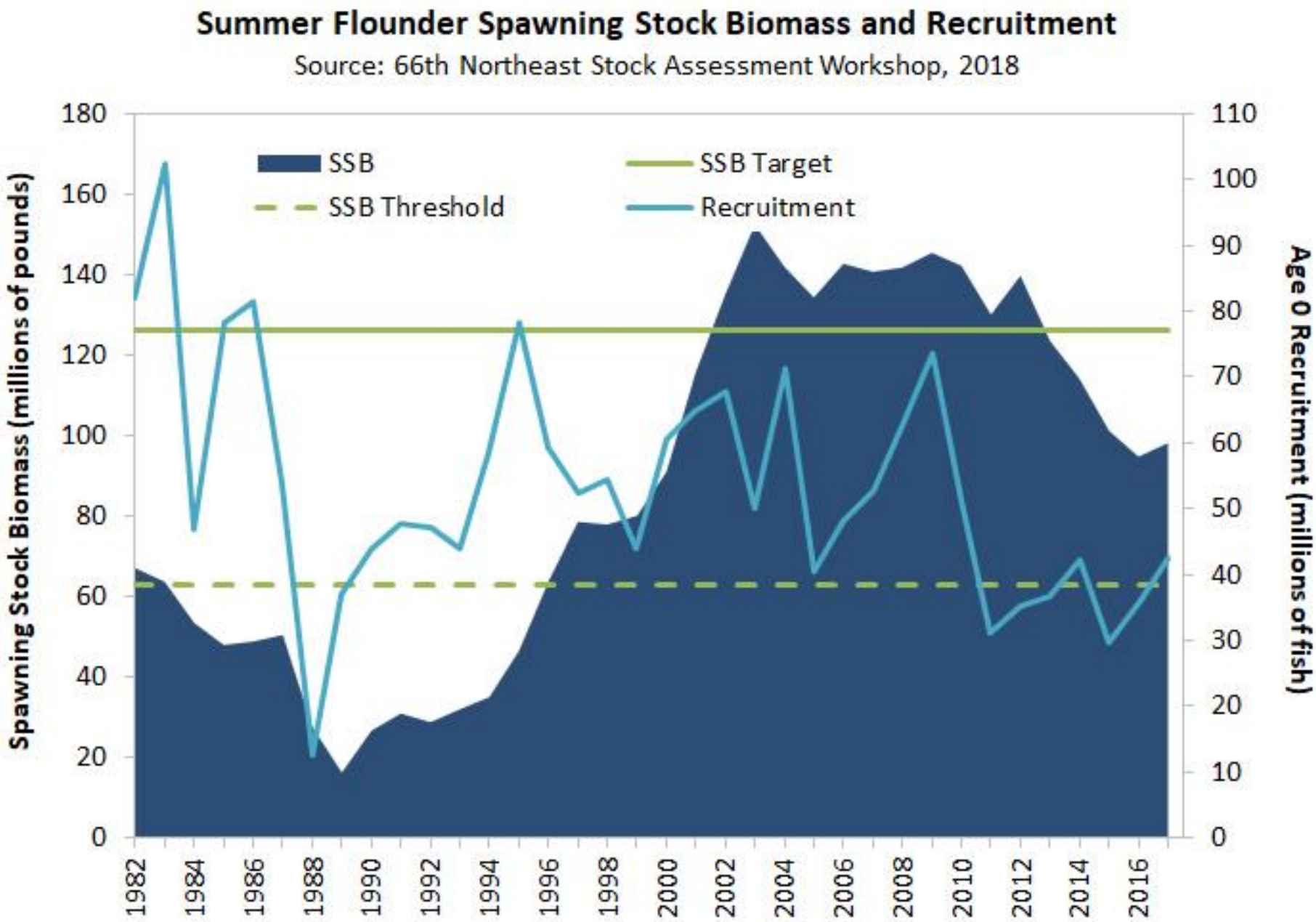
Summer Flounder Spawning Stock Biomass and Recruitment
Source: 66th Northeast Stock Assessment Workshop, 2018
SSB
SSB Target
SSB Threshold
Recruitment
Spawning Stock Biomass (millions of pounds)
Age 0 Recruitment (millions of fish)
0
20
40
60
80
100
120
140
160
180
0
10
20
30
40
50
60
70
80
90
100
110
1982
1984
1986
1988
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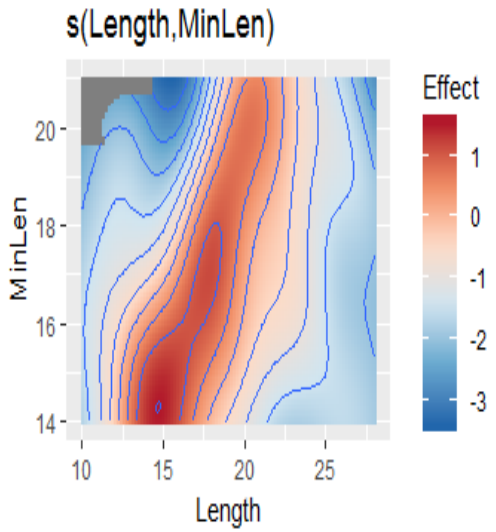
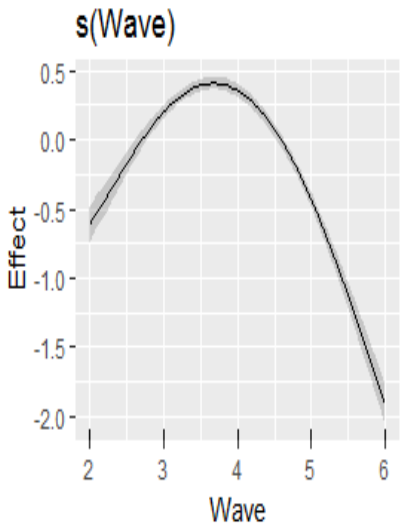
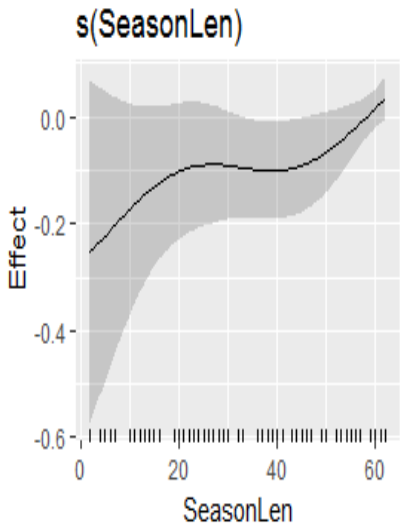
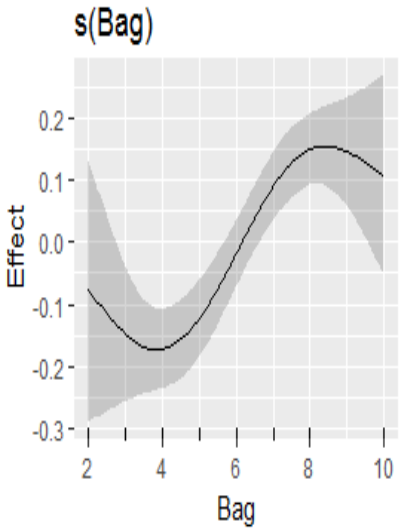
2012
2014
2016

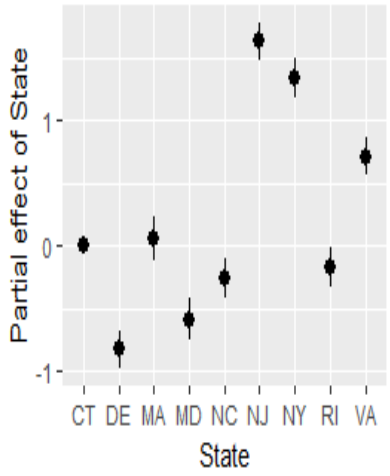
Landings – Recreational Fleet Dynamics Model



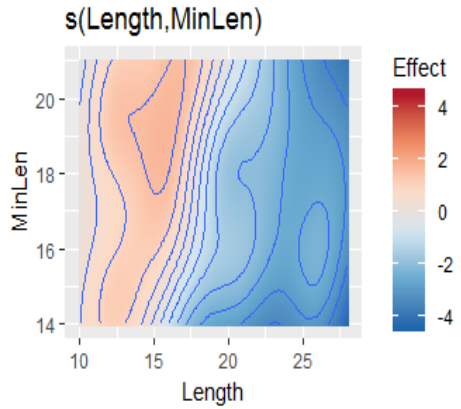


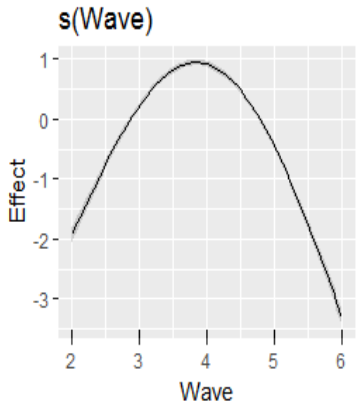


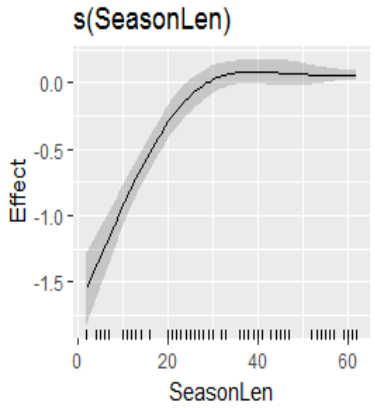


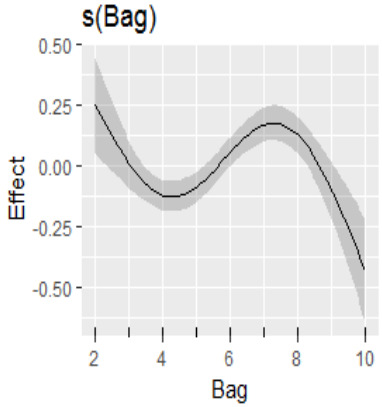


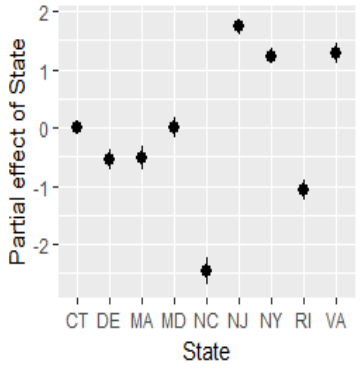
Discards – Recreational Fleet Dynamics Model











MSE Components

- Age-structured (operating) model of flounder population dynamics.
- Stock assessment, generating estimates of:
  - biomass, fishing mortality relative to targets, to derive ABC
  - recreational catch (e.g. as obtained through MRIP)
- Calculation of the Recreational Harvest Limit (RHL)
- **Management model** sets new input controls based on expectation needed to meet annual target for recreational harvest.
- **Fishery Response model**: uses new settings for input controls to determine realized recreational catch
- Performance metrics related to objectives:
  - Conservation
  - Yield
  - Stability in recreational regulations & availability of recreational opportunities