INTERNATIONAL PACIFIC HALIBUT COMMISSION

Development of the 2025 stock assessment

Agenda item: 4.1.2
IPHC-2025-SRB027-07
(I. Stewart, A. Hicks & R. Webster)

Outline

- Stock assessment and review process
- SRB requests
  - Commercial and FISS CPUE
  - Maturity and fecundity
  - Bridging and preliminary 2025 models
  - Priors on natural mortality
  - Retrospective evaluation of management information
  - Recruitment projections
  - State-space modelling
- Finalizing the 2025 stock assessment

Stock assessment and review process

- Full stock assessments – every ~3 years
  - 2015, 2019, 2022, **2025**
  - Includes re-evaluation of all data sources, model structure, etc.
  - Updated stock assessments in intervening years:
    - Only minor/necessary changes as data sets and methods evolve
- June SRB review
  - Research and development
  - Recommendations primarily to the Secretariat
- September SRB review
  - Finalizing the assessment and planning for next June
  - Recommendations to the Secretariat and Commission

SRB requests and recommendations

- SRB025 (para. 20):

  *"The SRB **REQUESTED** an analysis of the relationship between commercial CPUE and the FISS WPUE at the coastwide and regional levels to investigate the strength of hyperstability/hyperdepletion in CPUE for the stock assessment in 2025. This analysis should include two scenarios: (i) the historical FISS WPUE estimates and (ii) FISS WPUE estimates calculated from reduced designs (i.e. subset the historical FISS data and recalculate WPUE from the reduced data set). The statistical model used for the analysis should account for uncertainty in the FISS index (the X-axis variable) using, for example, an error-in-variables approach like that in Harley et al. 2001 (CJFAS). This analysis represents a first step in including presumed hyperstability in scenarios that investigate the impacts of reduced FISS designs."*

- SRB026 (para. 18):

  *"The SRB **RECOMMENDED** that the 2025 stock assessment incorporate the new maturity ogives, however, the incorporation of new fecundity information should be delayed until the next full stock assessment when more robust data and analysis of fecundity at age/weight information are available."*

- SRB026 (para. 21):

  *"The SRB NOTED the bridging, data updates, and sensitivity analyses on the stock assessment and **RECOMMENDED** adopting those changes and moving forward with the final models presented at SRB026."*

- SRB026 (para. 22):

  *"The SRB **RECOMMENDED** conducting a sensitivity analysis of all ensemble models to the use of a Normal (rather than Lognormal) prior distribution on natural mortality. The Normal distribution is the least informative option when an informative prior is needed."*

- SRB026 (para. 23):

  *"The SRB **RECOMMENDED** an analysis of historical performance of the decision table metrics, i.e. a retrospective analysis of stock assessment outputs used in management advice."*

- SRB026 (para. 24):

  *"The SRB **RECOMMENDED** that recruitment projections in the stock assessment and Management Strategy Evaluation (MSE) incorporate a random-walk starting from the most recent reliable recruitment estimate to constrain expected short-term recruitment around recent estimates rather than immediately reverting to the stock-recruitment relationship."*

- SRB026 (para. 26):

  *"The SRB **RECOMMENDED** that a candidate state space assessment model (e.g. WHAM) be developed for Pacific halibut and presented by SRB032, tentatively scheduled for June 2028. Progress toward this modelling framework may also be presented at interim SRB meetings."*

SRB requests and recommendations

- SRB025 (para. 20):

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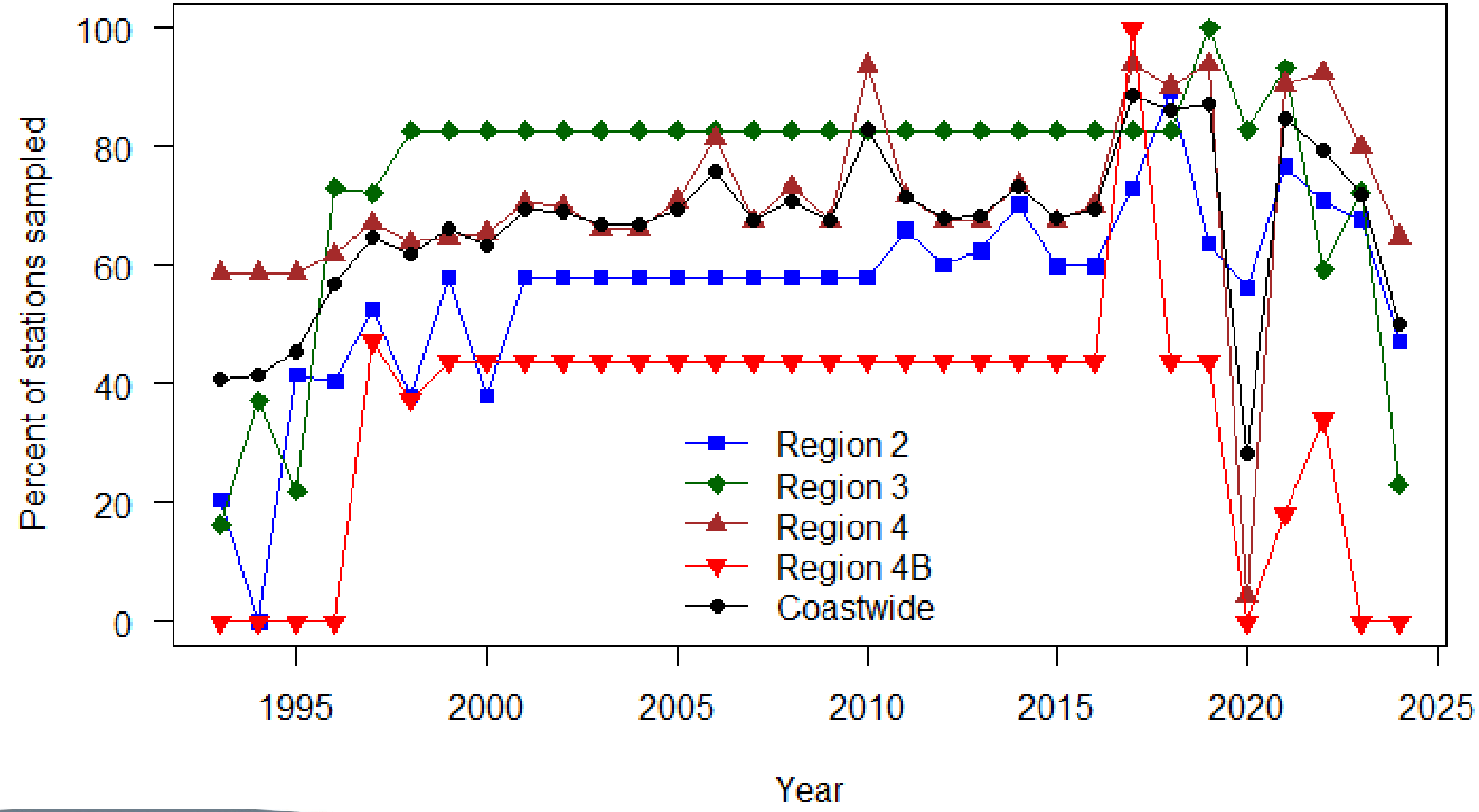
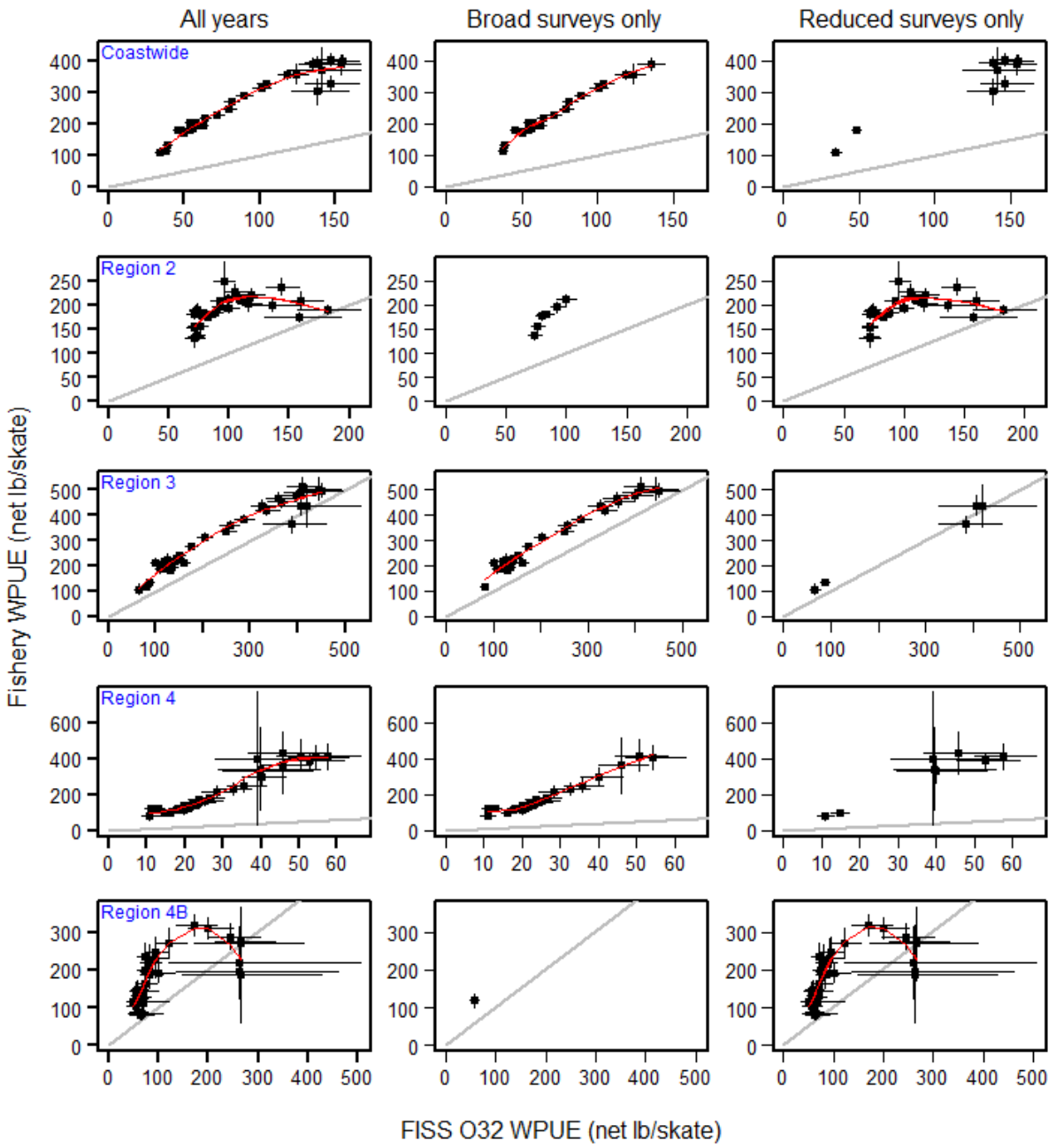
FISS annual coverage (of 1,890 full design stations)



Commercial vs FISS CPUE

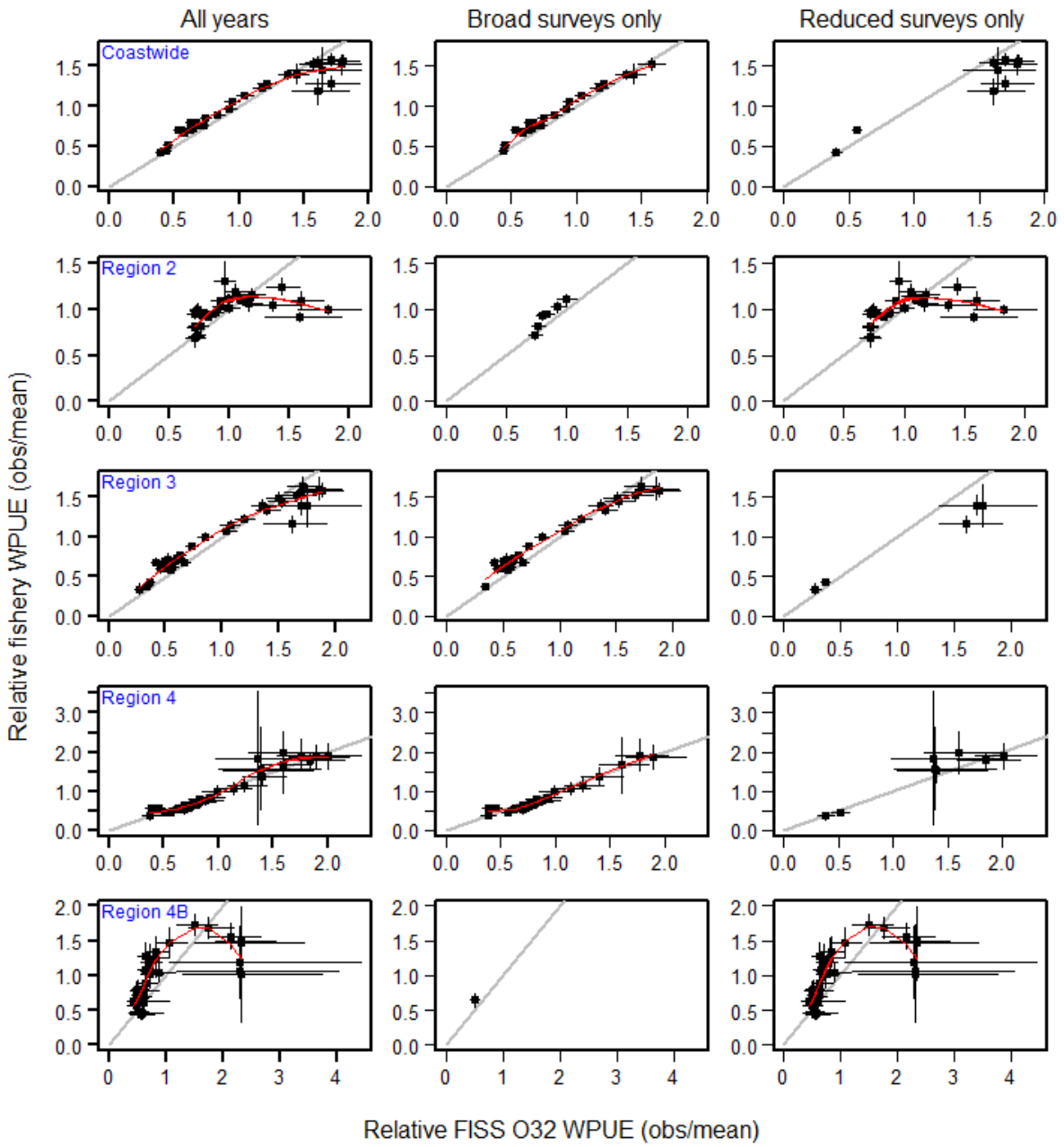
"Broad surveys": >= 65% of stations

"Reduced surveys": < 65% of stations



Relative commercial vs FISS CPUE

- Divide each series by the mean
- Removes catchability difference



SRB requests and recommendations

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- Updated maturity is included in the 2025 stock assessment, per the bridging analysis completed in June
- Fecundity data will be collected, analyzed and included in the 2028 full stock assessment

SRB requests and recommendations

- SRB026 (para. 21):

  *"The SRB NOTED the bridging, data updates, and sensitivity analyses on the stock assessment and **RECOMMENDED** adopting those changes and moving forward with the final models presented at SRB026."*

- All model development has continued from the June preliminary assessment after bridging.

SRB requests and recommendations

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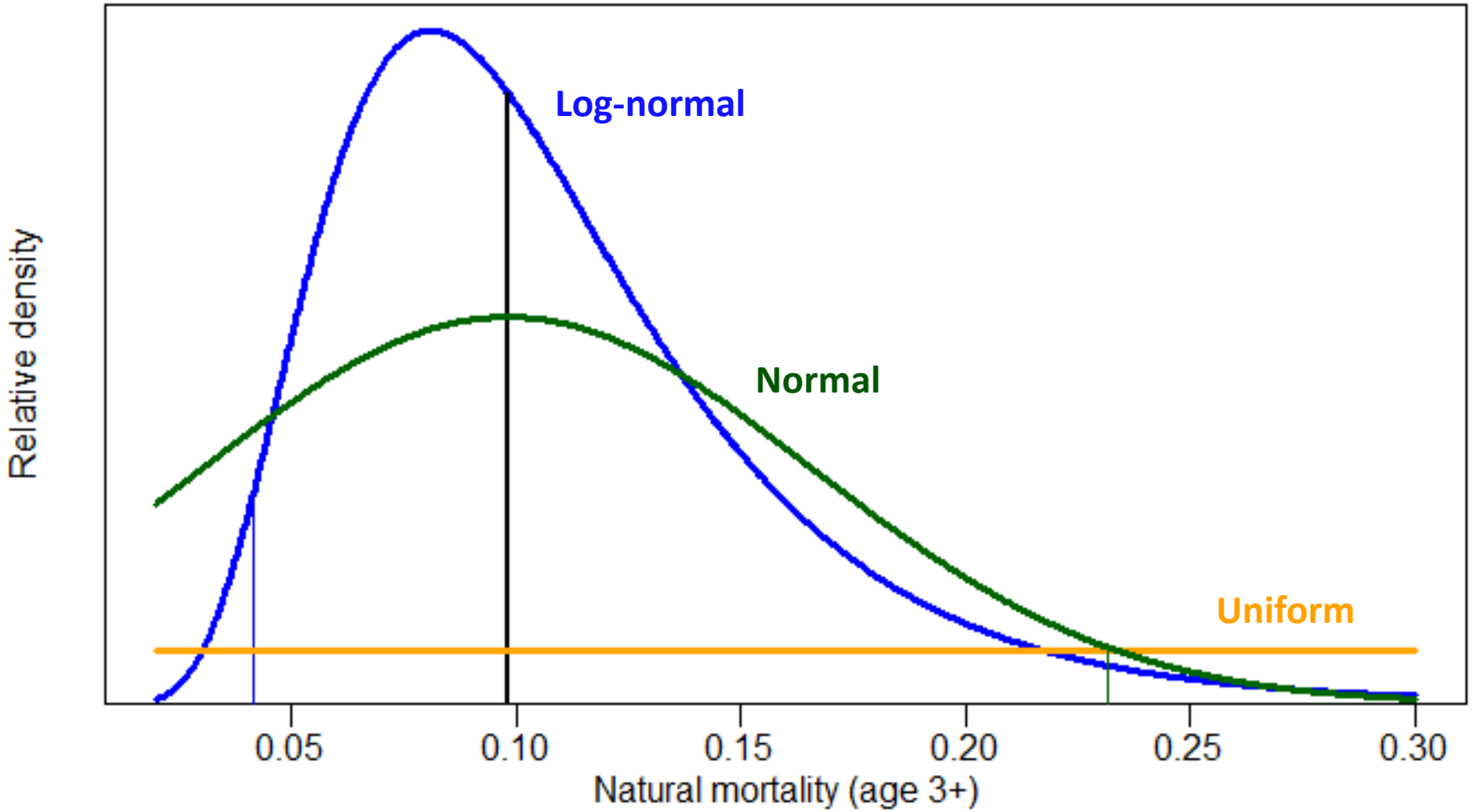
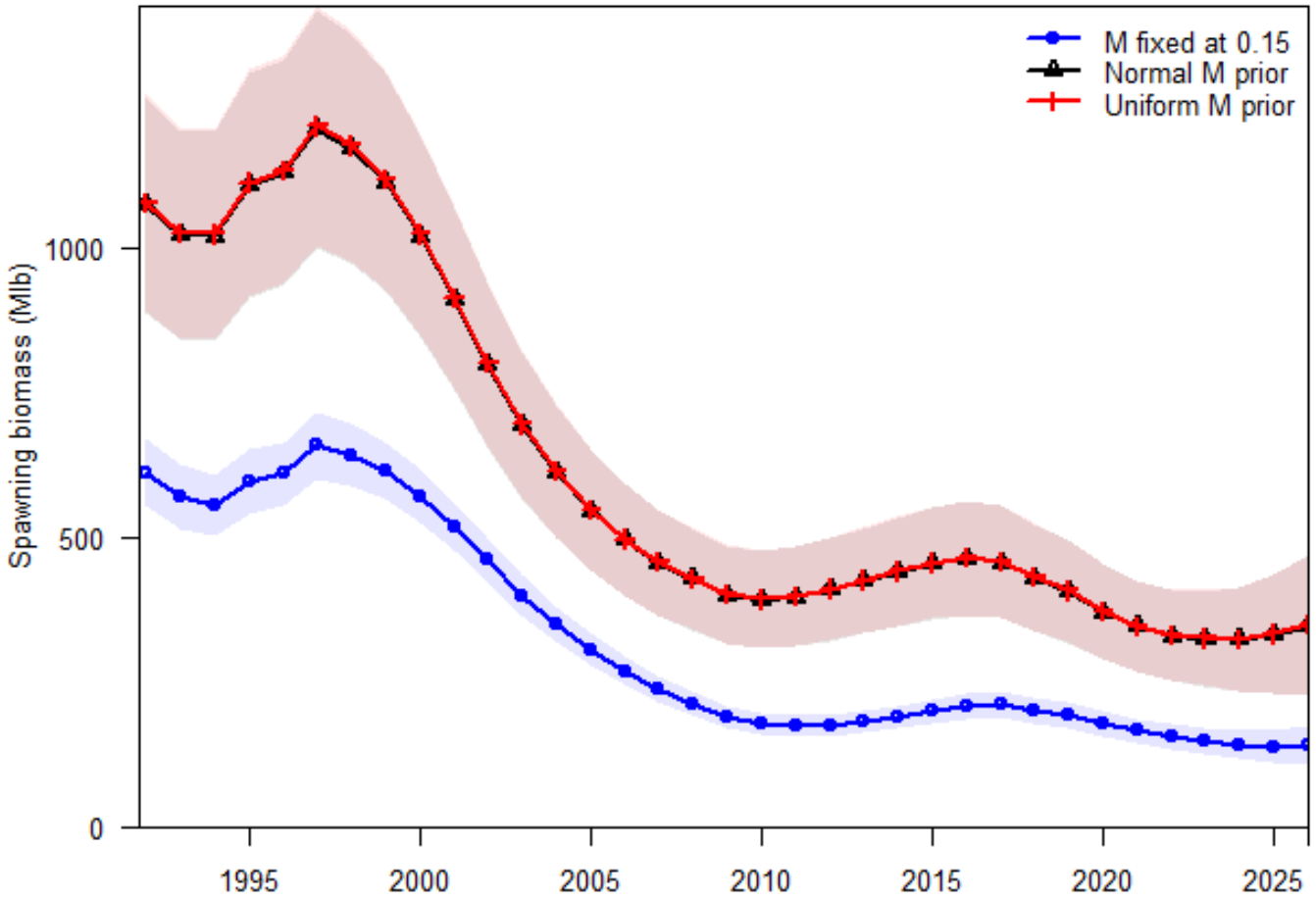
Priors on natural mortality



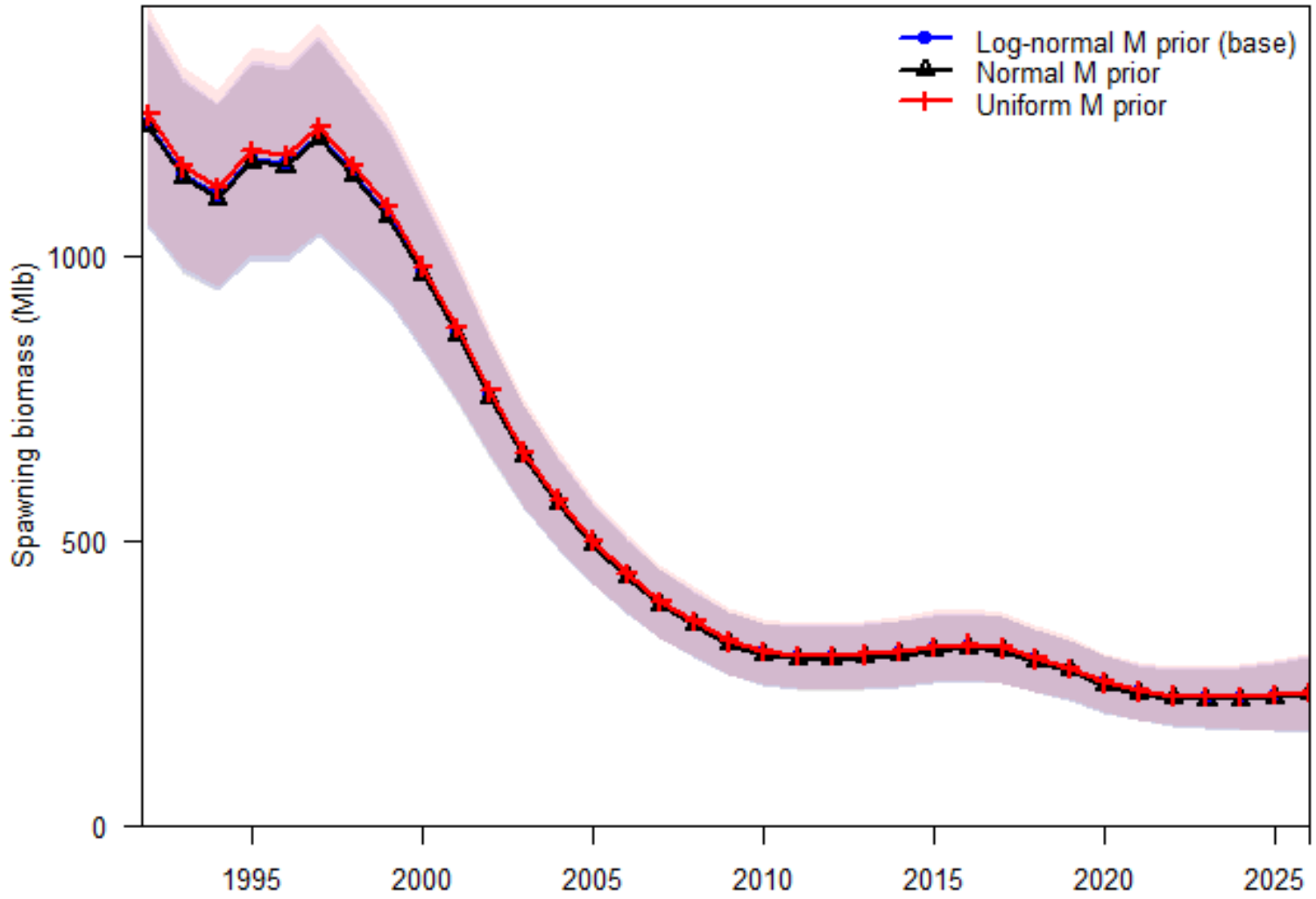
(PDFs scaled independently for easier visualization)

Priors on natural mortality – short coastwide model

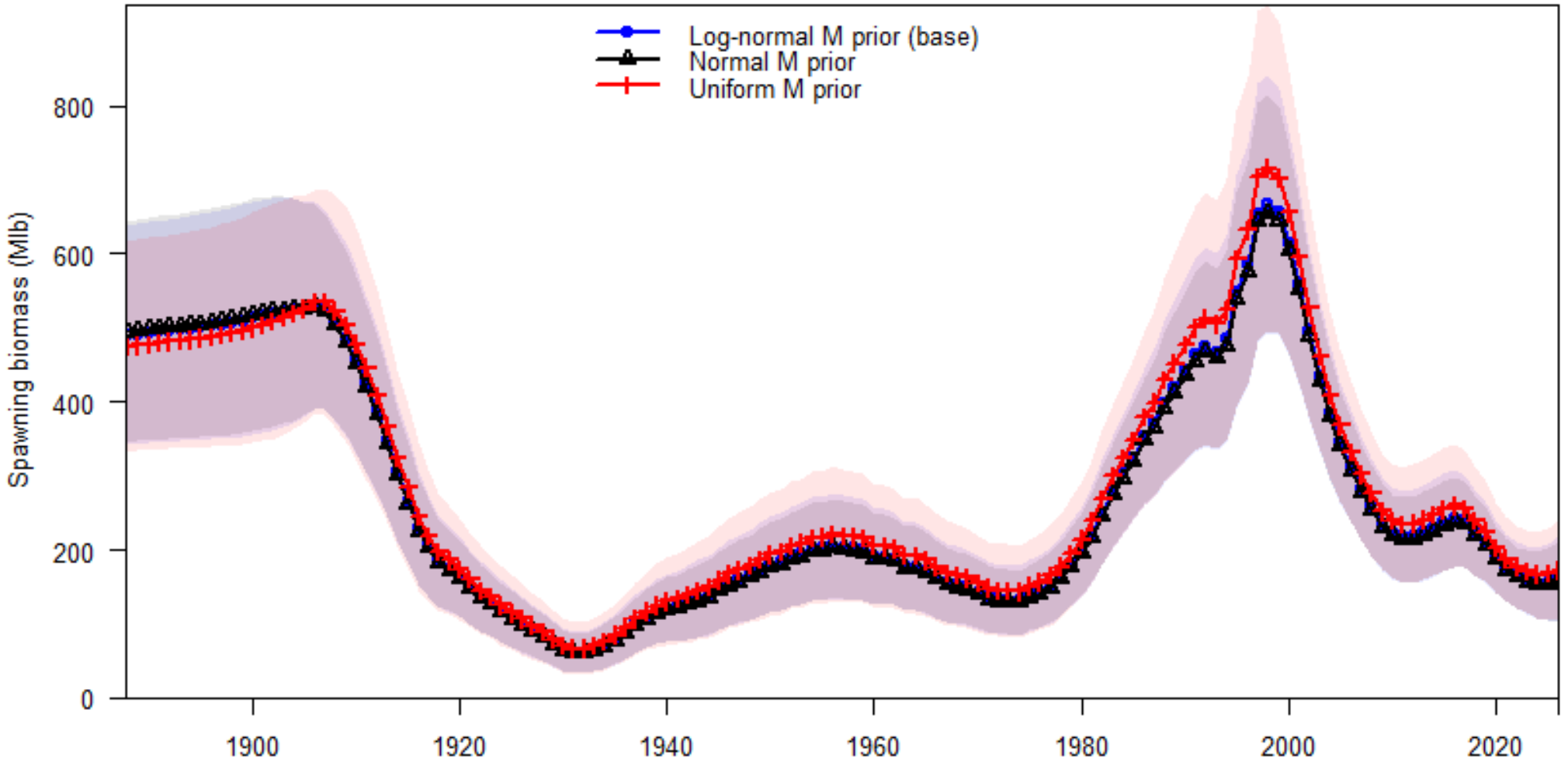


M at upper bound (0.25)

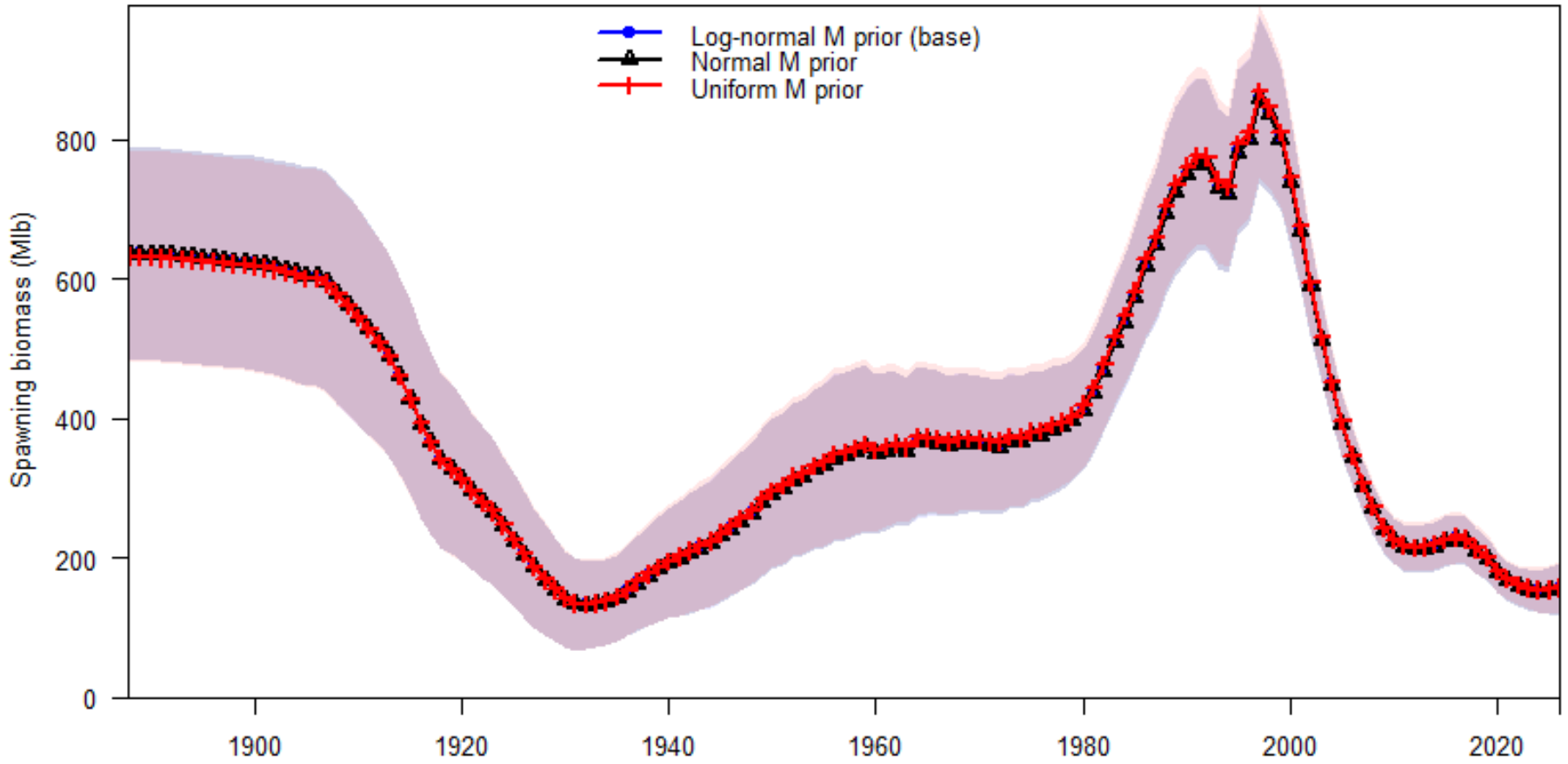
Priors on natural mortality – short AAF model



Priors on natural mortality – long coastwide model



Priors on natural mortality – long AAF model



SRB requests and recommendations

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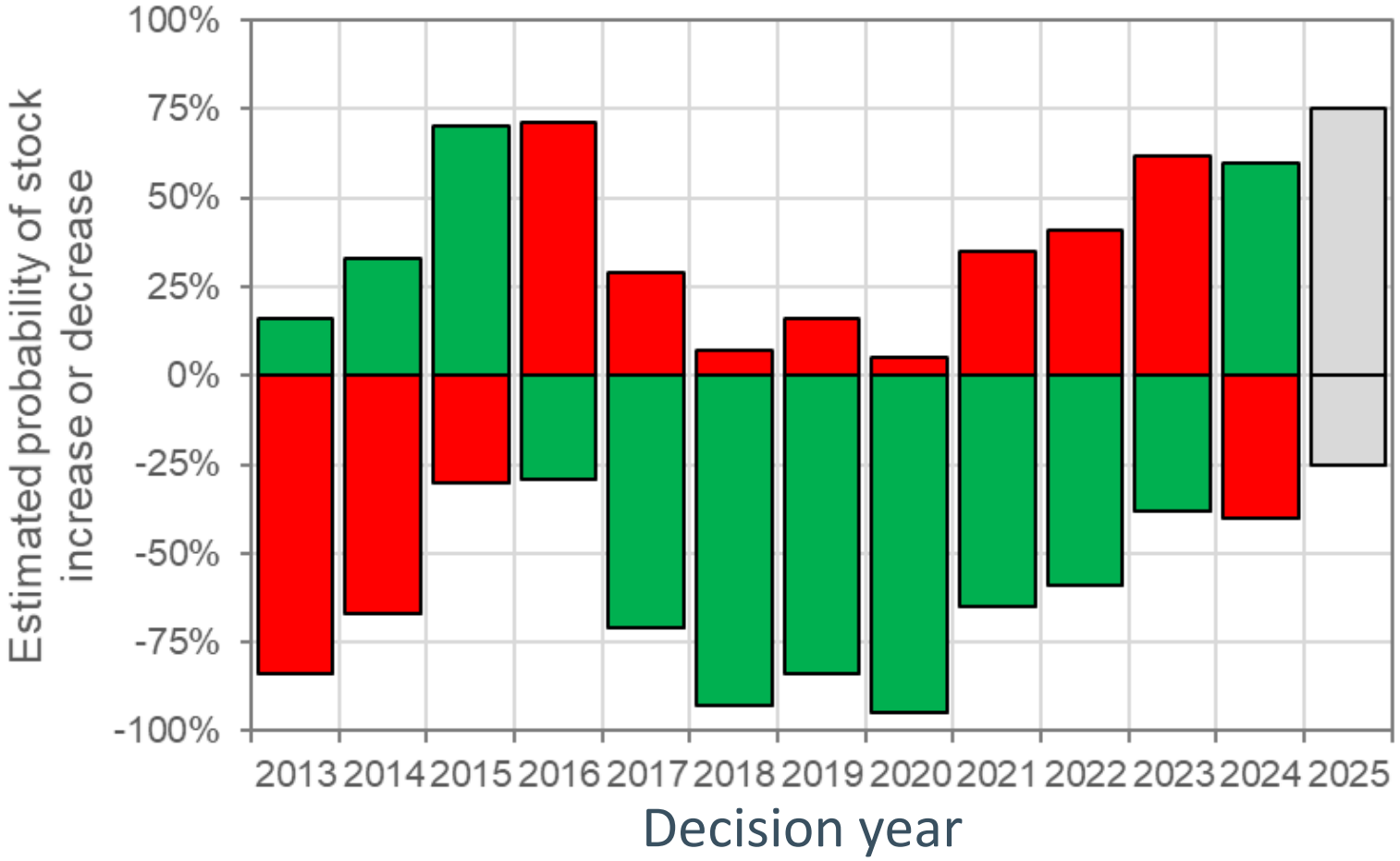
Decision table retrospective

- Two key management metrics from the decision table:
  - Probability of stock decline over the next year
  - Probability of stock decline of at least 5% over the next year
  - The “data”:

	At the time		Current assessment
Decision year	Estimated P(decline)	Estimated P(decline>=5%)	Estimated stock change
2013	84%	4%	2%
2014	67%	1%	3%
2015	30%	1%	3%
2016	**29%**	1%	-1%
2017	**71%**	**10%**	**-5%**
2018	**93%**	**19%**	**-5%**
2019	**84%**	**34%**	**-8%**
2020	**95%**	**62%**	**-7%**
2021	**65%**	**39%**	**-5%**
2022	**59%**	25%	-4%
2023	**38%**	7%	-1%
2024	40%	9%	3%
2025	25%	4%	NA

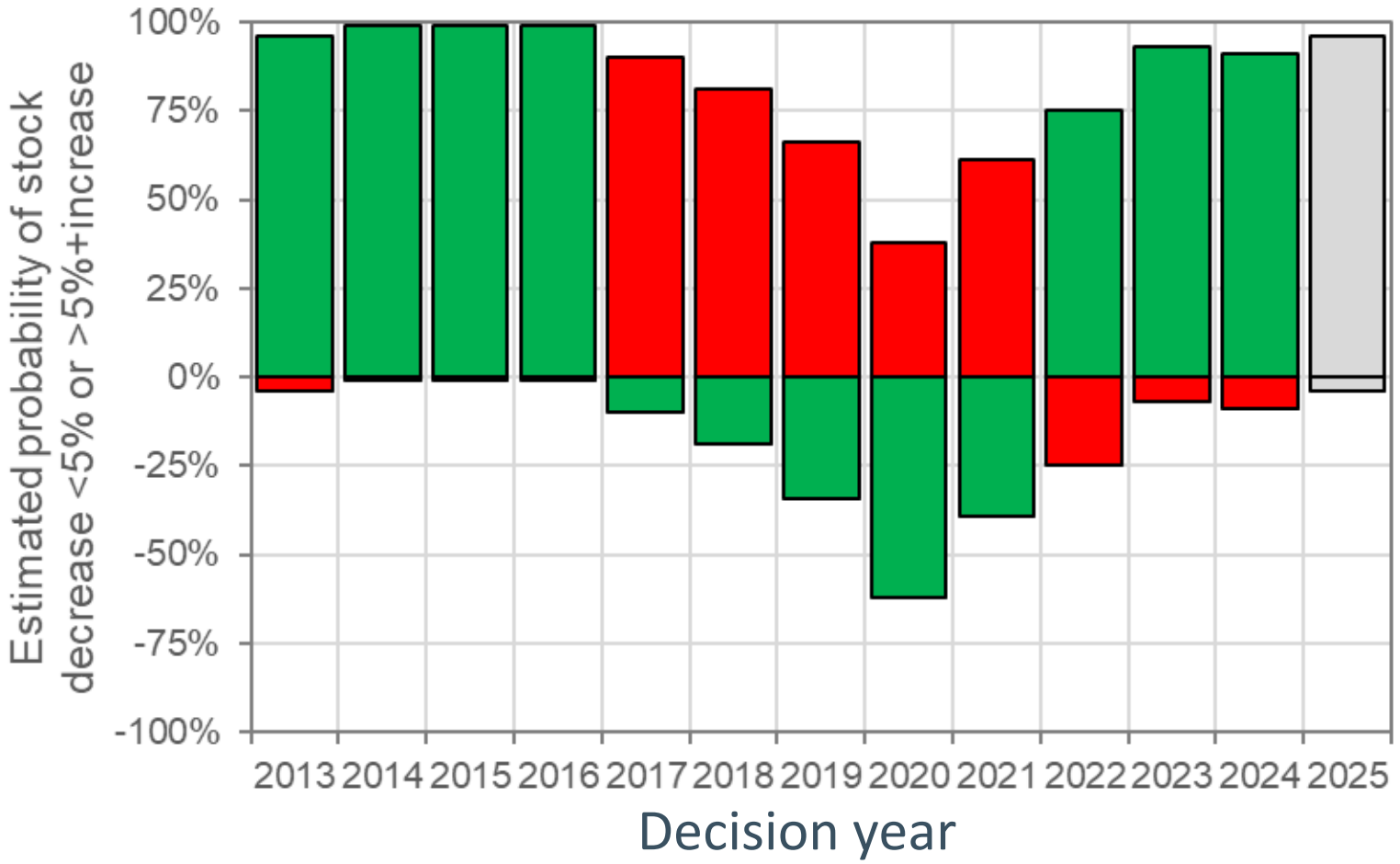
Decision table retrospective – stock decline

Probability of the "actual" outcome / Probability of the other outcome



Decision table retrospective – stock decline >= 5%

Probability of the "actual" outcome / Probability of the other outcome



SRB requests and recommendations

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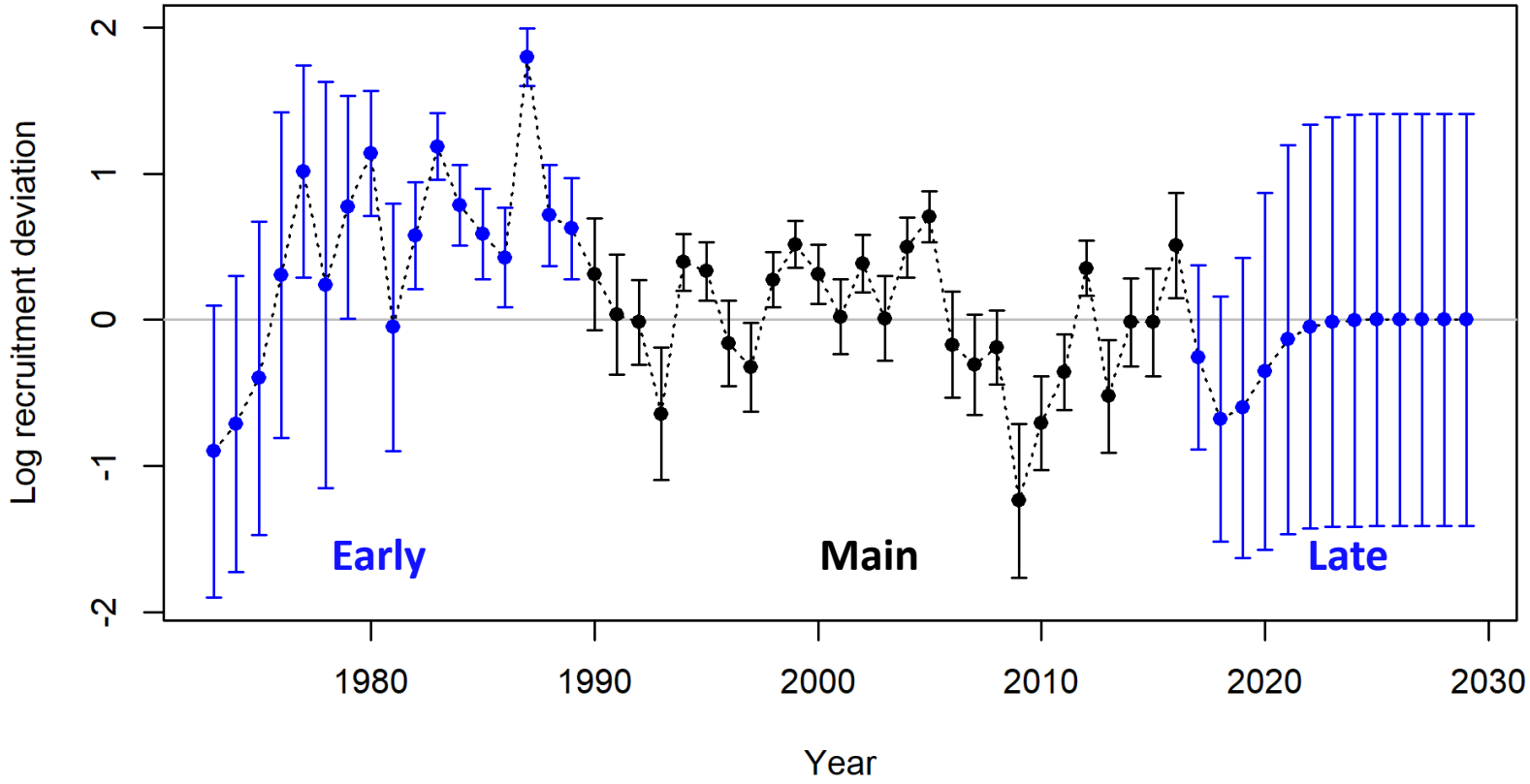
Recruitment projections

- The assessment projections are limited to 3 years from the last year of the model:
  - FISS observes fish from ~age-5 onward
  - Maturity increases steeply at about age 8
  - ‘Unobserved’ cohorts will have little effect on projection of spawning biomass

Recruitment projections

- Treatment of recruitment deviations:

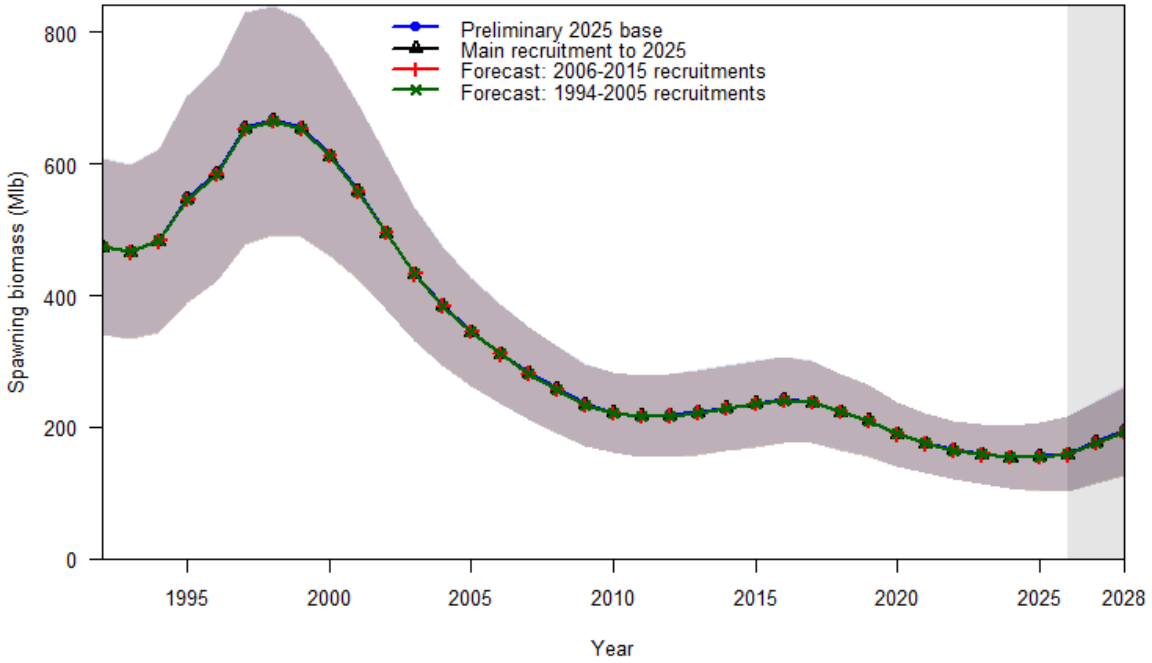
  Early, Main (centered on S-R function), Late (includes forecast)

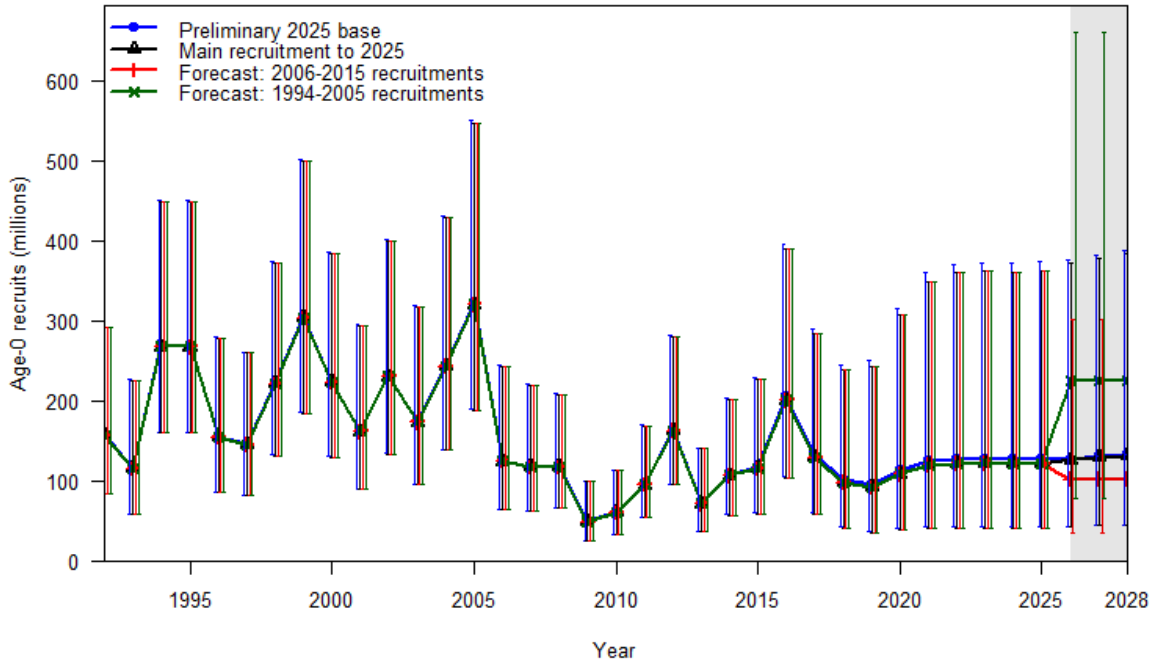


Recruitment projections

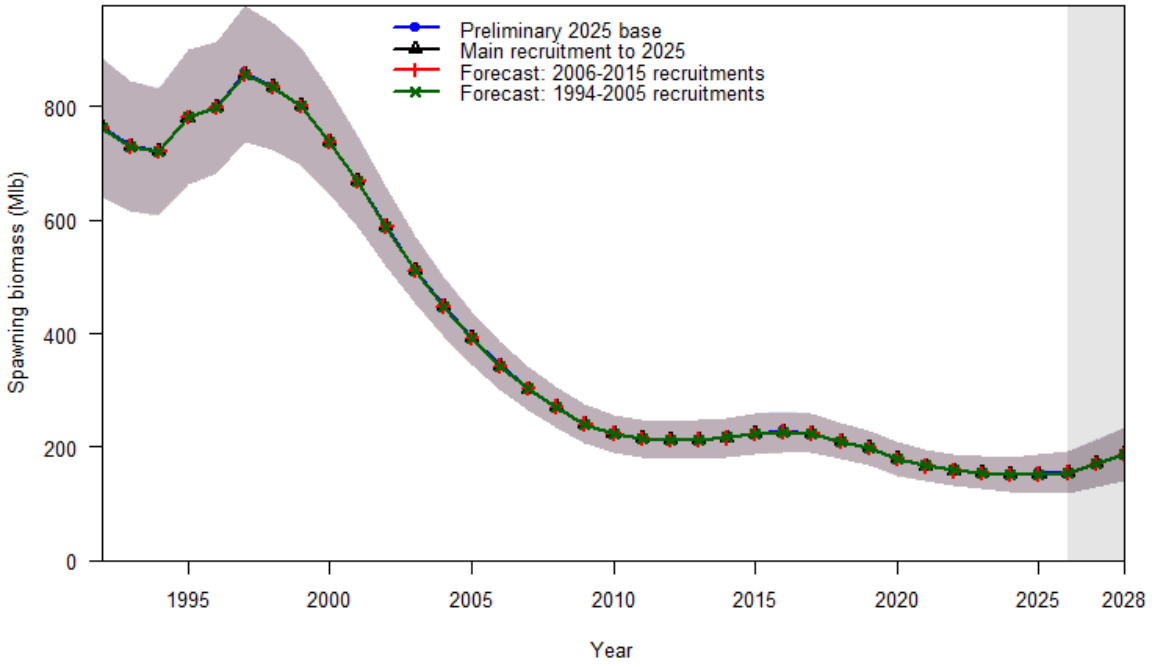
- Treatment of recruitment deviations:
  - Current options only allow control over Late recruitments occurring after the end-year of the model
  - Extending the Main recruitments to the end year of the model can induce 'balancing' of uninformed deviations with the rest of the time series (especially in models with shorter time-series')
- Comparison:
  - Extend the Main deviations to the end year
  - Change central tendency from the S-R curve to
    - "Low recruitment" – average observed over 2006-2015 (below the S-R curve)
    - "High recruitment" – average observed over 1994-2005 (above the S-R curve)

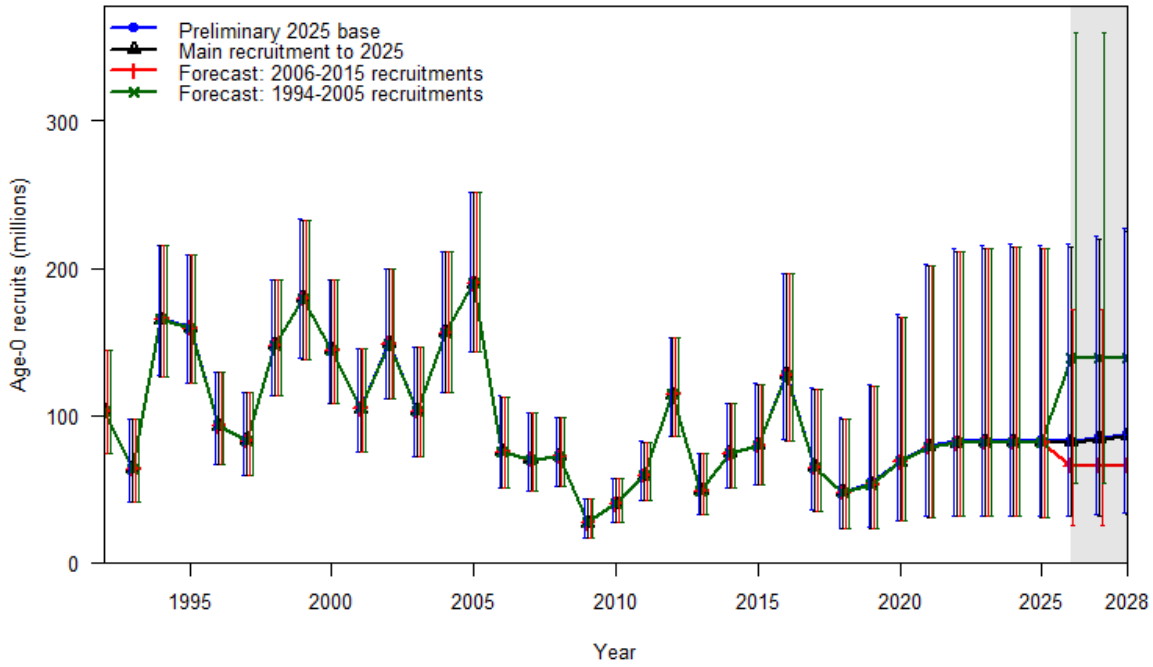
Recruitment projections – coastwide long



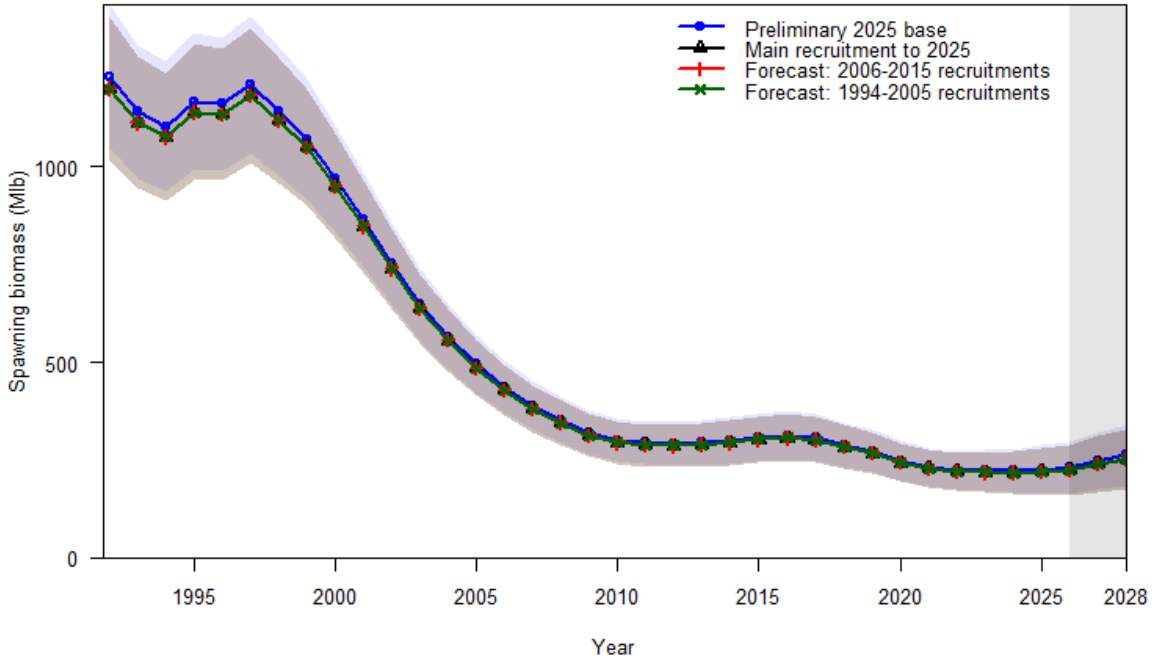


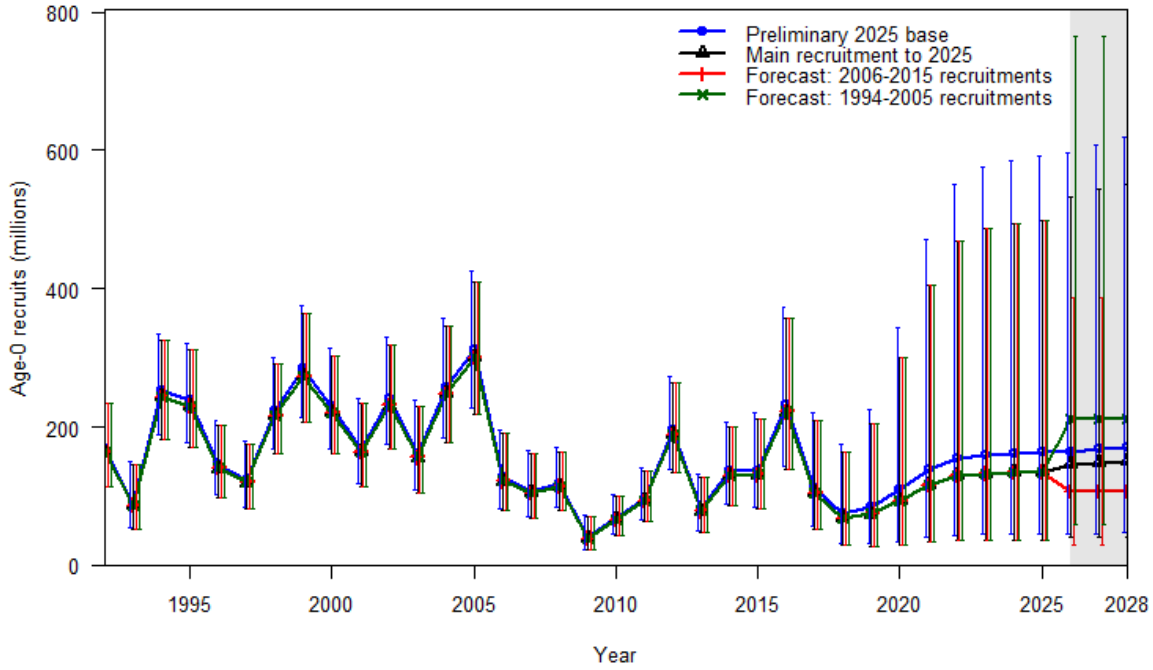
Recruitment projections – AAF long





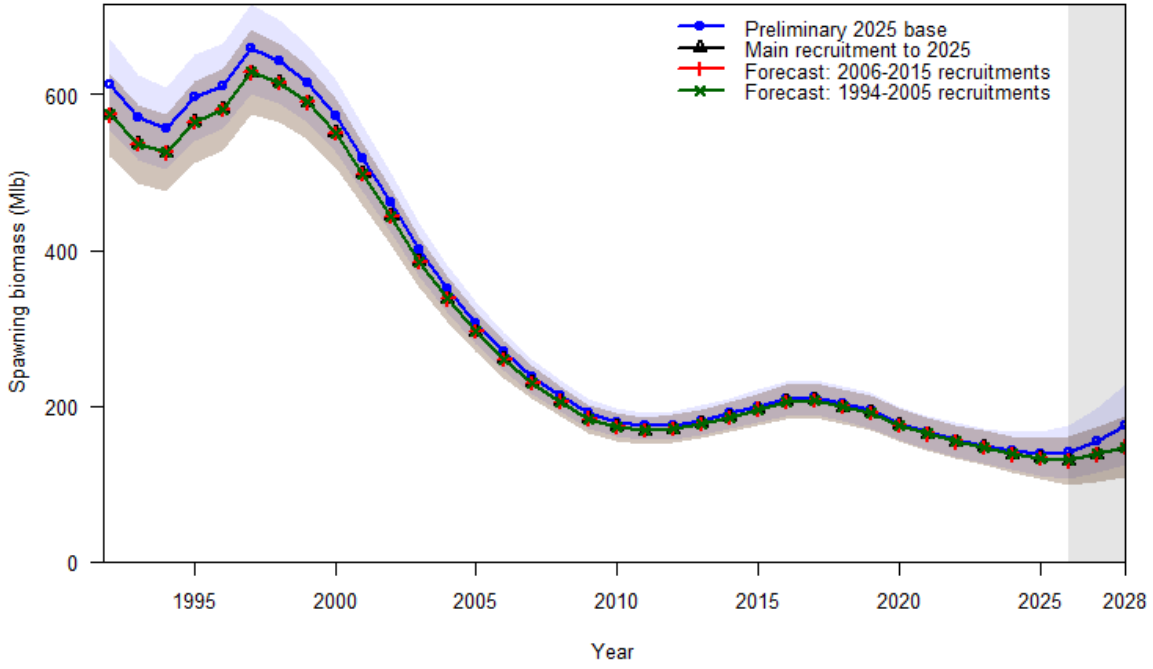
Recruitment projections – AAF short

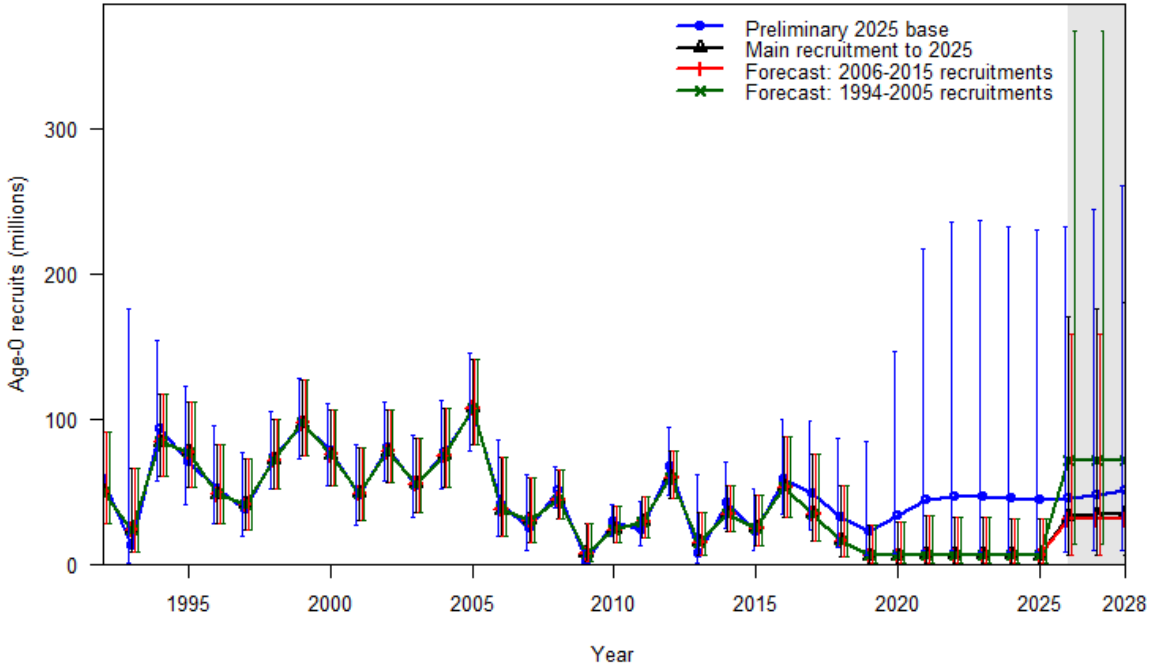




Some balancing of Late deviations, but no feedback to spawning biomass

Recruitment projections – Coastwide short





Heavy balancing of Late deviations (essentially no recruitment after 2018), still little feedback to spawning biomass

SRB requests and recommendations

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- To begin after the completion of the 2025 stock assessment

Remaining stock assessment development for 2025

- No further structural changes to the models. Final updated data sets available 1 November:

1) Trend, age, length, individual weight, and average weight-at-age estimates from the 2025 FISS.
2) Directed commercial fishery logbook trend information from 2025 (and any earlier logs that were not available for the 2024 assessment) for all IPHC Regulatory Areas.
3) Directed commercial fishery biological sampling from 2025 (age, length, individual weight, and average weight-at-age) from all IPHC Regulatory Areas. Sex-ratio at age from the 2024 commercial fishery.
4) Biological information (lengths and/or ages) from non-directed discards (all IPHC Regulatory Areas) and the recreational fishery (IPHC Regulatory Area 3A only) from 2024. These data routinely lag one year.
5) Updated mortality estimates from all sources for 2024 (where preliminary values were used) and estimates for all sources in 2025.

Recommendations

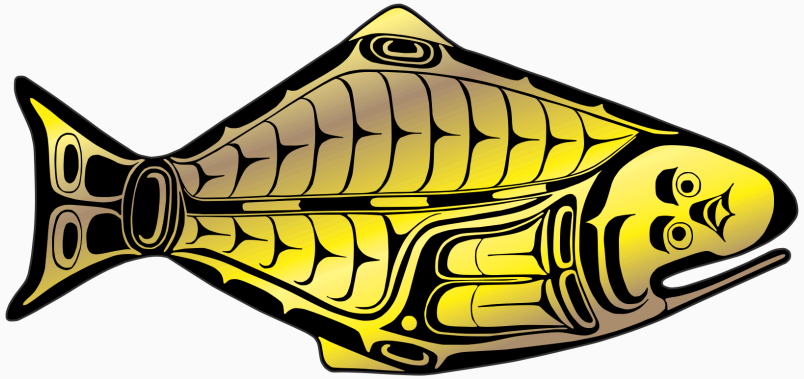
That the SRB:

a) **NOTE** paper IPHC-2025-SRB027-07 which provides a response to requests from SRB025 and SRB026.

b) **REQUEST** any modifications to the 2025 stock assessment.

c) **REQUEST** any analyses to be provided at SRB028 as part of the development of the 2026 update stock assessment.

INTERNATIONAL PACIFIC



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