mseR-ISCAM

Summary of closed loop simulation framework for
Pacific Herring reference point simulations

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Background

DFO asked Landmark to link ISCAM to mseR for closed loop simulations that mimic DFO management procedures for Herring as closely as possible.

Framework features

Operating Model:

- Age-structured (ages 1- 10)
- Multi-fleet (3 fisheries, 2 surveys)
- Time-varying mortality
- BH stock recruitment

Management Procedures:

- DFO precautionary approach control rule (.25B0 cutoff, 20% harvest rate at .3125B0)
- Three assessment methods:
  - DFO_12: current DFO AM, ISCAM with time-varying M using 12 nodes
  - conM: ISCAM with constant M
  - survIdxData: Data-based rule, uses aerial survey SB estimate in HCR - no smoothing

OM conditioning

Two OMs were conditioned from assessments of 2015 data by ISCAM

1. Strait of Georgia (SOG)
2. West Coast of Vancouver Island (WCVI)

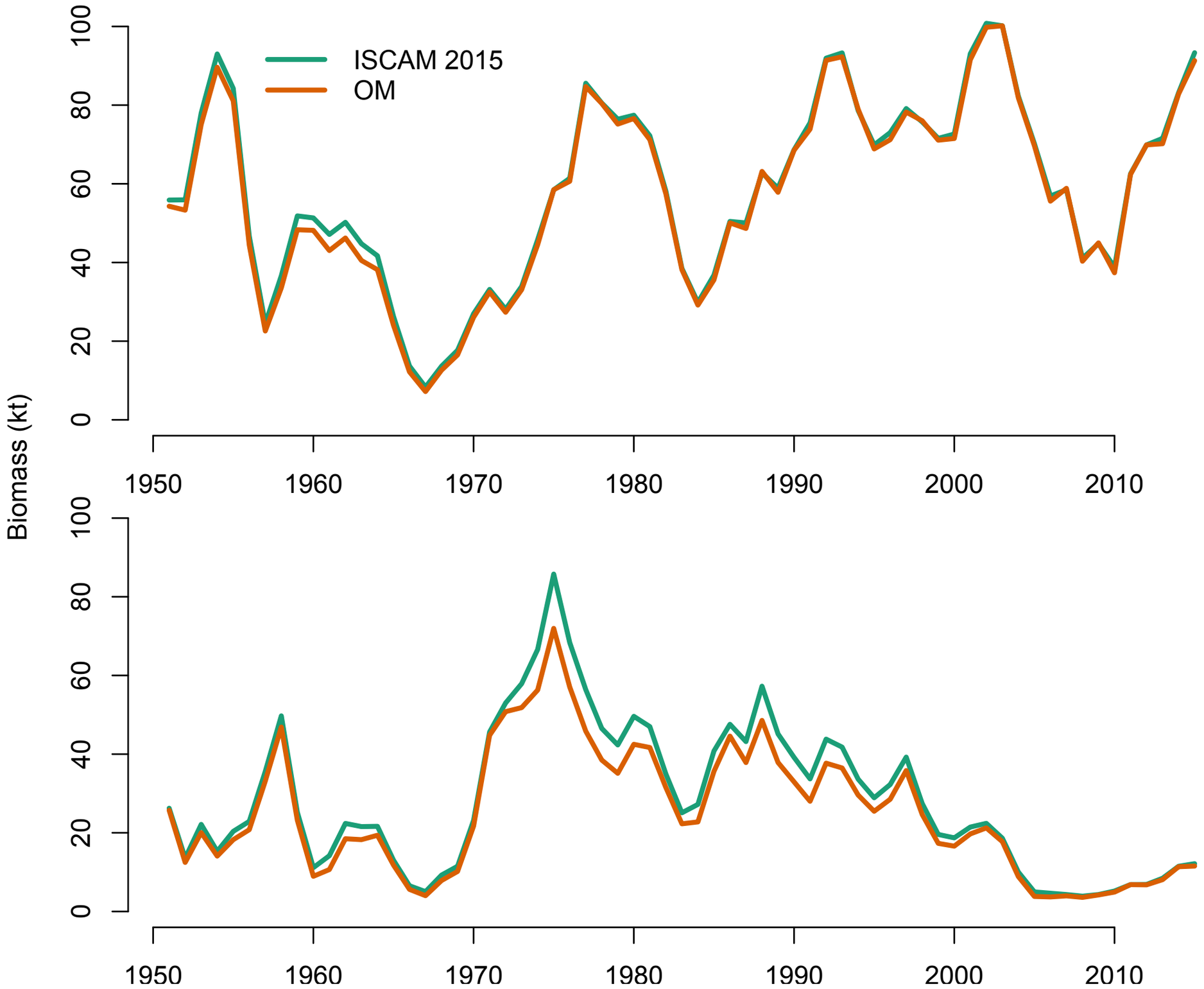
OM conditioning

- Unscaled selectivity curves in ISCAM to produce fully selected F estimates - *previous sim work found that this has no effect on estimates*

- Solved for age-1 recruitments at time t using ISCAM estimates of Mt and age-2 recruitment at time t+1 - *necessary to remove bias from conditioned OM SSBt*

- Assumed maturity at age 1 was 0, and historical weight-at-age used empirical observations in 2015 assessment data

OM conditioning



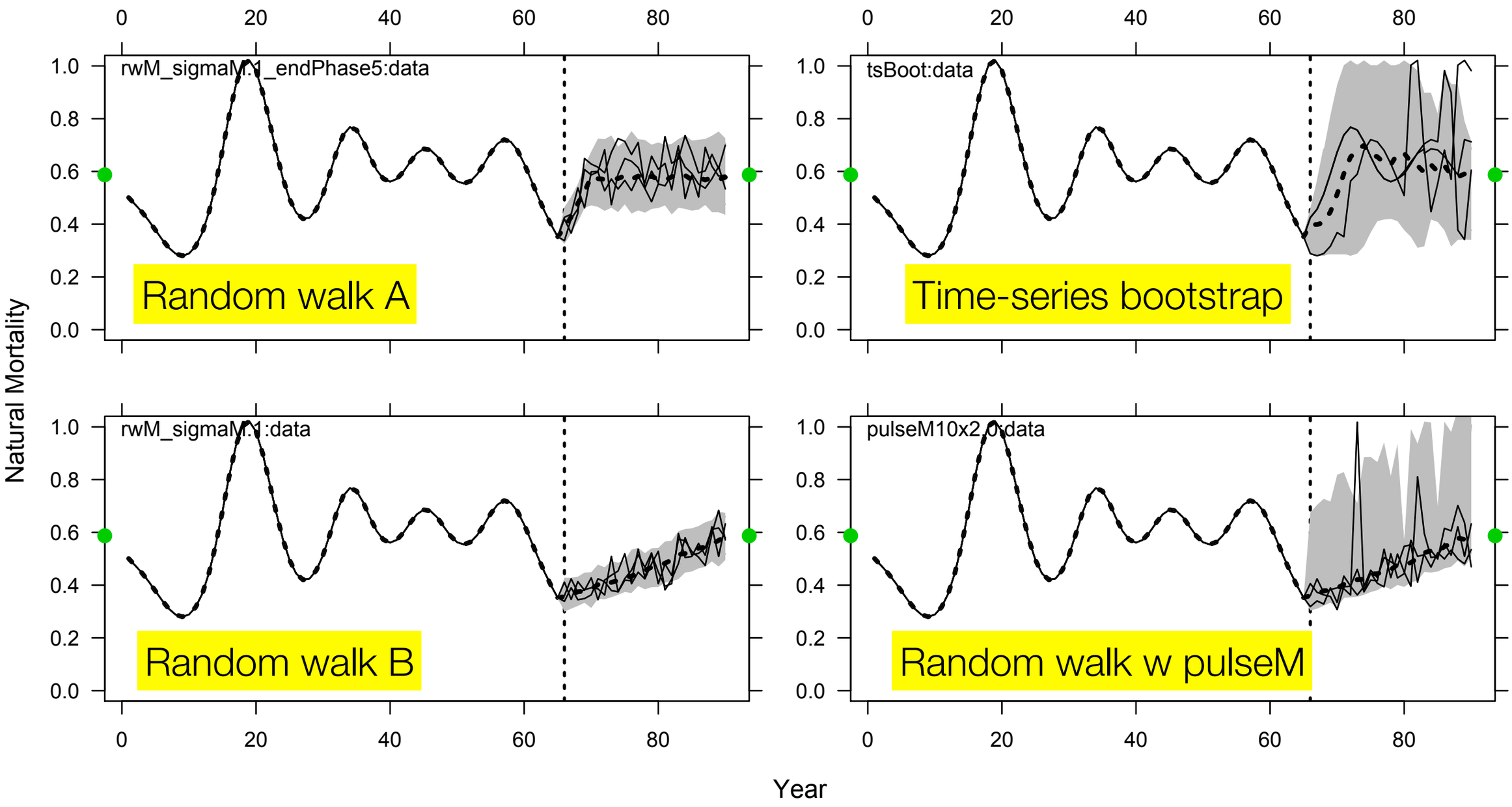
OM projections: random draws

Projections of 25 years (~6 generation lengths) are initialised with unique random seeds, producing random draws of

- Recruitment deviations
- Natural mortality, using either:
  - Random-walk (w/ pulse)
  - Time-series bootstrap

* Following envelope plots are based on 10 replicates! Do not draw conclusions.

M projection examples: dependent on starting point



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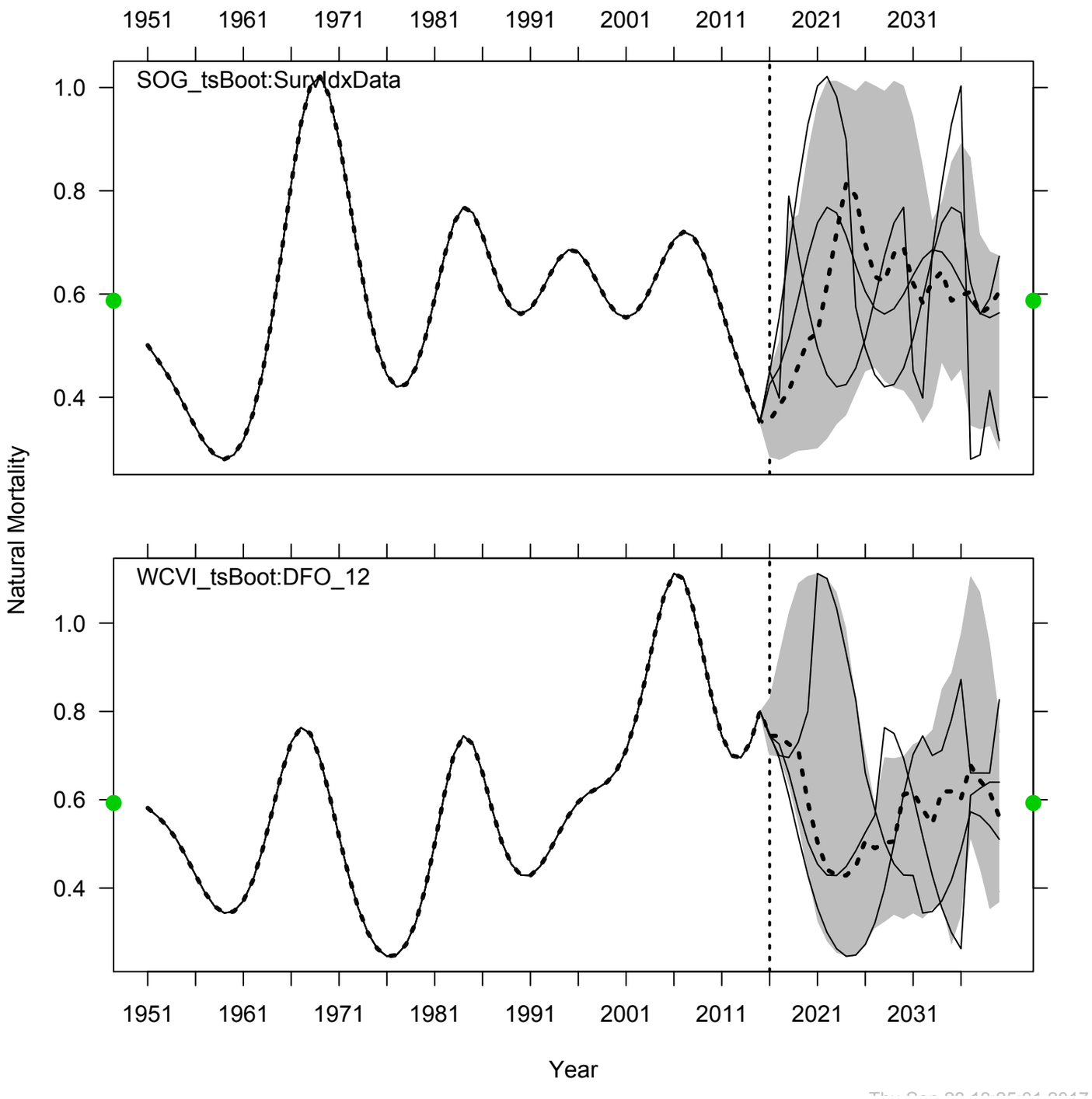
Time Series Bootstrap

- As found in previous study, time series bootstrap tends to approach long-term average
- This can have optimistic or pessimistic outcomes, depending on Mt at the start of the projections



OM projection performance examples

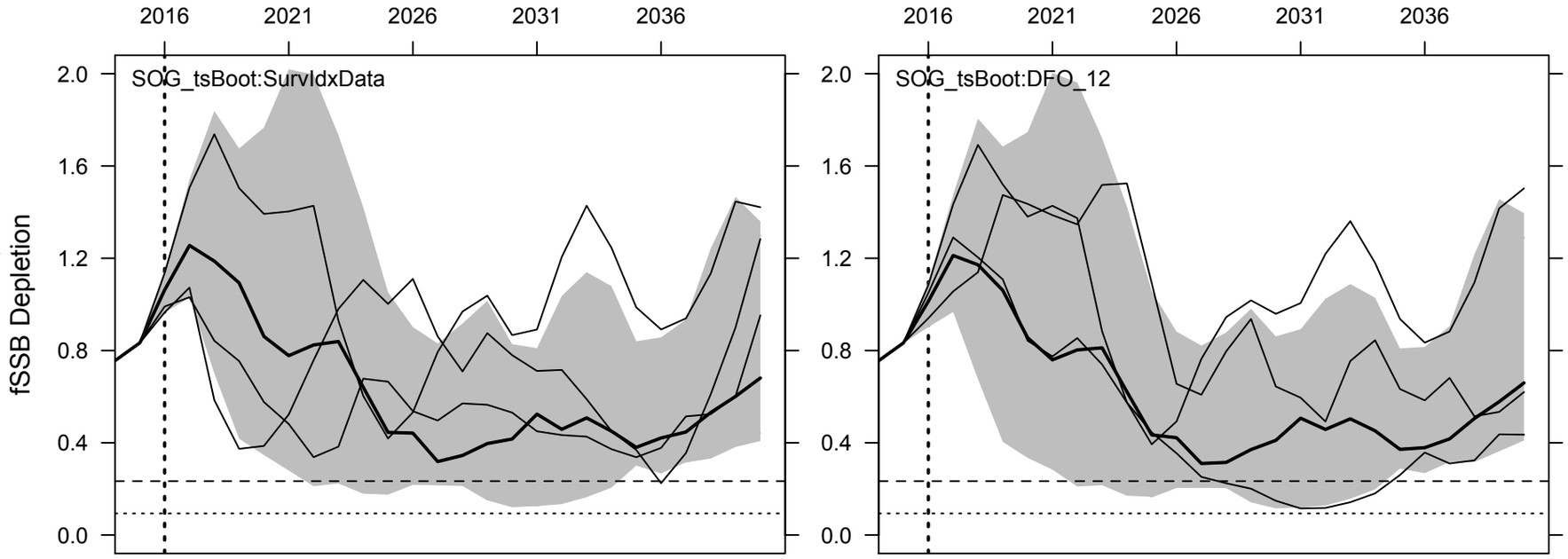
For both SOG and WCVI, the projections are optimistic.

- SOG Bt currently very high, and growing. Low current Mt implies continued growth
- WCVI Mt currently much lower than average, projections return to average so produce growth

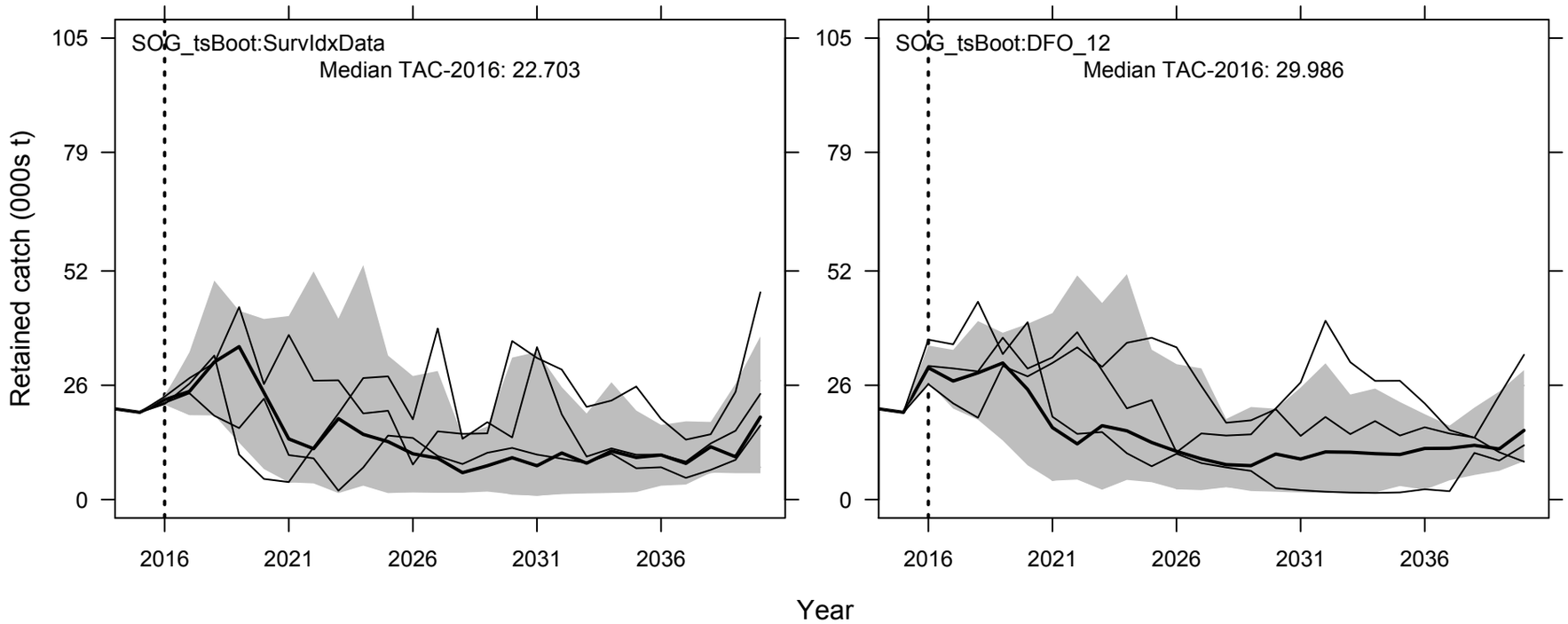
conM AM setting has trouble converging on SOG projections. If we want to test this procedure, some tinkering is necessary.

SOG projections under survIdxData and DFO_12

Optimistic Depletion →



Stable Catch →



Similar Performance of Data and ISCAM? *10 reps

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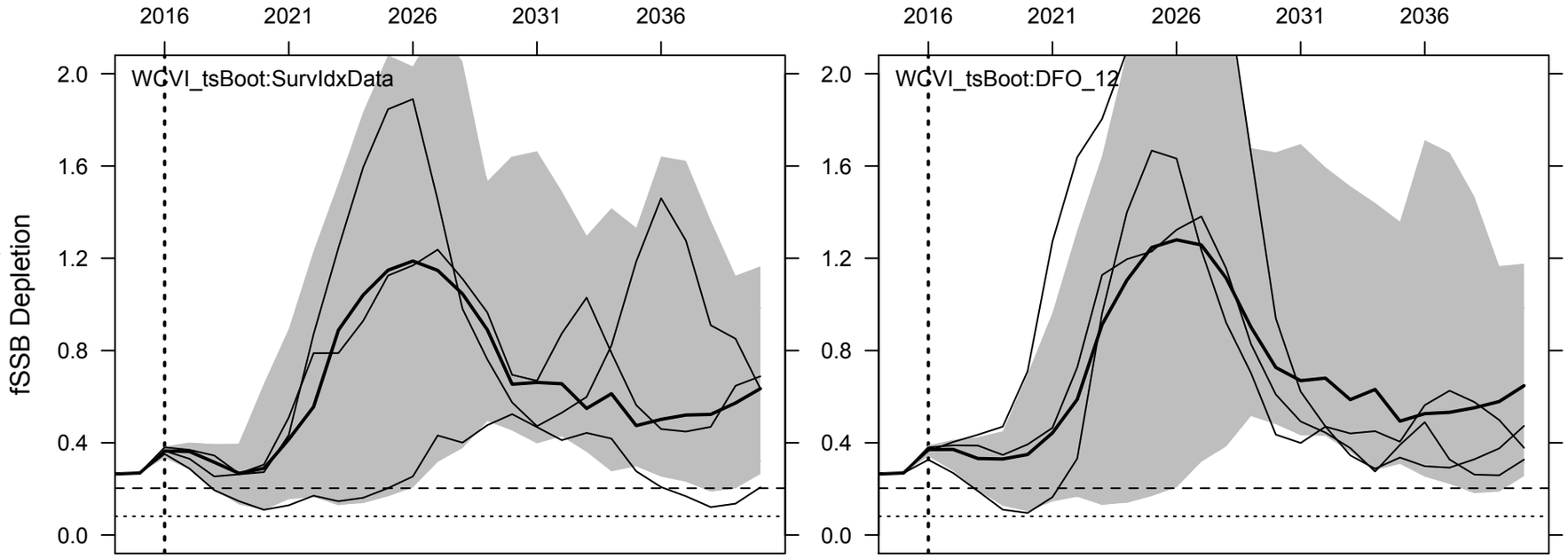
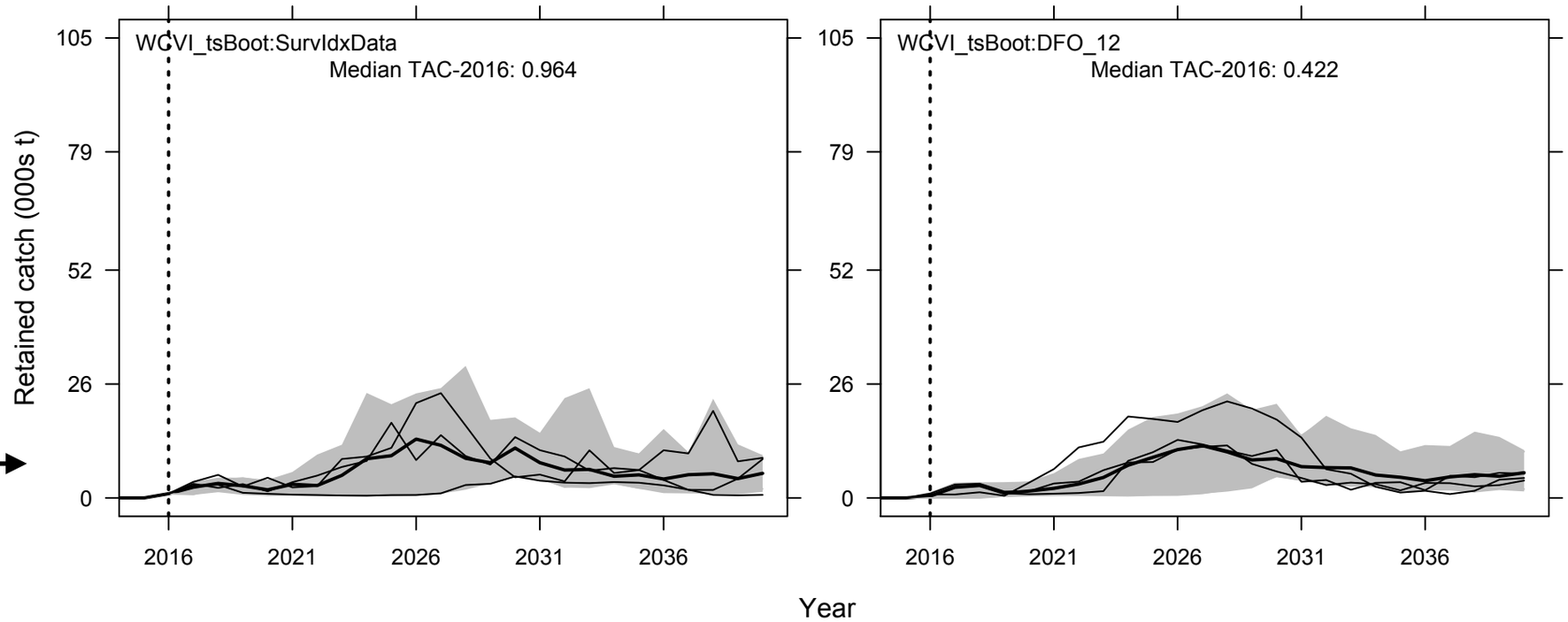
WCVI projections under survIdxData and DFO_12

Large growth →



Similar Performance of Data and ISCAM? *10 reps

Open Fishery →



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Next Steps

What else is required to make mseR-ISCAM ready for USR and LRP sims?

Sample options:

- Further fine-tuning of OM conditioning (e.g. reduce slack in WCVI)
- Encourage conM to run on SOG projections
- Other M projection methods with more variation in average behaviour

Speed Issues

- mseR-ISCAM is VERY slow: A single simulation run of 100 replicates will take approx. 16 hours to complete.

- This can be mitigated by parallel processing, which will complete ~23 runs in 16 hours on our lab server

- We will run a comparison of assessCA and ISCAM on a single fleet OM to check the benefit of using ISCAM