Assessment Development 2016

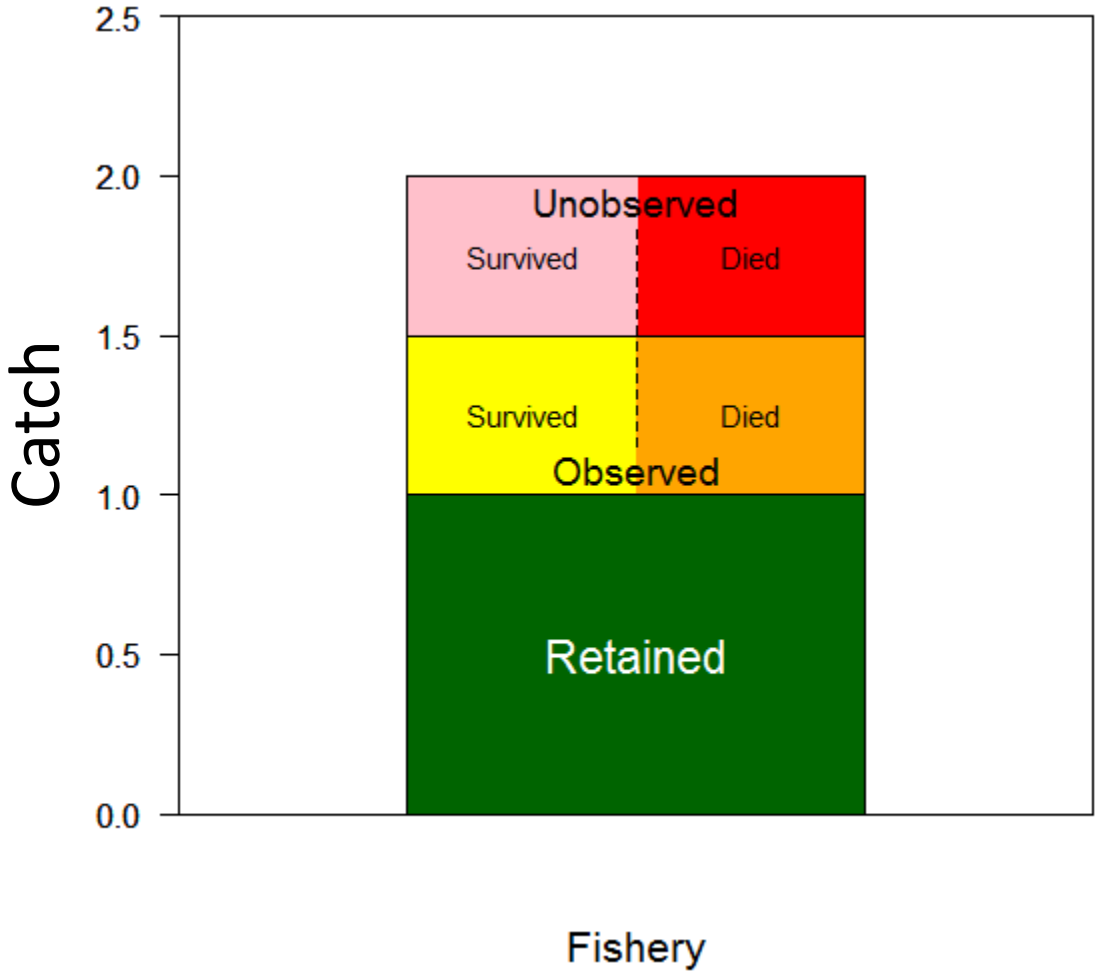
June 2016 SRB Meeting

Outline

- Data related projects
  - Bycatch and wastage: evaluation of uncertainty
  - Other updates
- Modelling topics
  - Spatial model/movement rates
  - Model weighting
  - Presentation tools
  - Other updates
- Planning for September


B7
KOREAN AIR
Economy Class
일 반 석
SONATA
B6
KOREAN AIR
Morning Calm
모닝캄 회원
SONATA

Concept: Disposition of catch



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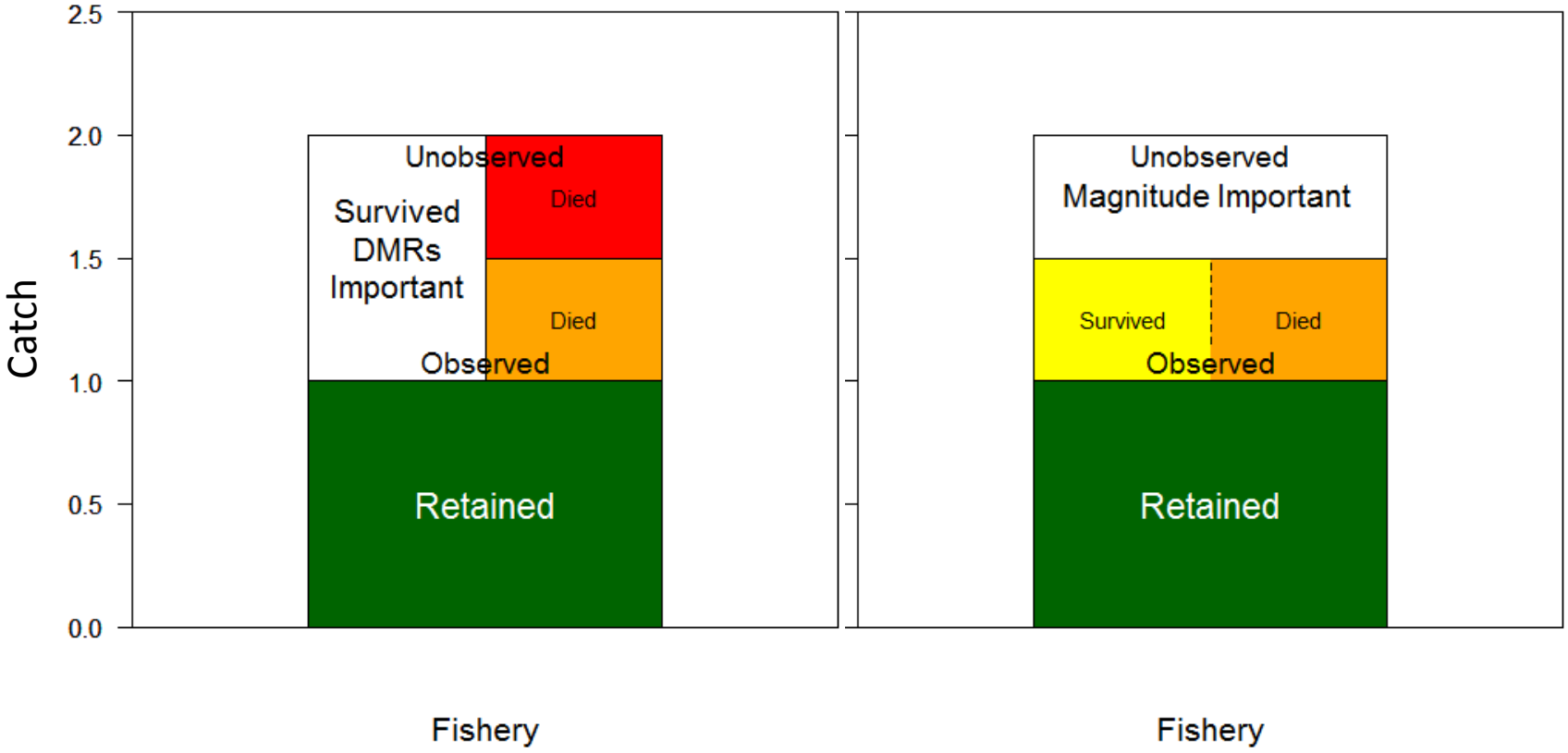
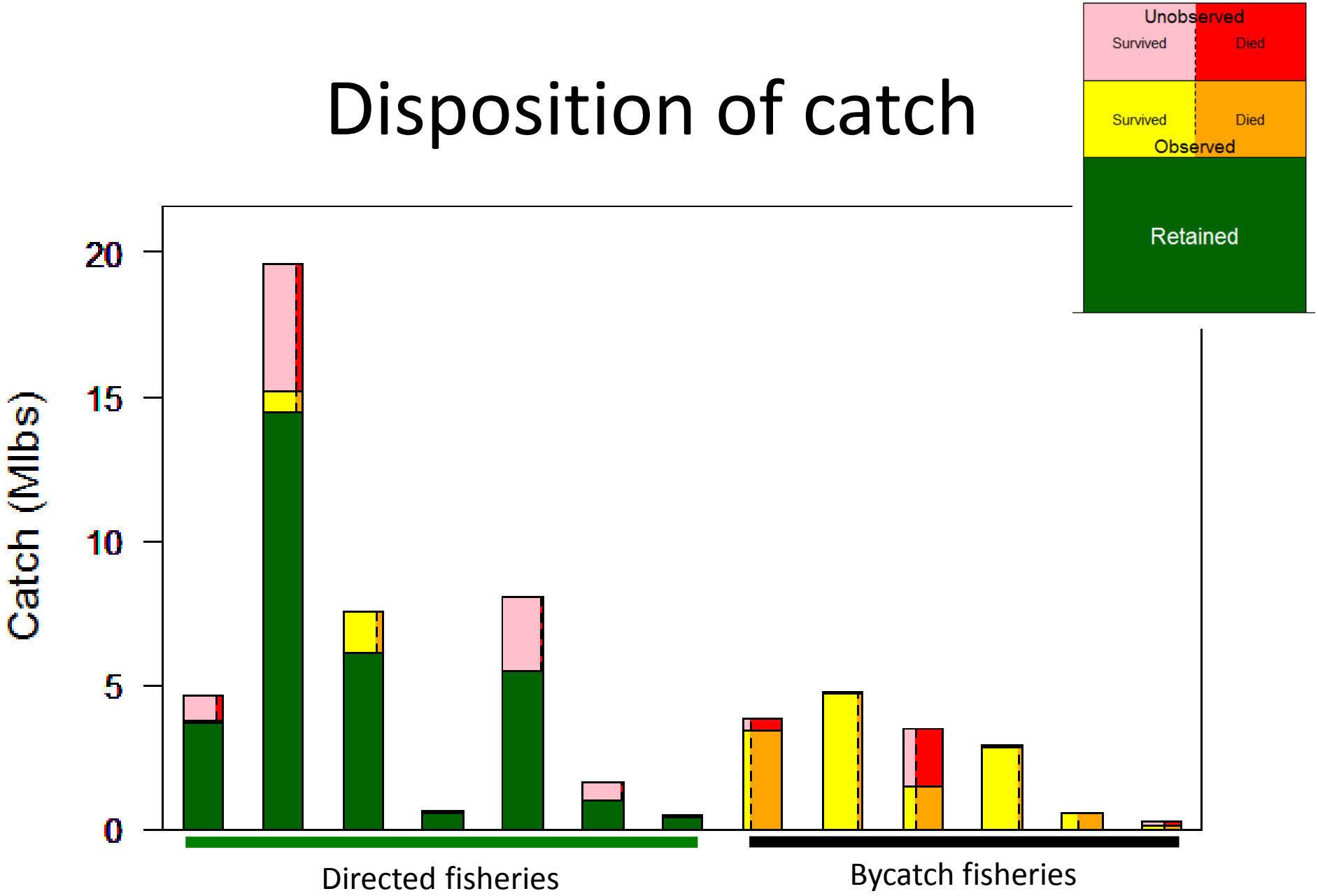


Disposition of catch



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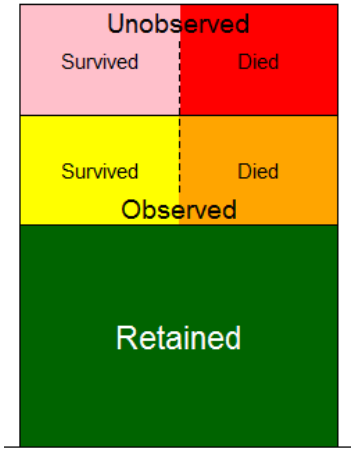

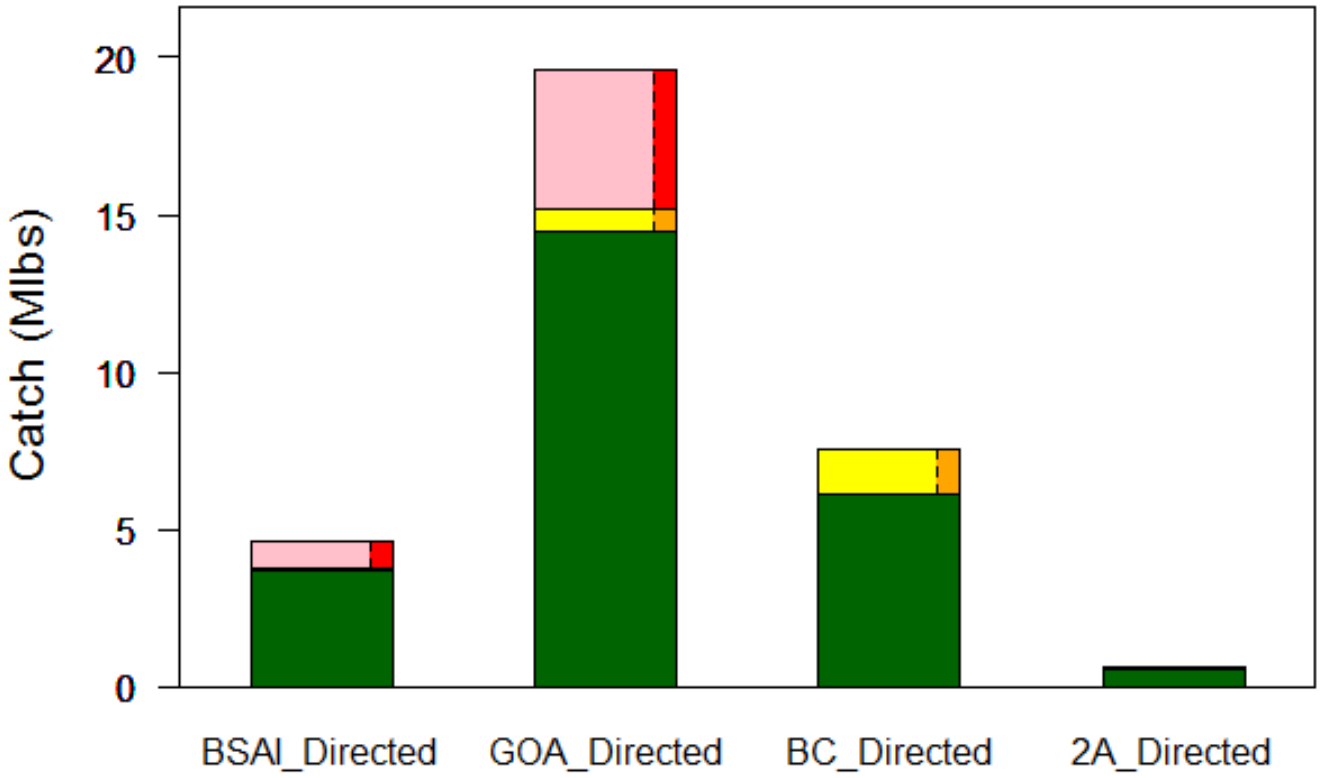

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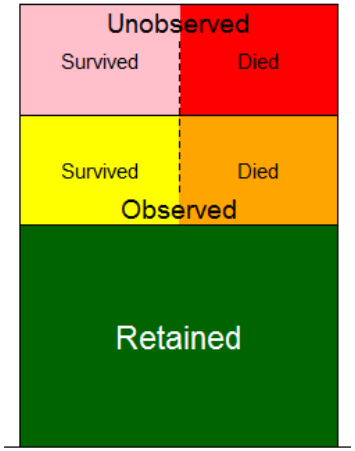

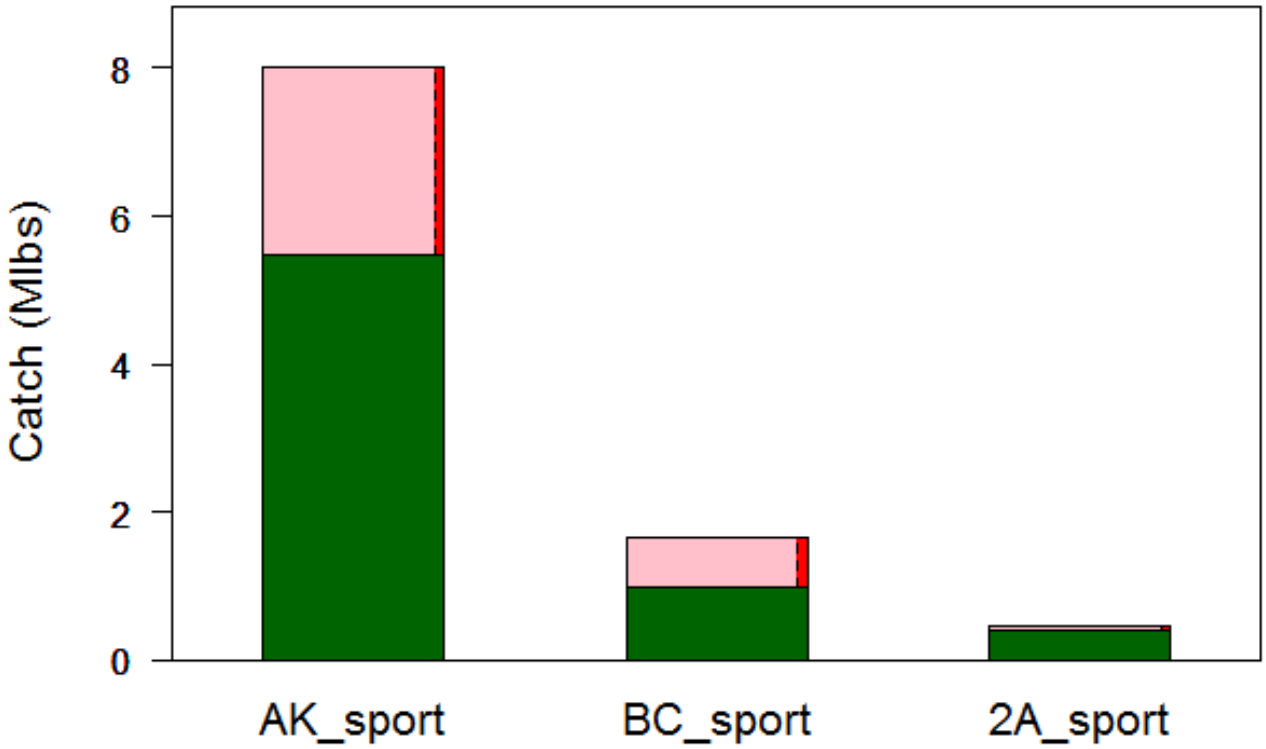

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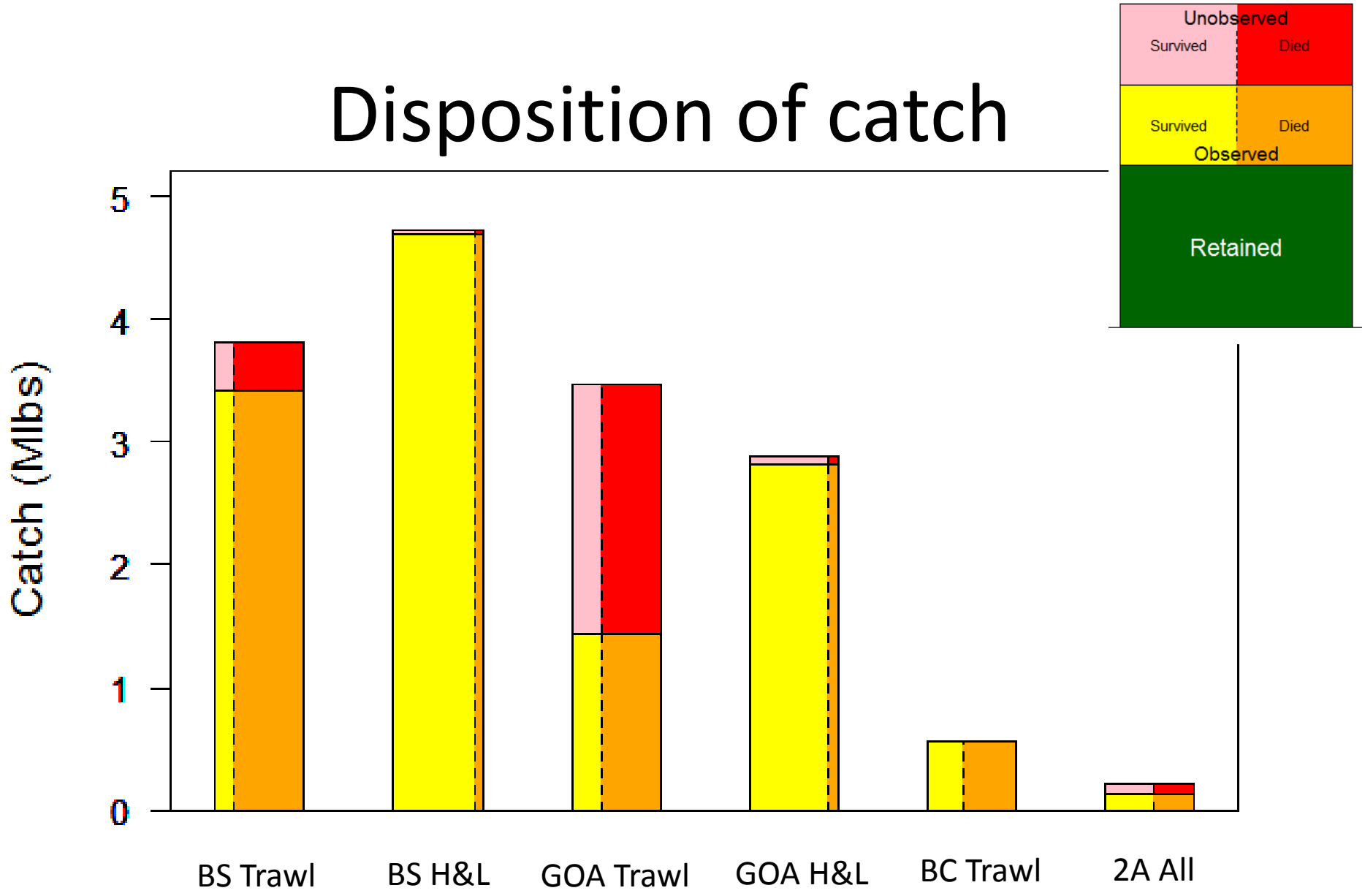
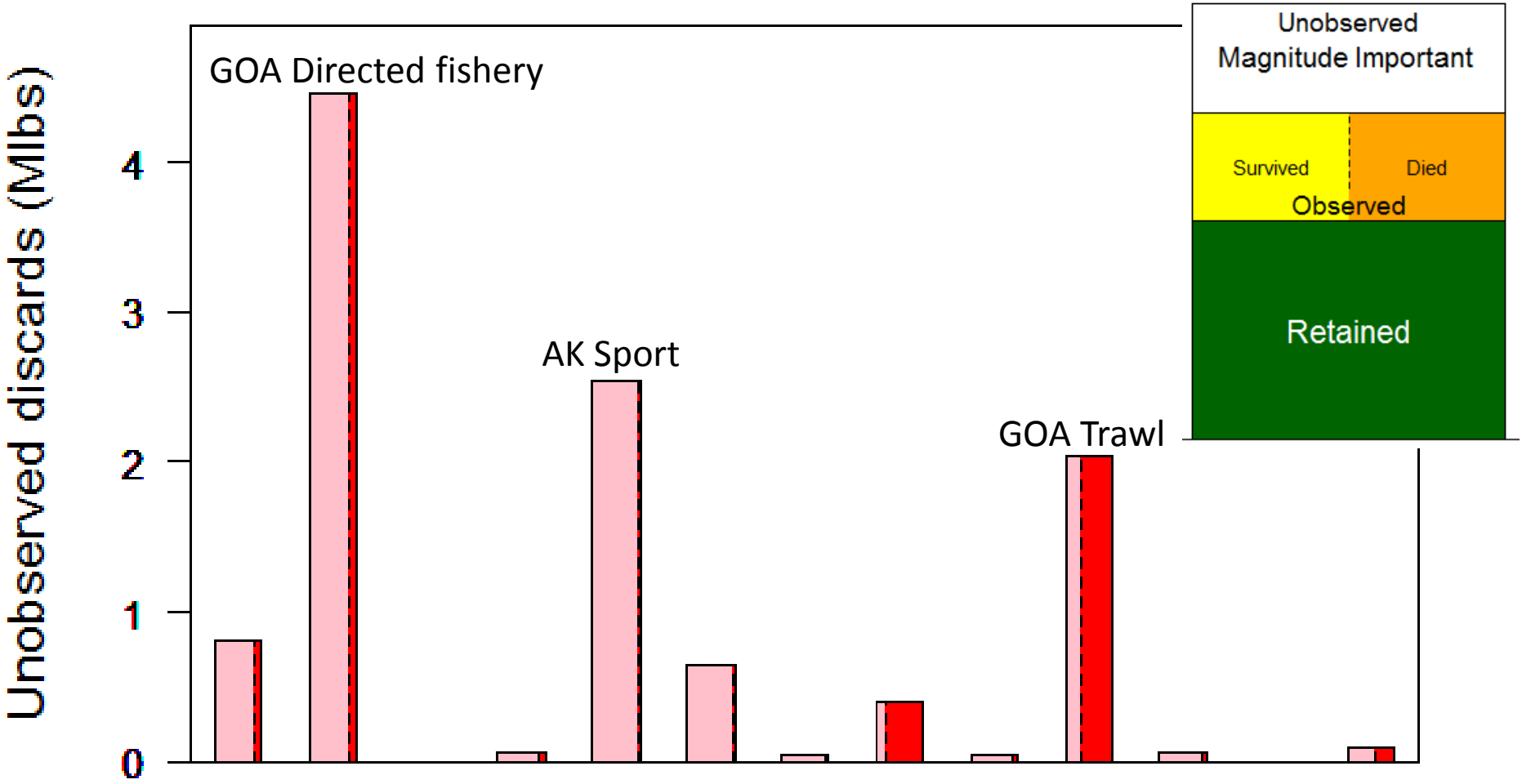


Unobserved discards (Observer coverage important)



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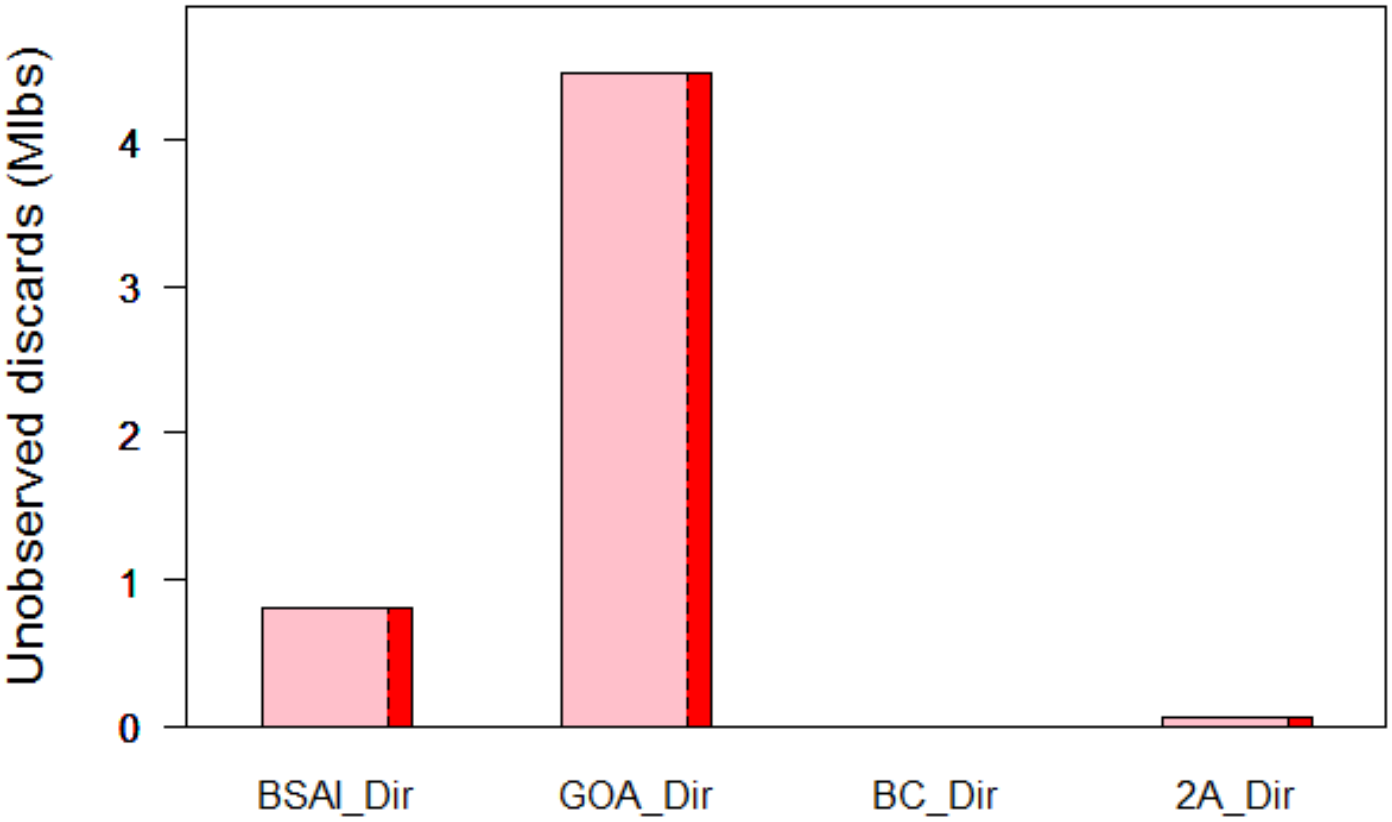

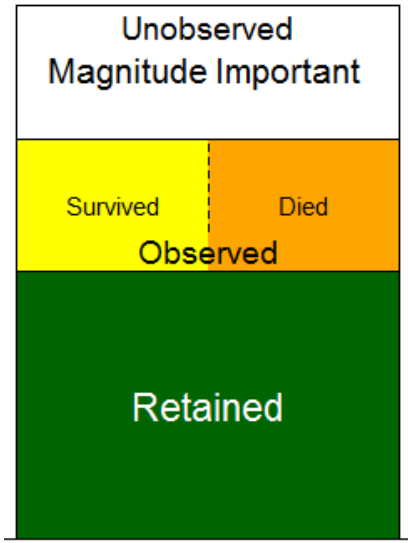

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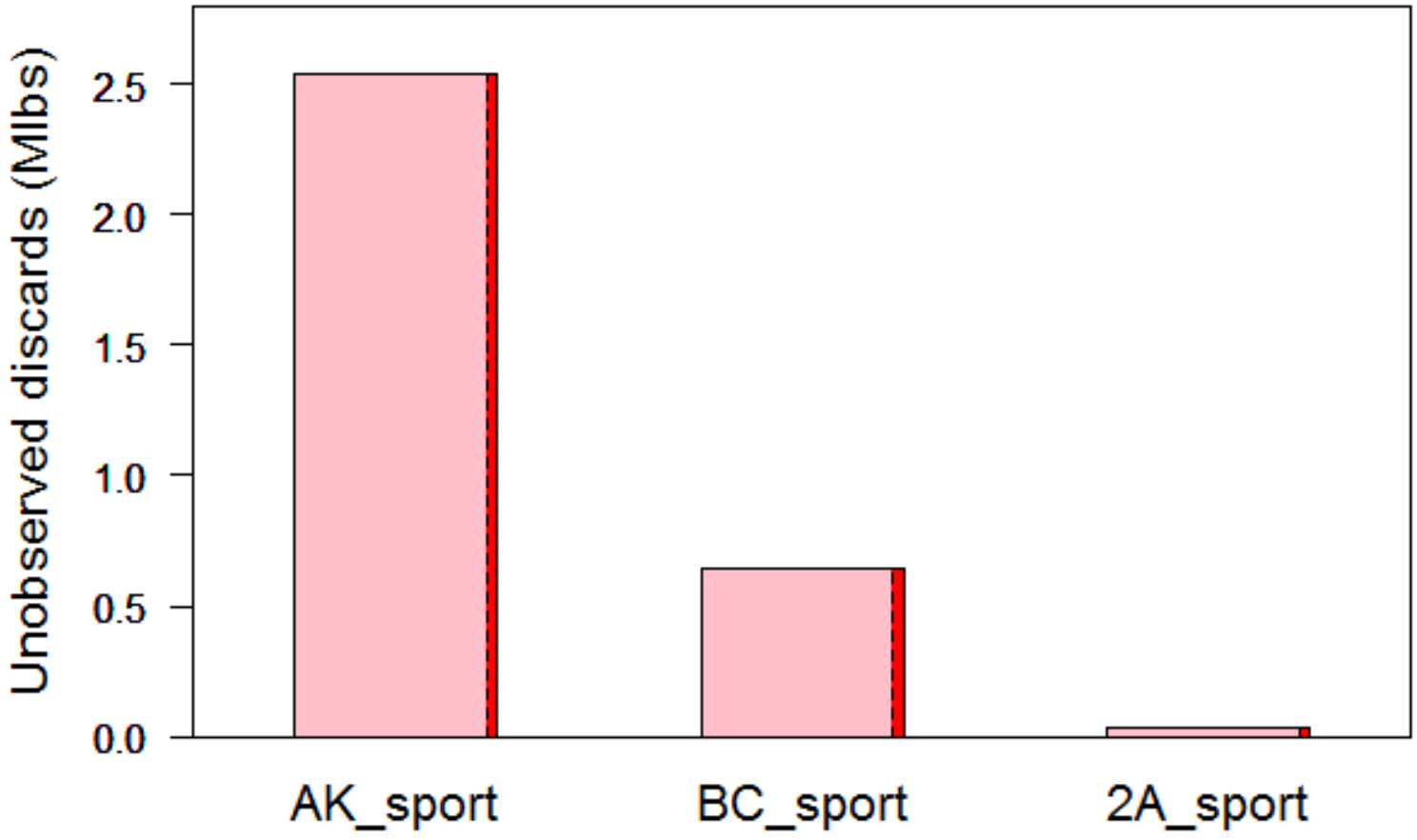

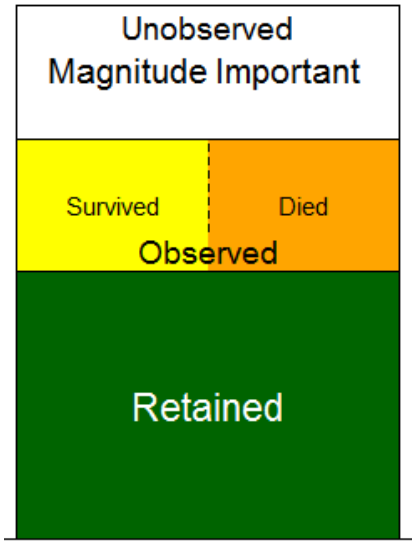

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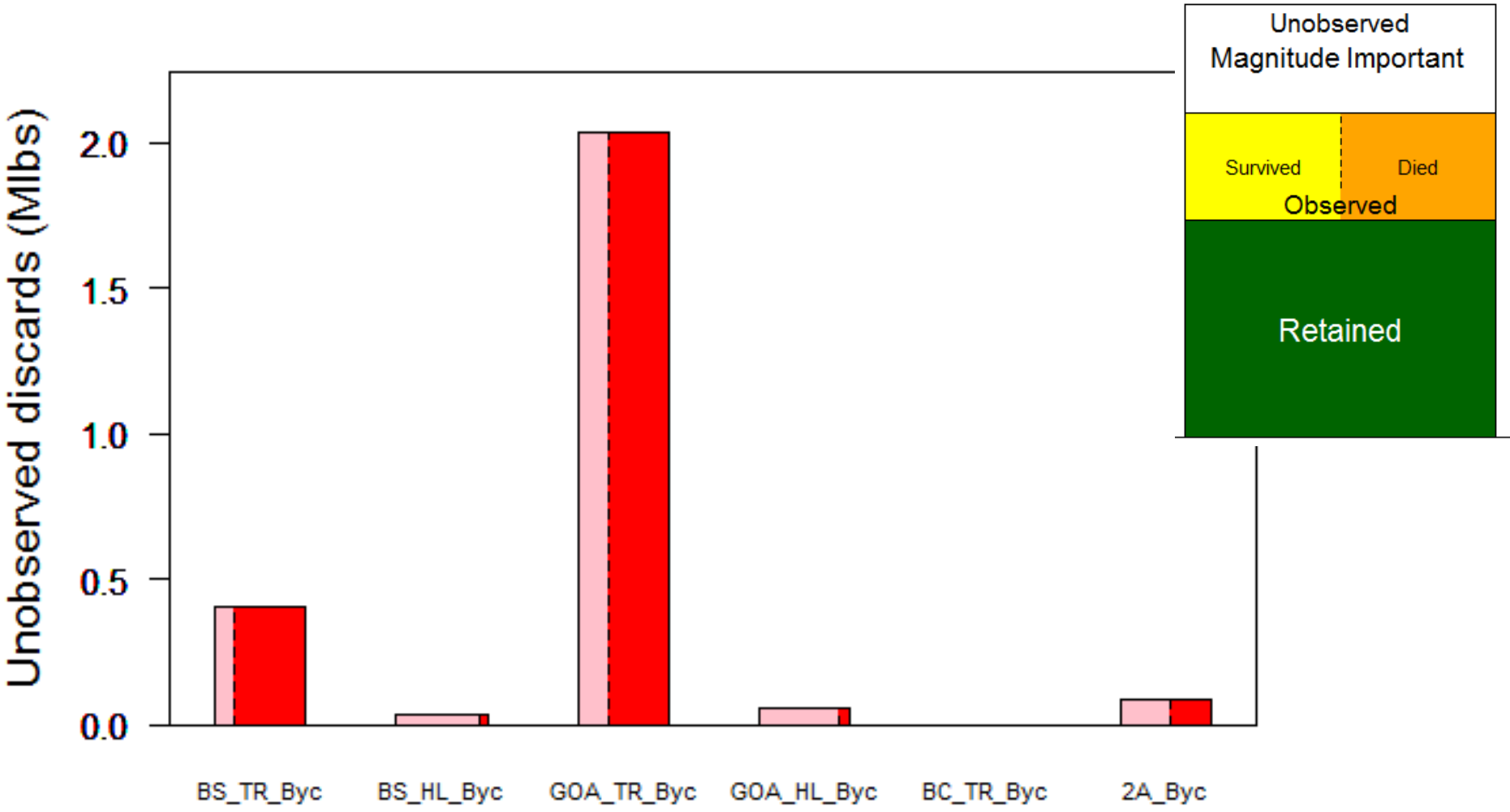
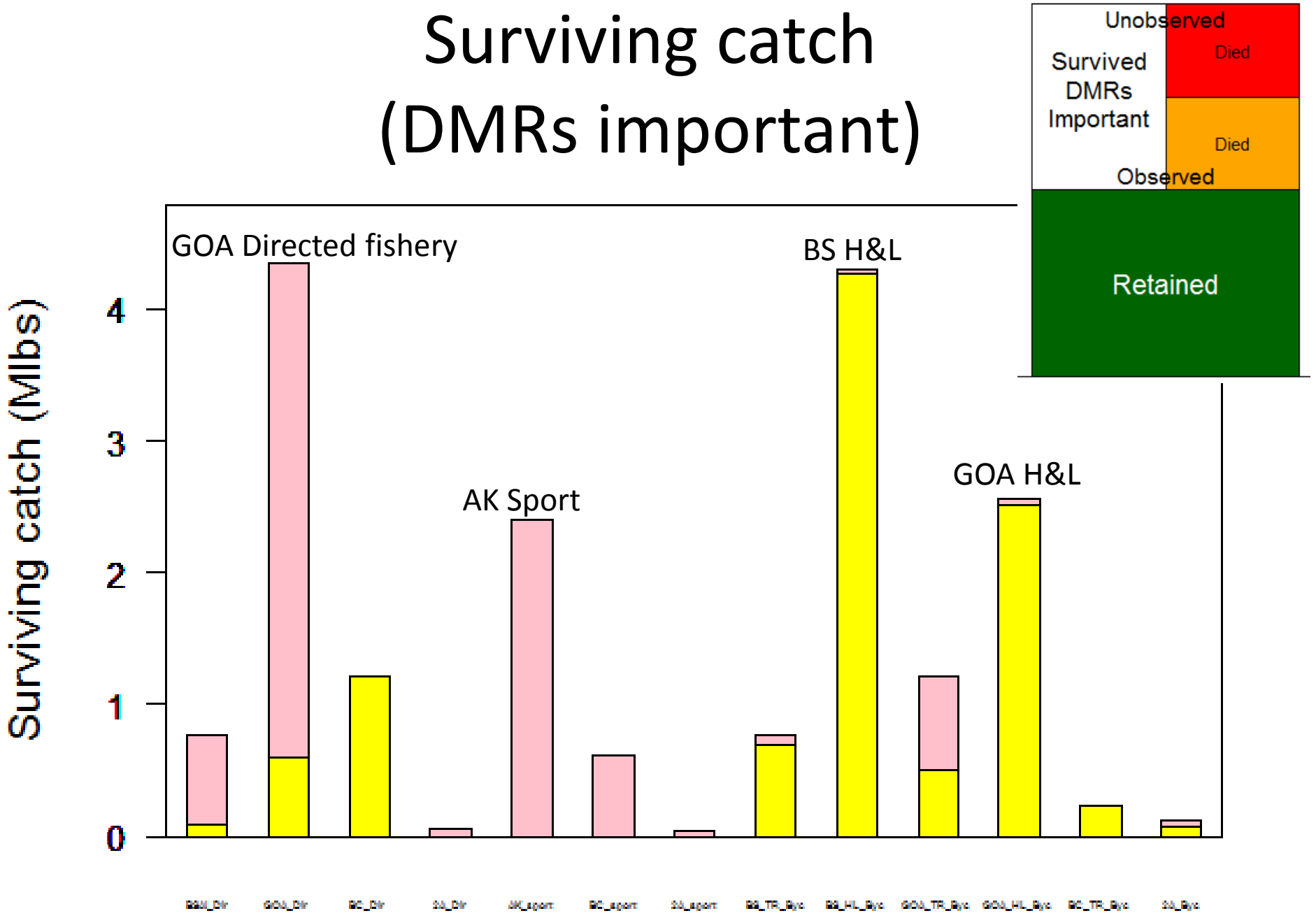


Surviving catch (DMRs important)



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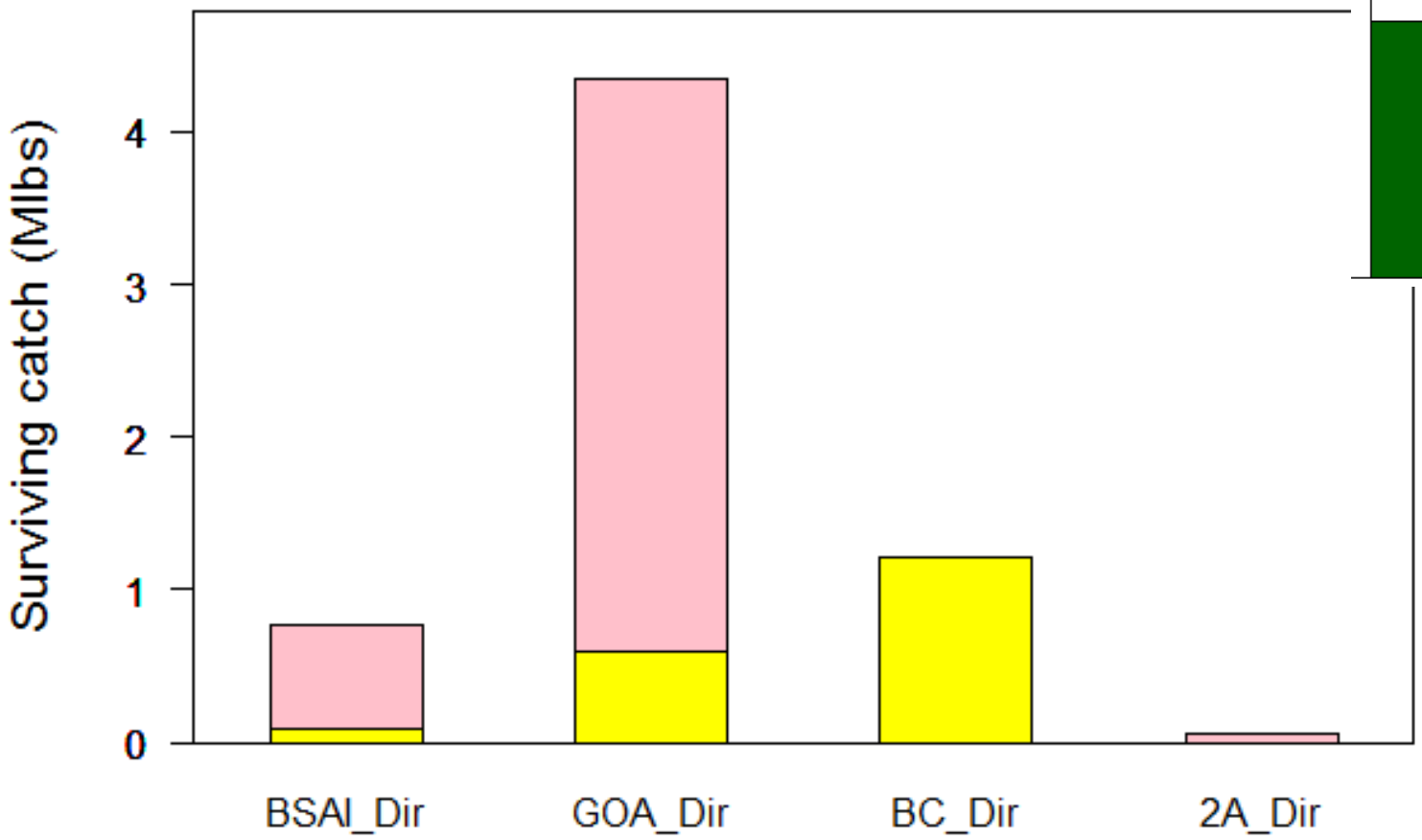

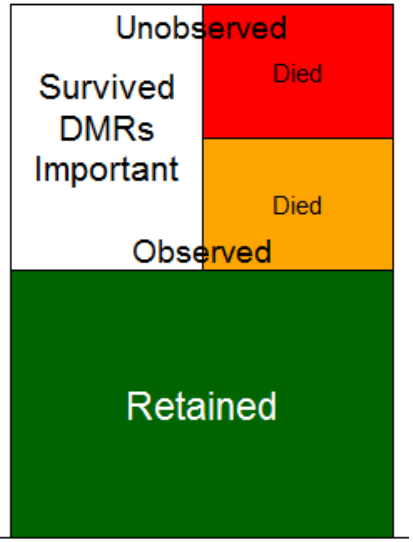

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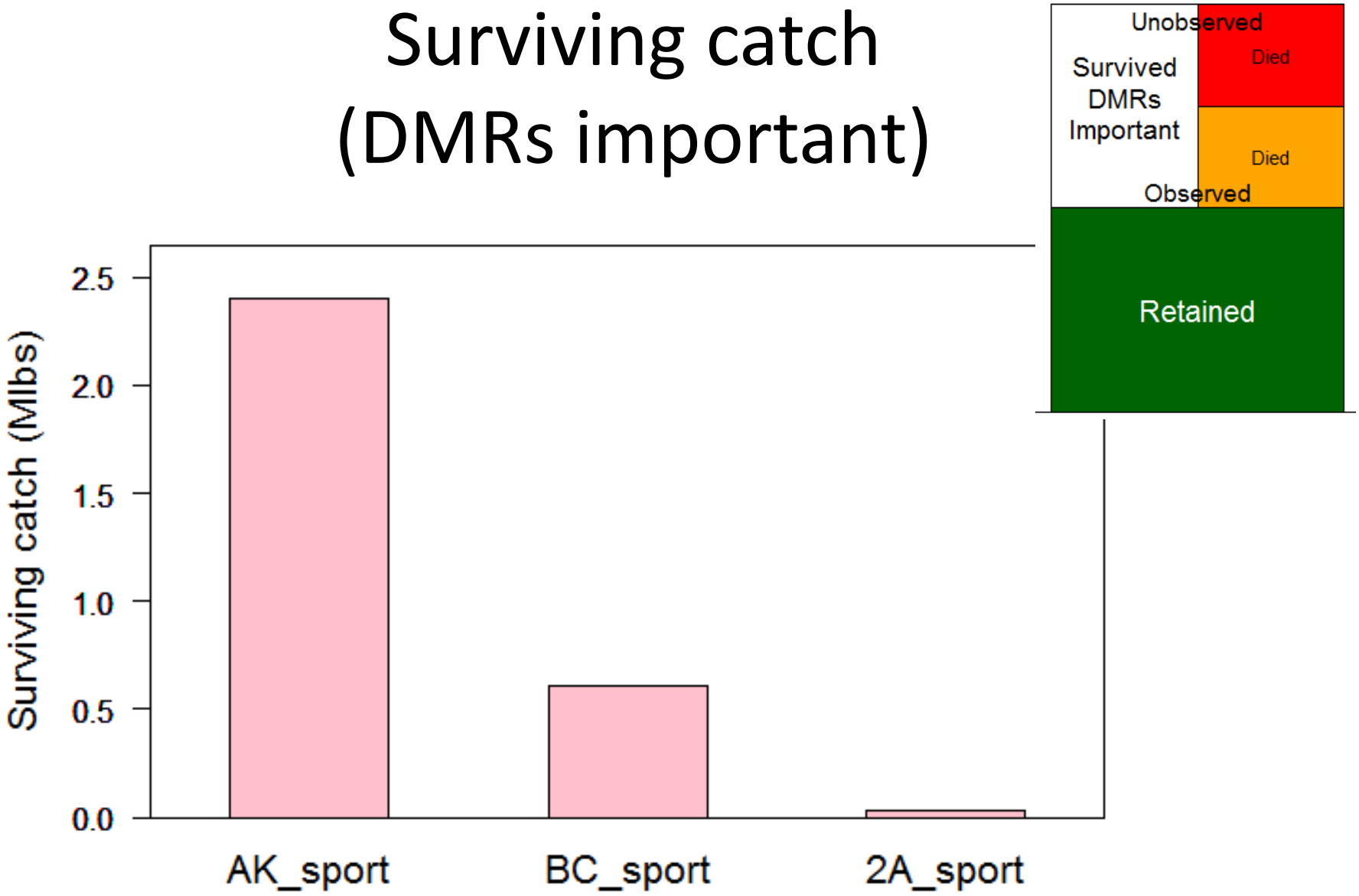

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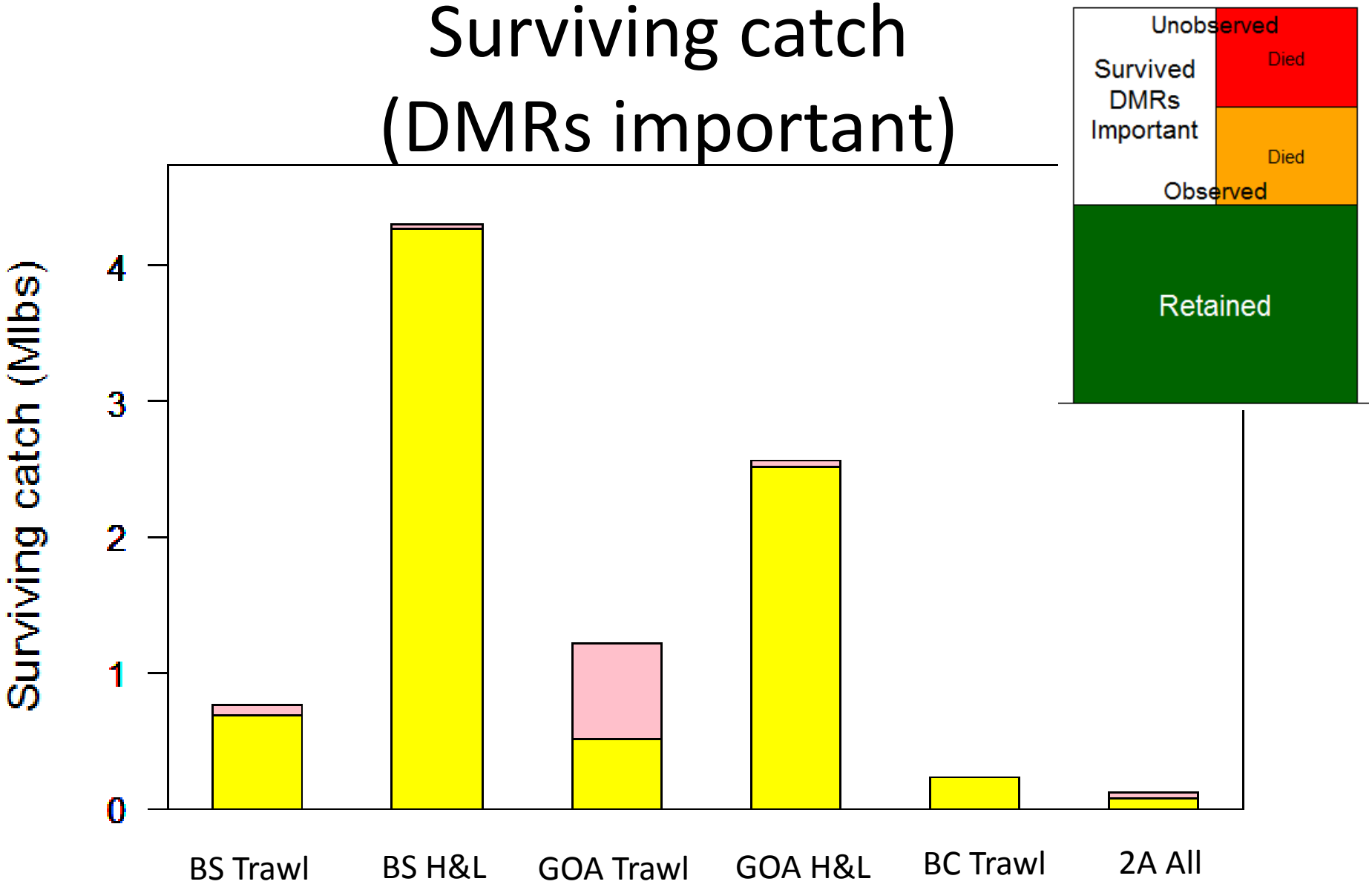
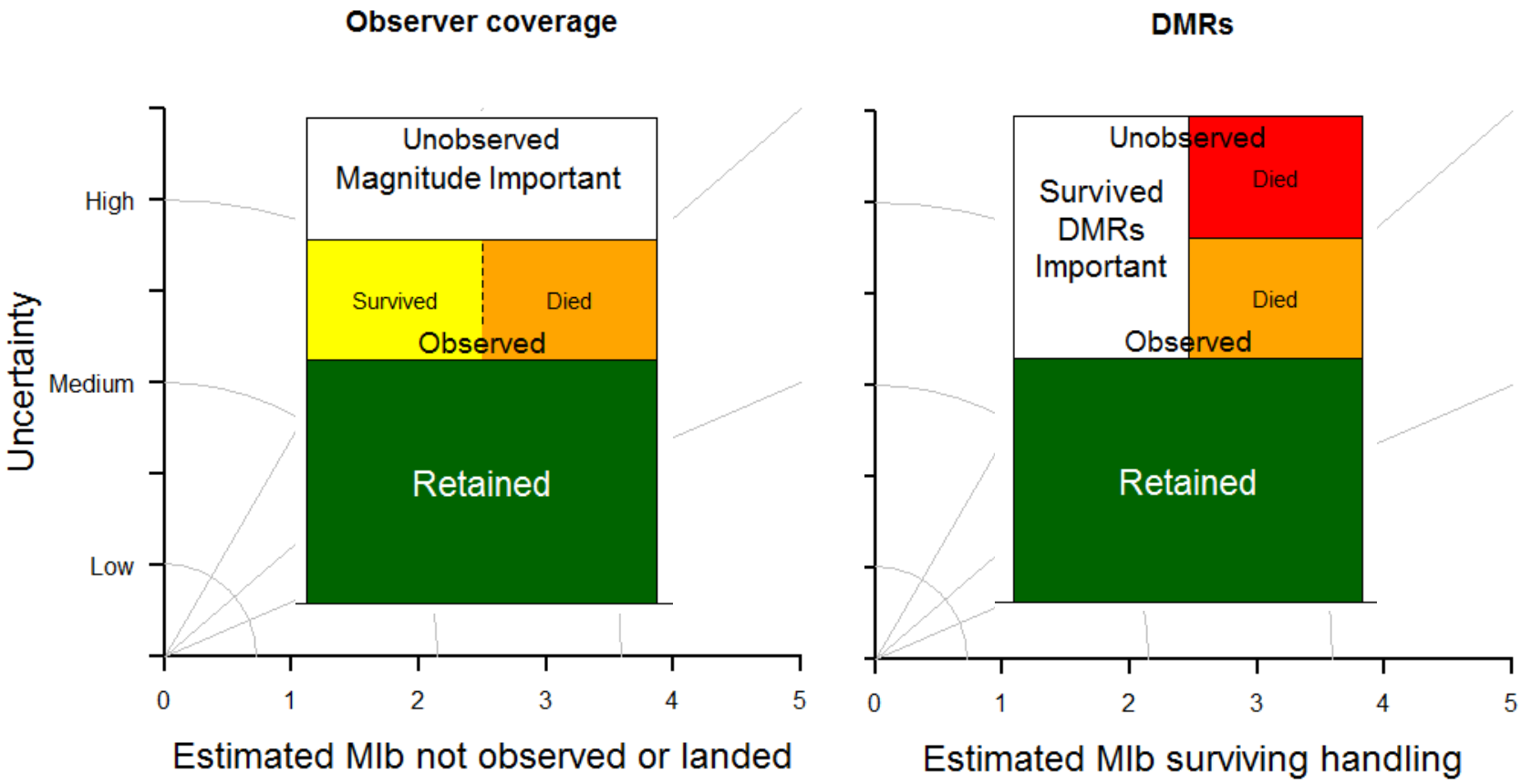


Range plots: Uncertainty and magnitude



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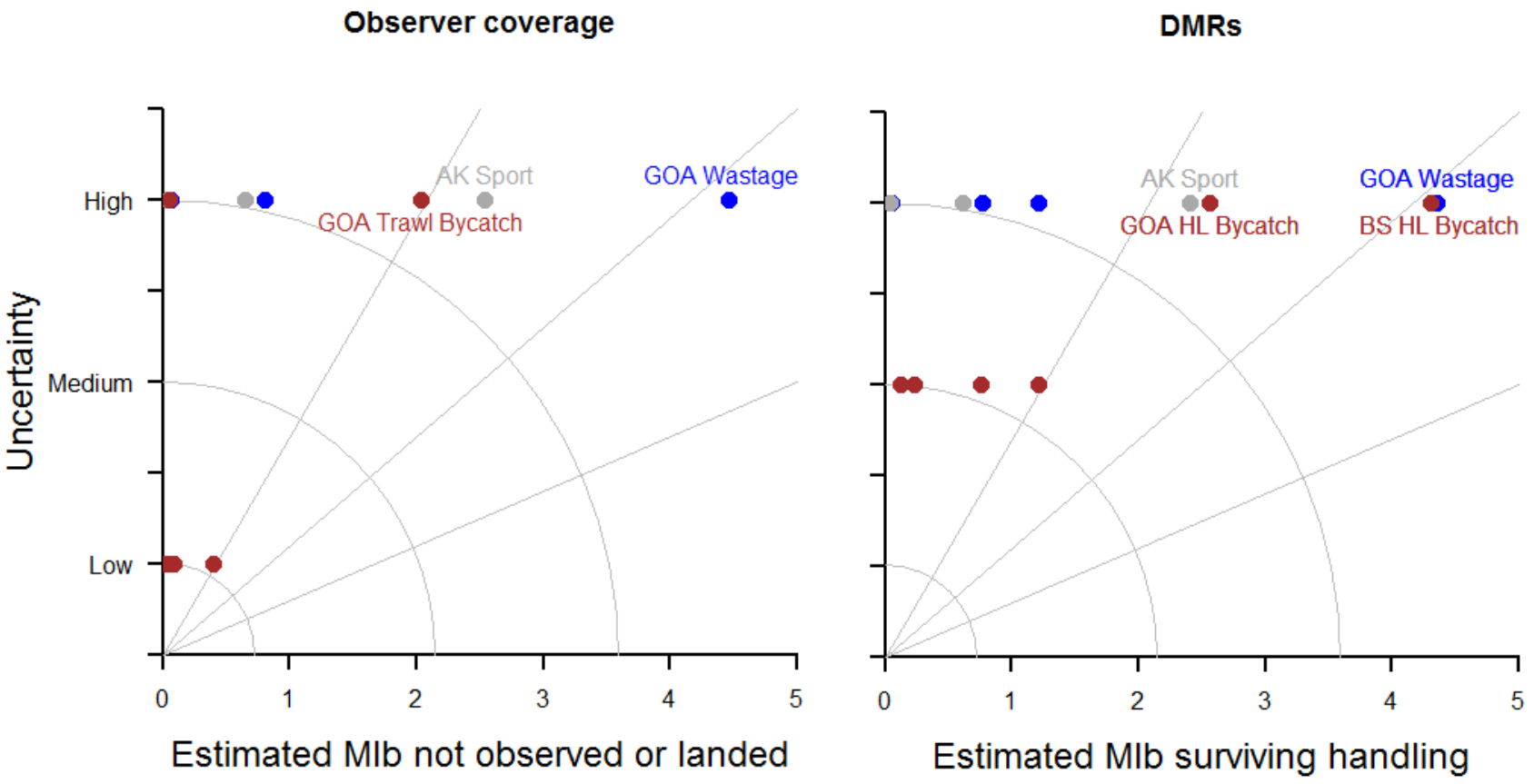

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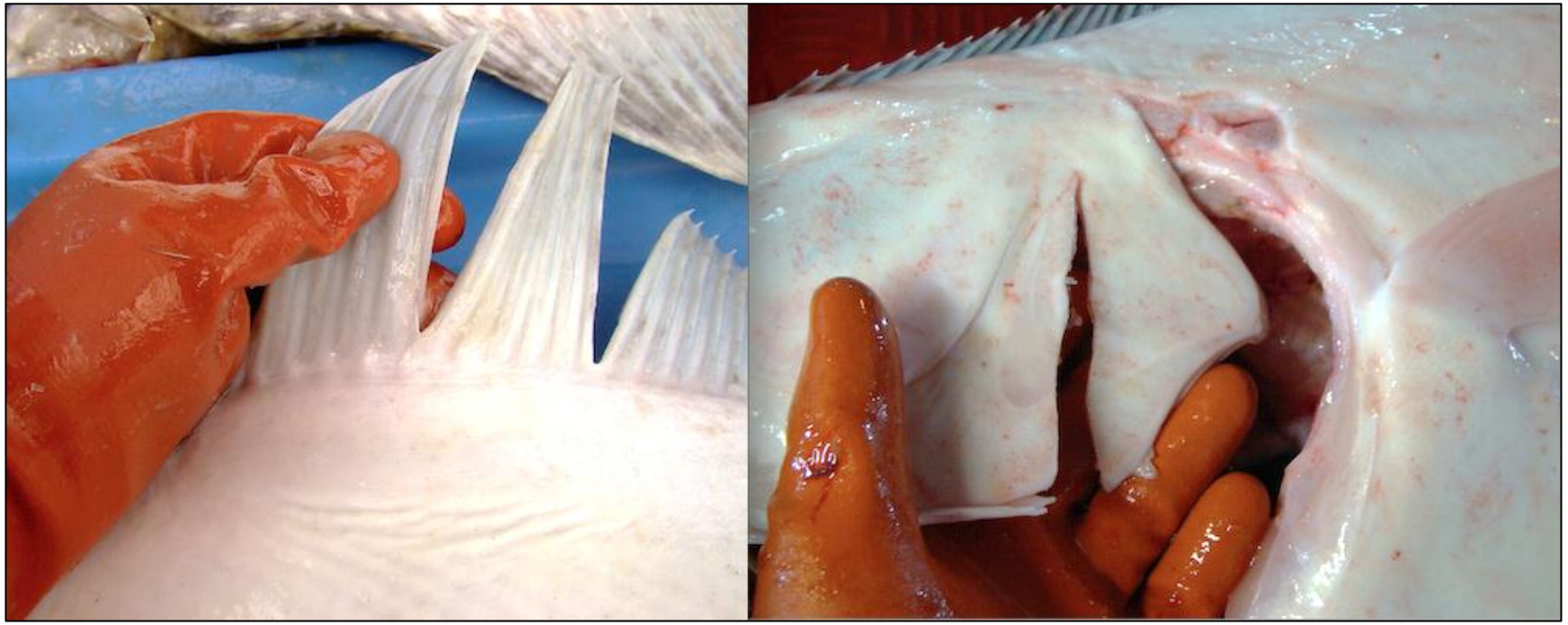
Fishery sex-ratios

2014: Mark testing and development (survey)
2015: Volunteer marking pilot, and genetic assay
2016: Genetic assay development, marking pilot – all of 2B

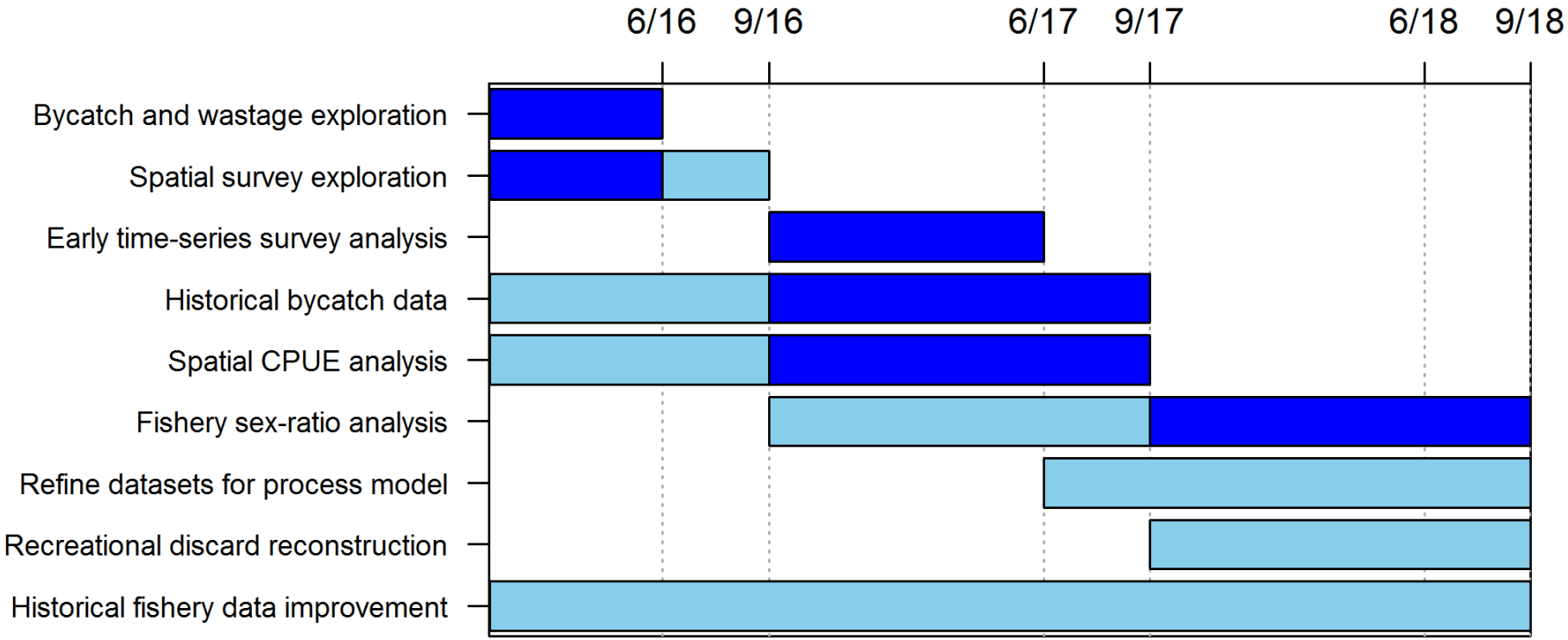


Dorsal Cut (Female) **Gill Plate Cut (Male)**

Fishery sex-ratios

2014: Mark testing and development (survey)
2015: Volunteer marking pilot, and genetic assay
2016: Genetic assay development, marking pilot – all of 2B
2017: Genetic assay to be completed; another area pilot?

Workplan – data



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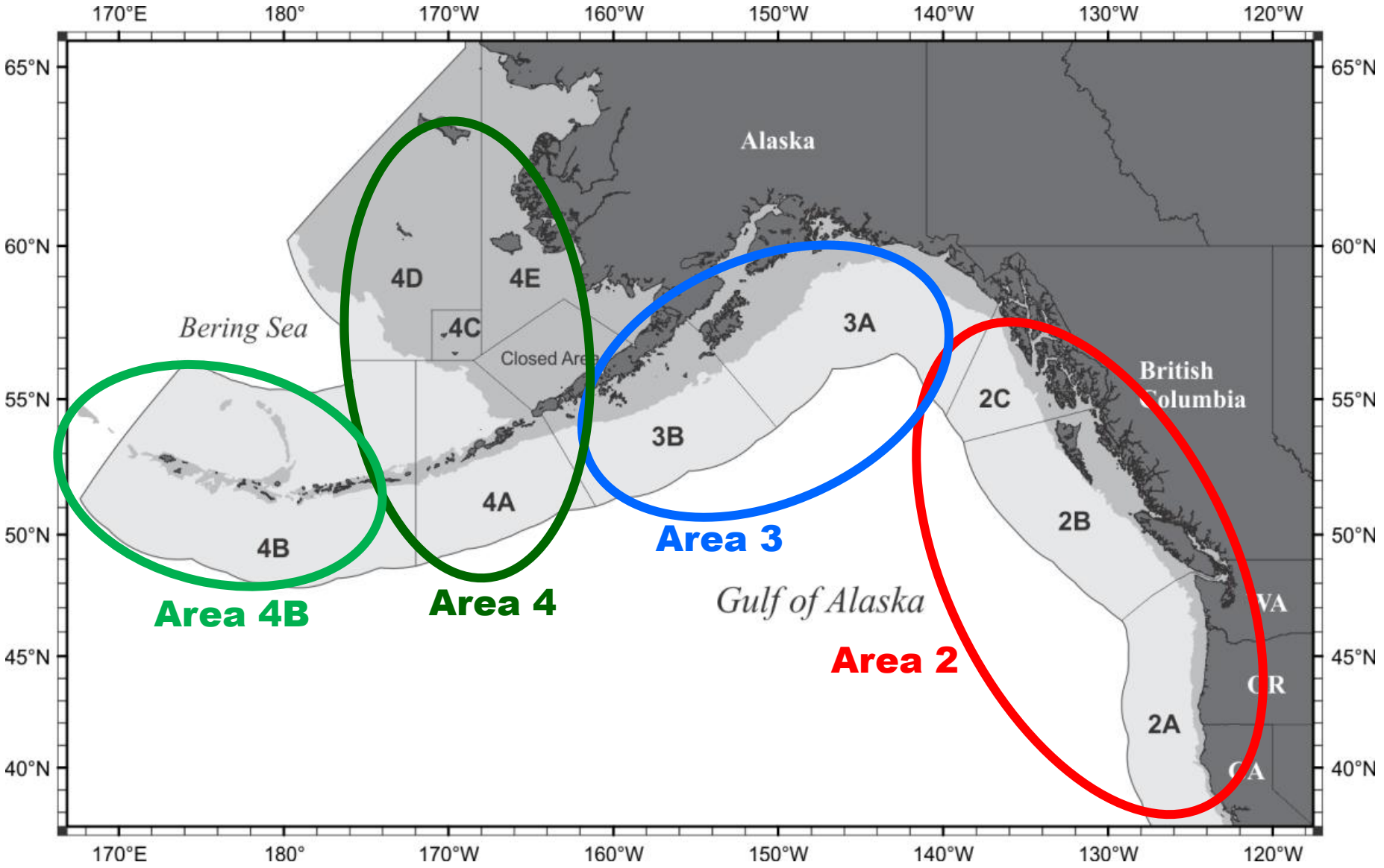
Spatial model development

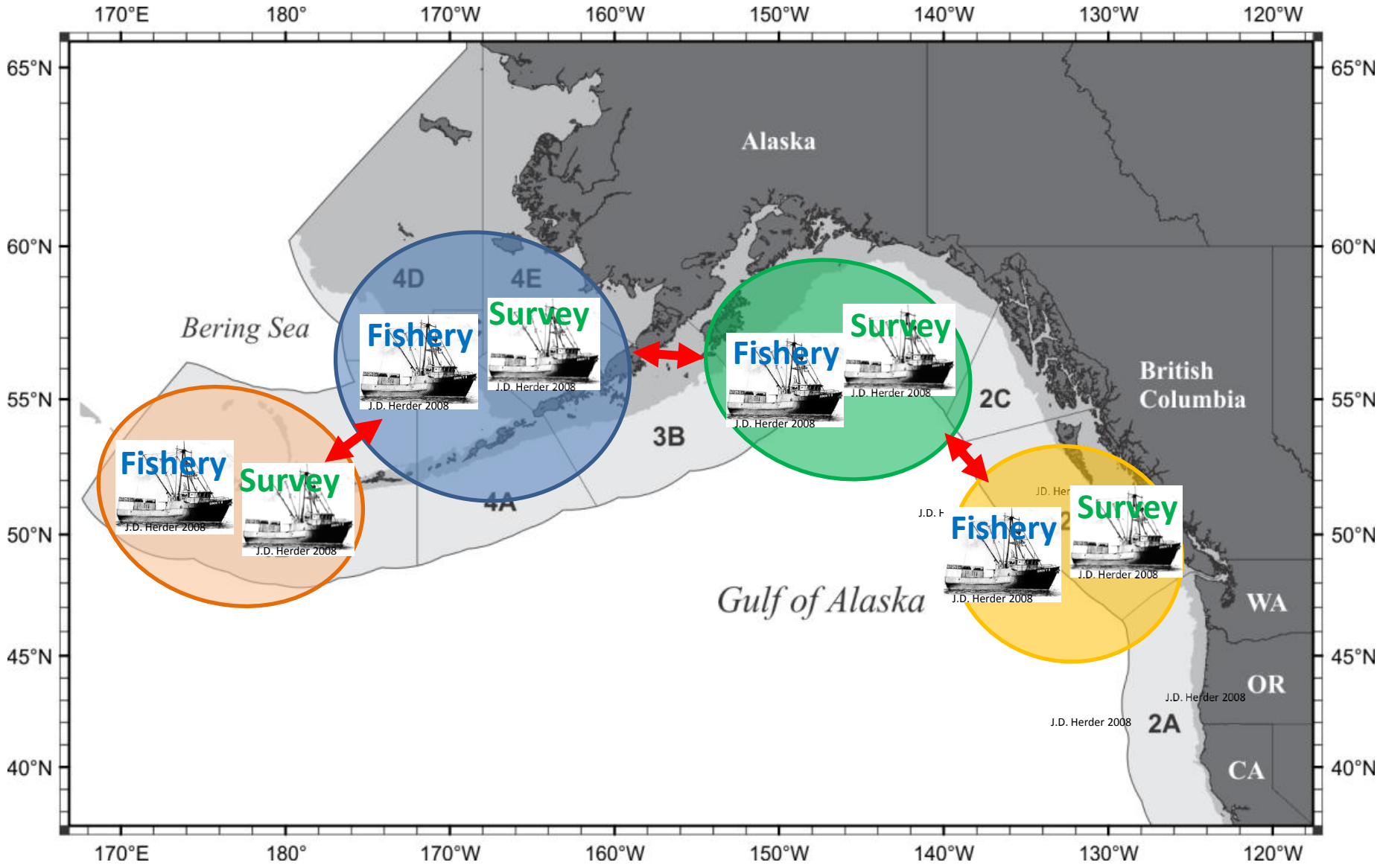
- Bottom line:
  - ~50 models in - still not within *5x* of existing model time series!

(Fishing mortality of little importance to the estimated dynamics, and the fits to the data are horrible…)

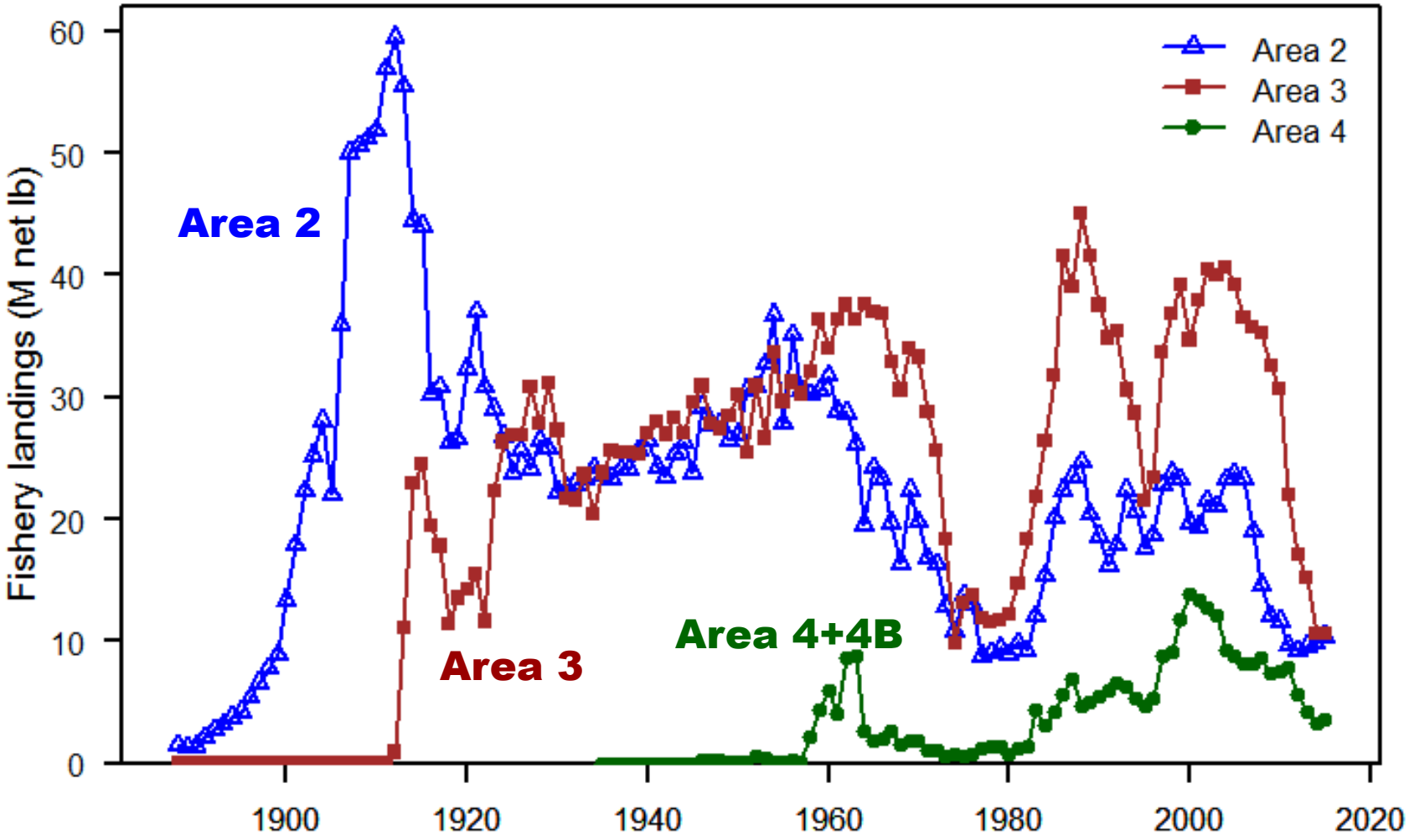
Spatial model structure



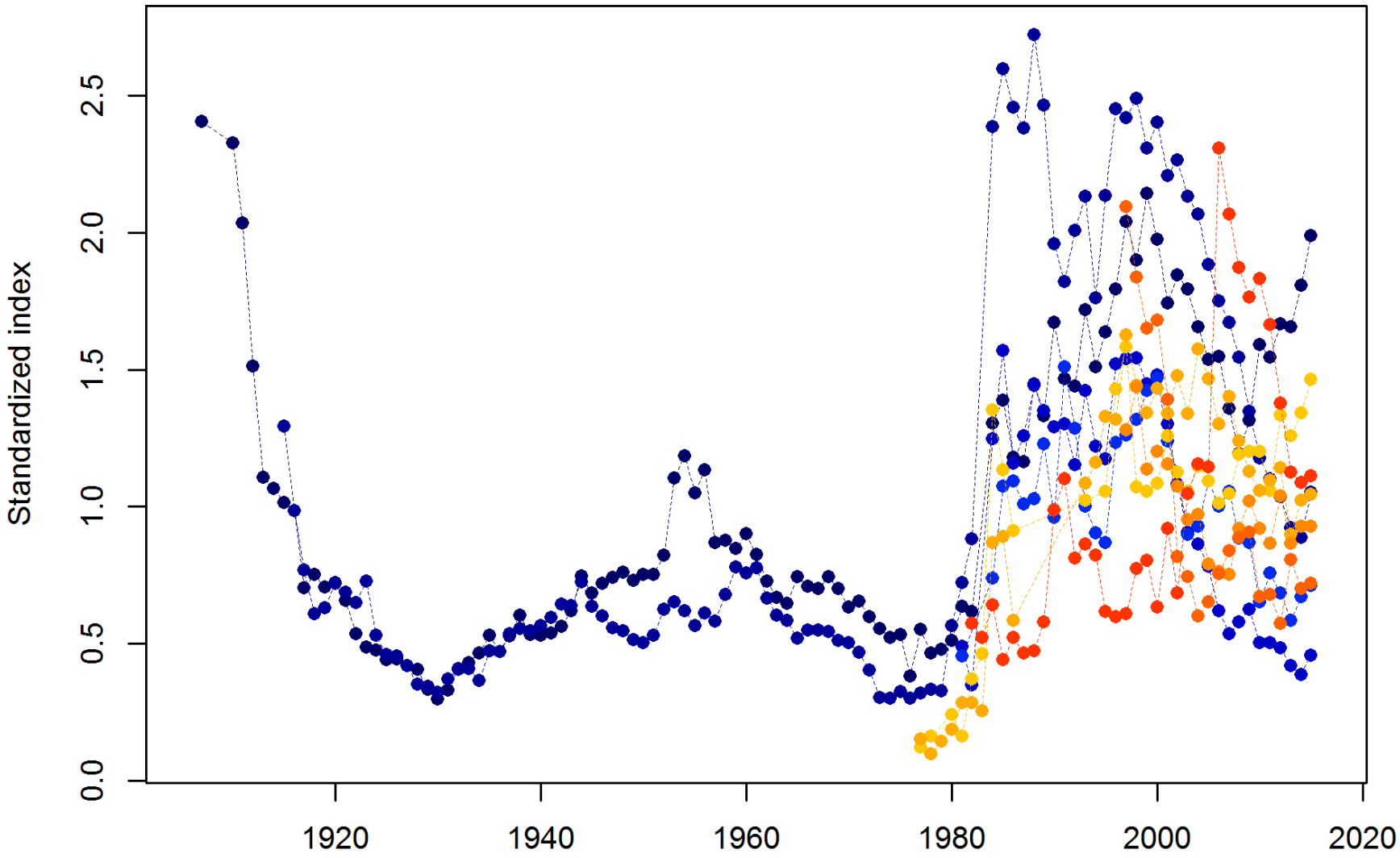
Spatial model structure



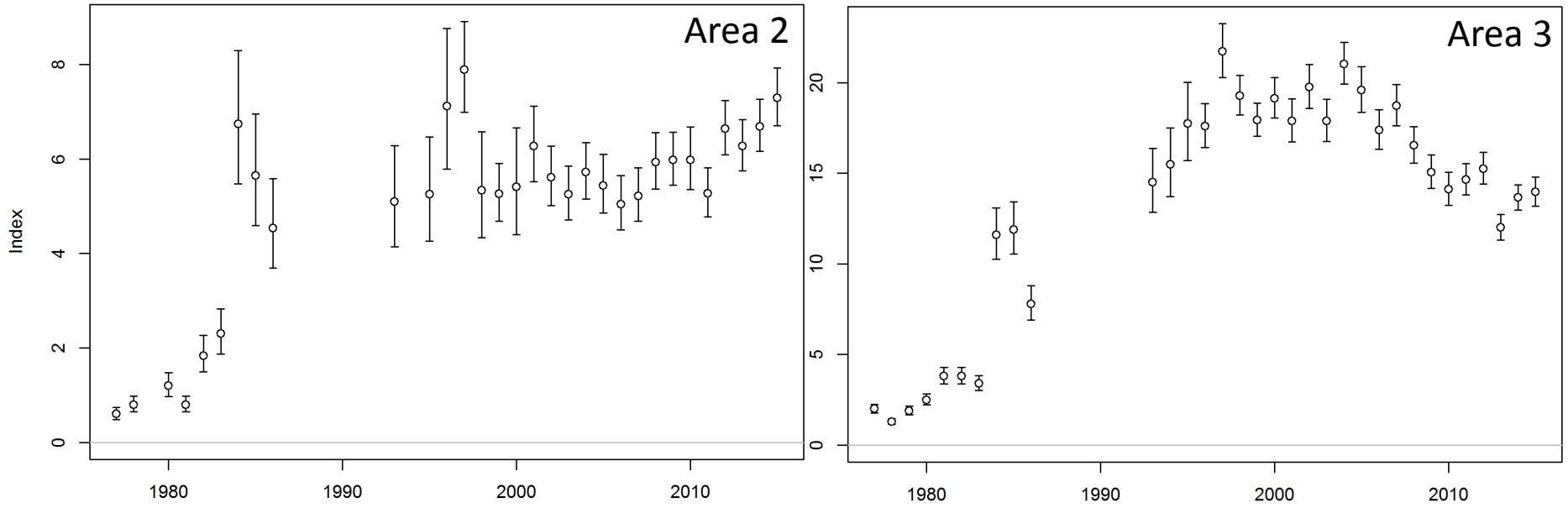
Fishery history



Spatial trends (!)

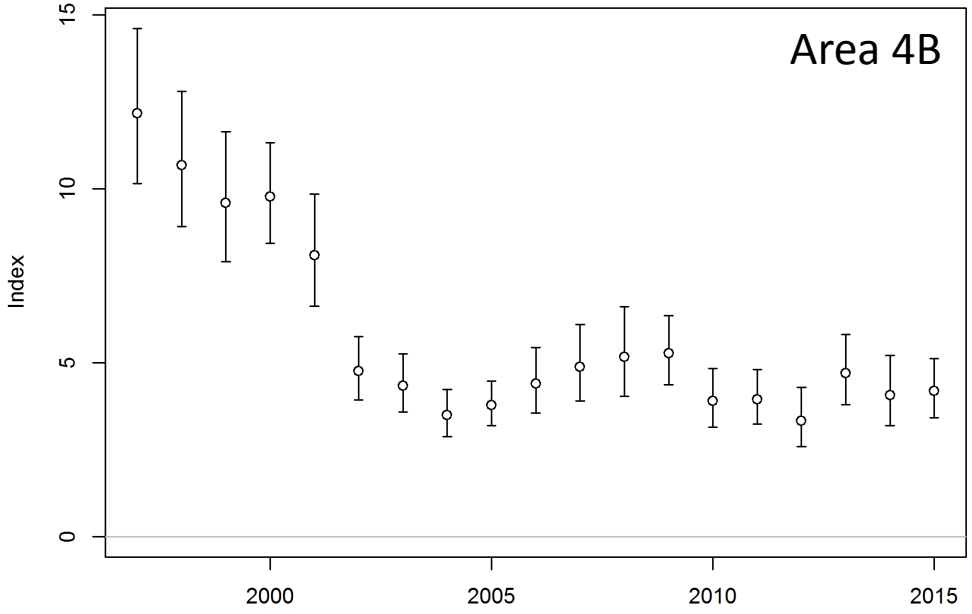


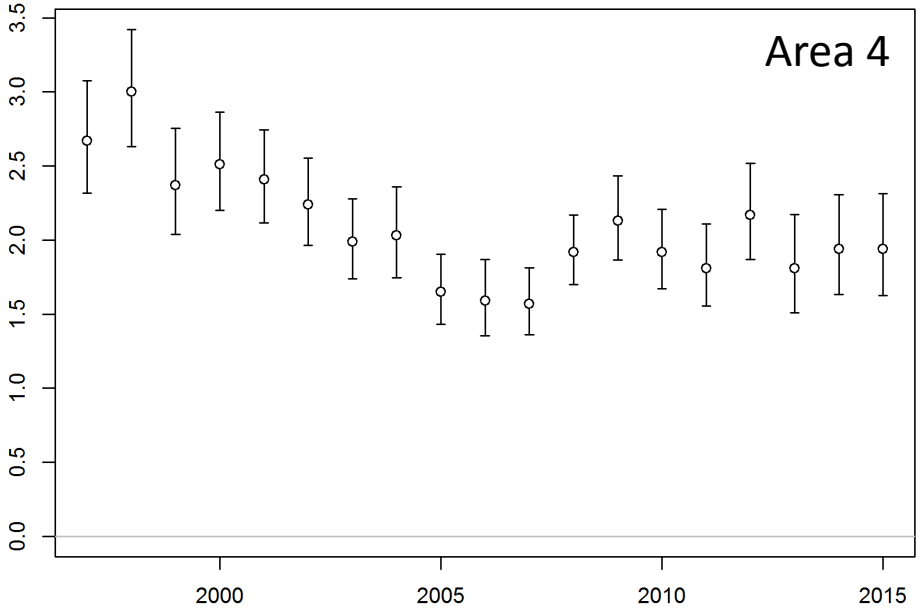
Surveys

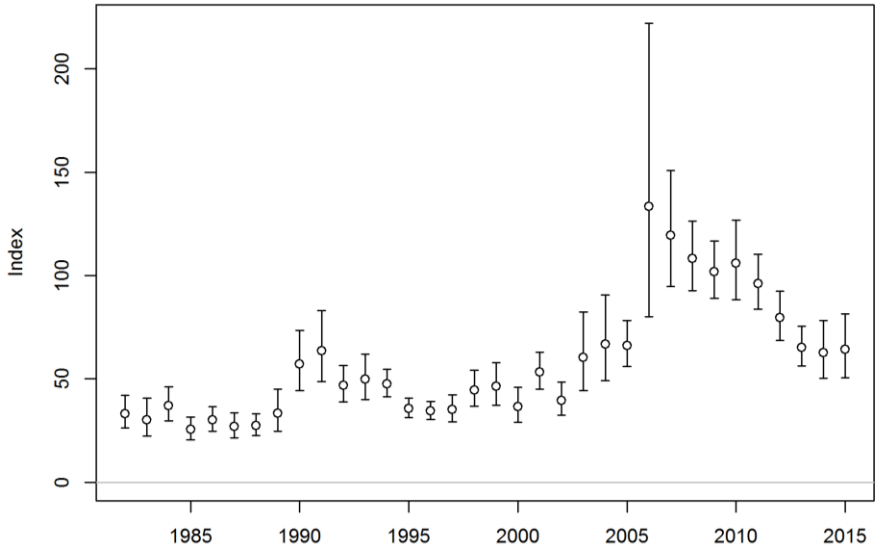

Area 2
Index
0
2
4
6
8
1980
1990
2000
2010

Area 3
0
5
10
15
20
1980
1990
2000
2010

Surveys


Area 4B
Index
0
5
10
15
2000
2005
2010
2015


Area 4
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
2000
2005
2010
2015


Index
0
50
100
150
200
1985
1990
1995
2000
2005
2010
2015

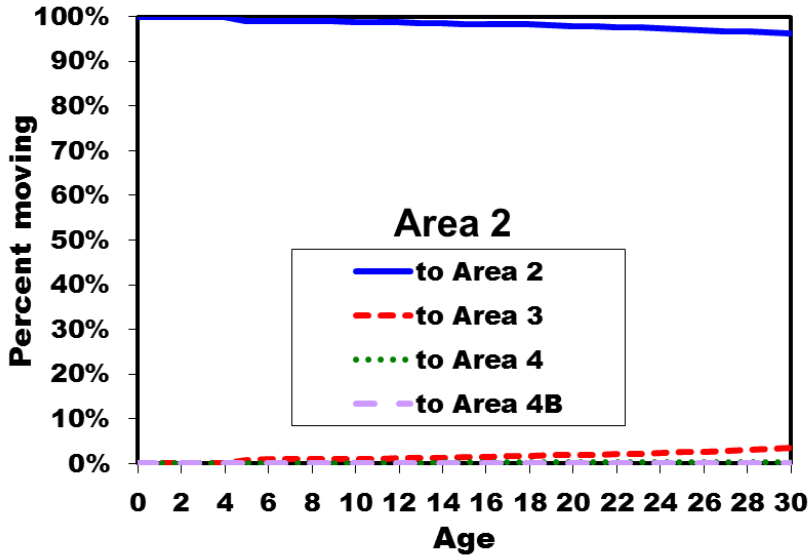
Spatial model structure

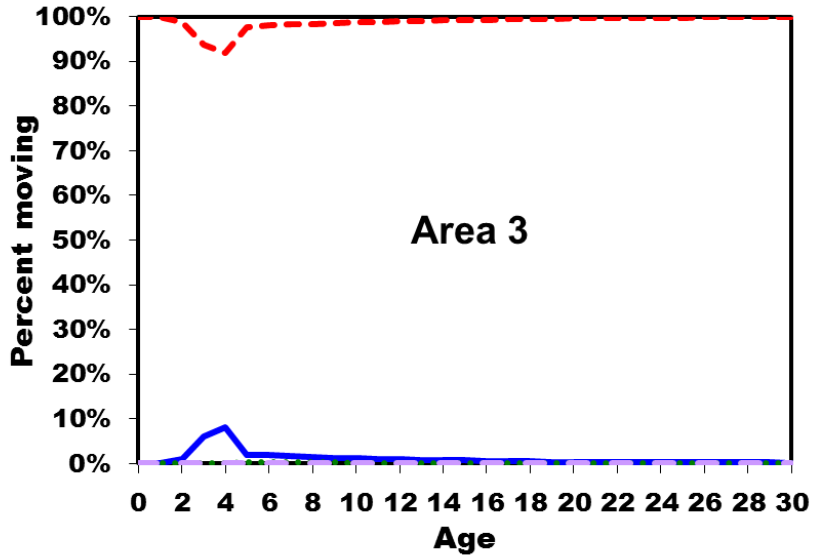
- 21 fleets:
  - 4x directed fishery
  - 4x discard fleet
  - 4x bycatch
  - 4x Recreational + subsistence
  - 4x IPHC survey
  - Bering Sea trawl survey

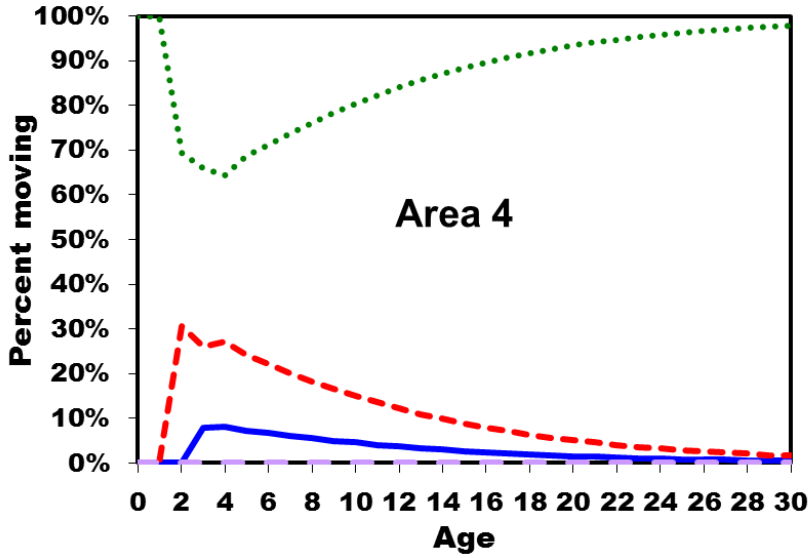
Initial approach

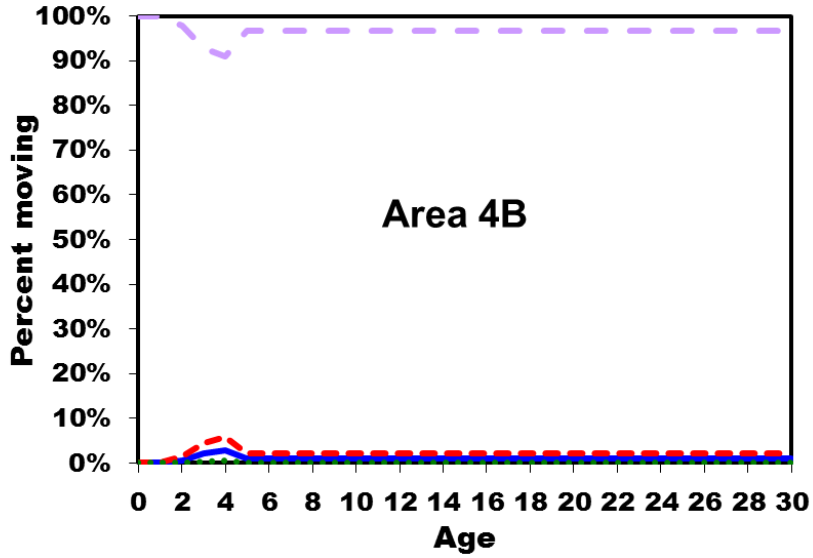
- Assert fixed movement rates
- Annual recruitment deviations and 3 partitions for each deviation, such that recruitment is freely estimated for all 4 areas.
- Trend and age data should inform recruitment scale and distribution

Movement rates

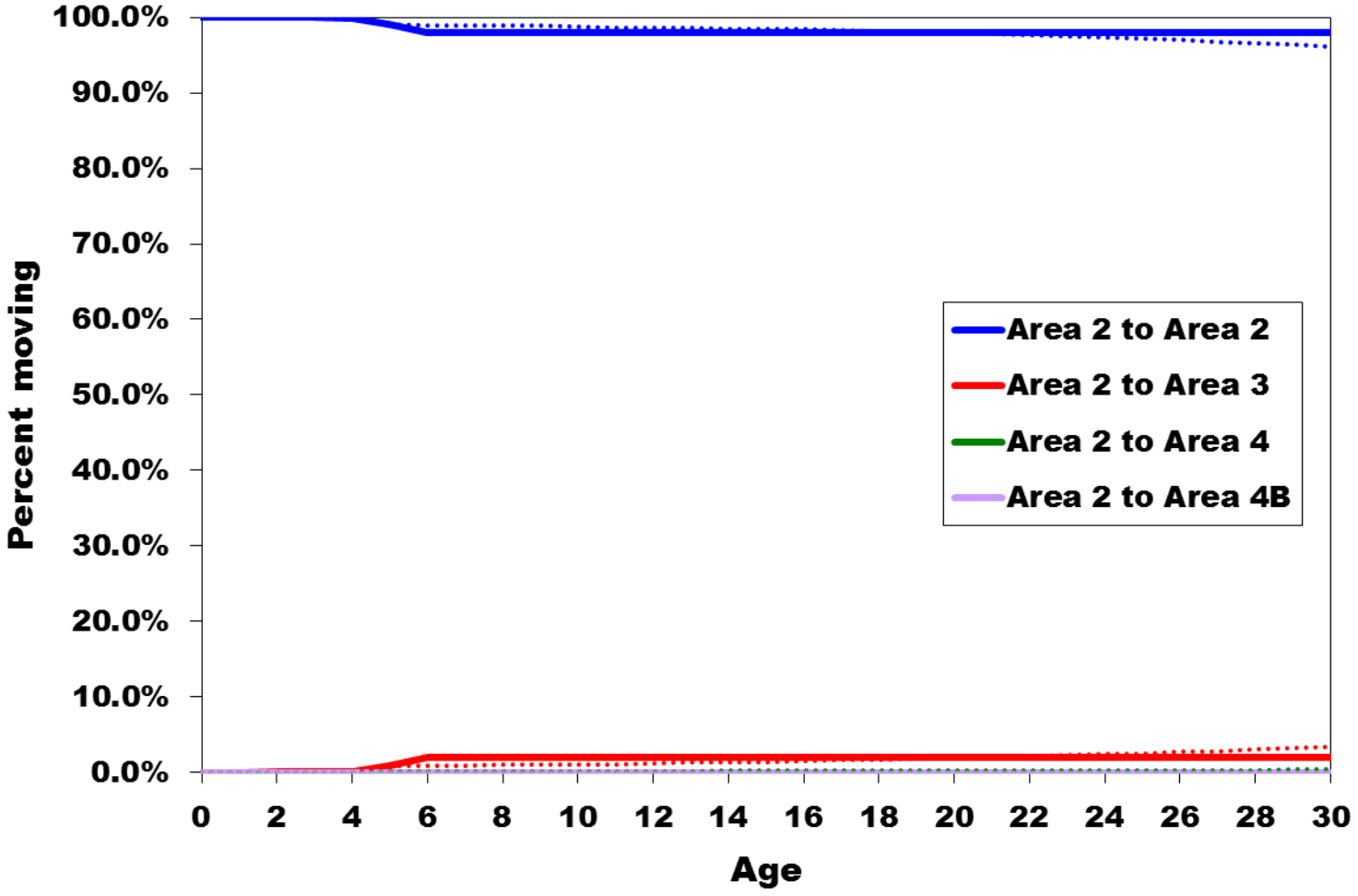








Approximated movement rates



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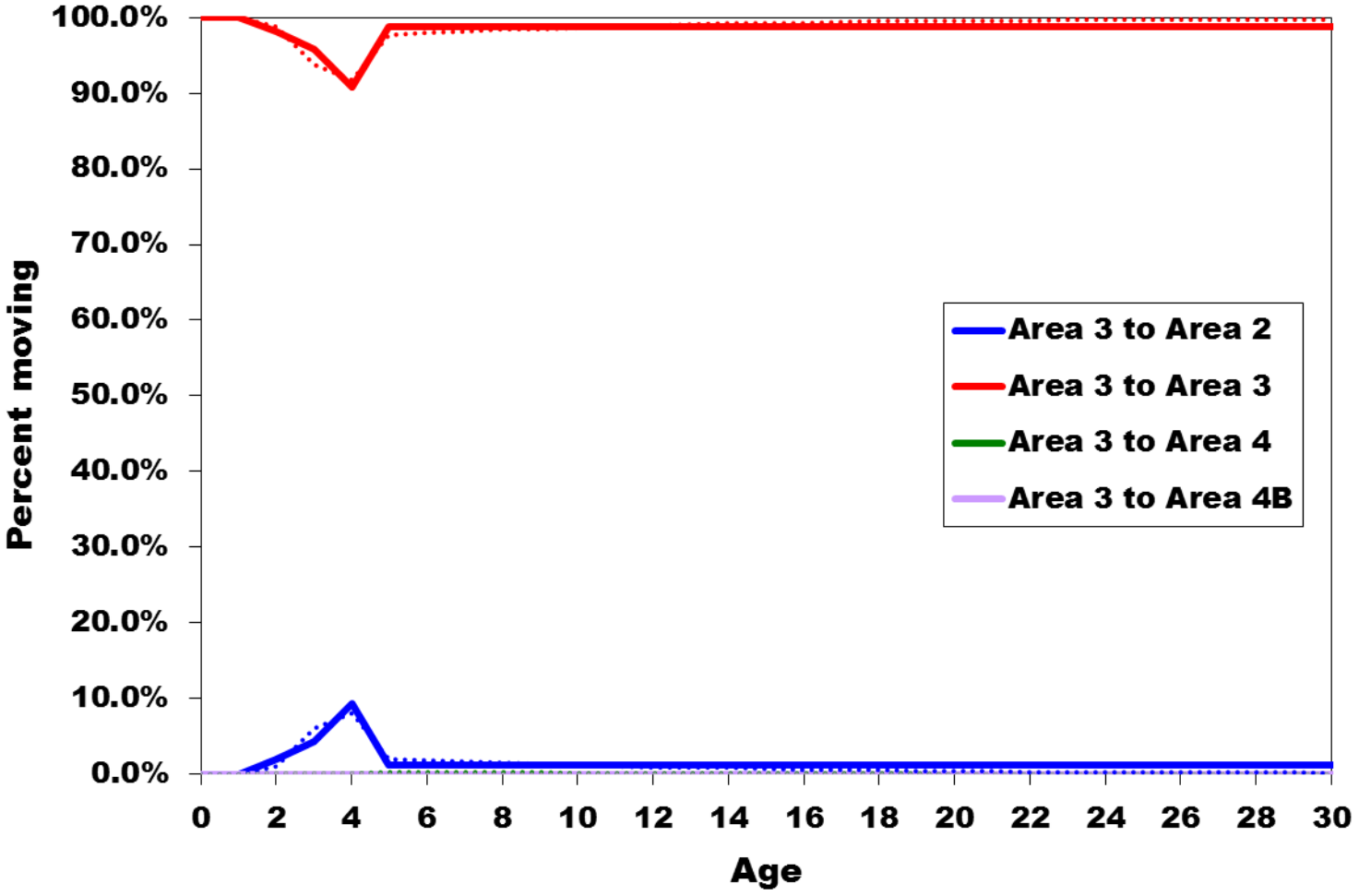

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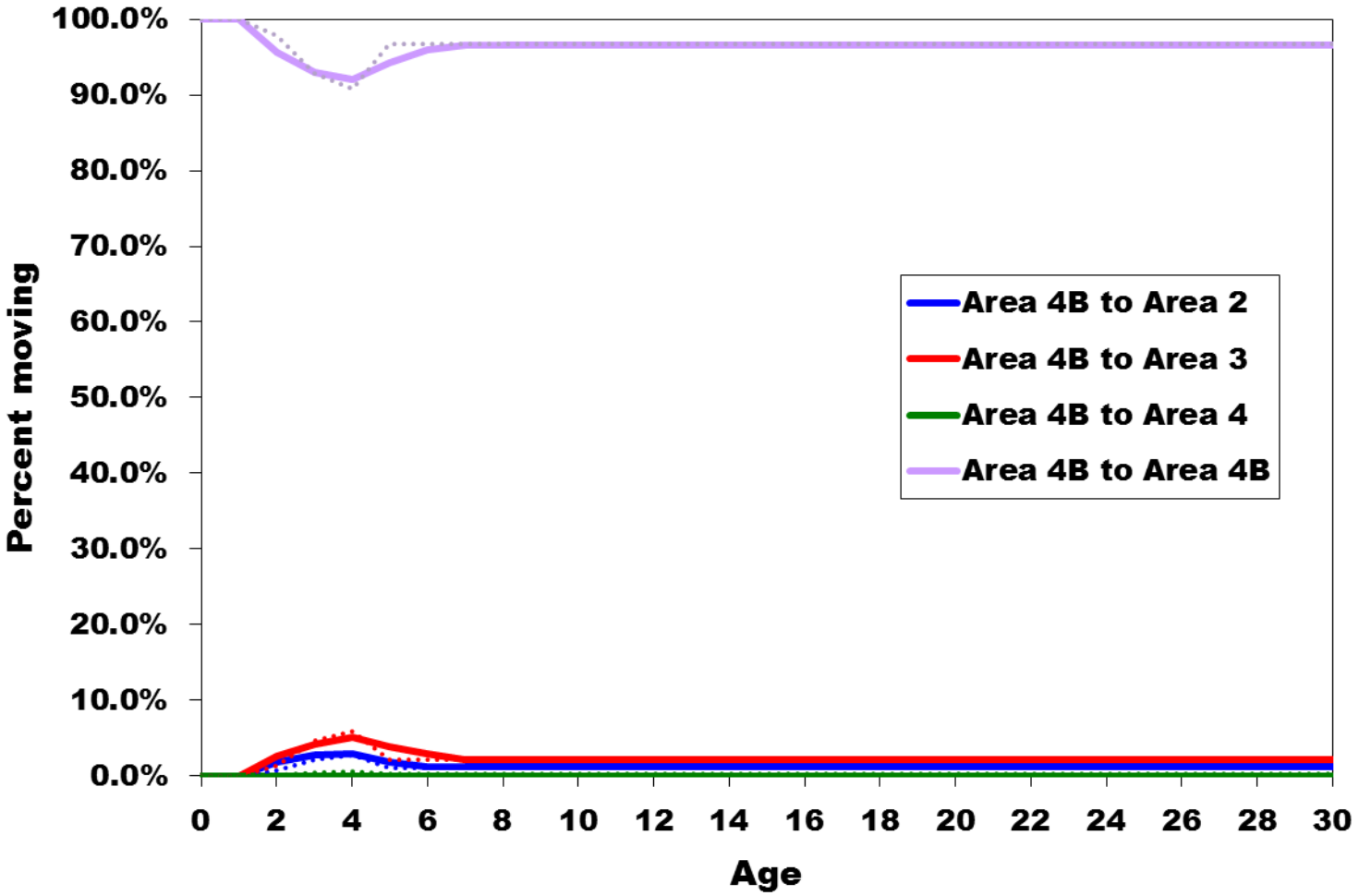

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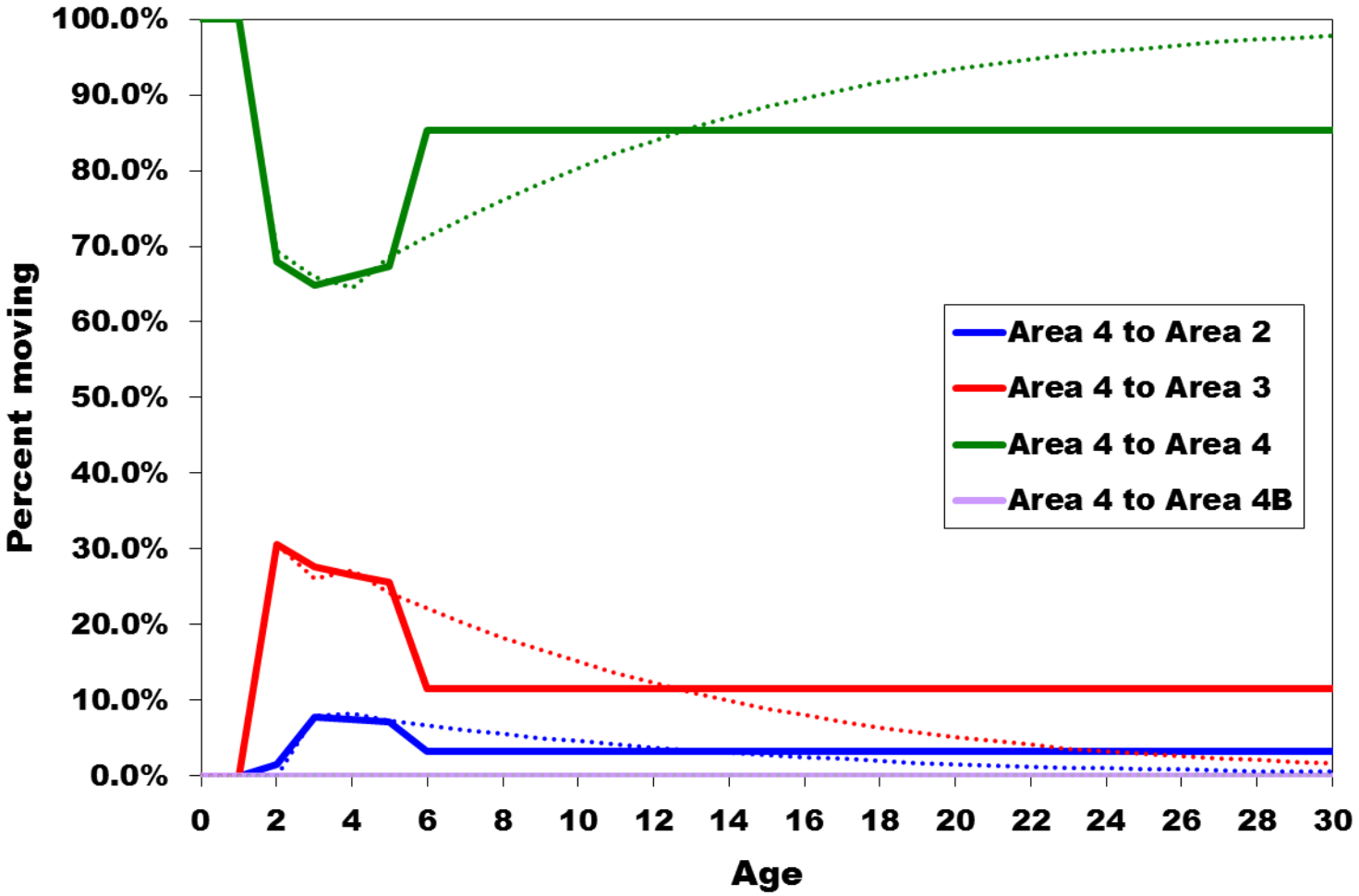
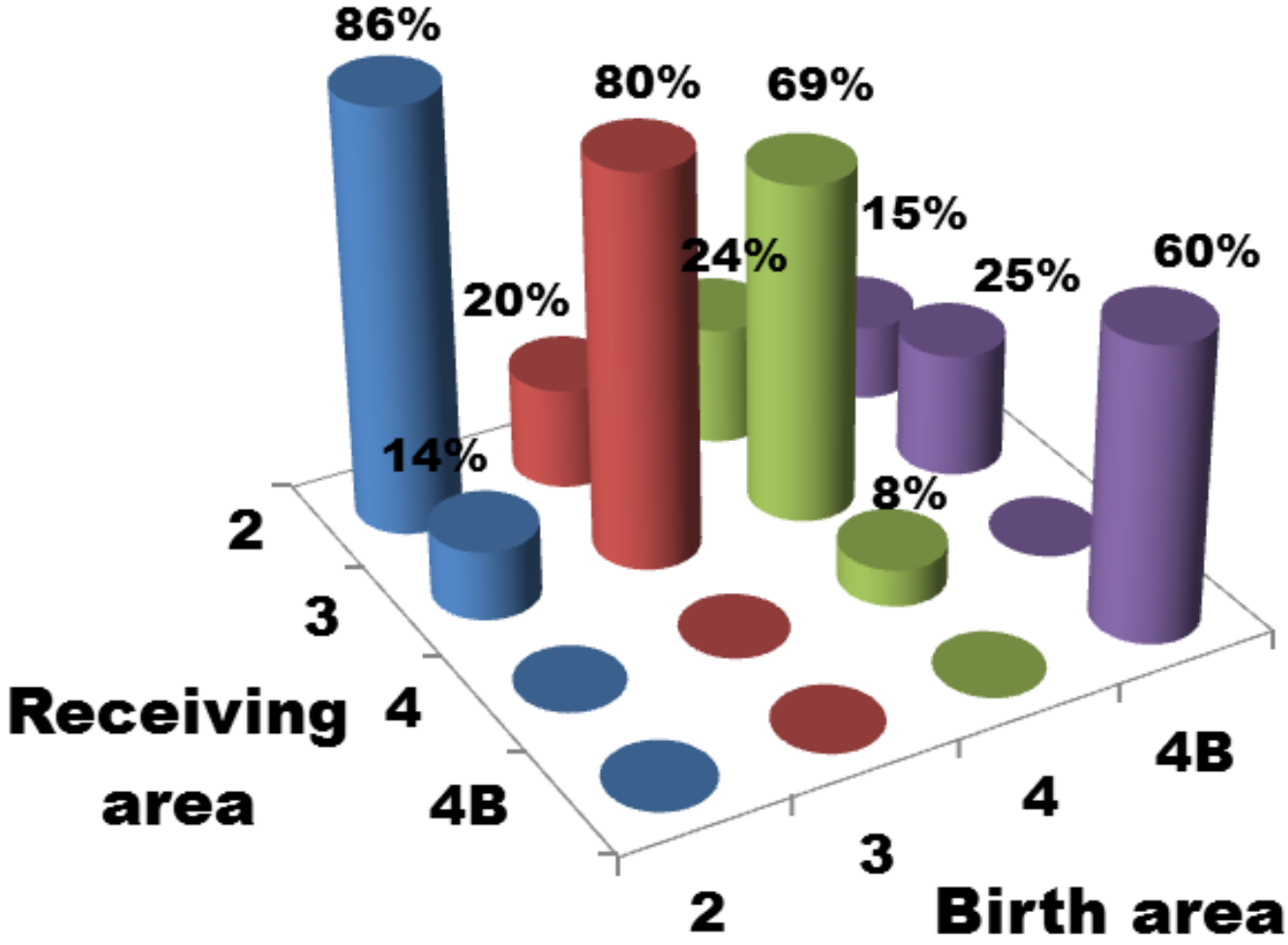


Equilibrium distribution (Age 8+)



Spatial model development

- ‘Average’ movement rates may be wrong
- Approximation in model may be poor
- Movement rates may be variable over time
- Sex-specific movement may be occurring (and confusing the signals in the age-specific estimates)

Some things I have tried

- Fit to indices only
- Fit to compositional data only
- Force constant (but estimated) recruitment distribution
- Force time-invariant selectivity
- Compare (profile) across R0 to identify conflicting signals implying only large stock sizes

Some things I haven't tried

- Forward building from single data sets
- Varying the movement rates
- Estimating movement and fixing recruitment distribution
- Considering the actual tag-recapture data
- Sex-specific movement options
- Short time-series
  - Recruitment deviation splits don't propagate into initial conditions

Spatial model development

- Continued model exploration should be interesting
- Current status suggests that spatial MSE operating models may need to be more hypothesis driven than data driven (we may not have a tactical model anytime soon)

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Model weighting

- Developing a manuscript on approaches to ensemble model weighting
- Goal: objective criteria that can be agreed upon prior to discussions that include the specific results.
- Presentations at several conferences/meetings this year

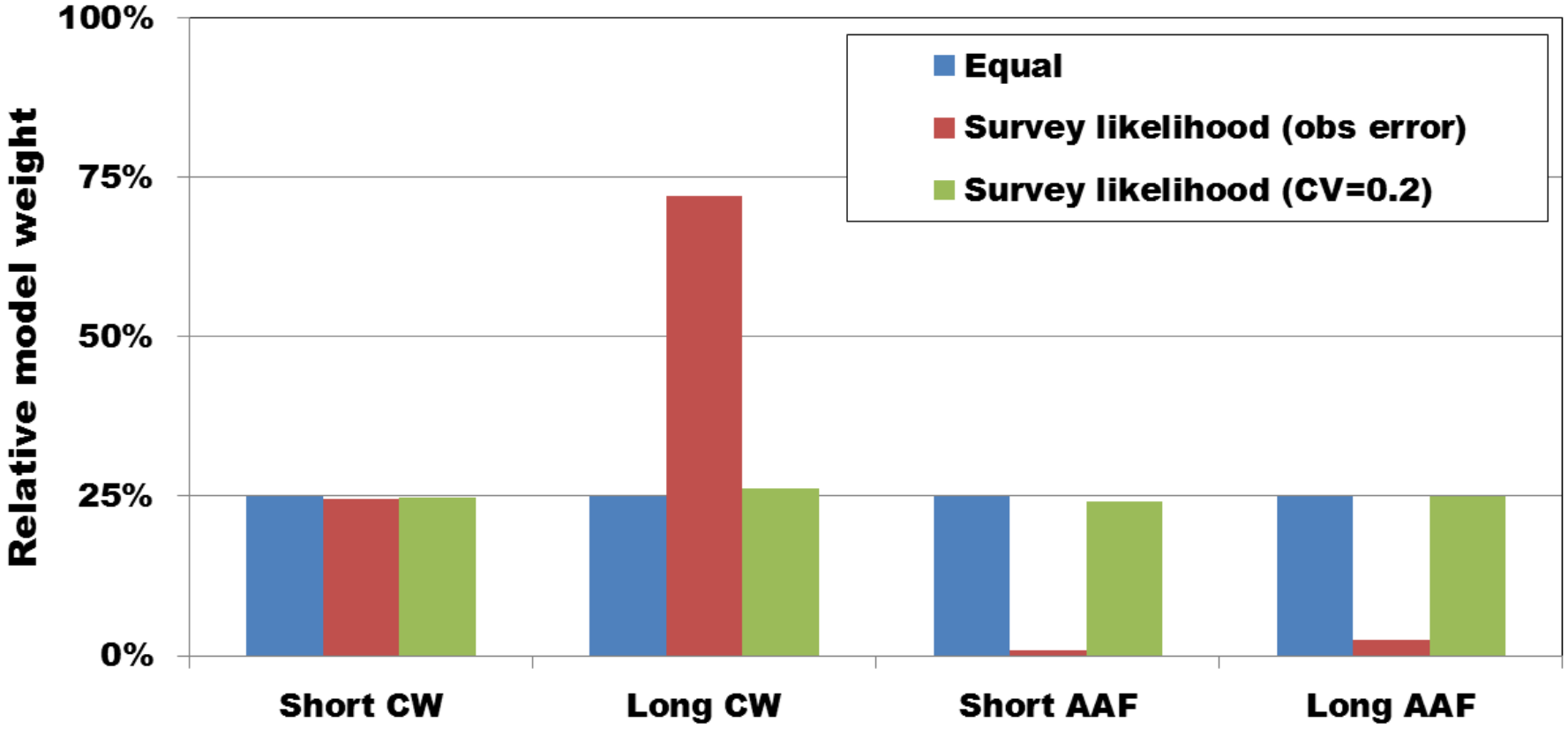
(Approximated from Hurtado et al. 2015)

Weighting alternatives

Static (model basis)

- Ranges of parameter values (maybe from a prior)
  - Natural mortality, Steepness, Recruitment variability
  - …
- Alternative structural assumptions (maybe from simulation)
  - Time-varying dynamics
  - Time-series length
  - Fleet aggregation
  - …
- Fit to key data sources (e.g., Francis 2011)

Fit to aggregate survey index



Weighting alternatives

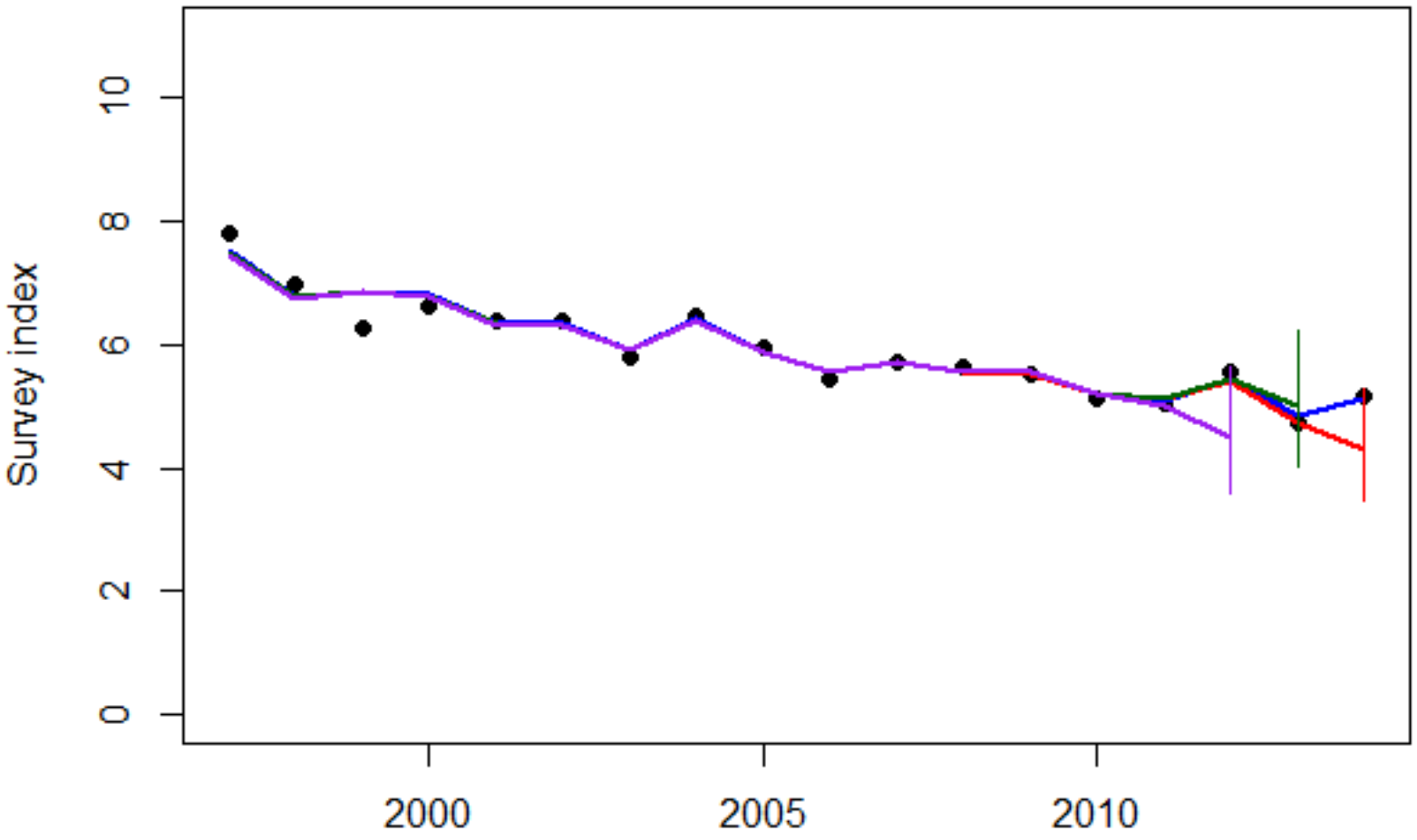
Static (model basis)

- Ranges of parameter values (maybe from a prior)
- Alternative structural assumptions
- Fit to key data sources (e.g., Francis 2011)

Dynamic (model performance)

- Predictive skill
- Retrospective behavior

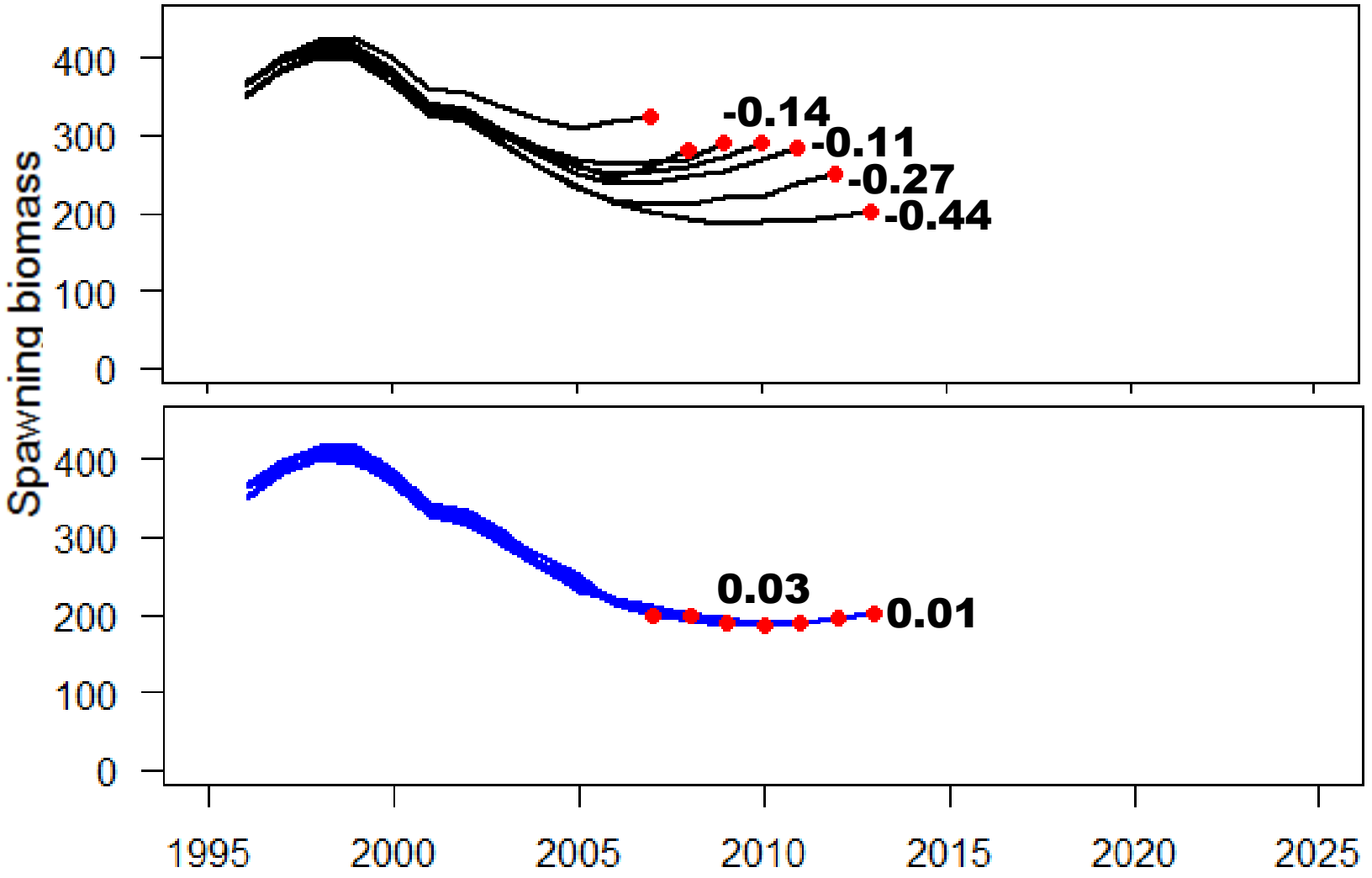
‘Retrospective’ Predictive distributions



Retrospective performance

- Mohn's Rho (Mohn, 1999) to measure of retrospective bias
- (Modified slightly) and simulated by Hurtado et al. 2015:
  - Values > ~0.2 suggest poor skill relative to a simulated 'null' distribution.

Retrospective performance



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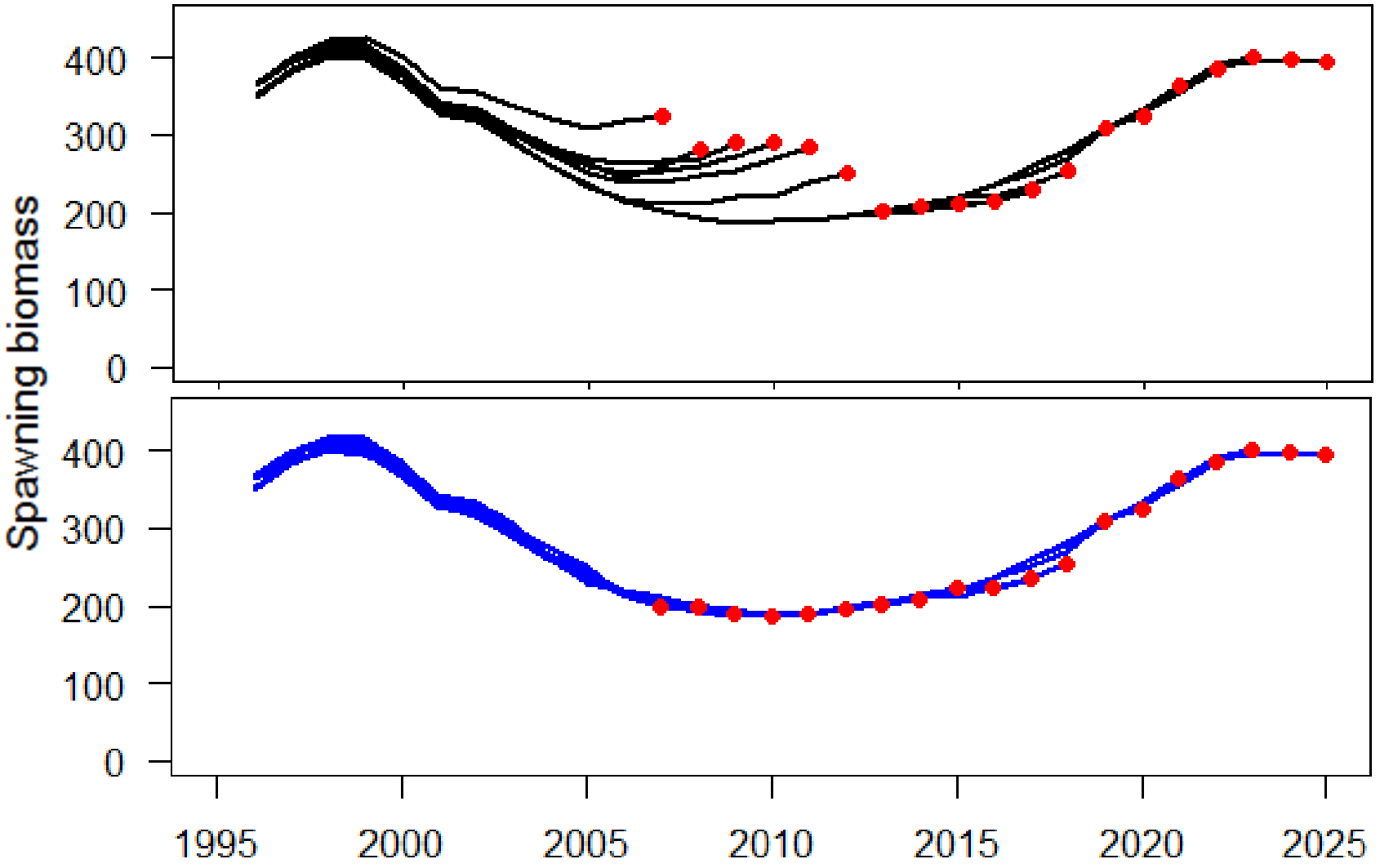

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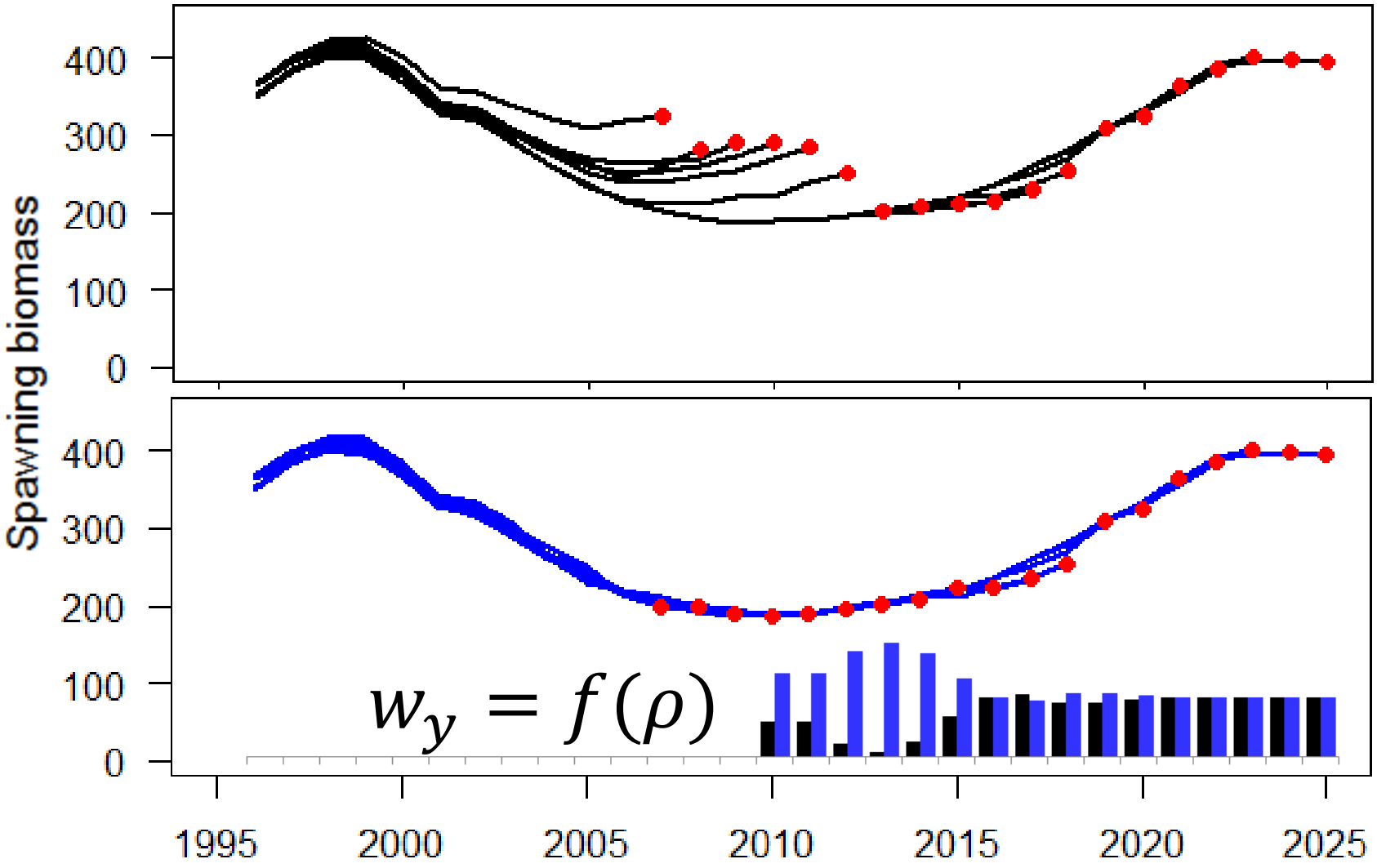
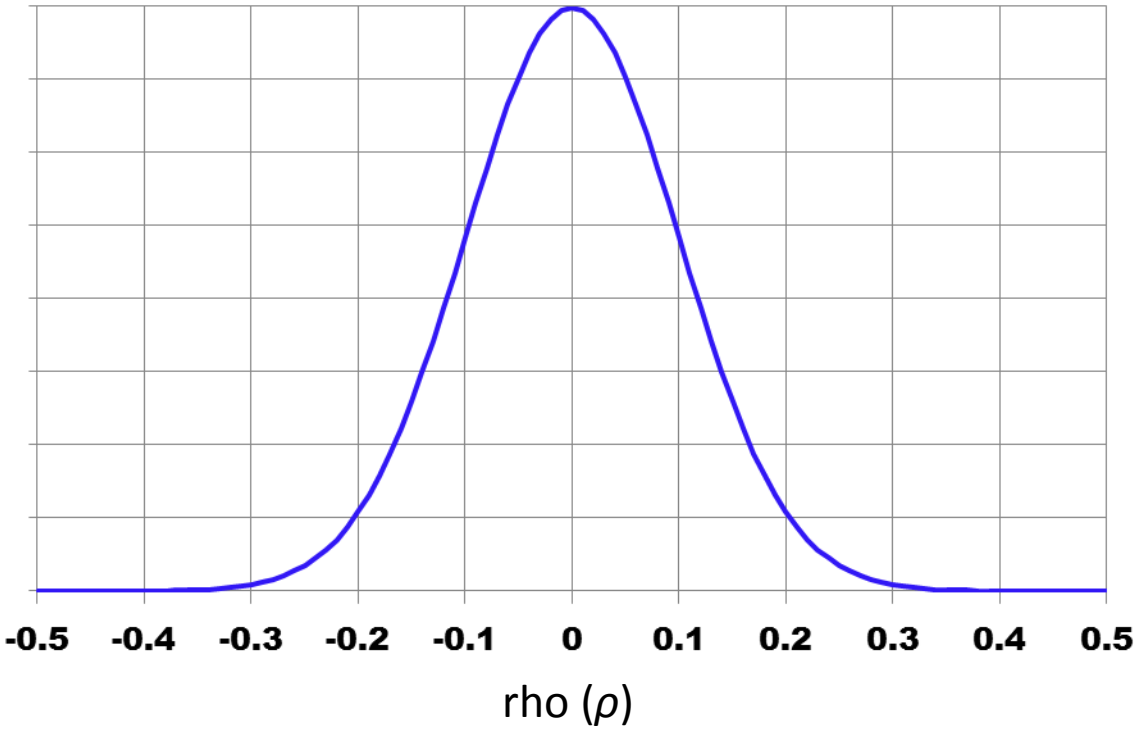


Null distribution for Mohn's rho (ρ)

(Approximated from Hurtado et al. 2015)



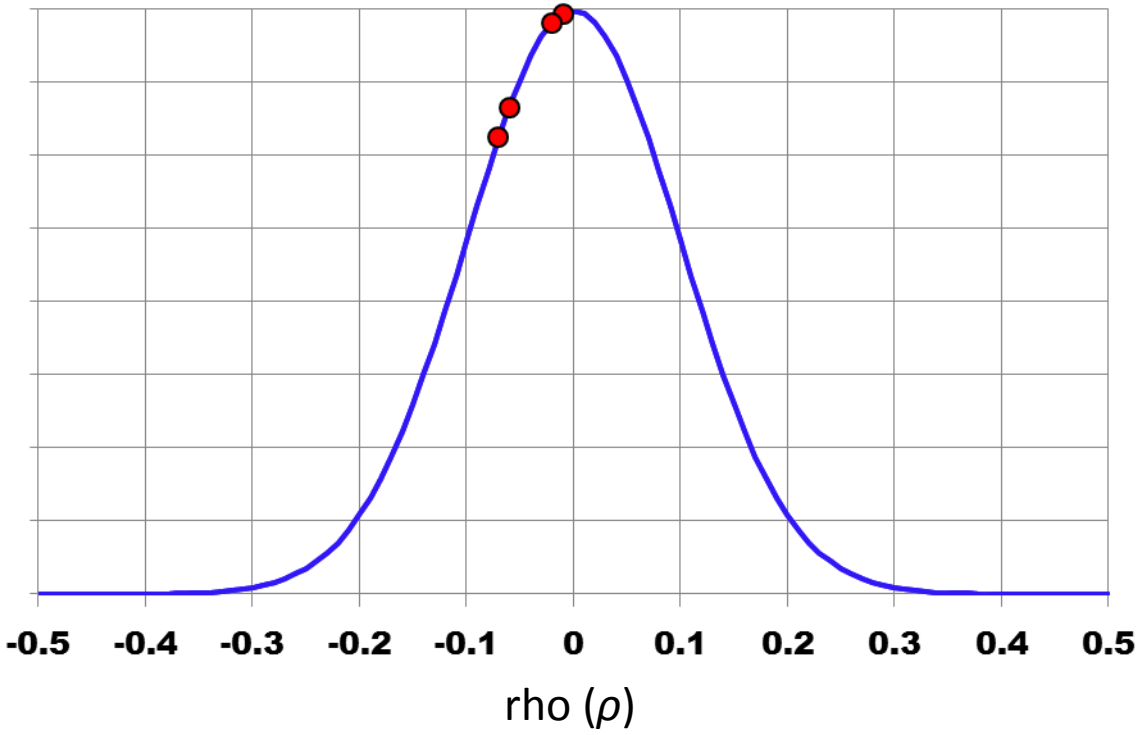
Weights from the Null distribution ($\tilde{\rho}$)

$$\mathrm{P}(\rho|M_i) \propto w_i = \exp(-0.5\Delta_i)$$

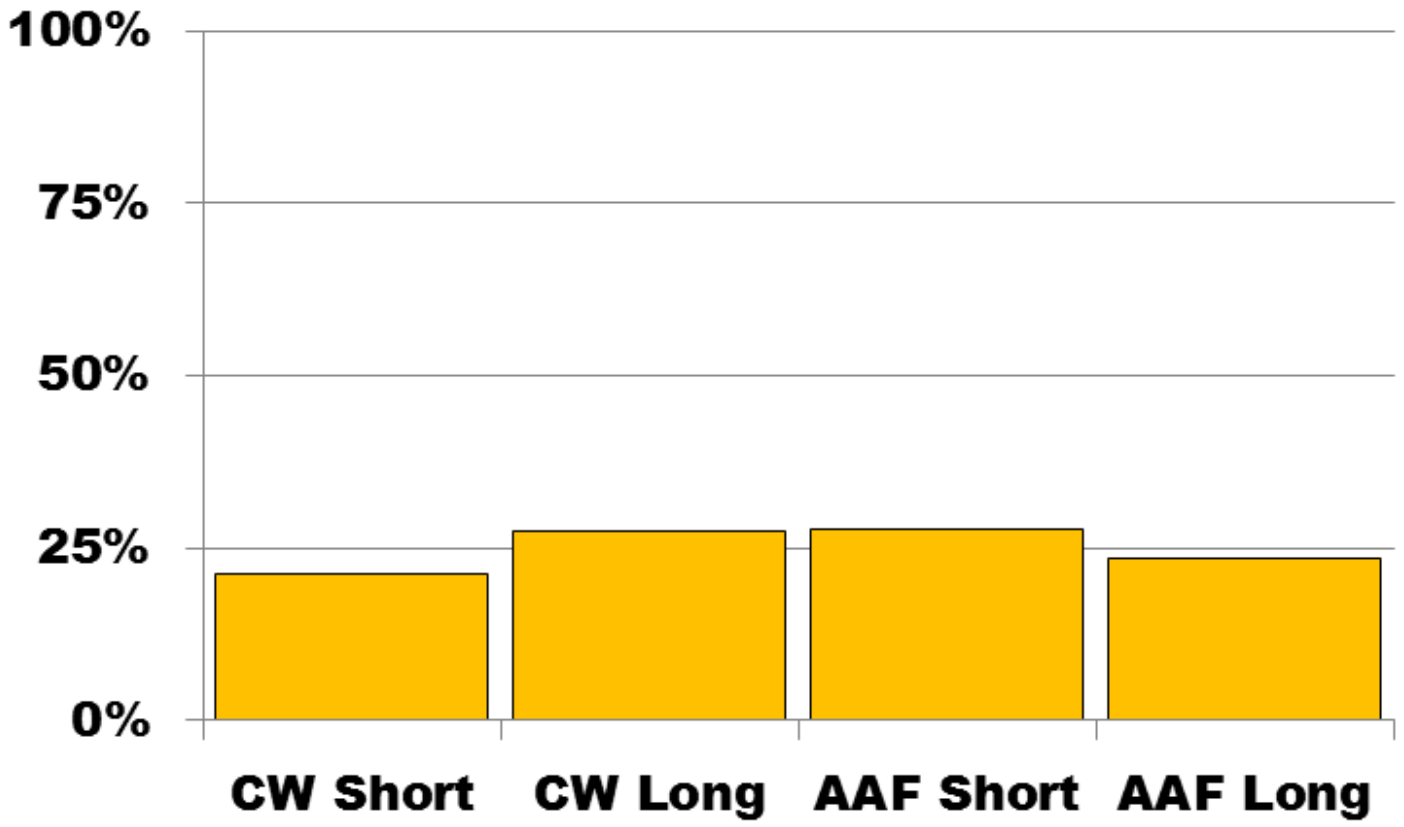
$$\Delta_i = 2 * NLL_i - 2 * NLL_{min}$$

$$NLL_i = \frac{(\tilde{\rho} - \rho_i)^2}{2\sigma_{\tilde{\rho}}{}^2} + \ln(\sigma_{\tilde{\rho}})$$

2016 halibut Models



2016 Models – implied weights



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  - Other updates
- Modelling topics
  - Spatial model/movement rates
  - Model weighting
  - Presentation tools
  - Other updates
- Planning for September

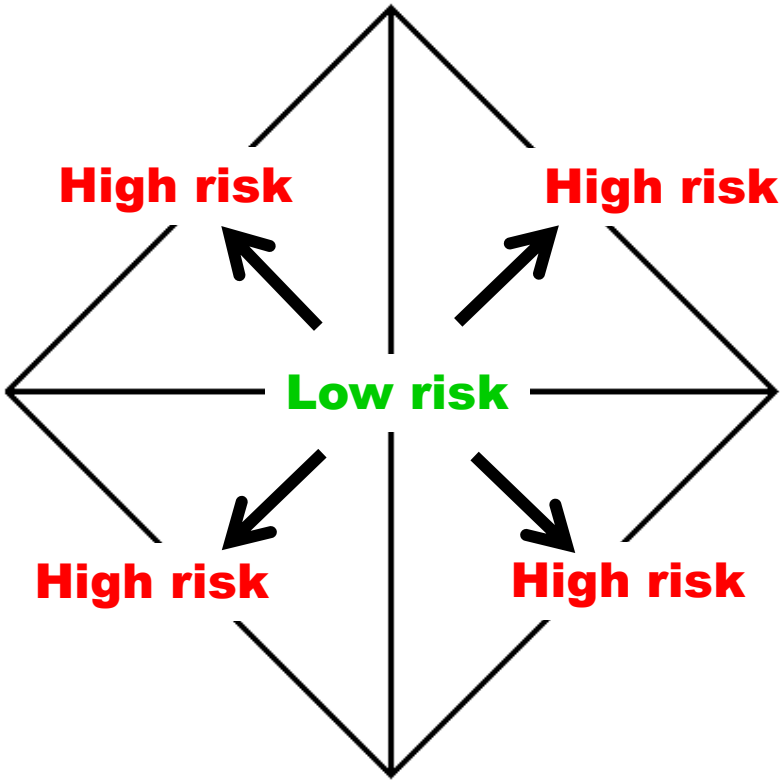
Susan Joslyn (UW Psychology)

- Less is more
- Simple statements of probability
- Graphics not always better
- 80% intervals
- No PDFs or CDFs (!)
- References:

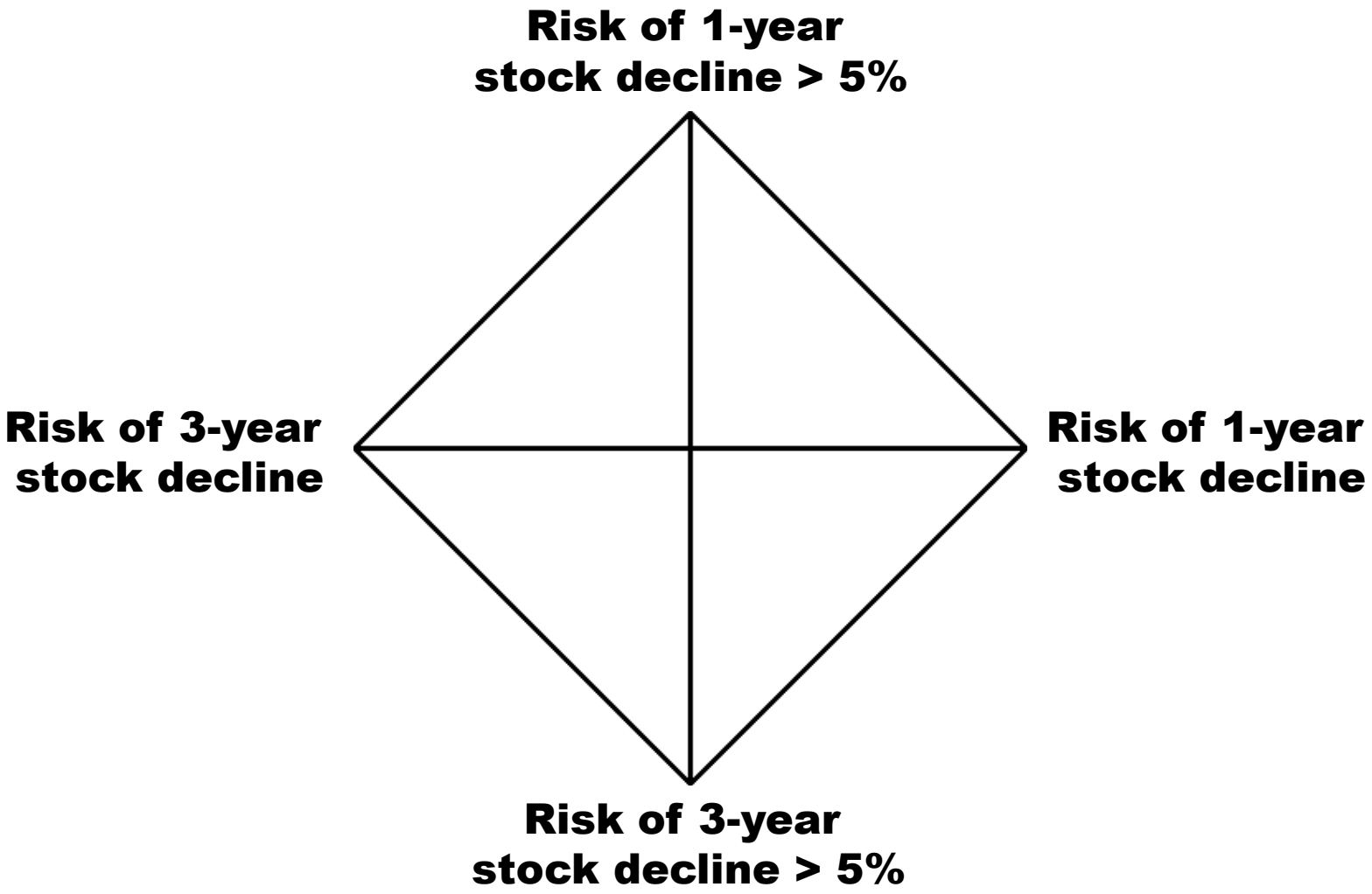
Decision making with uncertainty lab:
http://depts.washington.edu/forecast/research/

Savelli, S. and S. Joslyn. 2013. The Advantages of Predictive Interval Forecasts for Non-Expert Users and the Impact of Visualizations. Applied Cognitive Psychology 27(4): 527-541.

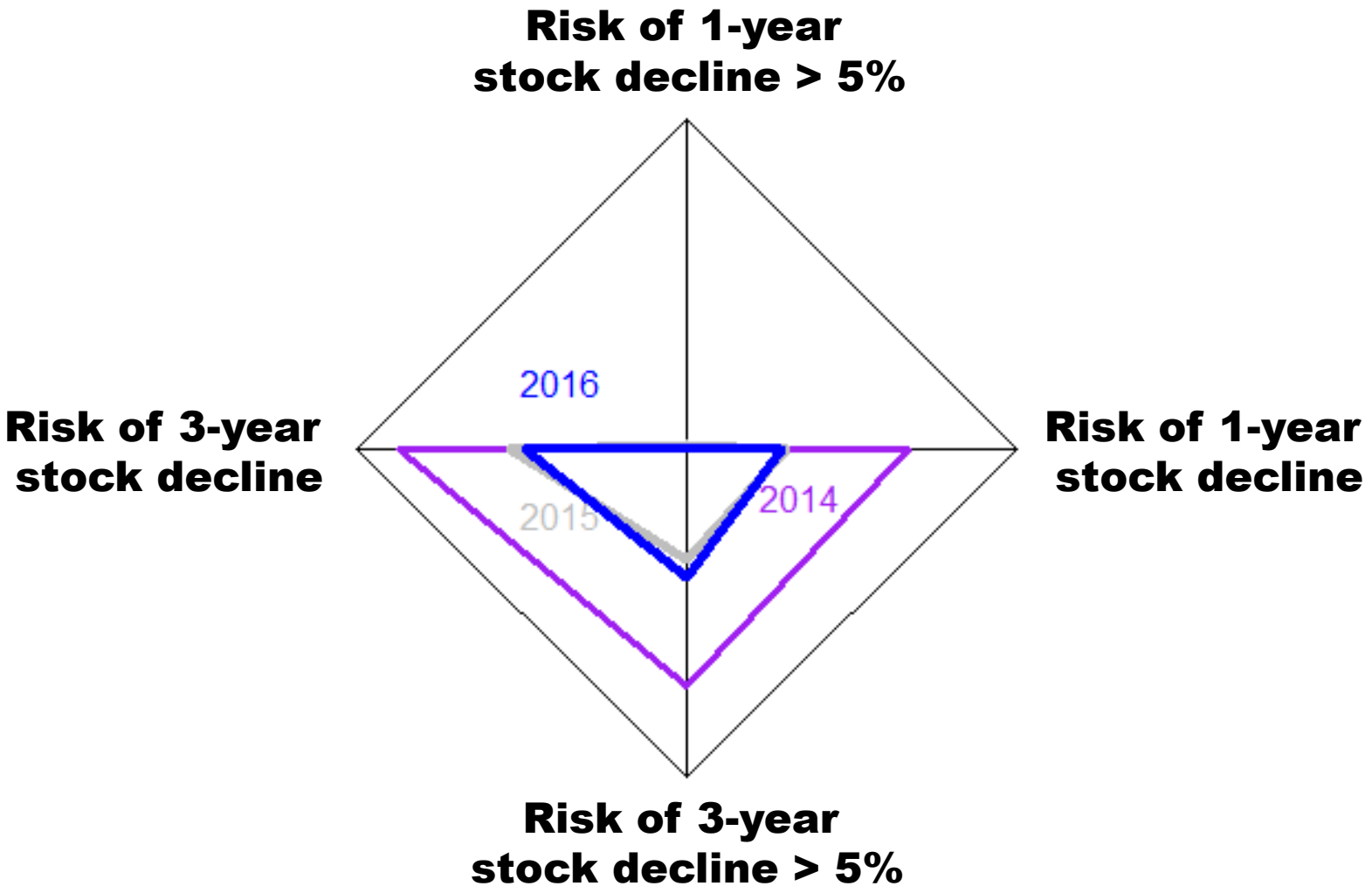
Risk profiles (‘emergent’ harvest policy) Radar plots



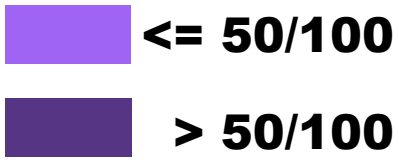
Risk profiles (emergent harvest policy)



Risk profiles (emergent harvest policy)



Decision table: Stock trend (times/100)



	Spawning Biomass			
	in 2017		in 2019	
	is less than 2016	is 5% less than 2016	is less than 2016	is 5% less than 2016
No removals	<1	<1	<1	<1
FCEY = 0 (11.6 Mlb total)	<1	<1	<1	<1
20 Mlb total	<1	<1	3	<1
30 Mlb total	3	<1	28	9
Blue Line (38.7 Mlb)	19	<1	45	32
Status quo FCEY (41.4 Mlb)	28	1	48	38
Maintain 2015 SPR (42.9 Mlb)	32	<1	50	40
50 Mlb total	45	3	64	48
60 Mlb total	50	22	73	55

Outline

- Data related projects
  - Bycatch and wastage: evaluation of uncertainty
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  - Other updates
- Planning for September

Data weighting

- CAPAM data-weighting workshop, October, 2015

Stewart, I.J., and Monnahan, C.C. *Accepted*. Implications of process error in selectivity for approaches to weighting compositional data in fisheries stock assessments. Fisheries Research *XX: xx-xx*.

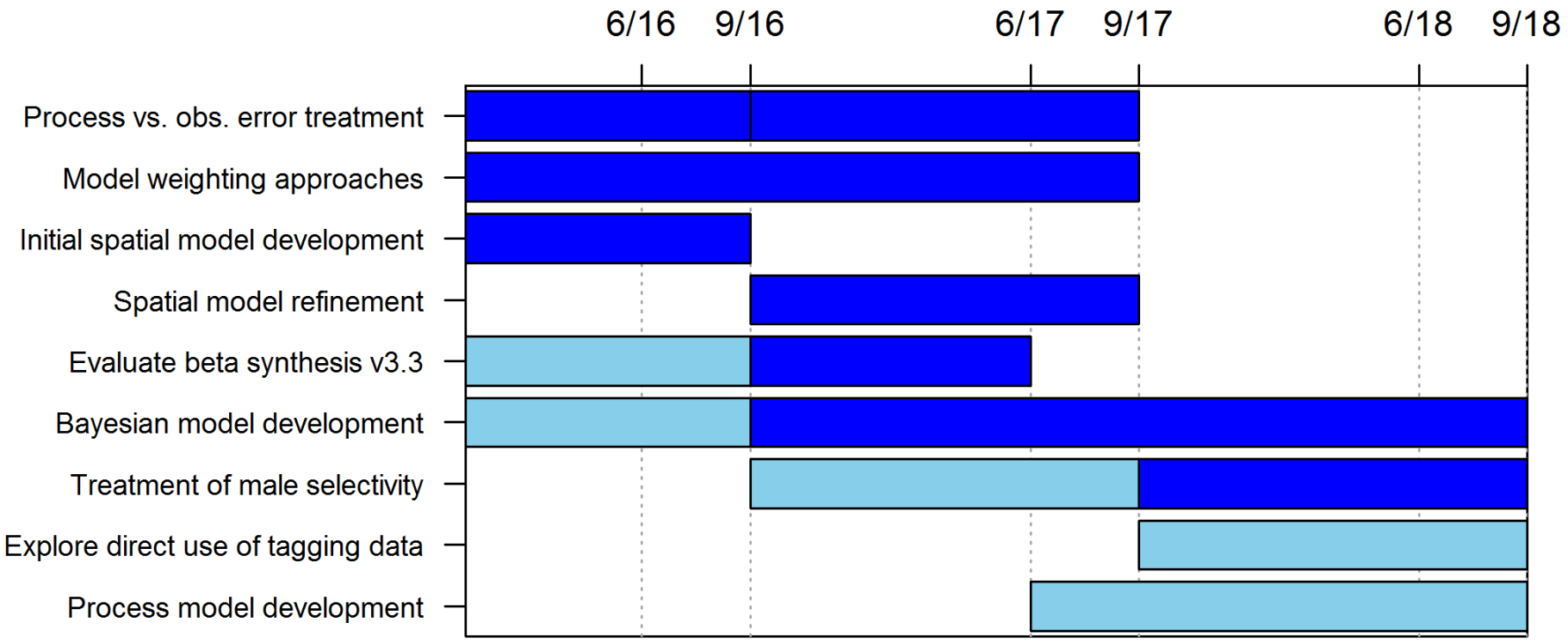
Data weighting

- Lack of fit can be due to process or observation error - need to consider both simultaneously.
- Broad down-weighting of compositional data does not fix a mis-specified model
  - And it can reduce performance of a well specified model.

Some new synthesis (3.3) options

- Better treatment of process error deviations (as parameters)
- Age-based discarding
- Additional posterior distribution output

Workplan - models



Planning for September

- Use model-based survey indices in the assessment?
- Are the bycatch/wastage evaluations ready to use?
- Explore SS v3.3; working toward using it next year
- Transitioning to informed harvest policy discussions at the Annual Meeting
  - Consider an SPR-target based Blue Line (again)?