EAFM Recreational Summer Flounder MSE

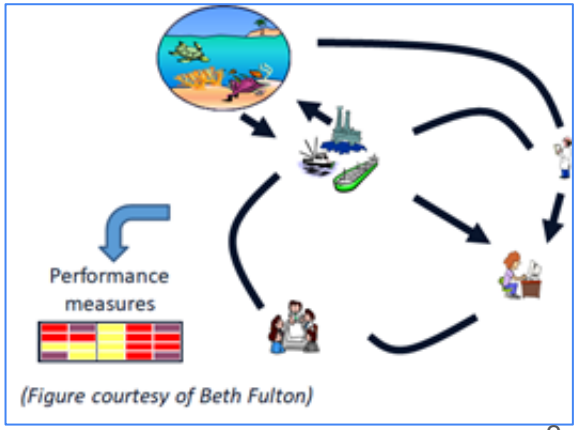
Summary of Process, Model Overview, and Outcomes

Mid-Atlantic SSC
March 8, 2023

MID-ATLANTIC FISHERY MANAGEMENT COUNCIL

Presentation Outline

- Overview of process and MSE development
- Management considerations
- Simulation framework
  - Population dynamics model
  - Recreational demand model
- Key findings
- Broader MSE takeaways



(Figure courtesy of Beth Fulton)

For all model outputs - https://bit.ly/fluke-mse-metrics

For more information about the MSE - https://www.mafmc.org/actions/summer-flounder-mse

MSE Technical Work Group and Core Group Members

Technical Work Group

- Andrew Carr-Harris/NEFSC
- Dustin Colson-Leaning/ASMFC
- Jonathan Cummings/Contractor, USFWS
- Kiley Dancy/MAFMC
- Geret DePiper/NEFSC
- Jon Deroba/NEFSC
- Gavin Fay/UMass Dartmouth
- Sarah Gaichas/NEFSC
- Kaili Gregory/Cornell
- Jorge Holzer/U. Maryland
- Emily Keiley/GARFO
- Jeff Kipp/ASMFC
- Doug Lipton/NOAA Fisheries
- Annabelle Stanley/Cornell
- Mark Terceiro/NEFSC
- Mike Wilberg/U. Maryland
- Greg Wojcik/CT DEEP

Core Stakeholder Group

- Leah Barton/Shore
- Rick Bellavance/Charter Boat
- Eleanor Bochenek/Academic
- Neil Delanoy/Party Boat
- John DePersenaire/National Recreational Org.
- Greg DiDomenico/Commercial
- Paul Haertel/Private Boat
- Rich Hittinger/Private Boat
- Mike Oppegaard/Charter Boat
- Michael Plaia/Charter Boat
- Harvey Yenkinson/Private Boat
- Mike Waine/Rec. Secondary Market

Also, significant input from Adam Nowalsky, Justin Davis, Tony DeLernia, and Peter deFur

EAFM to MSE

- Project is part of the Council's implementation of the EAFM guidance document
- Structured and deliberative approach to incorporating ecosystem considerations within the management process
- **MSE Goals:** 1) Evaluate biological and economic benefits of minimizing rec discards (live and dead) and convert to landings and 2) identify management strategies to realize benefits
- Opportunity to align EAFM work with traditional management process
- Different approach and process to evaluate management challenges to address and reduce regulatory discards

Source: Sarah Gaichas, http://www.mafmc.org/s/3_Habitat_in_IEAs_Gaiches.pdf

MSE Process

Phase 1 - Public Scoping & Engagement

May 2020 - May 2021

AP Kick-Off Webinar –
Introduction to MSE process

Scoping Feedback Form -
Broad input on variety of topics

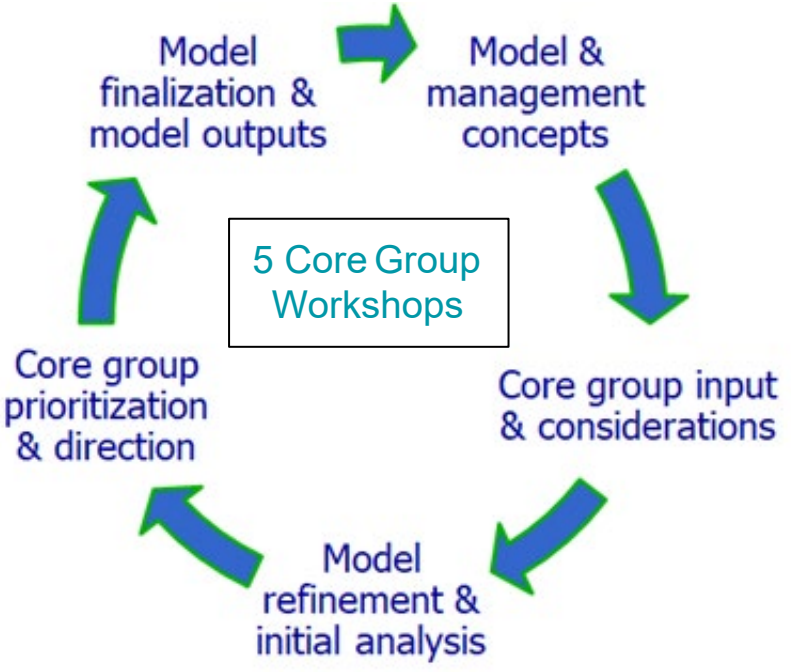
Regional Workshops –
Targeted, focused input

Core Stakeholder Group –
Direct input and feedback to technical team

Early and continued engagement

Phase 2 - Management Application & Model Development

June 2021 - June 2022



Management Objectives & Performance Metrics

- Broad objectives identified when agreeing to MSE
- Didn't explicitly provide guidance for other management considerations
- Define what a successful fishery that minimizes discards would look like
  1. Improve the quality of the angler experience
  2. Maximize the equity of anglers' experience
  3. Maximize stock sustainability
  4. Maximize the socio-economic sustainability of the fishery
- A set of 17 performance metrics, multiple metrics for each objective
  - Calculated at either the trip, state/region, or coastwide
  - Core group interest in mode specific and other metric options

Management Procedures (aka - strategies, regulations)

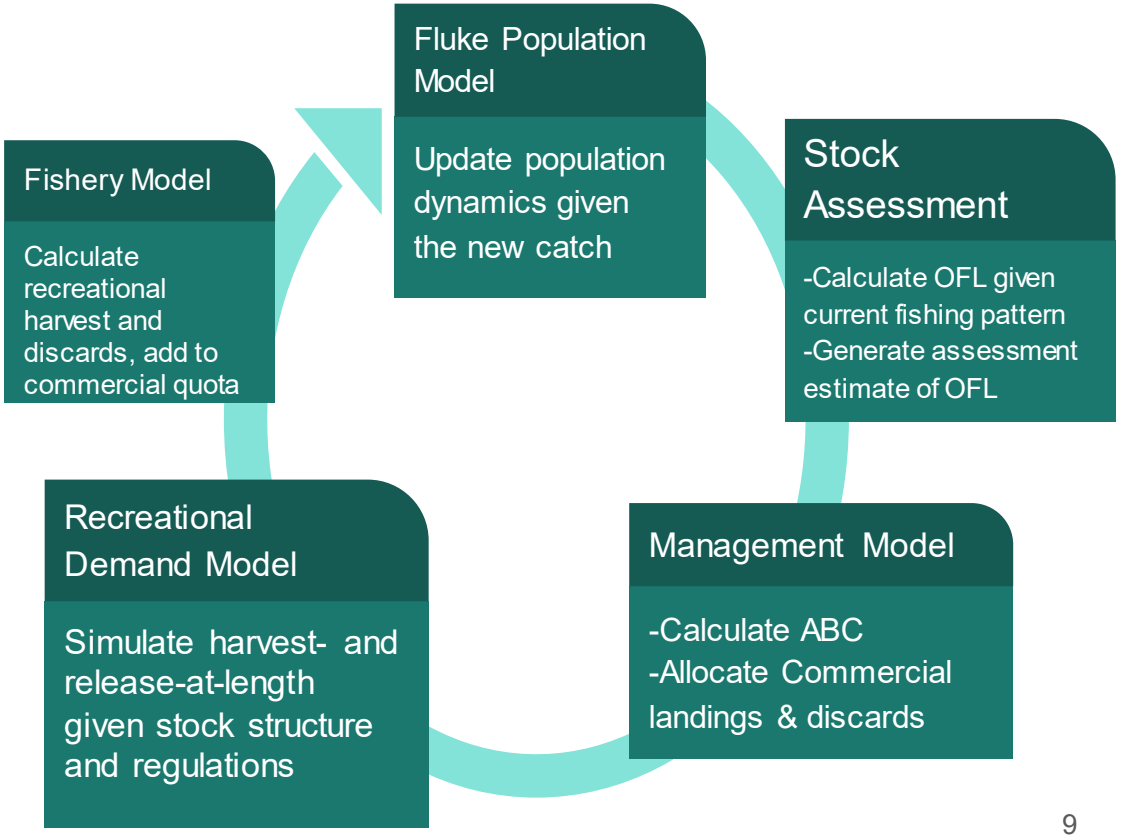
Management Procedure #	Procedure Explanation
1 (status quo)	Status Quo - 2019 regulations
2 (minsize-1)	2019 regulations but a 1 inch decrease within each state to a minimum of 16 inches
3 (season)	2019 regulations but season of April 1 - Oct 31 for all states
4 (region)	Modified regions: MA-NY - 5 fish, 18 inch min, May 1 - Sept 31 NJ - 3 fish, 17 inch minimum, May 1 - Sept 31 DE-NC - 3 fish, 16 inch minimum, May 1 - Sept 31
~~5~~	~~1 fish, 14 inch minimum, May 15 - Sept 15~~
6 (c3@17)	3 fish possession limit, 17 inch minimum size, May 1 - Sept 30
7 (c1@16-19)	Modified slot: 1 fish from 16" - 19", 2 fish 19 inches and greater, May 1 - Sept 31
8 (slot)	True slot limit: 3 fish possession limit between 16 inches and 20 inches, May 1 - Sept 31

Coupled modeling approach

- Link extant ecological, fishery, & economic models
  - Less time on development & testing, more time on ensuring representation of working group needs
- Population dynamics & fishery model
  - Population size, status, multiple fishing fleets
- Emulate scientific assessment & management advice
- Length structure of population available to recreational fishery
- Simulate response of recreational fishery to both stock availability and regulations (at various scales).
- Feedback effect of recreational fishing response to regulations into the stock dynamics.

Coupled Modeling Approach: Operating & Management Models

- Age, length, sex-structured summer flounder population dynamics model
- Length-based fishing for commercial and recreational landings & discards
- Conditioned on results of 2021 Management Track Stock Assessment
- Emulates our current best estimates of stock status productivity
- Assessment/Management Model includes our perception of scientific uncertainty, focuses on recreational fishery dynamics
- Fishery & Population model is similar to our stock assessment BUT allows us to directly include implications of changes in size structure of the removals (say due to changes in size limits)



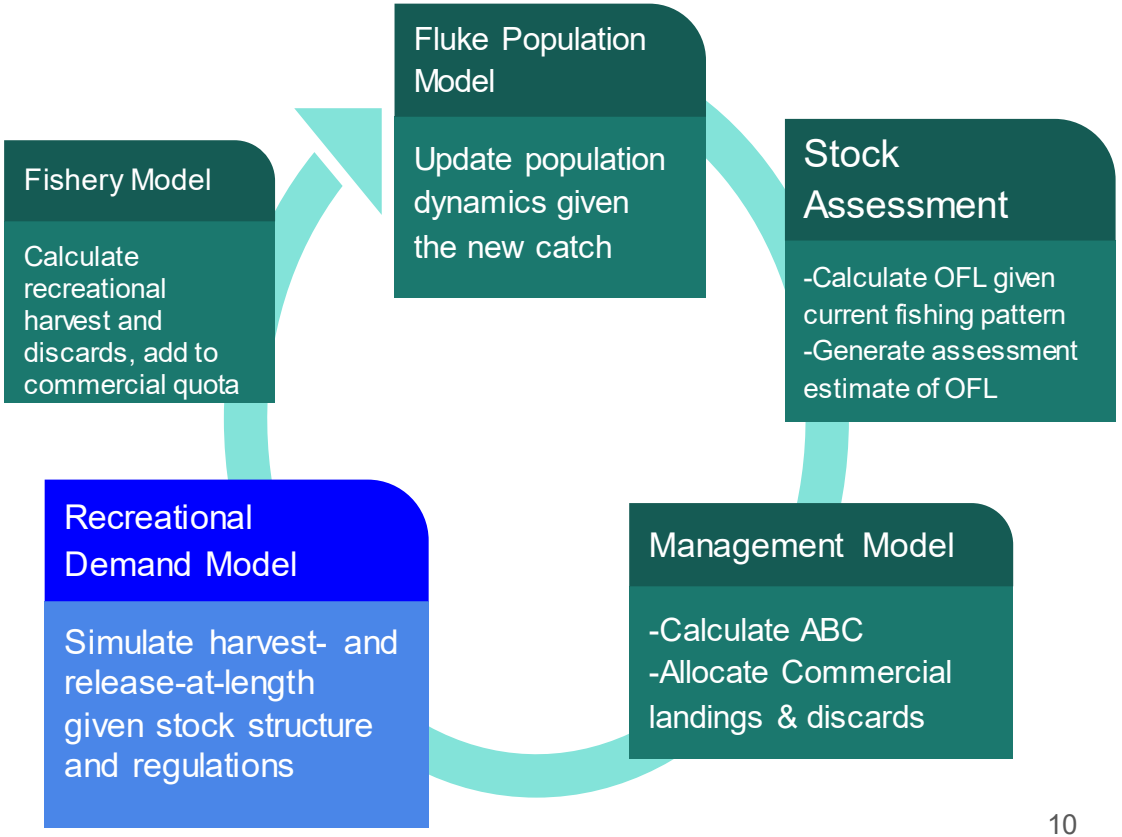
Coupled Modeling Approach: Recreational Demand Model

Predicts recreational harvest & discards given simulated population size and the management alternatives

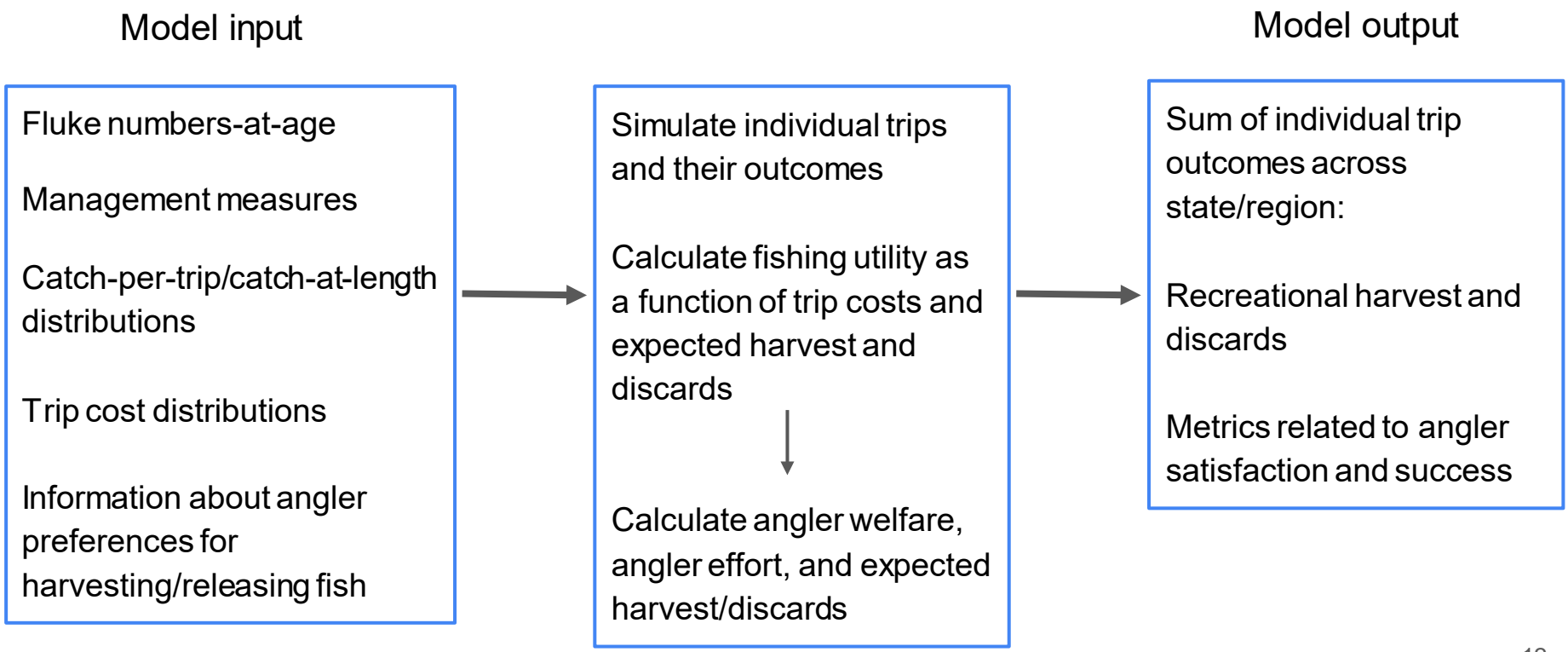
- Passed back to the fishery model to update the population dynamics with these removals

Also, calculates expected effects of population size and mgt. alternatives on:

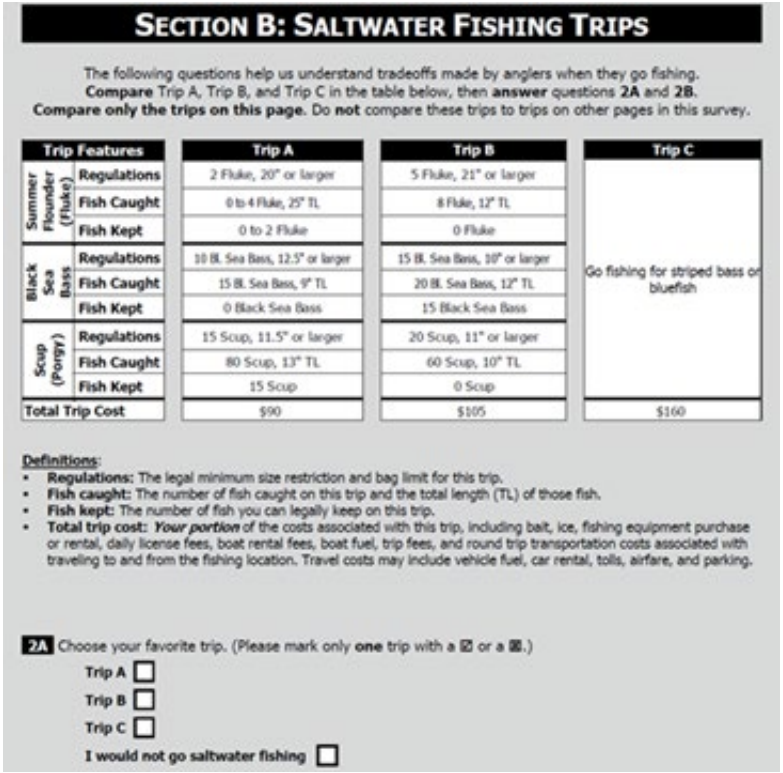
- fishing effort (recreational demand)
- angler satisfaction/welfare
- aggregate trip expenditures → impacts to downstream businesses



Recreational demand model (RDM)



Estimating angler preferences



SECTION B: SALTWATER FISHING TRIPS

The following questions help us understand tradeoffs made by anglers when they go fishing.
Compare Trip A, Trip B, and Trip C in the table below, then **answer** questions **2A** and **2B**.
Compare only the trips on this page. Do **not** compare these trips to trips on other pages in this survey.

Trip Features		Trip A	Trip B	Trip C
Summer Flounder (Fluke)	Regulations	2 Fluke, 20" or larger	5 Fluke, 21" or larger	Go fishing for striped bass or bluefish
	Fish Caught	0 to 4 Fluke, 25" TL	8 Fluke, 12" TL	
	Fish Kept	0 to 2 Fluke	0 Fluke	
Black Sea Bass	Regulations	10 Bl. Sea Bass, 12.5" or larger	15 Bl. Sea Bass, 10" or larger	
	Fish Caught	15 Bl. Sea Bass, 9" TL	20 Bl. Sea Bass, 12" TL	
	Fish Kept	0 Black Sea Bass	15 Black Sea Bass	
Scup (Porgy)	Regulations	15 Scup, 11.5" or larger	20 Scup, 11" or larger	
	Fish Caught	80 Scup, 13" TL	60 Scup, 10" TL	
	Fish Kept	15 Scup	0 Scup	
Total Trip Cost		$90	$105	$160

Definitions:
- **Regulations:** The legal minimum size restriction and bag limit for this trip.
- **Fish caught:** The number of fish caught on this trip and the total length (TL) of those fish.
- **Fish kept:** The number of fish you can legally keep on this trip.
- **Total trip cost:** *Your portion* of the costs associated with this trip, including bait, ice, fishing equipment purchase or rental, daily license fees, boat rental fees, boat fuel, trip fees, and round trip transportation costs associated with traveling to and from the fishing location. Travel costs may include vehicle fuel, car rental, tolls, airfare, and parking.

2A Choose your favorite trip. (Please mark only **one** trip with a ☑ or a ☒.)

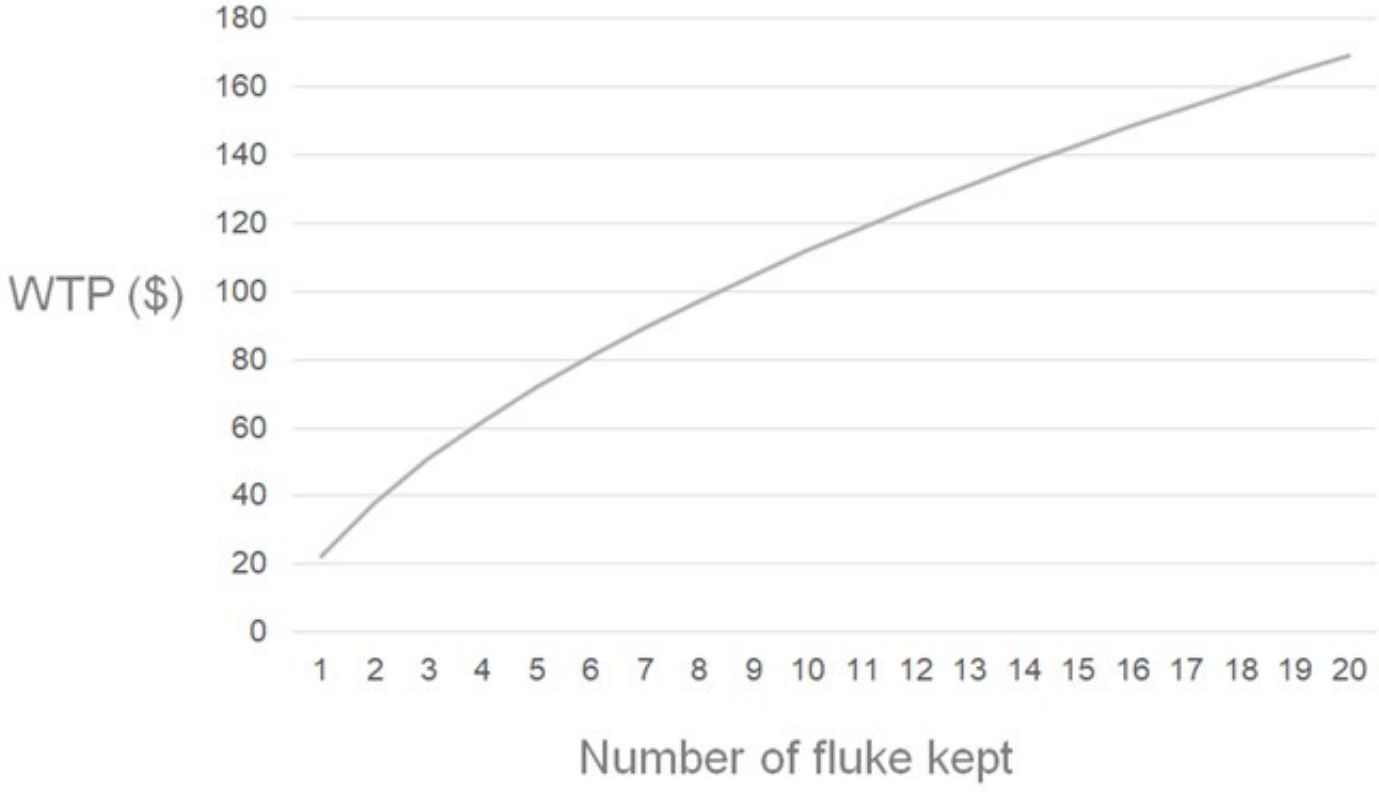
- Trip A ☐
- Trip B ☐
- Trip C ☐
- **I would not go saltwater fishing** ☐

Example choice experiment question from 2010 survey

	ME-NY	
Mean parameters	*Estimate*	*St. Error*
trip cost	-0.012***	0.000
√SF kept	0.559***	0.063
√SF released	-0.061	0.046
√BSB kept	0.275***	0.034
√BSB released	-0.021	0.024
√scup kept	0.075***	0.021
√scup released	-0.010	0.015
√WF kept		
√WF released		
√RD kept		
√RD released		
do not fish	-2.641***	0.252
fish for other species	1.429***	0.181
No. choices	3460	
No. anglers	449	
Pseudo R^2	0.332	
LL	-3203.6	
LL(0)	-4796.6	
AIC	6441.1	
BIC	6569.2	

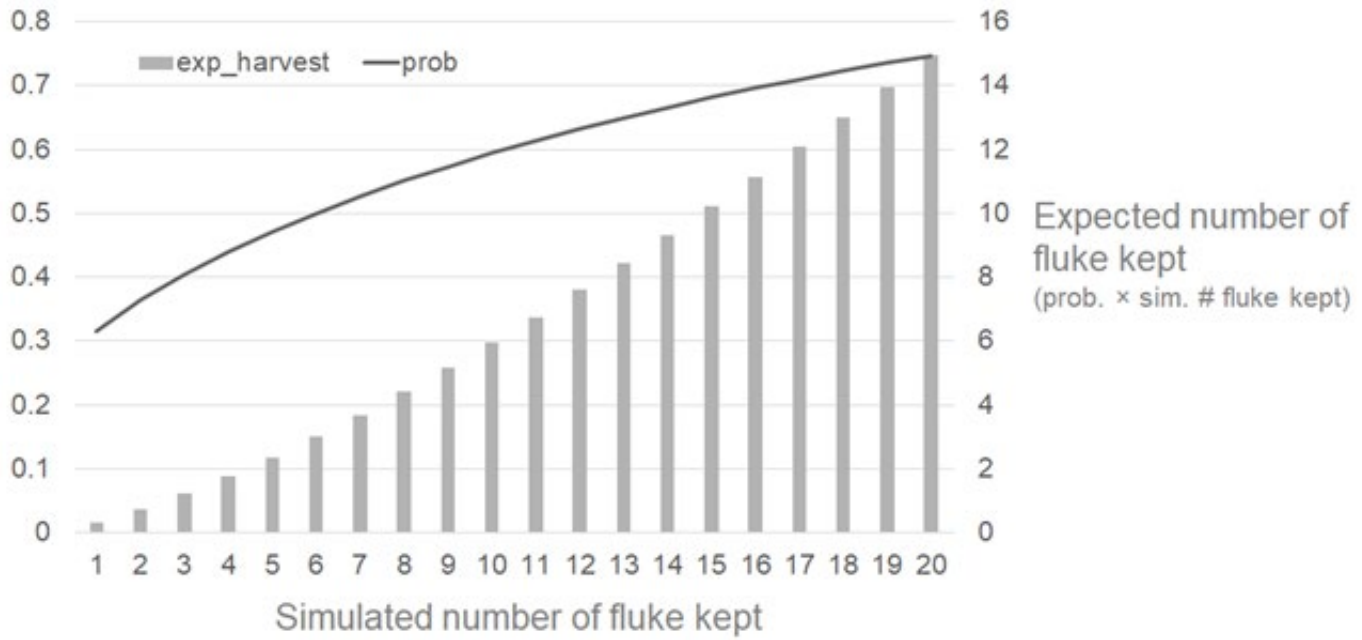
Estimated utility parameters

Angler willingness-to-pay for keeping fluke



Relationship between simulated fluke keep, recreational demand, and expected keep

Probability of an angler taking a trip (recreational demand)



Results from a simulated trip occasion with no other catch, trip cost of $35

RDM output

- Recreational harvest- and discards-at-length
  ➔ feeds back into the operating model

- Angler welfare (relative to baseline year)

- Aggregate trip expenditures
  ➔ # trips × average trip costs

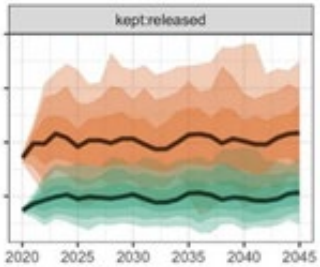
Alternative Operating Model Scenarios

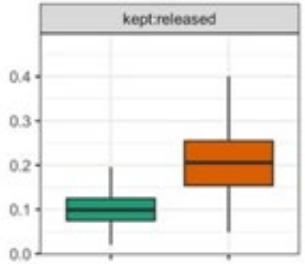
- Two additional scenarios chosen in addition to the ‘base’ representing key aspects of uncertainty.
- MRIP Bias
  - Models initialized & calibrated based on an assumption that the data from MRIP are biased high.
    e.g. historical recreational removals and effort were not as high
- Distribution Shift
  - Regional availability of summer flounder to the recreational fishery changes in the future.

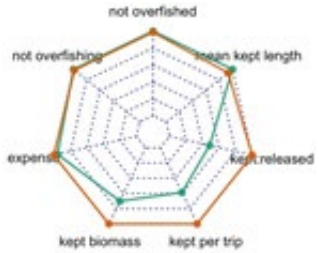
Quick Review: Projections and Outputs

- 100 simulations for each management procedure
- 26-year projection period (13 assessments and management cycles)
- Same management procedure for entire projection
- Metric calculated from final 10 years of projection
- Median values used as point estimate for metric

Ex. outputs



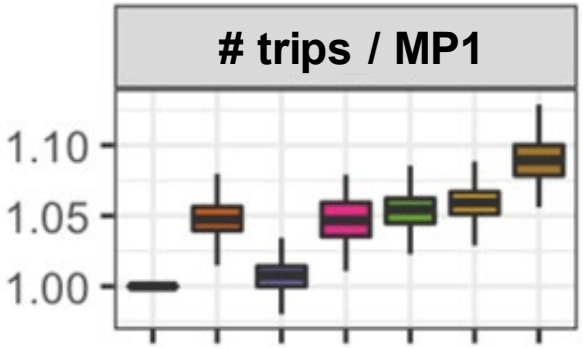


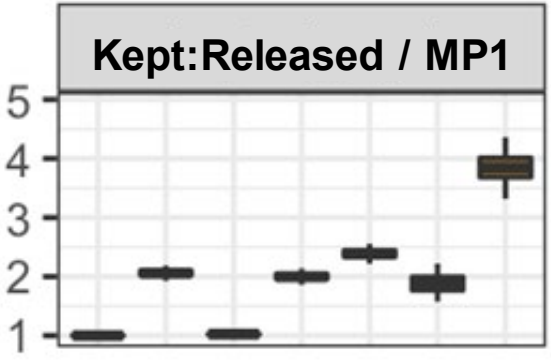


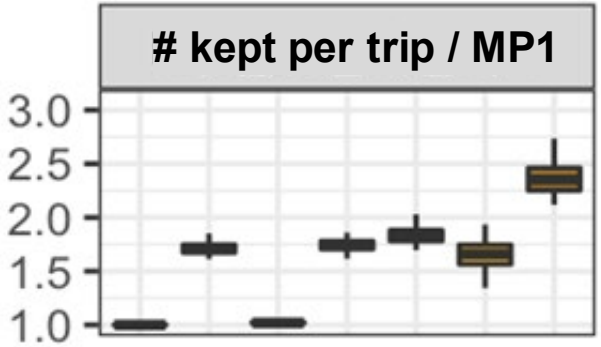
Key Takeaways

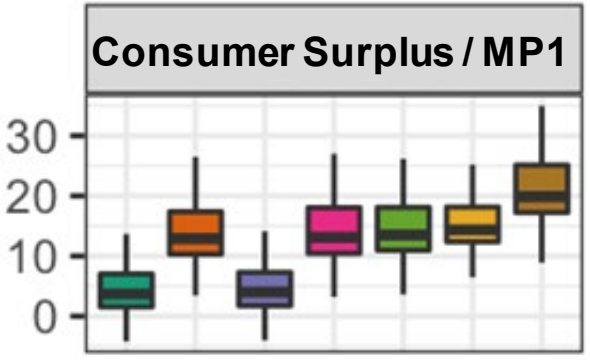
Most management procedures outperformed status quo across the majority of metrics

- Reduce recreational discards
- Provide increased harvest opportunities
- Increase angler welfare
- Greater economic benefits



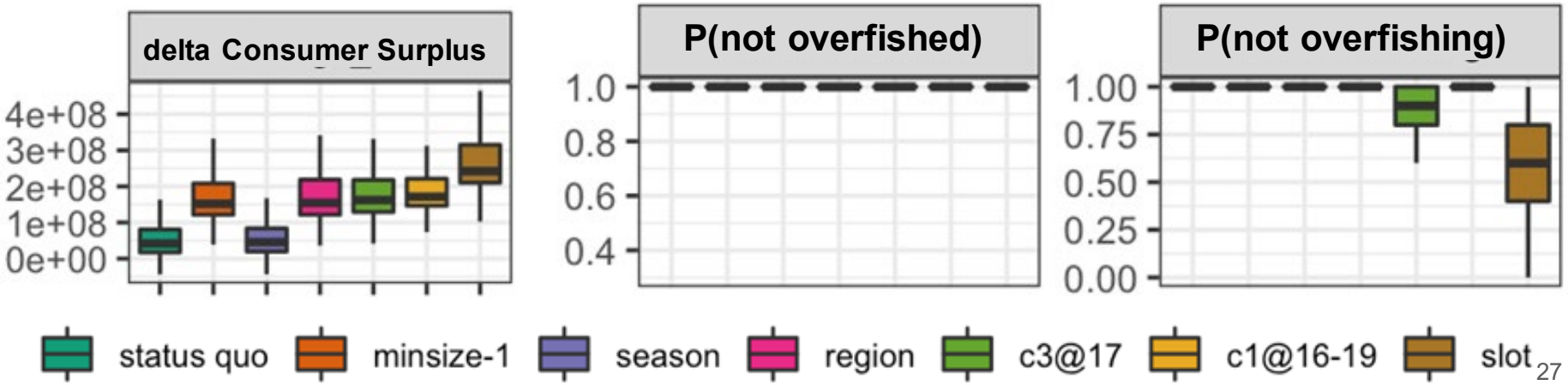






Improved recreational fishery outcome did not come at expense of conservation status.

- No management procedure resulted in stock being overfished.
- Most had low risk of overfishing

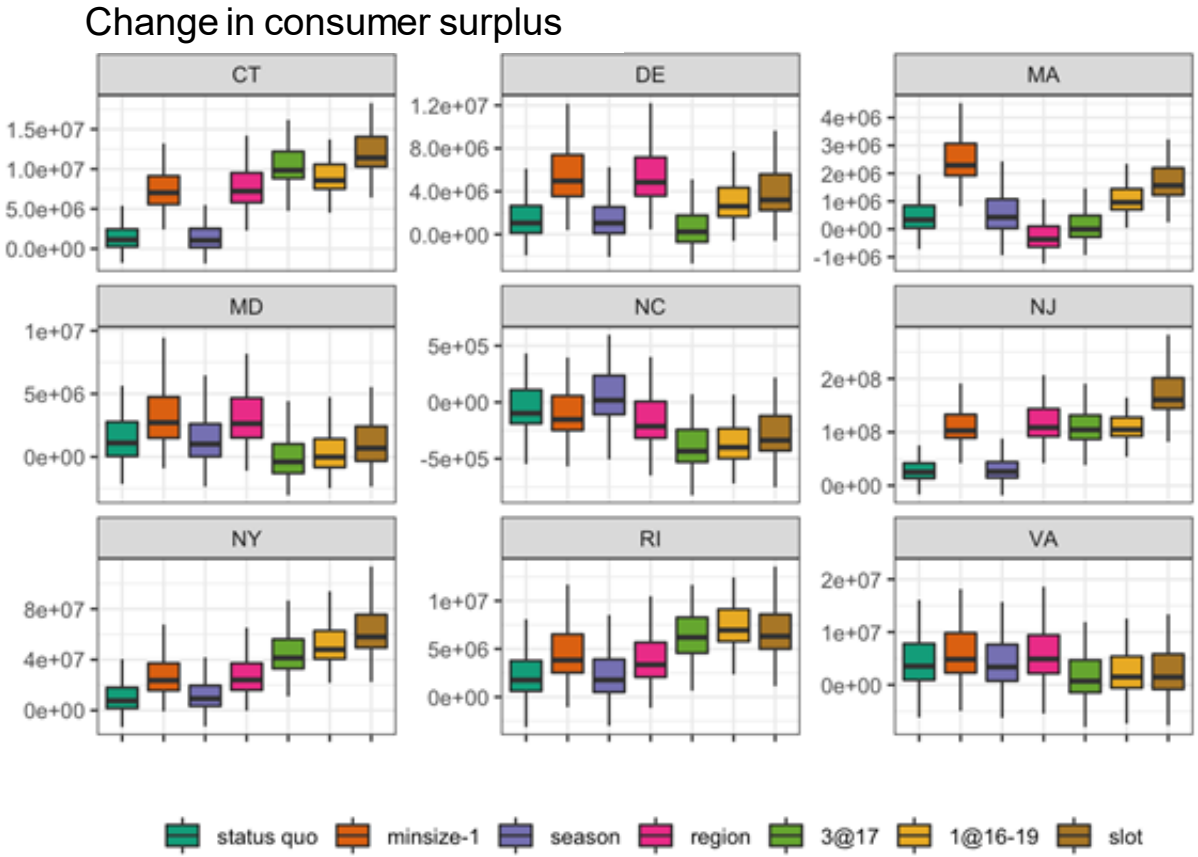


The relative performance of management procedures remained similar under different operating model scenarios.

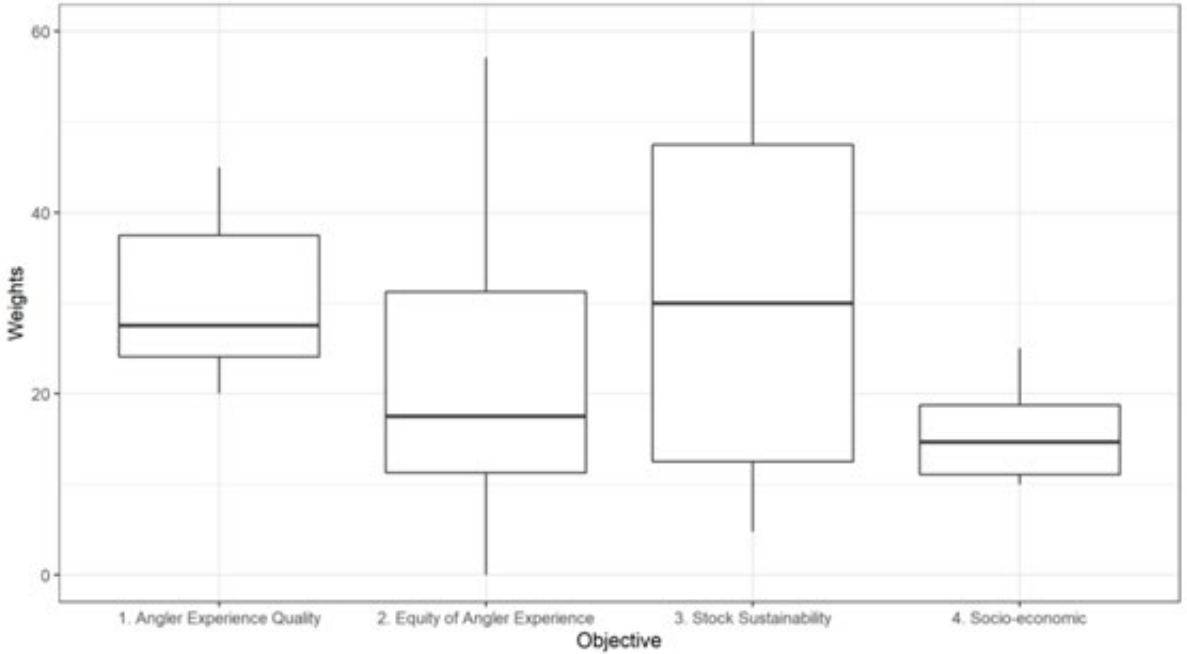
- Performance of a given management procedure generally lower than baseline under both MRIP bias and distribution shifts.

Relative performance of a management procedures is variable at state/regional level.

- For states New Jersey and north, ‘status quo’ and ‘season’ performed worst compared to other management procedures -
- ‘Status quo’ and ‘season’ options performed better or as well as others for Delaware and south.

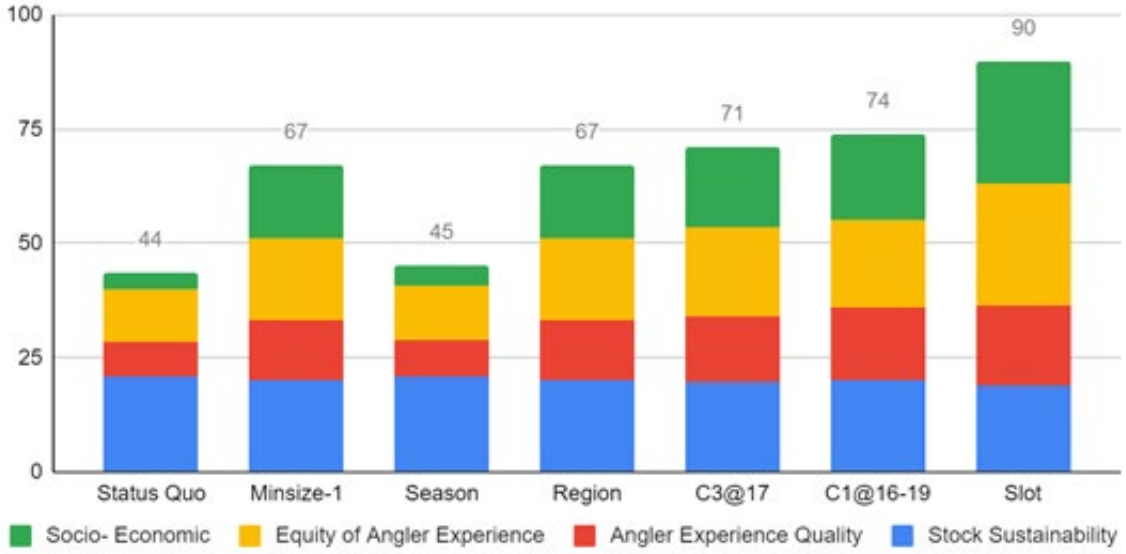


To examine tradeoffs among metrics and procedures, core group preferences were captured through weights assigned to the management objectives.



- Stock Sustainability & Quality of Angler Experience Quality are higher priority.
- Can be used to evaluate future procedures

Based on stakeholder preferences, proposed management procedures are expected to increase stakeholder satisfaction.



- MPs provide 4-106% increase in perceived performance
- Driven by socioeconomics, equity, and experience improvements
- ‘Slot’ had the highest score across weighting schemes,
  - Robust to range of stakeholder preferences, always ranking best

Broader MSE Results & Takeaways

Core Group Feedback

Positives:

- Valuable for management
  - Supported the science/model conclusions
- Think outside the box
- Learned and thought about recreational fisheries and management differently
- Diverse membership; all encouraged to participate

Negatives:

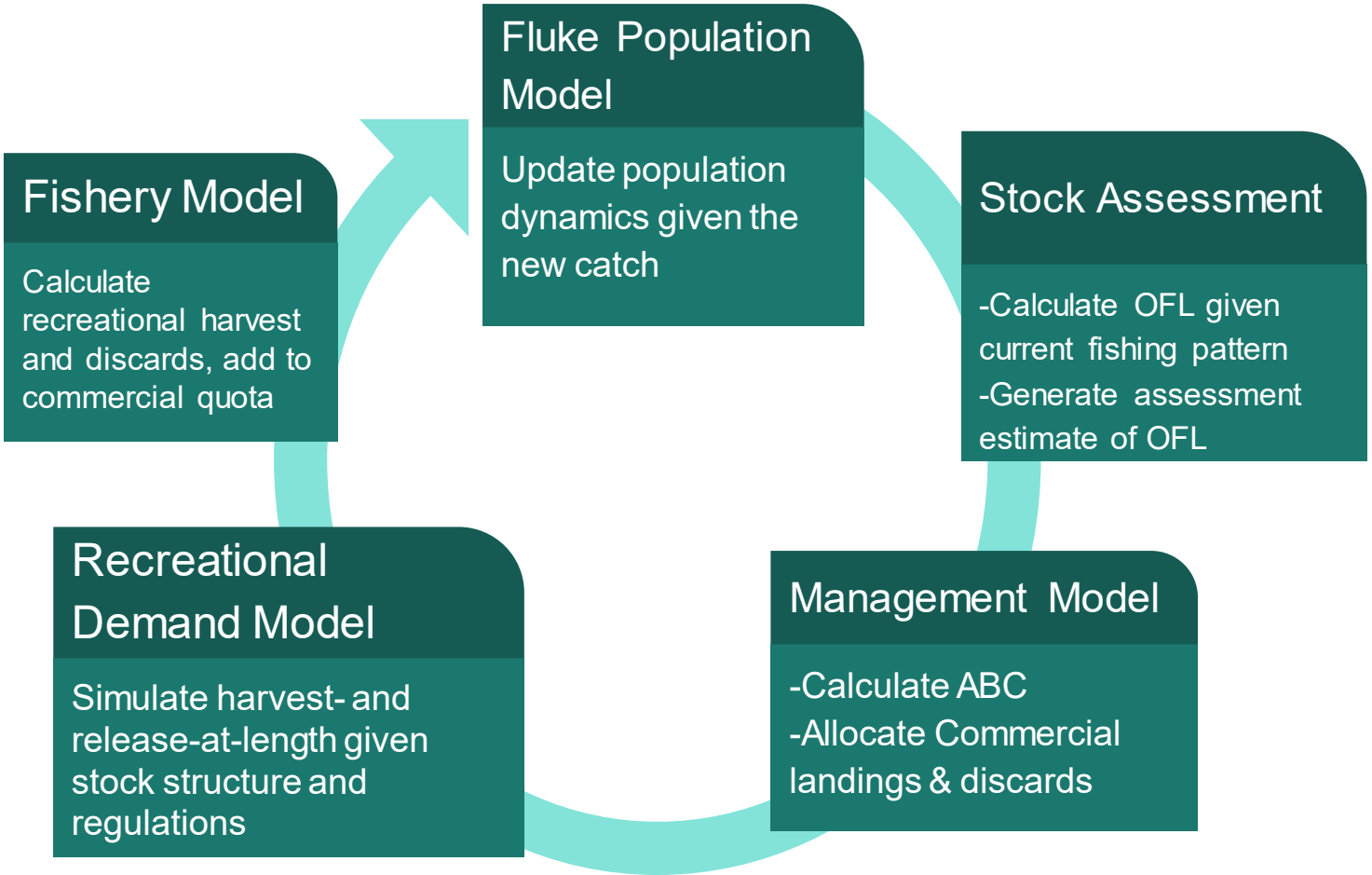
- Too technical and slow at times
- Some ideas were not pursued and limited discussion and ideas
- Concerns about data sources and therefore uncertainty in results
- Outcomes won't help recreational community

Additional applications - other research projects, use for other recreational species, other Council priorities

Questions?

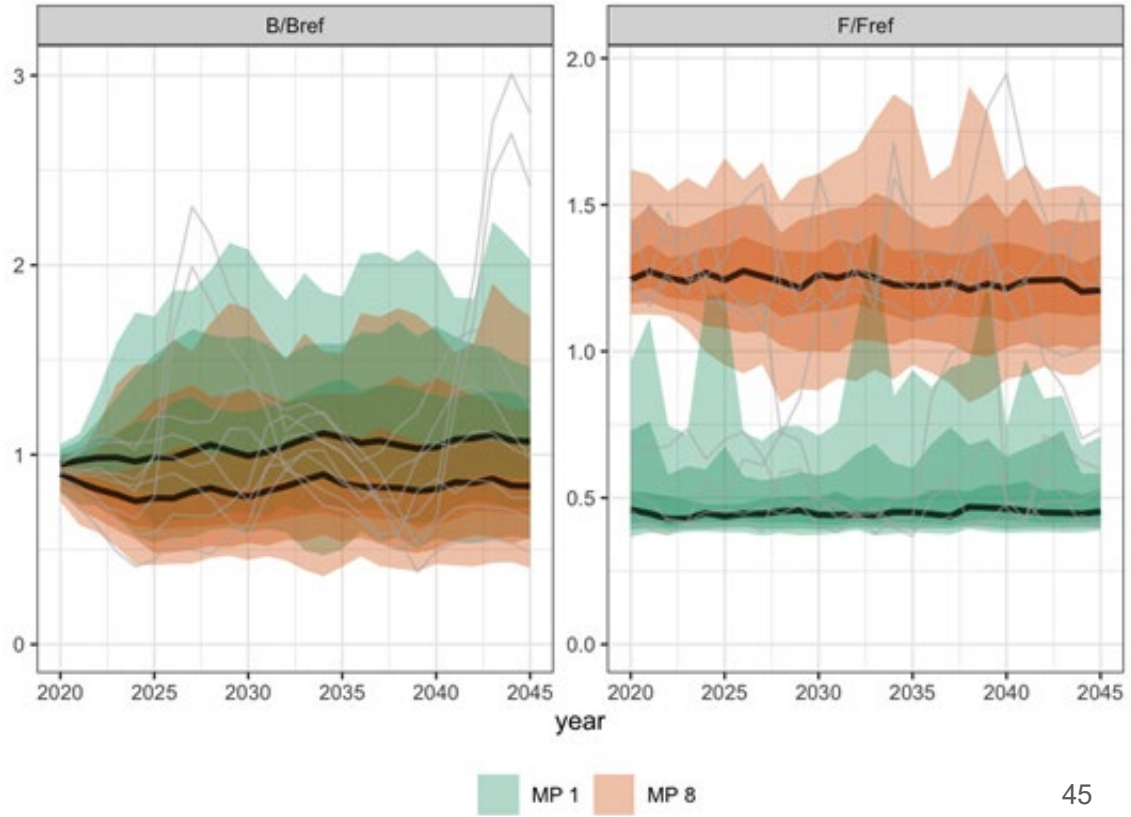
Backup Slides

MSE projection sequence



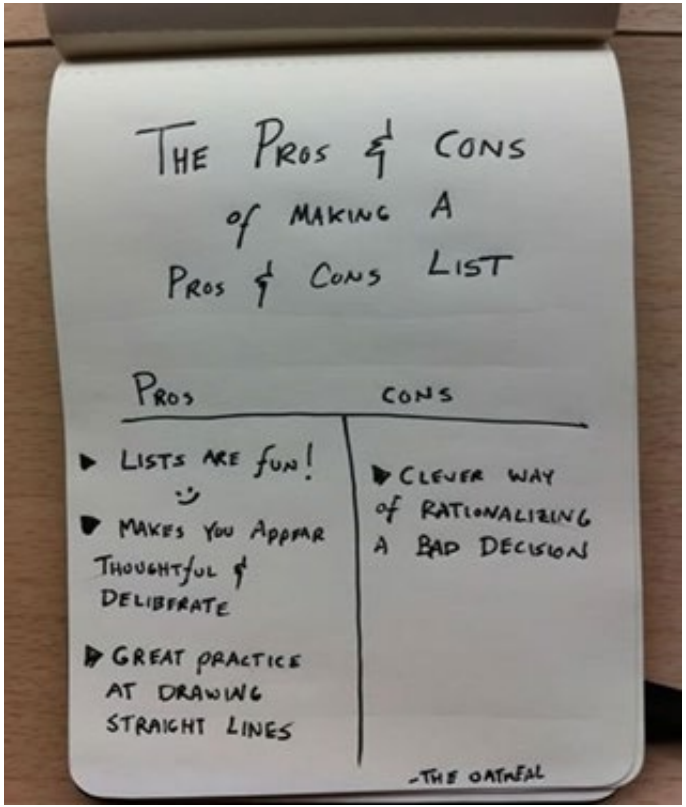
The MRIP bias scenario results in high risk of overfishing for the slot limit (MP8) but stock has low probability of being overfished

- F is higher than FMSY under the slot limit but not egregiously so.
- The stock never really drops below 0.5BMSY during the simulations.



Why consider tradeoffs and stakeholder preferences?

Improve upon Pro vs. Con lists



Which employer was chosen?

	Employer 1	Employer 2
Pros	Good location	Rewarding job
	Opportunity for development	Competitive pay
	Great team	Parking included
Cons	Restricted job scope	Long commute
	Slightly lower pay	Unknown development opportunities
	Parking costs aren't covered	Small isolated team

Example trade off based decision

Objective	Metric	Weight	Employer 1	Employer 2
Location	Commute (short, long)			
Development	Opportunity present			
Team	Excitement scale			
Rewarding Scope	Rewarding scale			
Pay	Relative to competitive			
Parking	Covered			
		Total Score		

Trade-off Tables

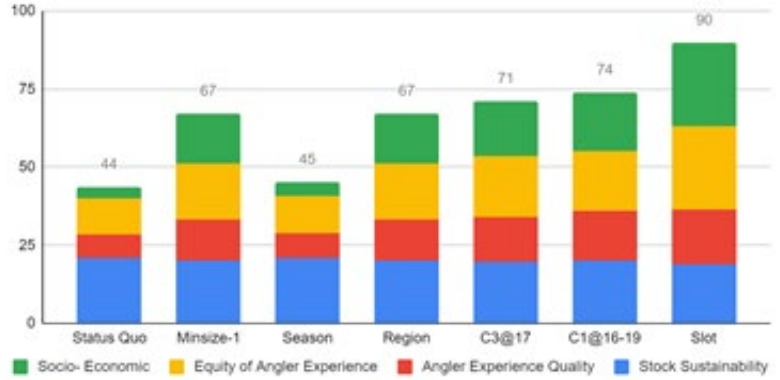
	Angler Experience Quality				Equity of Angler Experience		
	% of trips with a keeper	Average # kept per trip	consumer surplus per trip	% of trips with a trophy	% change chance of retaining a fish	Difference in chance of retaining a fish	% change in retention rate
Status Quo	3.50	1.14	0.55	2.44	6.07	1.18	3.39
Minsize-1	7.00	3.68	1.21	1.18	8.95	1.34	6.95
Season	3.89	1.27	0.58	2.54	6.39	1.00	3.73
Region	7.00	3.81	1.23	1.16	8.95	1.38	6.78
C3@17	7.78	4.06	1.26	1.03	9.59	1.29	8.14
C1@16-19	9.72	3.55	1.32	1.17	11.19	1.21	6.27
Slot	10.11	5.84	1.72	0.00	11.51	1.25	13.22
Weight	**15.6**	**8.0**	**2.8**	**4.3**	**12.1**	**2.4**	**6.8**

Trade-off Tables

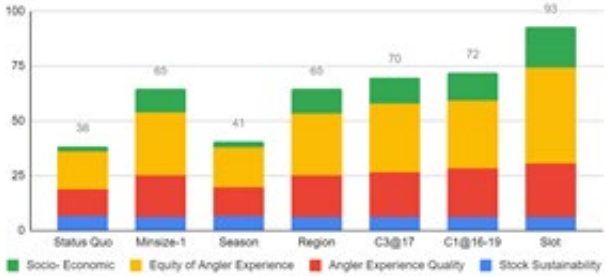
	Stock Sustainability					Socio- Economic		
Options	% chance overfished	% chance overfishing	SSB	# fish released per trip	rec removals	number of trips	aggregate consumer surplus	% change in fishery investment
Status Quo	9.08	3.80	4.03	0.55	1.93	1.82	0.98	0.83
Minsize-1	9.08	3.80	3.36	0.94	1.47	3.11	11.13	1.77
Season	9.08	3.80	4.00	0.51	1.88	2.08	1.30	0.99
Region	9.08	3.80	3.29	0.83	1.42	3.11	11.35	1.78
C3@17	9.08	3.42	3.25	1.13	1.44	3.37	12.07	1.92
C1@16-19	9.08	3.80	3.42	0.77	1.59	3.63	12.93	2.08
Slot	9.08	2.28	2.99	1.57	1.49	4.41	19.47	2.68
Weight	**9.1**	**3.8**	**9.5**	**2.8**	**2.6**	**6.5**	**4.9**	**4.3**

Trade-off Figures

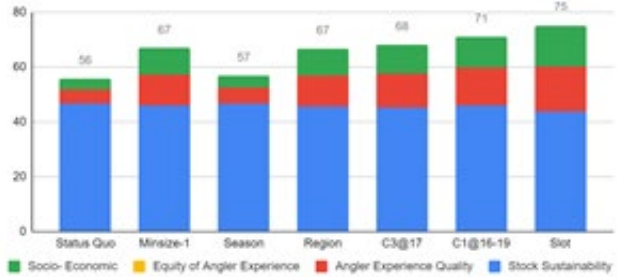
- Ranking is robust
- Degree of improvement
  - ‘Slot’ 34% to 228% increase in satisfaction relative to status quo



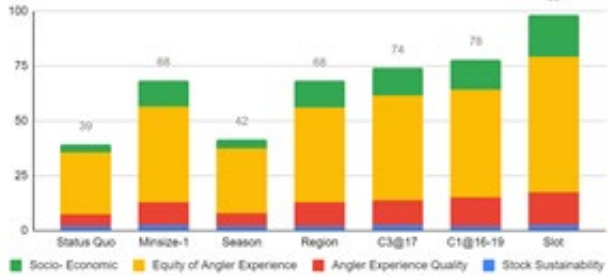
Stakeholder 1



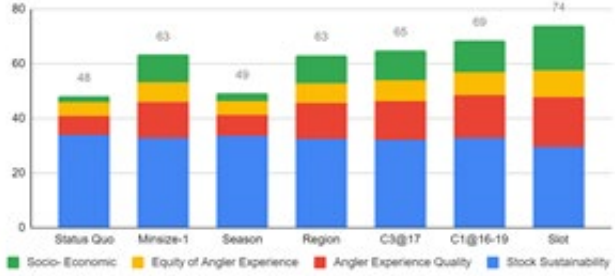
Stakeholder 2



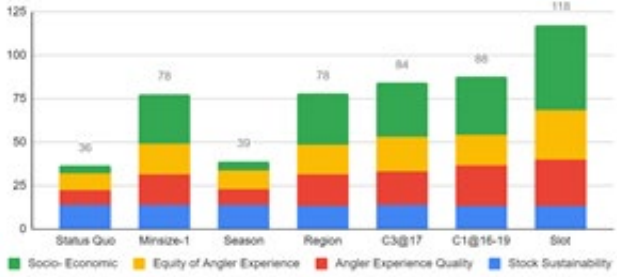
Stakeholder 3



Stakeholder 4



Stakeholder 5



Stakeholder 6