



Dolphin MSE Progress update

South Atlantic Fisheries Management Council SSC meeting



Roles and Responsibilities



	Modeling team	Stakeholders (and Council-associated advisory bodies)	SSC	Council
Management objectives & Performance metrics	<i>Quantify</i> operational management objectives and associated performance metrics	<i>Advise</i> on and articulate secondary management performance	<i>Advise</i> on biological minimum performance criteria (e.g. not overfishing and rebuilding) and risk tolerance	<i>Advise</i> on desired performance and <i>adopt</i> operational management objectives, performance metrics, and risk tolerance
Operating models (OMs)	<i>Construct</i> based on best scientific information available and agency player feedback	<i>Advise</i> on OM structure and key uncertainties	<i>Adopt</i> as best scientific information available	<i>Advise</i> on OM structure and key uncertainties
Management procedures	<i>Test</i> and <i>refine</i> MPs based on agency player feedback	<i>Advise</i> on MP features and management levers	<i>Advise</i> on MP structure and parameterization	<i>Adopt</i> and <i>implement</i> management procedure based on performance
Exceptional circumstances provisions (ECPs)	<i>Determine</i> ECP and regularly test for exceptional circumstances	<i>Advise</i> on unacceptable MP performance	<i>Advise</i> on unacceptable MP performance	<i>Adopt</i> and <i>implement</i> ECPs



Overview



1. Presentation on MSE tool and Operating Model design



ACTION ITEM: *Review* the operating model and its uncertainties. Consider operating model as consistent with BSIA determination.



2. Review of MP



ACTION ITEM: *Advise* on the management procedure structure and parameterization.



3. Regulatory Amendment 3 Scoping results



ACTION ITEM: *Provide feedback* on the potential scientific uncertainties and implications of regulatory amendment 3 scoping options.





1. MSE tool

Splash Page: <https://blue-matter.github.io/mahiMSE/>

Trial Specification Document (TSD):
<https://blue-matter.github.io/mahiMSE/tsd/TSD.html>

Github: <https://github.com/Blue-Matter/mahiMSE>



1. MSE



Model years: 1985 - 2024 (terminal historical year 2022)



4 seasons (Dec-Feb; Mar-May; Jun-Aug; Sept-Nov)



Age-structured operating model based on openMSE



5 areas / 8 fleets



No implementation error



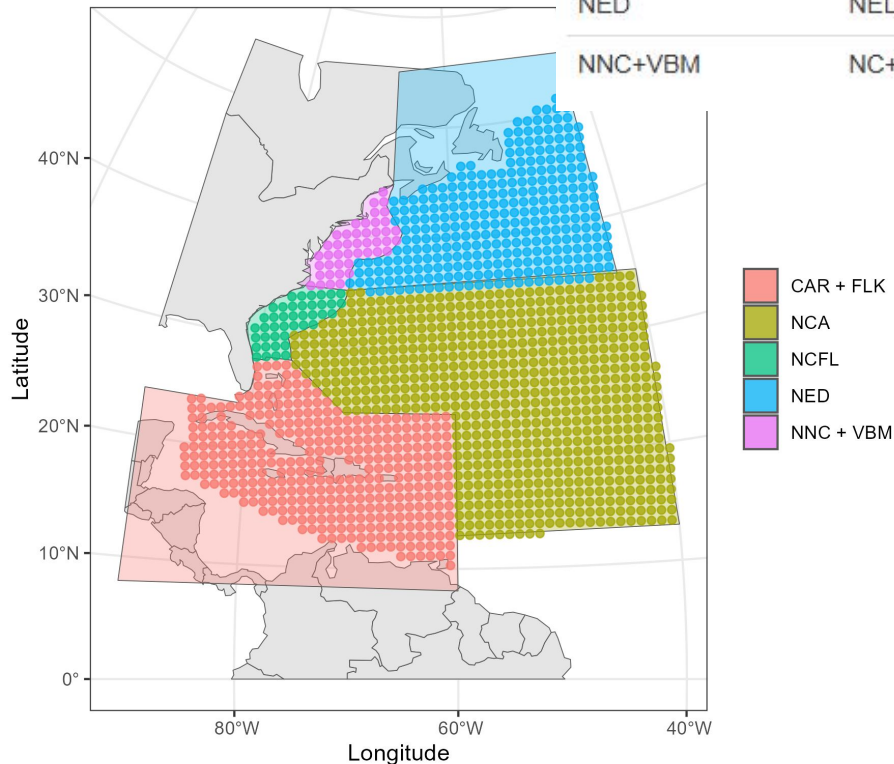
<https://openmse.com/>

<https://github.com/Blue-Matter/openMSE>



1. Space

Code	Alternative code	Description
CAR+FLK	CAR+SFL	Caribbean, South Florida and the Keys
NCA	SAR	Off Caribbean, South Florida and the Keys
NCFL	SE	Wilmington down to Mid Florida
NED	NED	Off North coast
NNC+VBM	NC+NE	Wilmington to Montauk



Seasonal pelagic longline logbook VAST model (Damiano et al. 2024) used to condition spatial & seasonal dynamics



1. Fleets



Code	Fleet	Areas	Years	Selectivity	Description
USCom	USA commercial longline	All	All	Logistic	US pelagic longline fleet
RecN	Recreational North	NNC+VBM	All	Domed	Private recreational fishing
RecS	Recreational South	CAR+FLK, NCFL	All	Domed	Private recreational fishing
HireN	For hire North	NNC+VBM	All	Domed	Headboat / party boat / charter
HireS	For hire South	CAR+FLK, NCFL	All	Domed	Headboat / party boat / charter
Intl	International	CAR+FLK, NCA, NED	All	Logistic (USCom)	Assumed to have the same seasonal distribution as the USCom fleet.
Disc	Discard	CAR+FLK, NCA, NNC+VBM	All	Logistic (USCom)	Assumed to have same catches as UnRep fleet and the same seasonal distribution as the USCom fleet.
UnRep	Unreported	CAR+FLK	All	Logistic (USCom)	Assumed to have the same catches as the Disc fleet and the same seasonal distribution as the USCom fleet.



1. Fleet data



Quarto Book of data and analysis (Mandy Karnauskas):

<https://sefsc.github.io/SEFSC-dolphin-analyses/>



Code: <https://github.com/SEFSC/SEFSC-dolphin-analyses/tree/main>



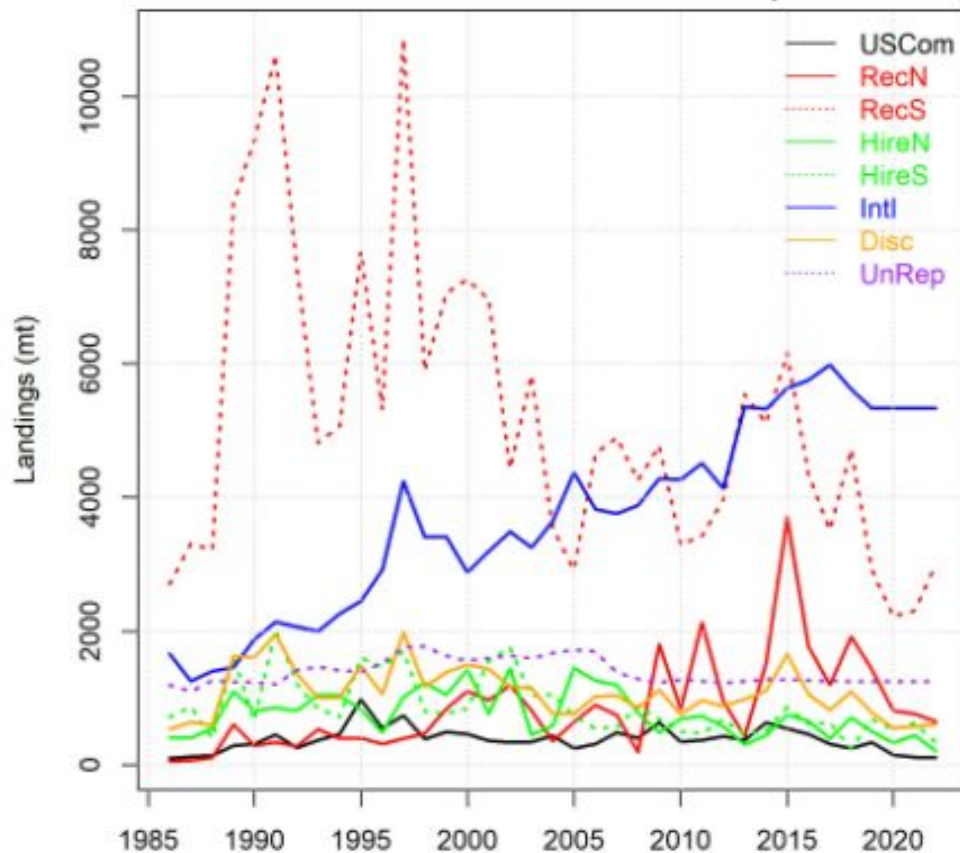
Type	Resolution	Description
Indices	Fleet, season, area	Derived from a custom 5-area VAST model fitted to U.S. pelagic longline catch and effort data
Catches	Fleet, season, area	NOAA dataset
Effort	Fleet, season, area	NOAA dataset
Length composition	Fleet, year	NOAA dataset, data are sparse for the International fleet and not used. Not available for unreported and discard fleets.





1. Catches

- Recreational landings from MRIP following ACL monitoring files for SERO (including discards)
- Commercial landings based on logbook and trip ticket databases (same data used for quota monitoring)
 - Discard rate = 1.4% and dead discard rate = 2.9% on average
- Discards based on assumed fixed percentages from landings...
- International catches from FAO database
- Unreported catches from the Sea Around Us Project (<https://www.searoundus.org/data/#/ez>)





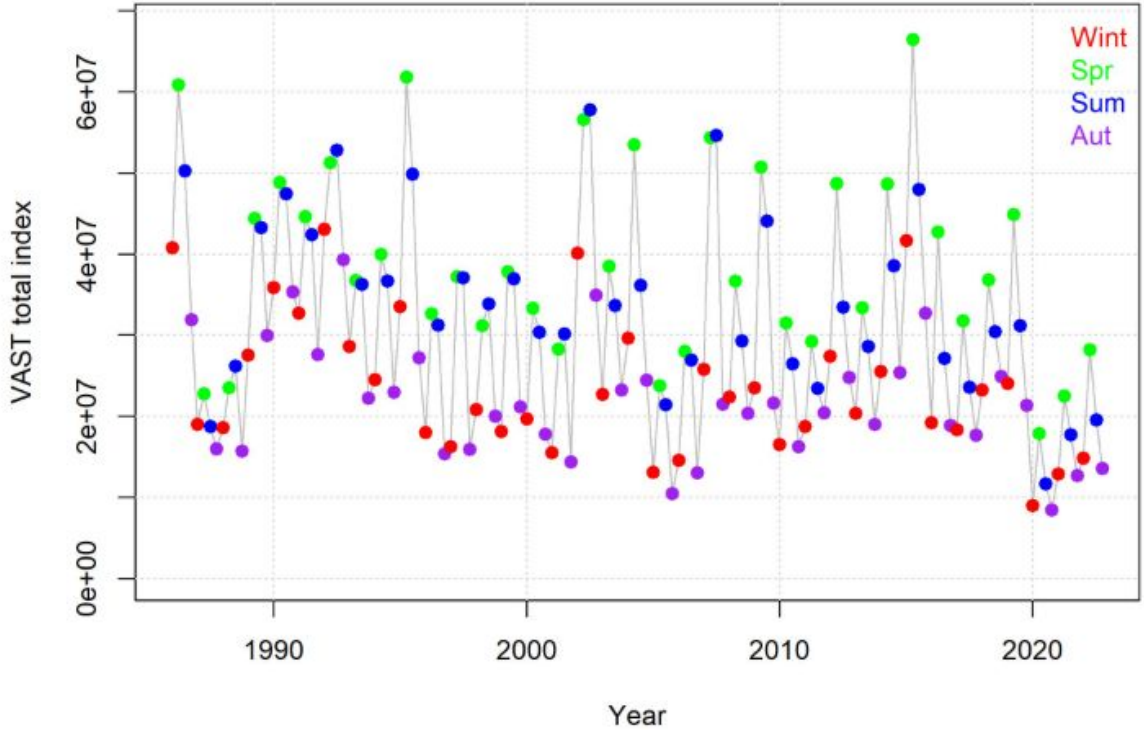
1. Abundance Indices



Damiano et al. 2024
5-area pelagic longline
logbook VAST index

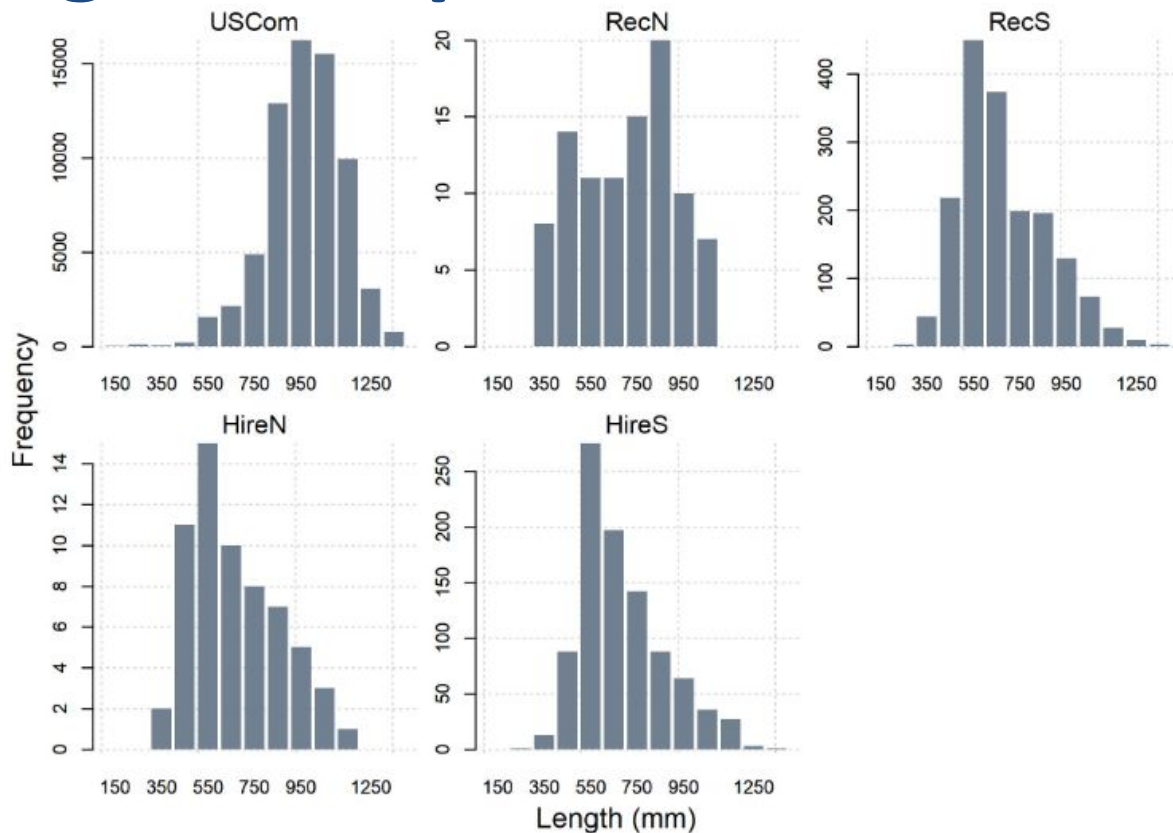


Additional indices in
development





1. Length Compositions



1. Life history



Schwenke and Buckel (2008) for

- von Bertalanffy growth,
- maturity,
- natural mortality range*

Rudershausen et al. (2019) for

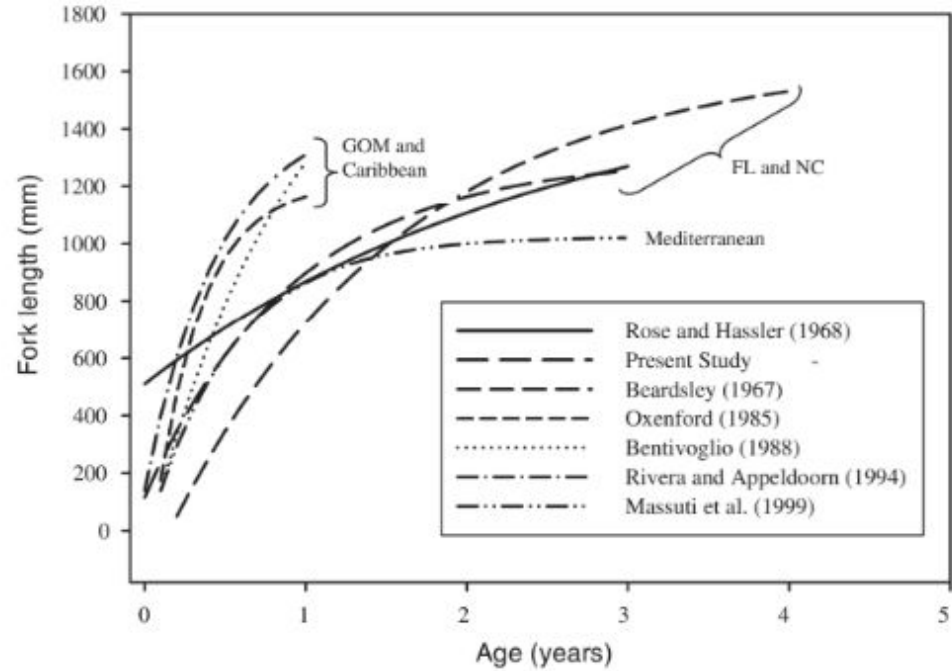
- Post-release mortality

MRIP data for

- weight-at-length

<https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/2008/1061/schwenke.pdf>

<https://beyondourshores.org/wp-content/uploads/2019/11/Rudershausen-et-al.-2019-Discard-Mortality.pdf>



1. Conditioning

1. Using the rapid conditioning model (RCM), condition OMs based on single area catches, summed-area VAST index, length composition.

a. Model fitting reports available from TSD
https://blue-matter.github.io/mahiMSE/tsd/TSD.html#7_Operating_model_dynamics

2. Superimpose seasonal movement dynamics to match the distribution of spatial VAST index.

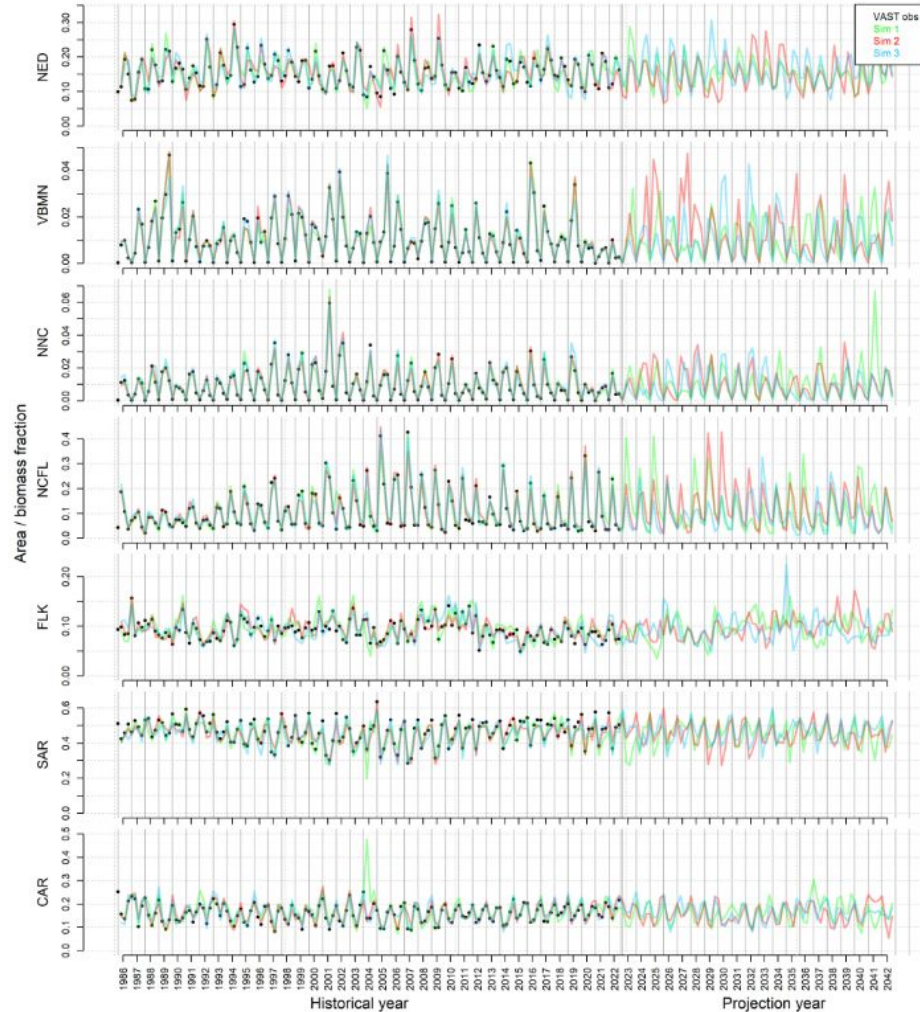
Iteratively solve for the spatial exploitation rate of each fleet to match historical spatial catches within the constraints of matching spatial VAST indices.

		Fraction in:	LOGIT Markov mov. Mat.					Row sum
2019 Winter	CAR+FLK	0.35	$g_1 + v_1$	g_2	g_3	g_4	0	1
	NCA	0.52	g_1	$g_2 + v_2$	g_3	g_4	0	1
	NCFL	0.03	g_1	g_2	$g_3 + v_3$	g_4	0	1
	NED	0.09	g_1	g_2	g_3	$g_4 + v_4$	0	1
	NNC+VBM	0.01	g_1	g_2	g_3	g_4	v_5	1
		Fraction out:	0.24	0.35	0.22	0.09	0.10	
			CAR+FLK	NCA	NCFL	NED	NNC+VBM	
			2019 Spring					



1. Future data

Generated with same properties of data from conditioned historical OM (sd, lag-1 autocorrelation)





1. Reference set of OMs



- Reflect key uncertainties based on which the MP should be parameterized
- Determined based on stakeholder input, biological understanding, MSE best practices
- Reference case OM (OM_29): low M, low steepness, full historical catches, future 100% mean recruitment, high stock mixing
- Reference OMs are currently equally plausibility weighted

Uncertainty	Level 1	Level 2
Natural Mortality	Low (m): 0.25 per season	High (M): 0.5 per season
Resilience (steepness)	Low (s): 0.7	High (S): 0.95
Catch levels of Disc and Unrep	Low (c): half NOAA calculated	High (C): 100% NOAA calculated
Recruitment Level	Low (r) 75% historical mean levels	High (R) 100% historical mean levels
Viscosity	Low (v): prob. stay. = 0.4	High (V) prob. stay. = 0.6



1. Robustness set of OMs



- Uncertainties of interest that may be less likely, less well-informed by data, speculated future scenarios, etc.
- Not used for MP development
- Used to further discriminate among MPs and to identify exceptional circumstances



Code	Description
ROM_C1	IUU increases by 1% every year
ROM_R1	Future recruitment declines 1% per year
ROM_R2	Future recruitment reduces by 25% after 5 years
ROM_R3	Future recruitment reduces by 25% after 10 years
ROM_R4	Future recruitment is 50% more variable
ROM_S1	Two percent decline in CAR and SFL, 1 percent increase in SE, 2% increase in NC and NE
ROM_S2	50% greater variability in spatial / seasonal distribution
ROM_S3	1% pa. increase in catchability reflecting range contraction
ROM_S4	20% Probability of staying where possible
ROM_S5	80% Probability of staying where possible
ROM_P1	1% pa. decrease in somatic growth rate (k)
ROM_P2	1% pa. decrease in condition factor (weight at length)
ROM_P3	1% pa. increase in natural mortality rate (all ages)



1. Implementation safeguards



Exceptional Circumstances Provisions



- ECPs detail scenarios where the true stock has strayed beyond what was simulation tested in the MSE
 - Typically review whether new data observations (e.g., indices) fall outside of simulation envelopes
- Checked for annually
- Constitute grounds to override MP and MP advice



MSE Review



- Pre-specified timeline to revisit MSE and MP
- Allows for re-tuning of the MP with additional data or management objectives
- Allows for incorporation of new information, addition or elimination of key axes of uncertainty, consideration of additional robustness scenarios, etc.





ACTION ITEM



Review the operating model and its uncertainties.

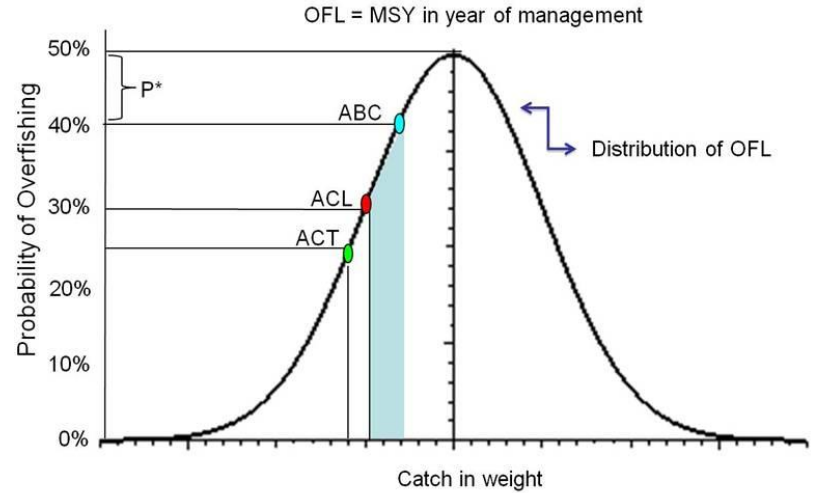
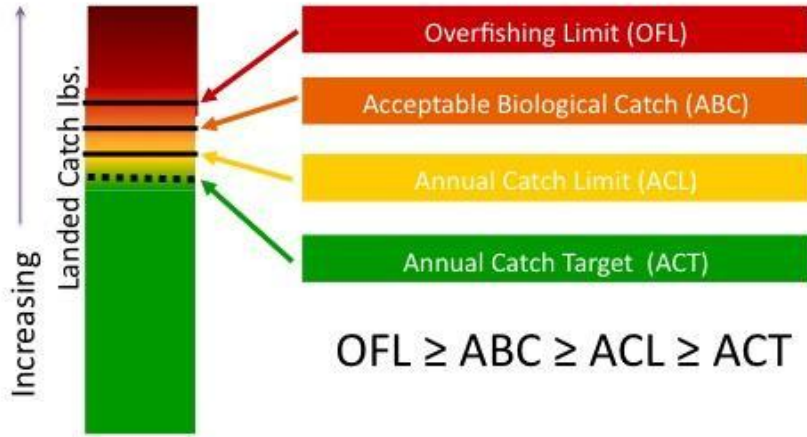


Consider operating model as consistent with BSIA determination.



2. Management Procedure

Magnuson-Stevens Fishery Conservation and Management Act; National Standard 1



- **Management Procedures (MPs)** – pre-specified series of rules to effectively manage a resource, where an indicator of stock status is used to guide management advice through a feedback loop;
 - the a catch control rule combined with the available data, estimating model approach, and the way that management advice is implemented



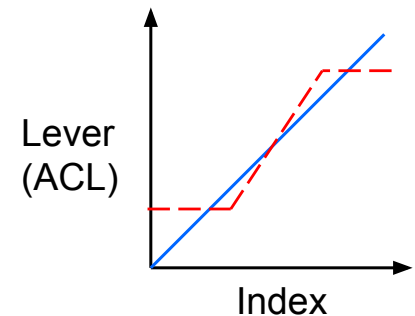
2. Management Procedure

Static versus dynamic

Management levers

- **ACL** by fleet and area
- **Effort** (access) relative to today by fleet and area
- **Vessel limit** by fleet
- **Minimum size limit** by fleet and area

Control rule – specifies how change in index relates to recommended change in management lever





2. Management procedure options

Status quo

- 1,719k lbs commercial ACL
- 22,850k lbs recreational ACL
- Recreational vessel limit of 54 fish / bag limit 10 fish
- 20" FL minimum size in SC, GA and FL

The Mahi MP can be configured to any of these various options:

INPUT DATA

VAST index
 CPUE indices
 Size composition
 Catch

LEVER

ACL
 Effort
 Trip limit
 Minimum size

CONTROL OPTIONS

Control rule
 Min / Max for any lever
 Max change for any lever

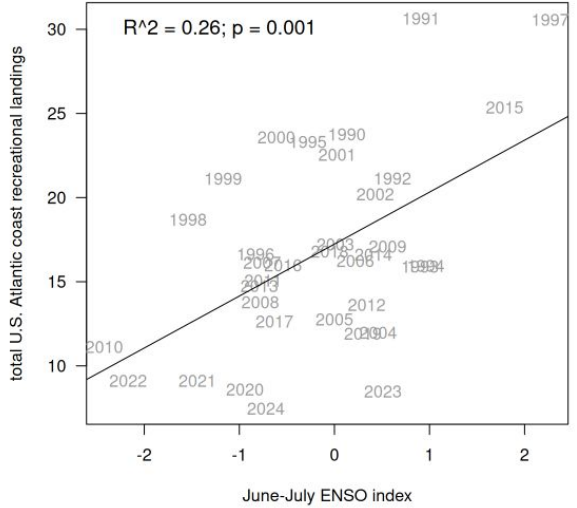




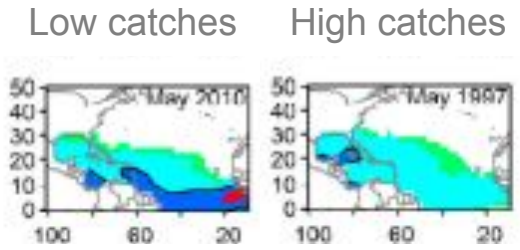
2. Management procedure candidate indicators

- VAST pelagic longline logbook index
- Standardized recreational CPUEs
- Standardized commercial CPUEs

El niño southern oscillation (ENSO)

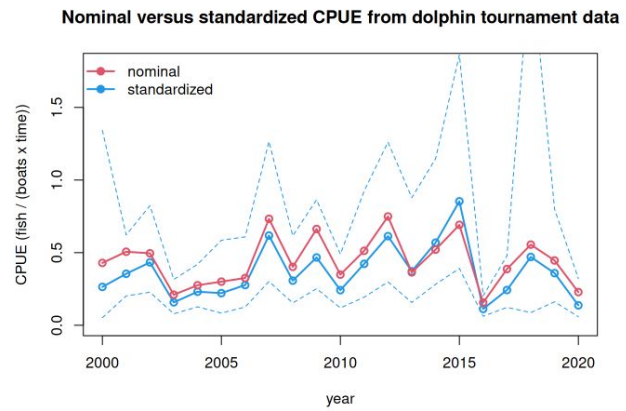


“Blue blob” SST distribution



Above temp threshold
Preferred temperature
Less preferred temperature
Less preferred temperature

Puerto Rico tournament index

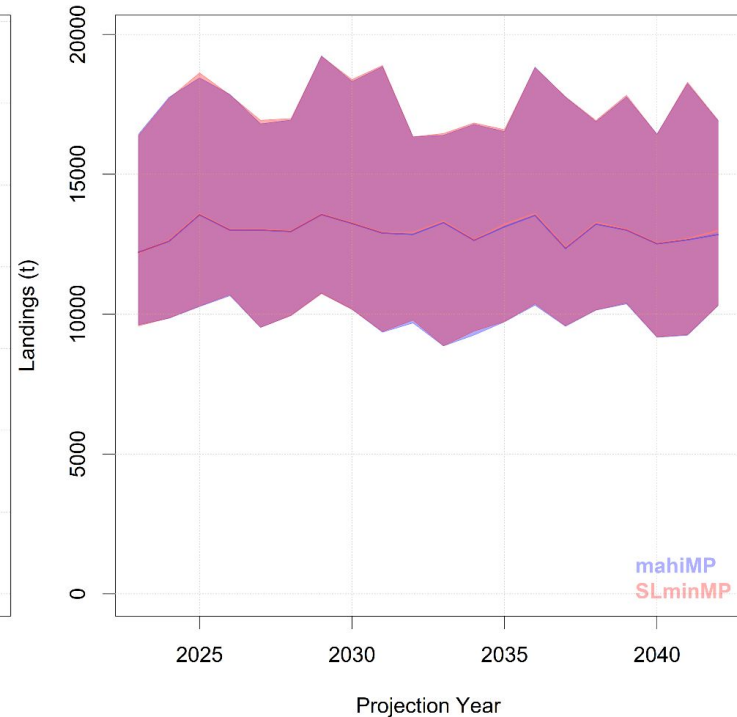
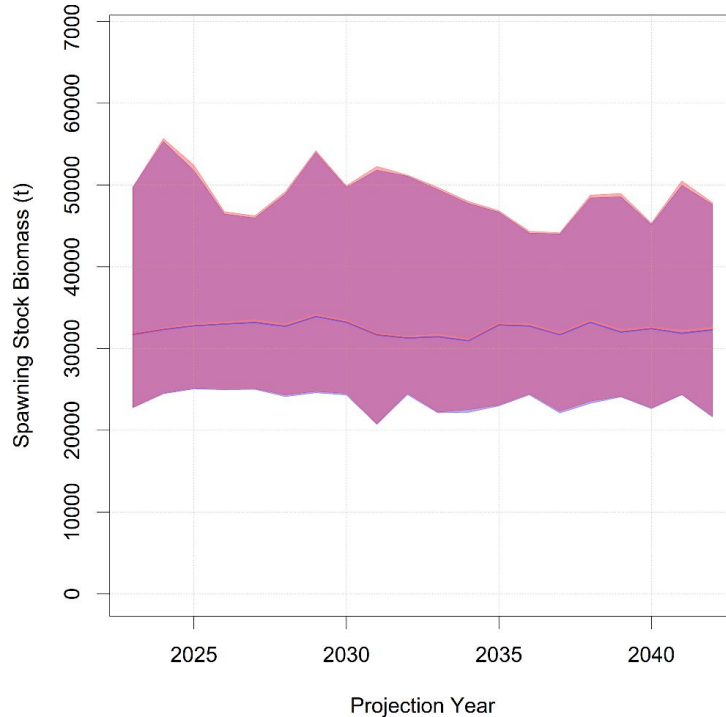




2. MP demonstration

Static MP: Minimum recreational size limit for all regions (500 mm = 19.685 in)

Reference case OM

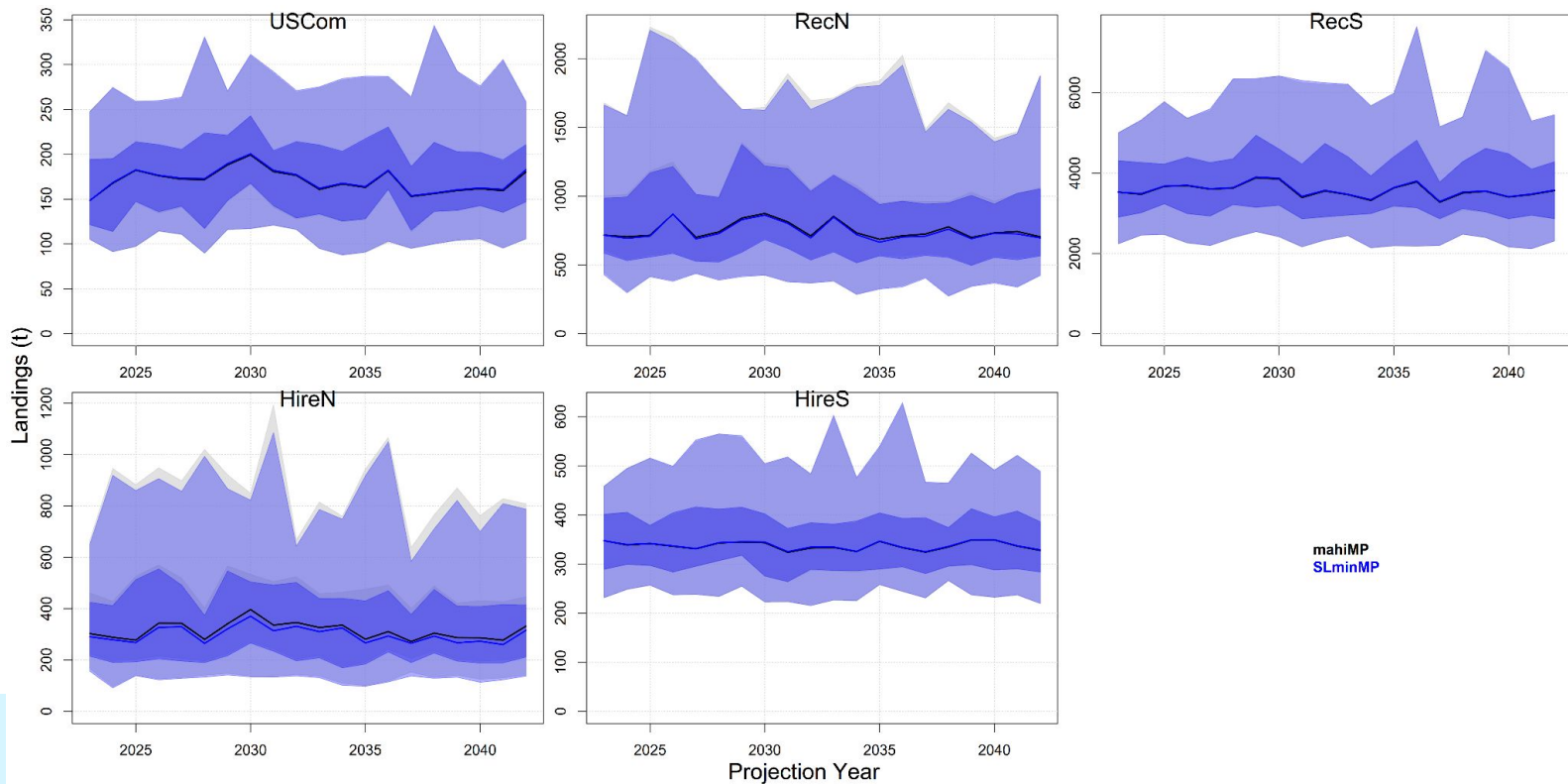




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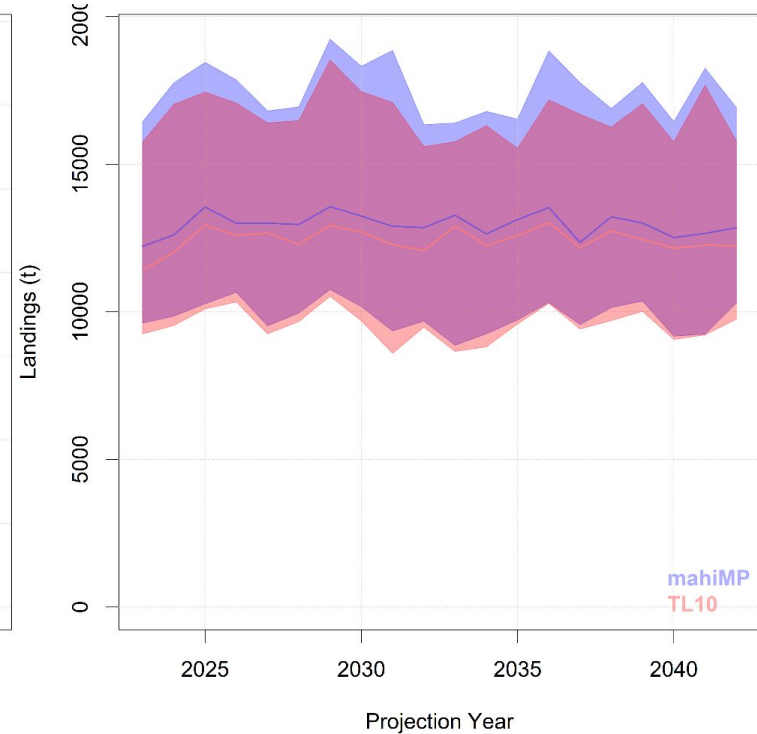
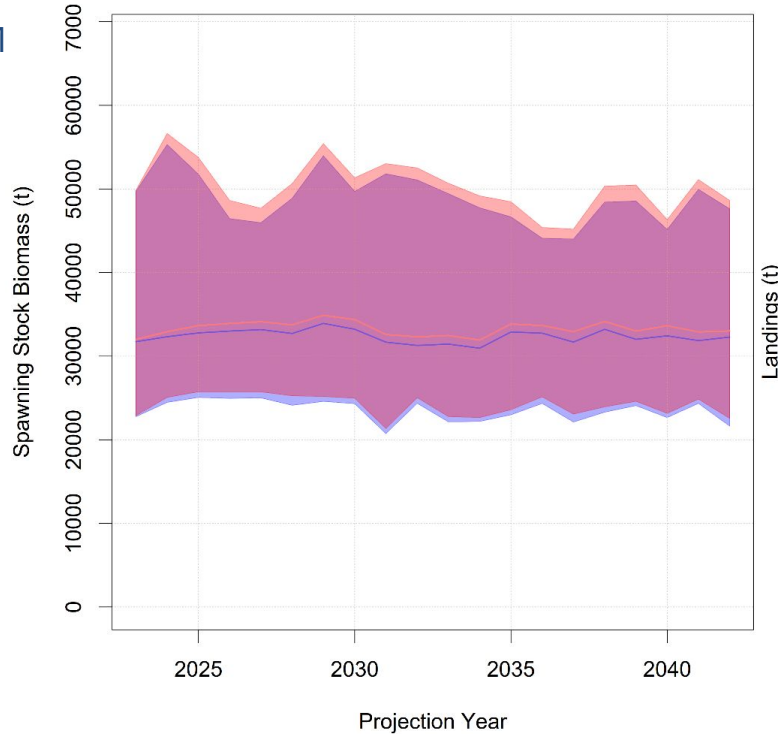




2. MP demonstration

Static MP: 10 fish recreational trip limit for all regions

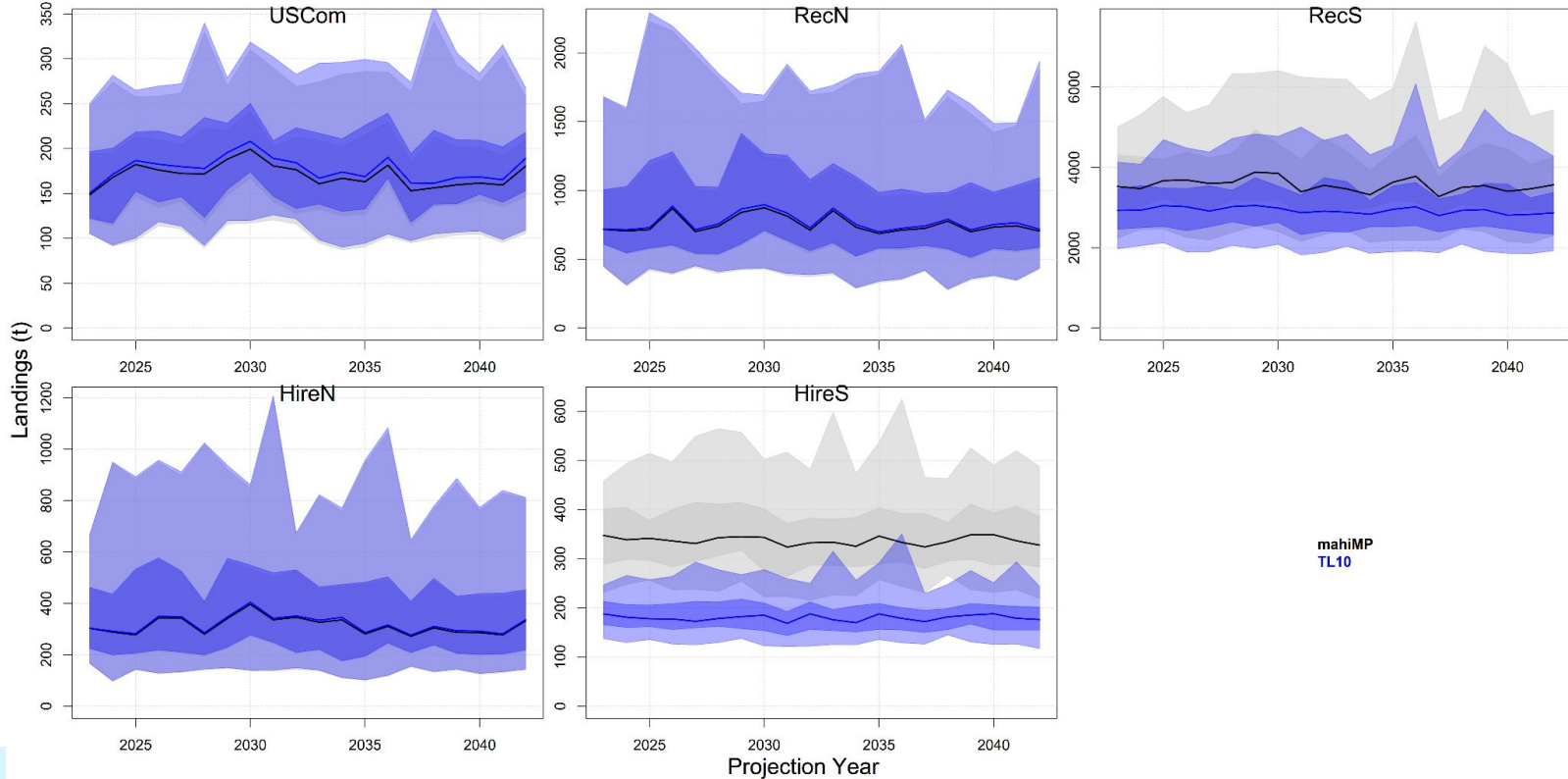
Reference case OM



2. MP demonstration

Static MP: 10 fish recreational trip limit for all regions

Reference case OM

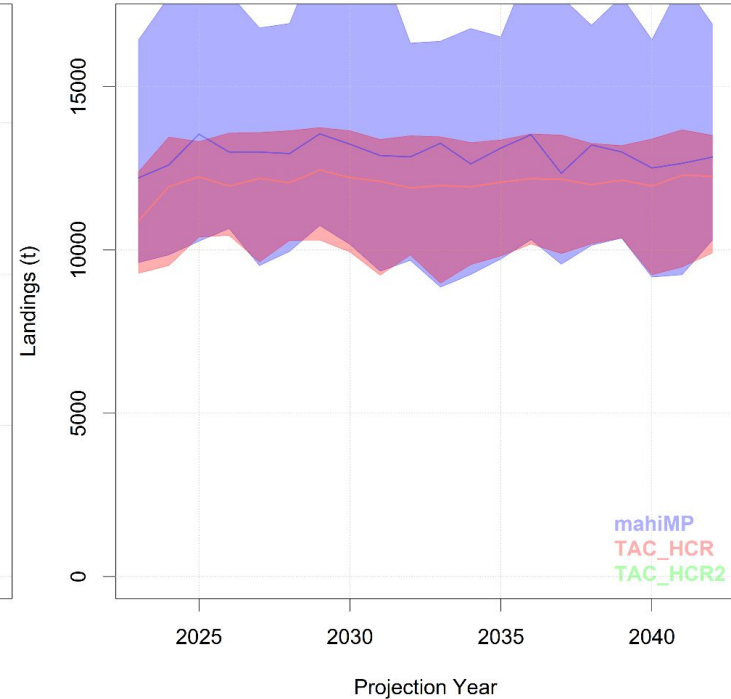
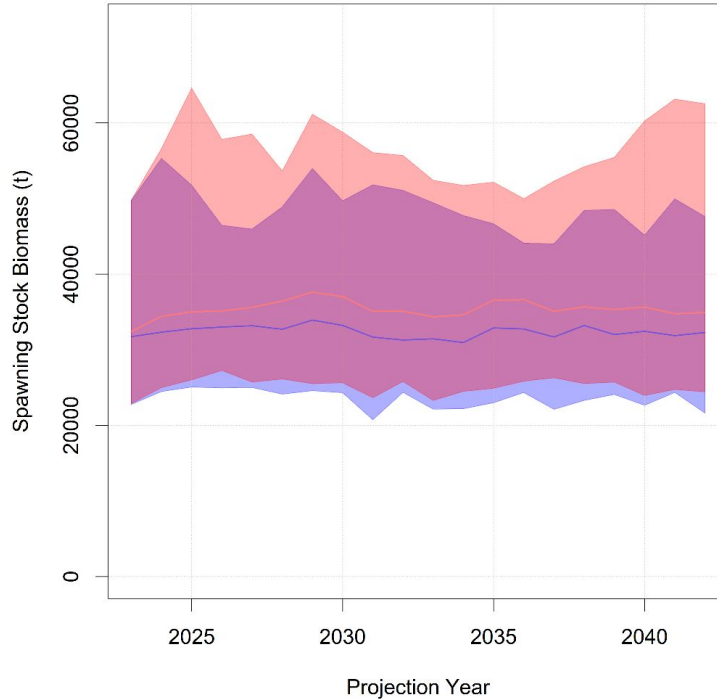




2. MP demonstration

Dynamic MP: Index-based (VAST) constant exploitation harvest control rule (HCR); ACL adjustment

Reference case OM

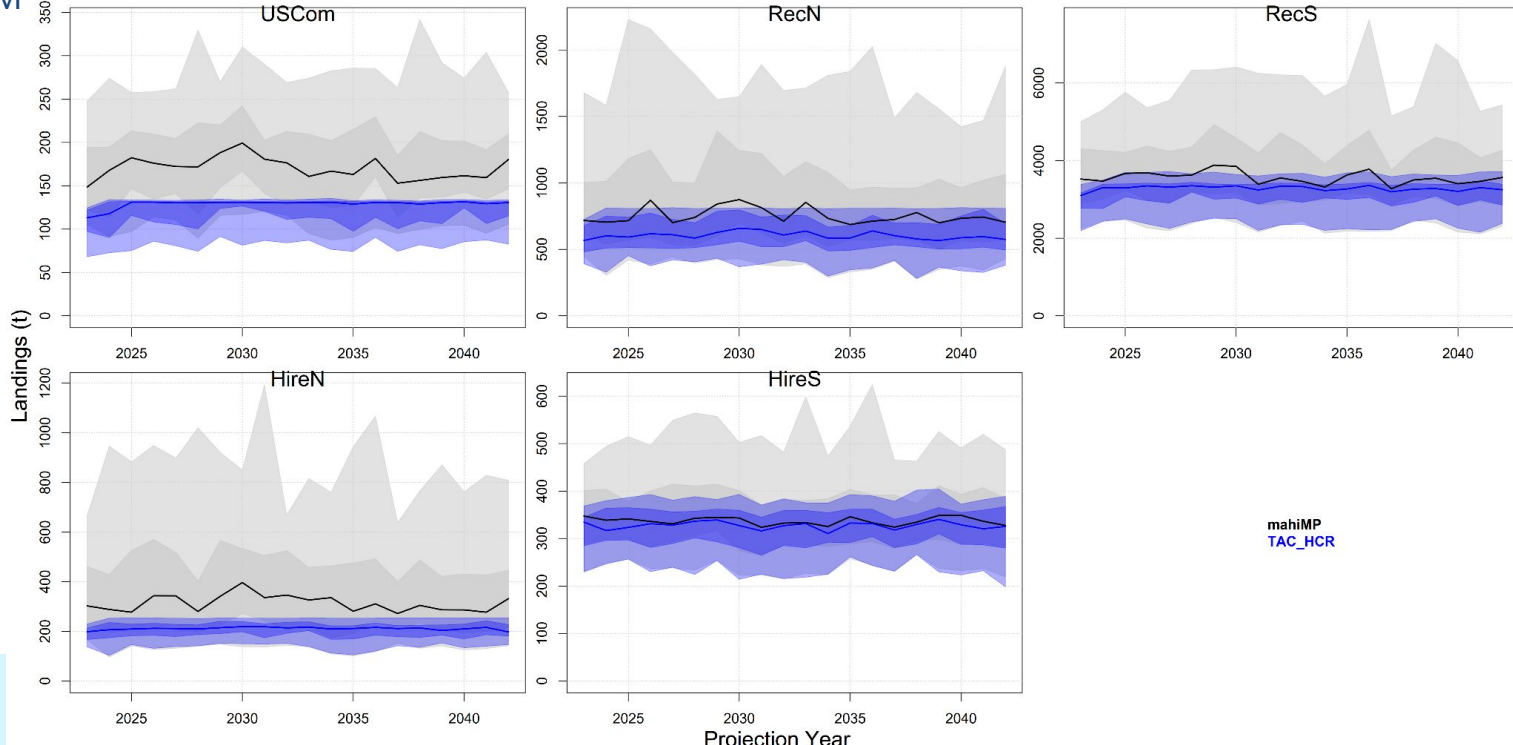




2. MP demonstration

Dynamic MP: Index-based (VAST) constant exploitation harvest control rule (HCR); ACL adjustment

Reference case OM



mhiMP
TAC_HCR



ACTION ITEM

Advise on the management procedure structure and parameterization.



3. Regulatory Amendment 3 Scoping



Potential regulatory measures:



1. Extending the applicable geographic range for the 20 inch fork length minimum size limit for dolphin that is currently in place off Florida, Georgia, and South Carolina northward,
2. Modifying the daily bag limit for dolphin,
3. Modifying the vessel limit for dolphin, and
4. Removing or reducing captain and crew bag limits for dolphin.



Consider 1 & 3 with MSE tool. Treat 2 & 4 as special cases of vessel limit, without average number of anglers / trip for each fleet & assuming bag limit sharing.





3. Regulatory Amendment 3 Scoping



SQM = status quo management



EMSL = expand min size limit (20" FL) for all commercial and private



RVL12 = recreational vessel limit of 12 fish



RVL24 = recreational vessel limit of 24 fish



RVL36 = recreational vessel limit of 36 fish



RVL48 = recreational vessel limit of 48 fish



RVL12p = recreational vessel limit of 12 fish for private rec only



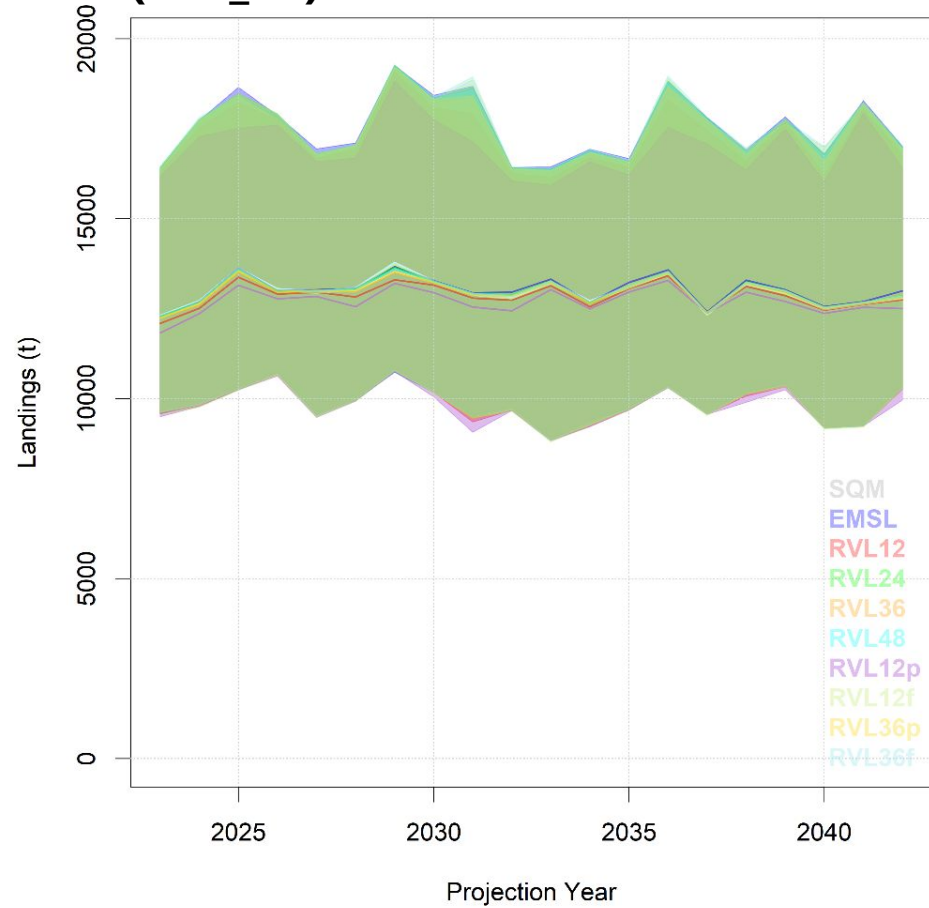
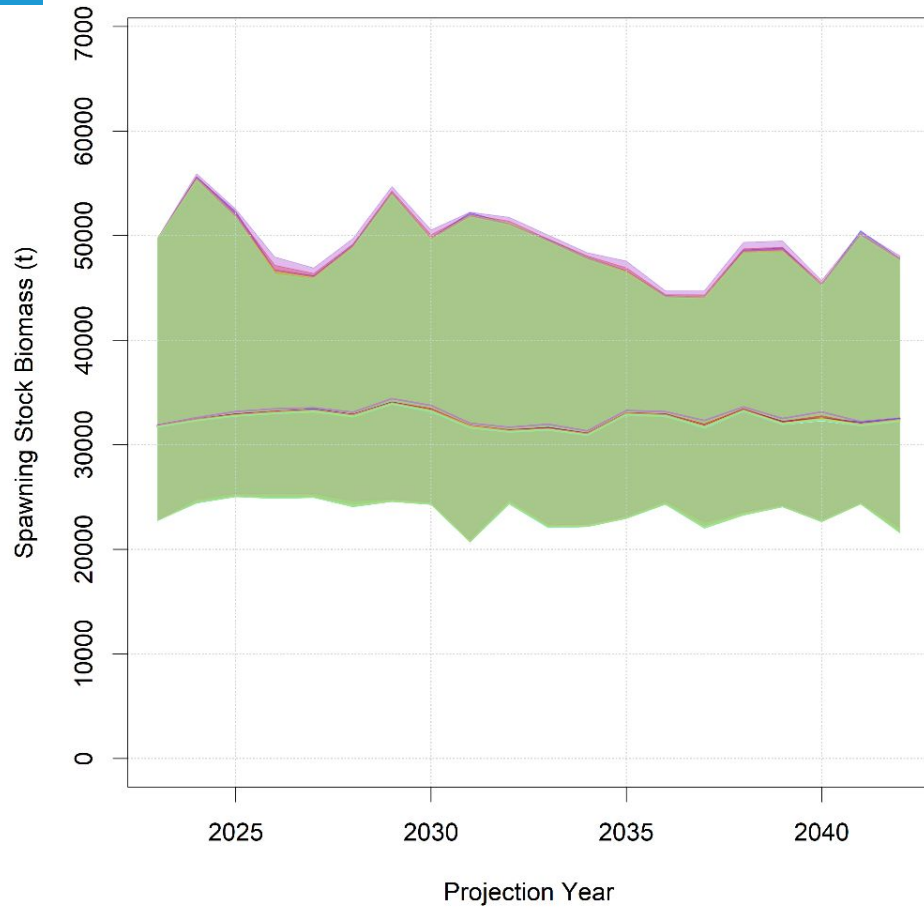
RVL12f = recreational vessel limit of 12 fish for for-hire rec only



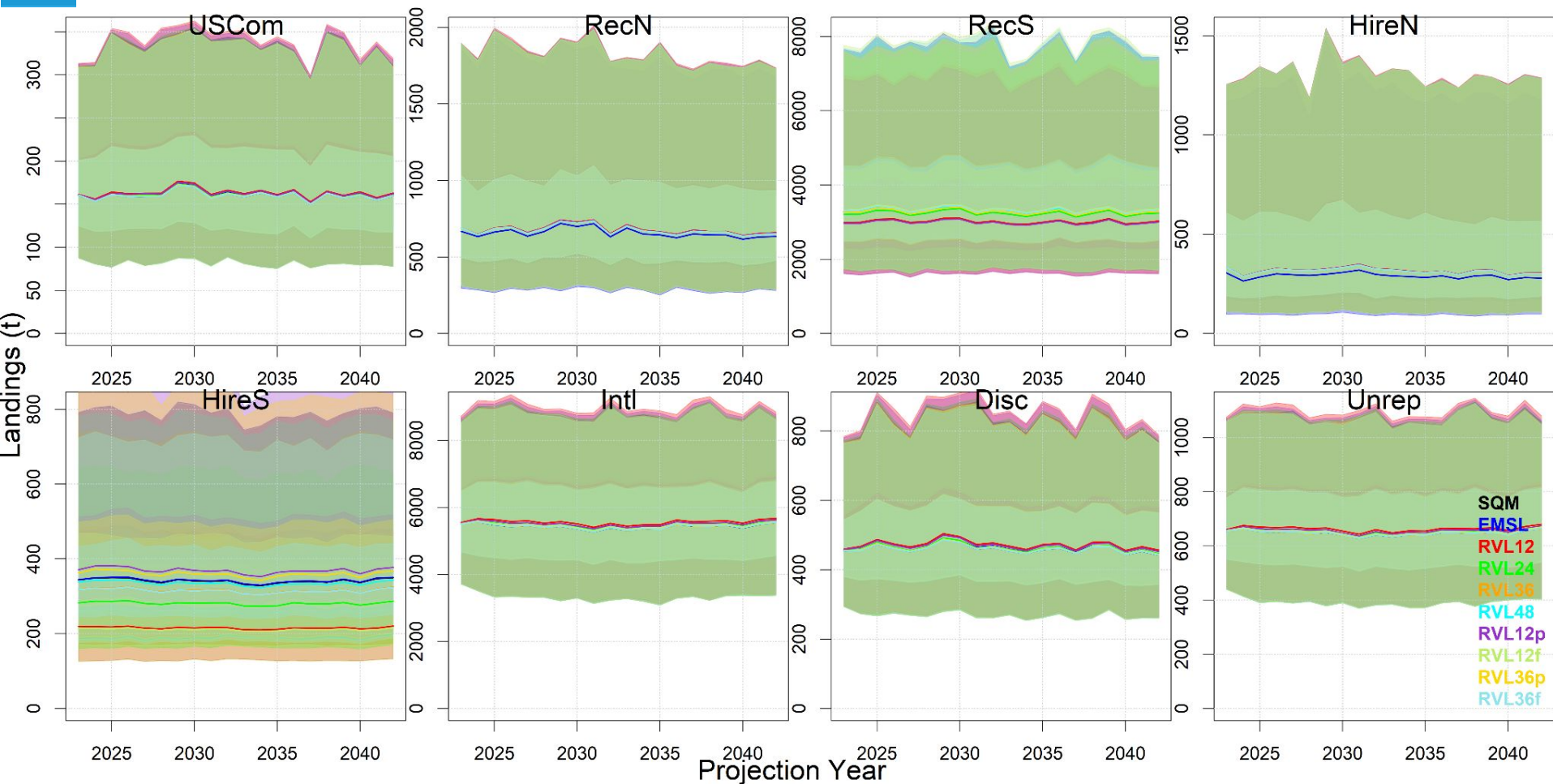
RVL36p = recreational vessel limit of 36 fish for private rec only

RVL36f = recreational vessel limit of 36 fish for for-hire rec only

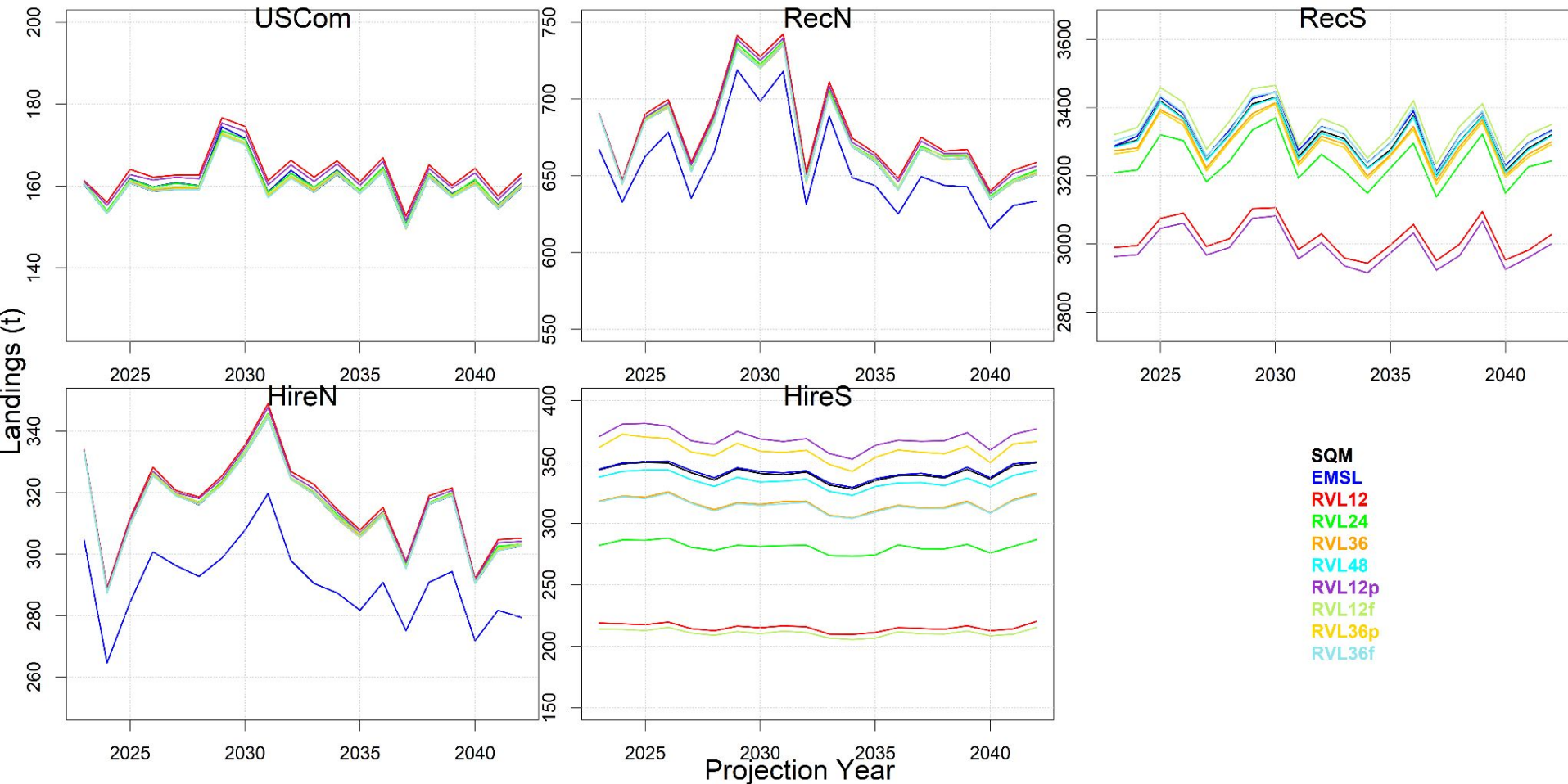
Reference case OM (OM_29)



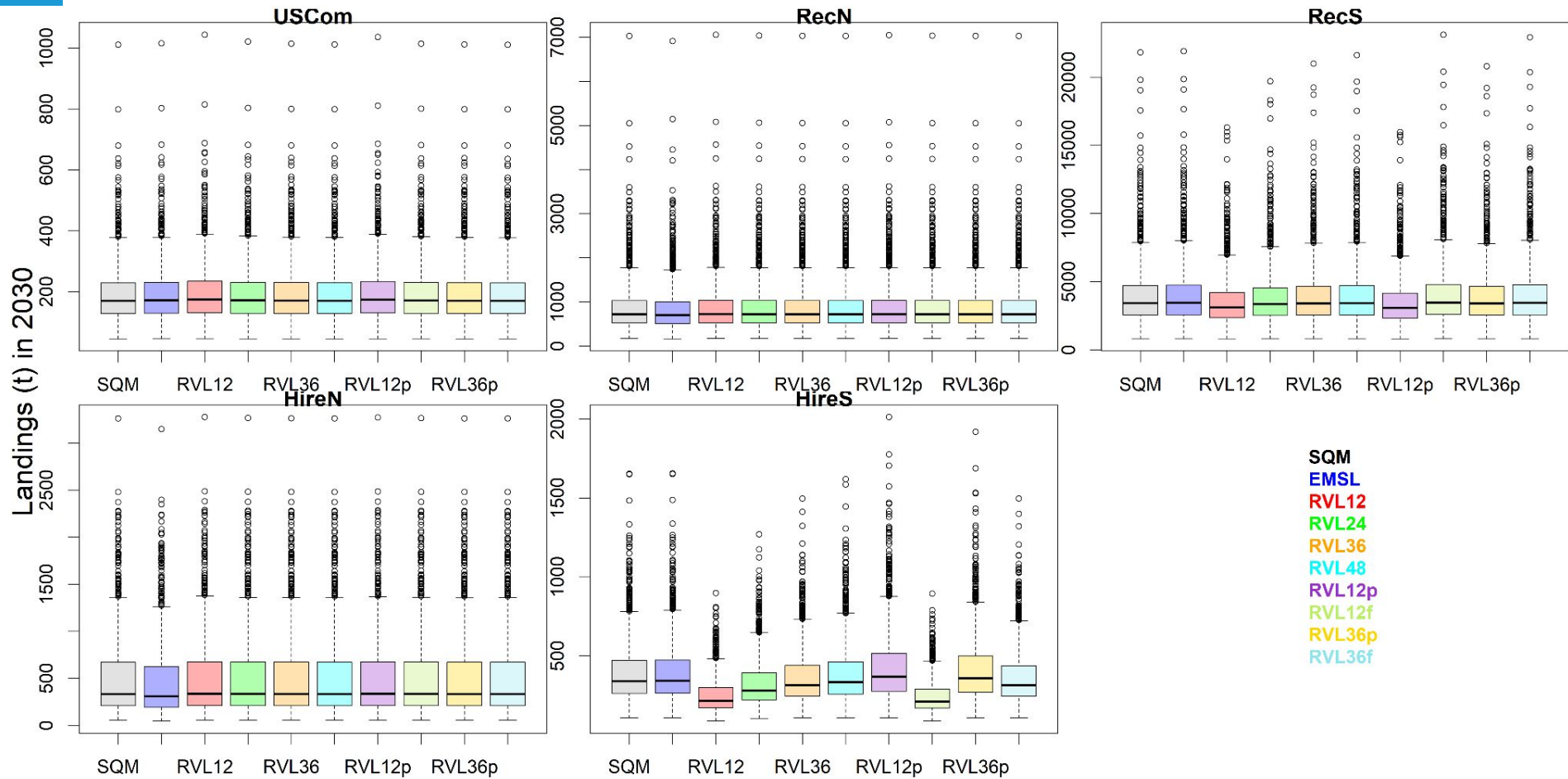
All Reference OMs



All Reference OMs



All Reference OMs





ACTION ITEM



Advise on Regulatory Amendment 3 scoping



Draft Timeline & Schedule

* Timing of results will depend on ability to meet target timeline

Legend:

OM: operating models

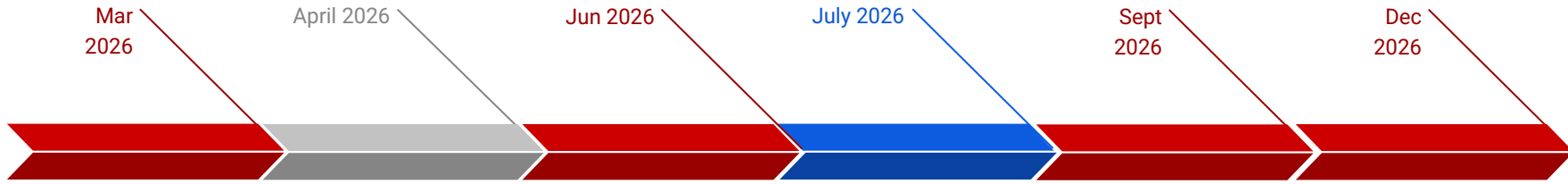
PM: performance metrics

MP: management procedures

Council Meeting

SSC Meeting

CIE Review



March Council

Spring SSC

June Council

CIE Review

Sept Council

Dec Council

Identify MP options:

Scientific Review:

Select preferred:

Review of MSE framework

Final action:

- Identify MP options

- Regulatory Amendment 3 scoping
- Scientific sign-off on MSE framework / OMs

- Regulatory Amendment 3 scoping
- operationalize management objectives
- MP revision

- Final action to adopt preferred MP

- Exceptional circumstance provisions & review schedule



Acknowledgements

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Blue Matter

Tom Carruthers, Adrian Hordyk, Quang Huynh

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Stakeholder Small Group