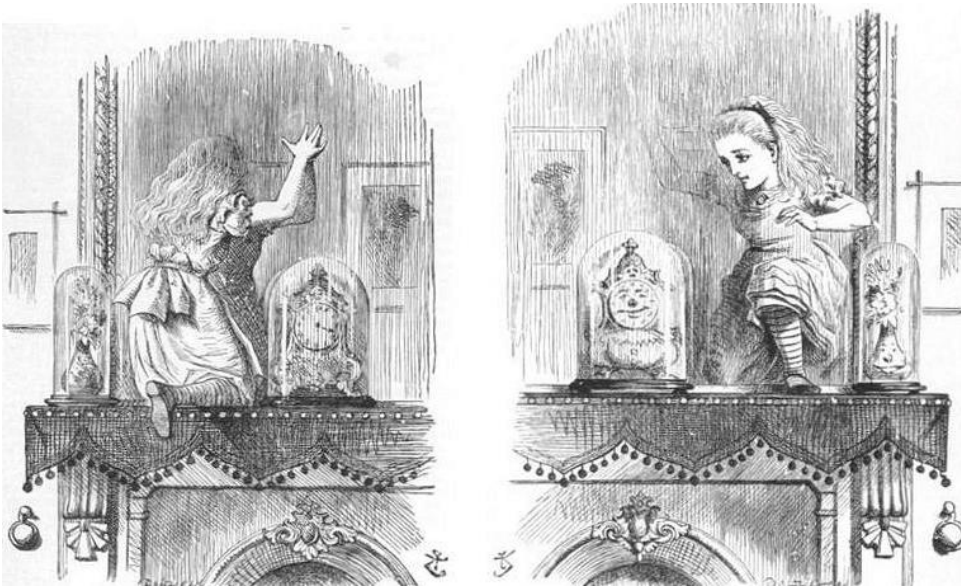


Examples of Extending the MSE for PBR



John Brandon

Outline

1. **Generic vs. Case Specific MSE**
2. **Review a couple examples extending MSE for PBR***
 - i. **Optimal Survey Intervals (Wade and DeMaster 1999)**
 - ii. **Tier System for calculating PBR based on different levels of data availability (Brandon *et al.* 2017)**

*André will be presenting a more recent example (Punt *et al.* 2018)

MSE for Optimal Survey Intervals

- Wade (1998) focused on 'tuning' PBR parameters (e.g. N_{MIN}) to meet the OSP goal of the MMPA
- Subsequently, Wade and DeMaster (1999) applied a similar MSE approach to explore optimum survey intervals
 - Examined the relationship between survey intervals, averaging across estimates, and error rates in classifying stocks as strategic

*Marine Mammal Survey and Assessment Methods, Garner et al. (eds)
© 1999 Balkema, Rotterdam, ISBN 90 5809 043 4*

Determining the optimum interval for abundance surveys

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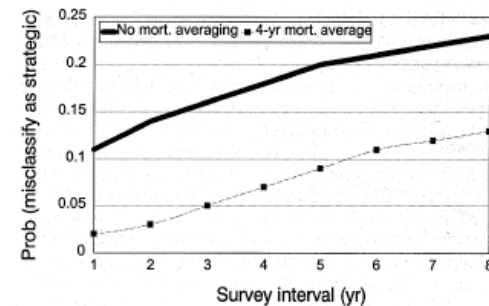


Figure 2. False positive error rate vs. survey interval for the southeast stock of Alaska harbor porpoise: $CV(A)=0.26$, $CV(M)=0.60$. The simulations assumed a 1% true mortality rate. All abundance estimates within an 8-year window were averaged. Mortality was estimated every year. The solid line represents the case where mortality was not averaged (i.e., each annual mortality estimate was used just once). The dashed line represents the case where a point estimate of mortality was calculated by averaging the most recent 4 estimates of annual mortality.

MSE for Optimal Survey Intervals

- Example of using MSE to compare data collection strategies given an objective (e.g. minimizing misclassification errors – false positive “strategic” stocks)
- MSE can inform decisions regarding allocation of survey effort and resources
- There’s not always a ‘one size fits all’ prescription
 - e.g. Optimum survey intervals may be a function of the achieved precision of estimates
- Moves a little bit away from ‘generic’ and slightly more towards a ‘case-specific’ MSE (including specific stocks as case-studies)

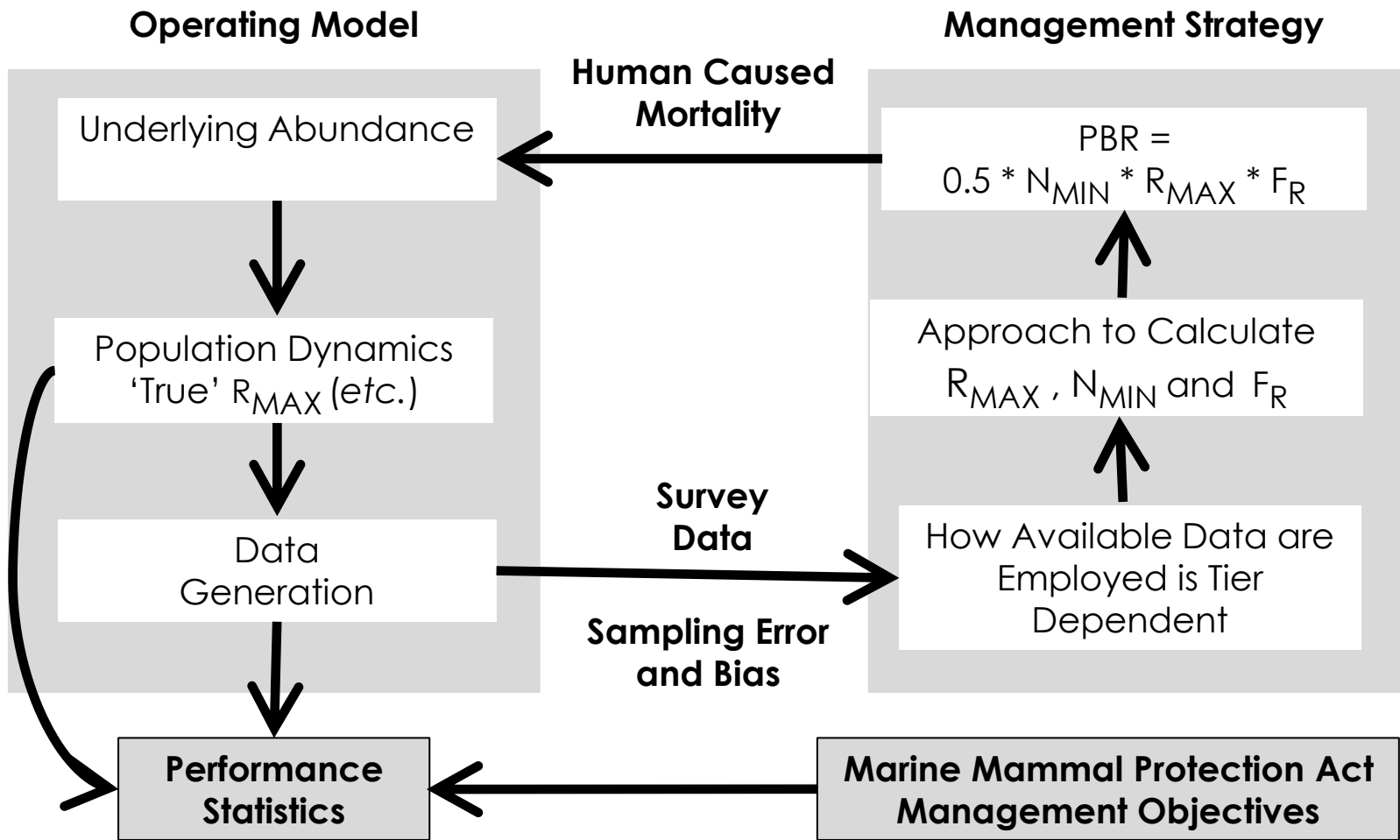
PBR Tier System Example

- Data availability (both quantity and quality) varies across stocks
- The standard approach to calculating PBR only uses the most recent available abundance estimate.
- Tier approach allows formal evaluation of approaches in use, or novel approaches, that haven't been tested.
 - e.g. Averaging multiple abundance estimates when calculating PBR, which is more consistent with approaches used at the IWC
- Incorporating more information in PBR calculations could lead to reduced uncertainty and volatility.

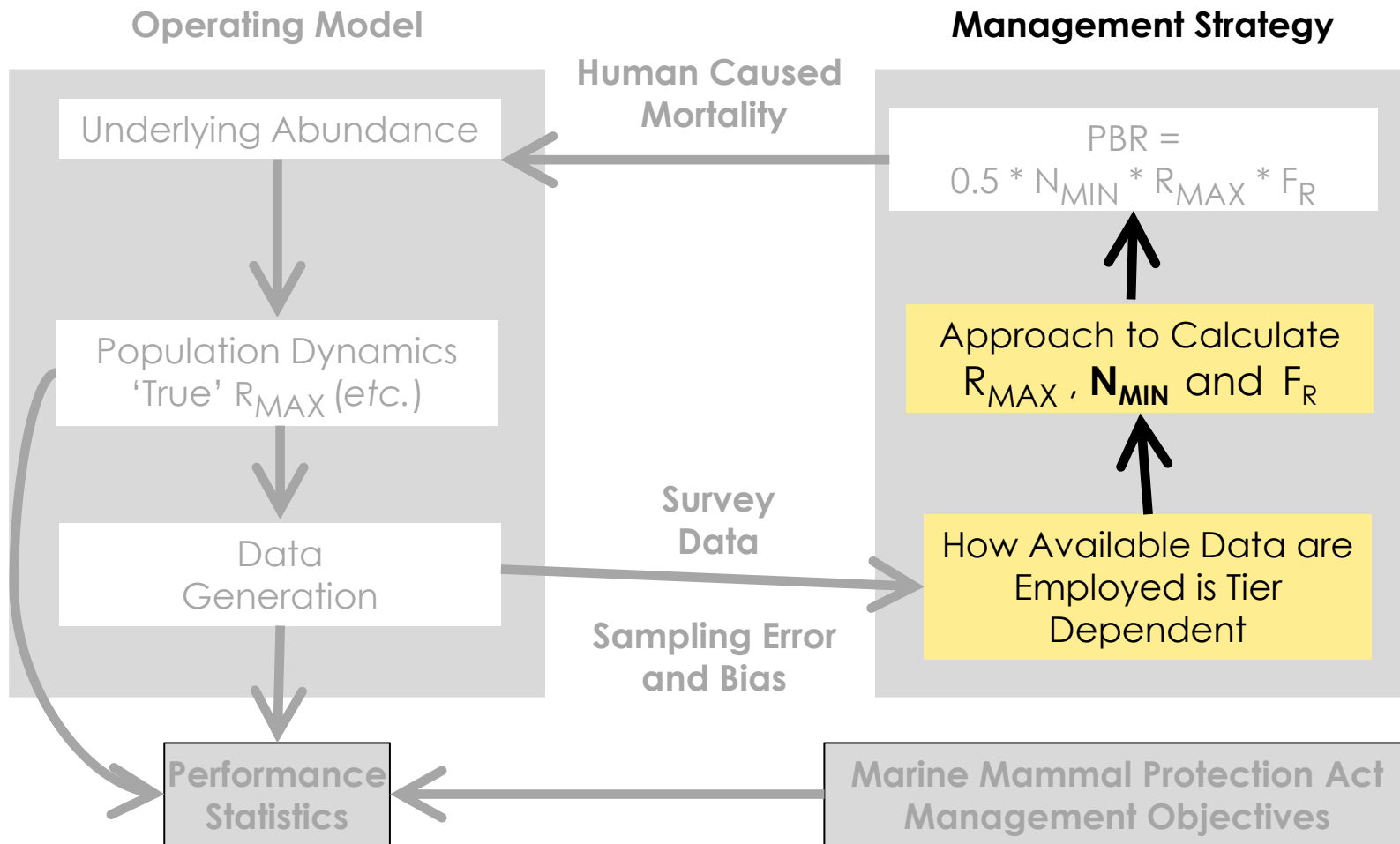
Toward a tier system approach for calculating limits on human-caused mortality of marine mammals

John R. Brandon^{1*}, André E. Punt², Paula Moreno³ and Randall R. Reeves⁴

Structure of the MSE for a PBR Tier System

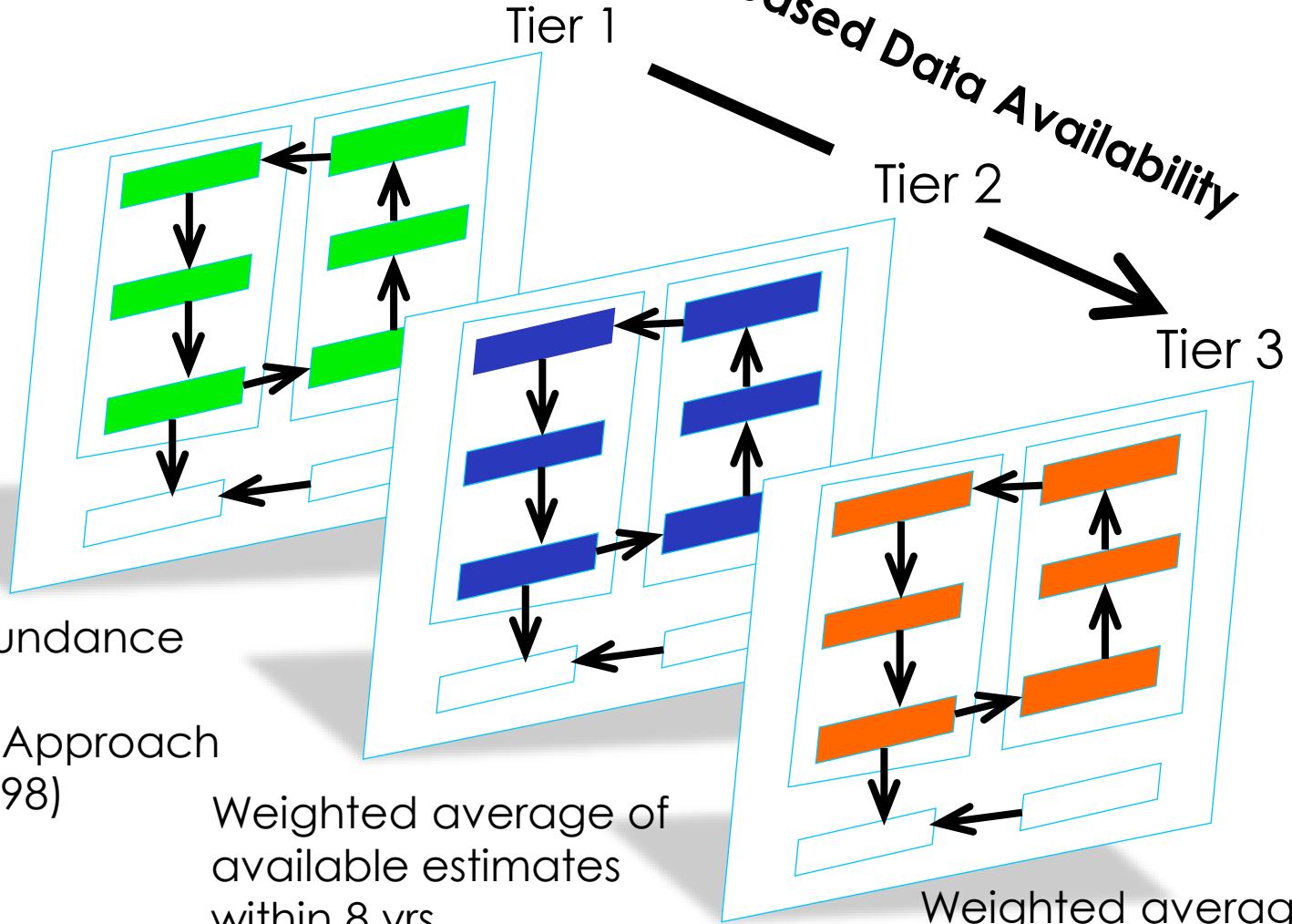


Structure of the MSE for a PBR Tier System



Tiered MSE approach

Increased Data Availability

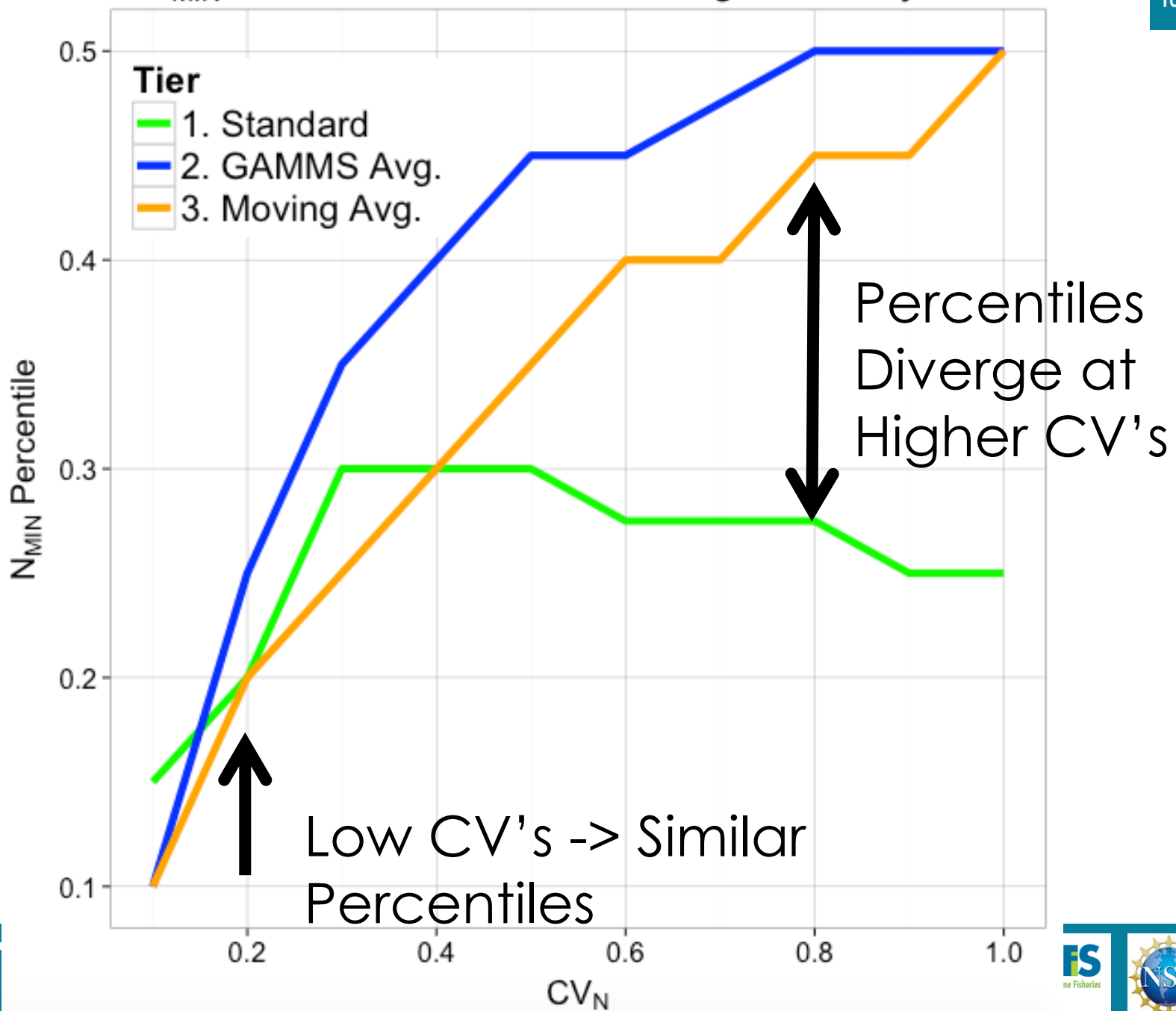


Single abundance estimate:
Standard Approach
(Wade 1998)

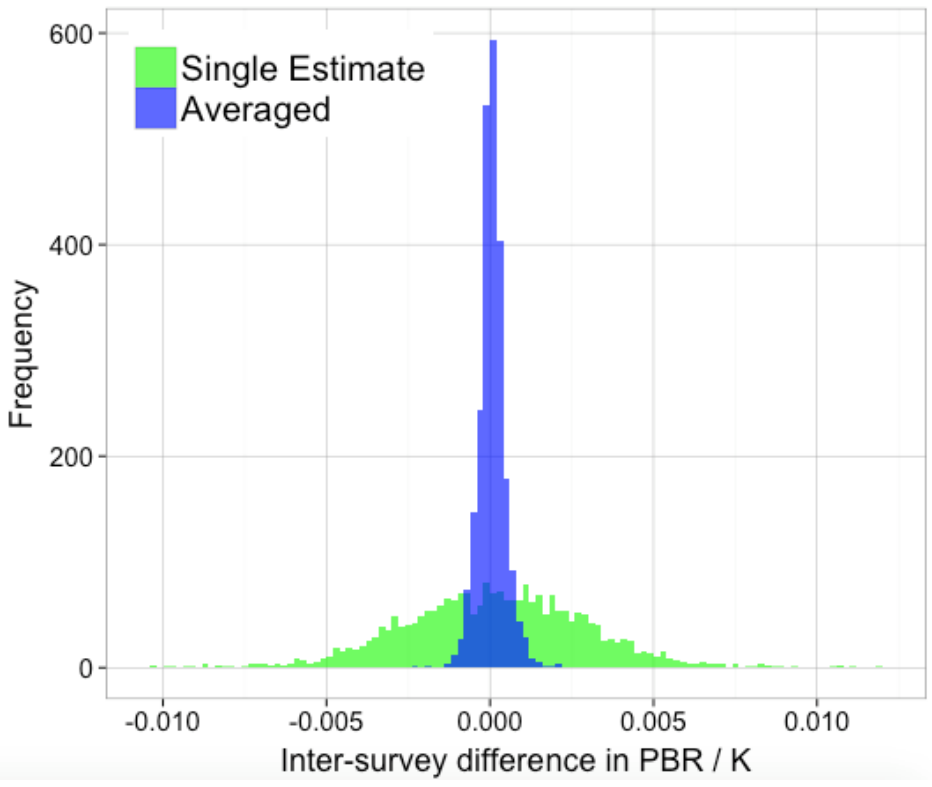
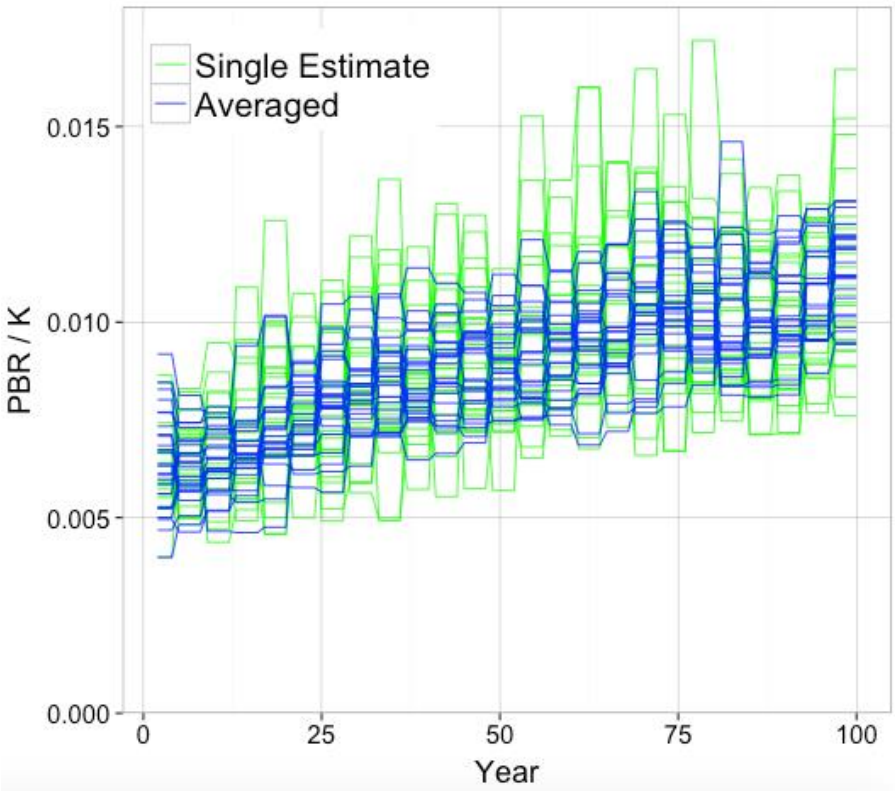
Weighted average of available estimates within 8 yrs.
(NMFS GAMMS 2005)

Weighted average by precision and time since survey: Moving Average

N_{MIN} Percentile That Meets Management Objective



Reduced volatility in PBR



PBR Tier System Example

- Followed previous approach used to test performance of PBR strategies (Wade 1998).
- Different operating model:
 - Sex and age-structured – allowed us to explore the effect of skewed sex-ratios in bycatch
- Example of a ‘generic’ MSE to evaluate performance of alternative approaches to calculating inputs to PBR, given different levels of available data

Open-source code available from:

github.com/John-Brandon/PBR-Tier-System

