2025 GOA rex sole stock assessment

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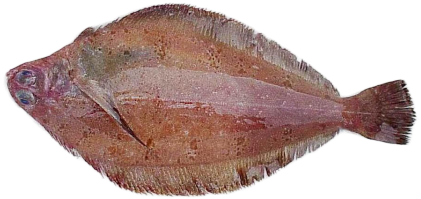
With presentation preparation / stand in: Sandra Lowe / Melissa Haltuch

Take Home Messages



Author recommended models to come forward in November: 2021 two-area base model with growth estimated separately in each area, and models 25.0 and 25.1

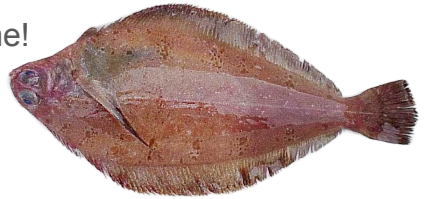
Uncertainty in maturity will be addressed through further sensitivity analysis and the risk table

CIE reviewers recognized the high level of data analysis and modeling effort for this species

Author *does not* recommend conducting ensemble modeling (as recommended in CIE review) for this underutilized species

Context

Catch me!

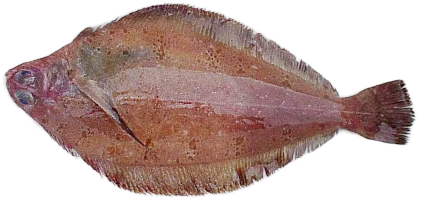


- Rex sole is caught by bottom trawl only
  - (no substantial catches by any other gear have occurred)
- Caught primarily in the W/C GOA
- Trawling in most of the EGOA is not permitted (almost no catch)
- 8-40% of the TAC and ABC are caught most years, ***underutilized*** species
- Split sex, age-structured statistical catch-at-age model implemented in Stock Synthesis version 3.3 (SS3) using a maximum likelihood approach.
- 2-areas (Eastern GOA and Western-Central GOA) with separate growth curves estimated based on survey data from each area

2025 CIE Review (3 independent desk audit reviews)

Assessment is appropriate for management: adequate, thorough, and robust

CIE Reviewer: Joe Powers



“The cavalier answer to each of the relevant research topics…is “sure… explore all these topics, why not?” But the reality is that none of these issues will likely alter the conclusion of not overfishing, not overfished. And while alternative estimation procedures might change OFL estimates in the order of 25% or less, the fishery itself would have to change considerably before the OFL, even with this uncertainty, would be approached”.

Suggestions for future stock assessments:

1. Maturity at Age uncertainty should be considered in the ABC decision rules. ✓
2. Support implementing an ageing error matrix. ✓
3. Explore natural mortality assumptions. Use Hamel and Cope (2022) for a prior, attempt to estimate. Continuing with a fix M is appropriate. ✓
4. Steepness = 1 is appropriate given lack of contrast in data. Could explore ability to estimate.
5. Conduct steepness sensitivity analysis. Use a lower steepness value, Fishlife steepness = 0.72.
6. Consider Thorson et al. 2014 flatfish sigmaR value of 0.636 instead of 0.6
7. Exploring different sigmaRs might be useful in understanding data weighting.
8. Use likelihood profiles and production functions.
9. Re-estimate weight-length each assessment, look for spatial variation.
10. Sensitivity analysis with survey q estimated without a prior.
11. OSA residuals should be calculated with both sexes combined.
12. Discuss movement uncertainty (e.g. BC / GOA).
13. Use new input sample sizes (ISS).
14. Compare alternative data weightings - McAllister and Ianelli, Dirichlet Multinomial.

Suggestions for future research:

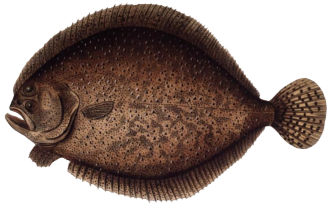
1. Ensemble modeling (e.g. around maturity uncertainty), deciding on model selection criteria ahead of time
2. Time varying explorations: selex and *M*, growth, and recruitment distribution between areas. Exploring time-varying growth low priority without more evidence.
3. Runs tests and hincast cross-validation MASE, evaluate forecast skill
4. Present alternative models within a Shiny App
5. Kell et al. 2024 model selection criteria
6. *Herding experiments are old; do more herding experiments*
7. Explore environmental impacts on recruitment (e.g. temperature) or M (predation)
8. Simulation analysis of sensitivity to stock structure
9. Consider Model-based indices
10. Consider including the ADF&G small mesh survey

Plan Team Minutes from 2021 Assessment

"The author provided several research priorities including developing an ageing error matrix, improving maturity-at-age estimates, and looking into growth further including time-varying growth.

The Team supports the author's research priorities, encourages further discussion on the utility of conducting maturity studies across the entire GOA, and endorses the author's intent to develop an ageing error matrix and further explore natural mortality rates."

**Further maturity field studies have not been conducted to date. Utility of conducting field studies?*



A bridging exercise conducted for the 2025 CIE review (Appendix 6A, “Bridging Analysis”) for 2021 model

Model 25.0 the updated “base case” - run “sampler survbio edits and new data”

- Recalculates all fishery age composition data using a slightly modified approach than that used in the 2021 assessment, consistent with other AFSC assessment methods (“sampler” code)
- Addresses necessary corrections to survey biomass data inputs
- Updates the model with new years of data that became available after the 2021 assessment cycle

Model 25.1

Adds an ageing error matrix to Model 25.0 (Appendix 6A).

*There will be a quiz

Processing of fishery data (“sampler” run)

- Random sampling from hauls and ports using Sampler,
- Including unsexed fish that are assigned half female and half male (sampler code)
- Including one strata in these calculations, and
- Updating the yearly input sample sizes to the number of hauls from which fishery age data originated to include hauls where ages for unsexed fish were collected. *Does this happen?*

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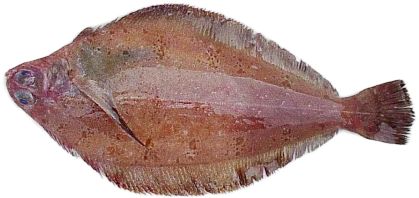
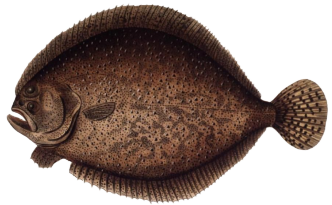


Survey biomass data corrections (“sampler and survbio edits run”)

- 2021 assessment used the *CV* corresponding to survey biomass estimates as model input for all years and areas, corrected to use standard error in logspace that is expected by SS3
- 2021 assessment included EGOA survey biomass for 1984, 1987, now omitted

New data since 2021 in Model 25.0

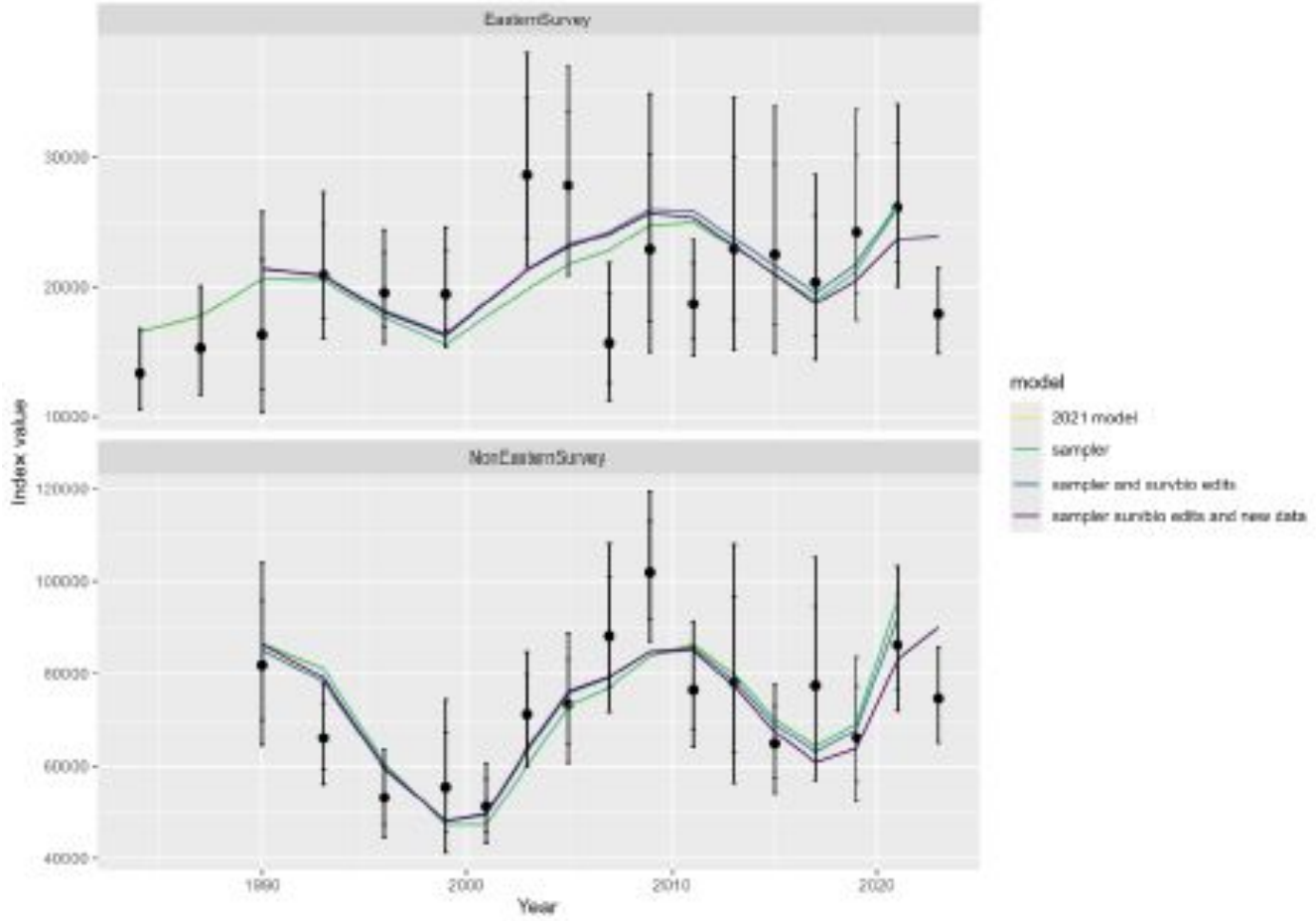
- Catch biomass for 2022-2024, and updated end-of-year catch biomass for 2021
- Fishery length composition data for 2022-2024
- GOA survey biomass data for 2023
- GOA survey length composition data for 2023



Bridging Analysis Survey Index Fits

Observed (black dots)
Predicted (lines)

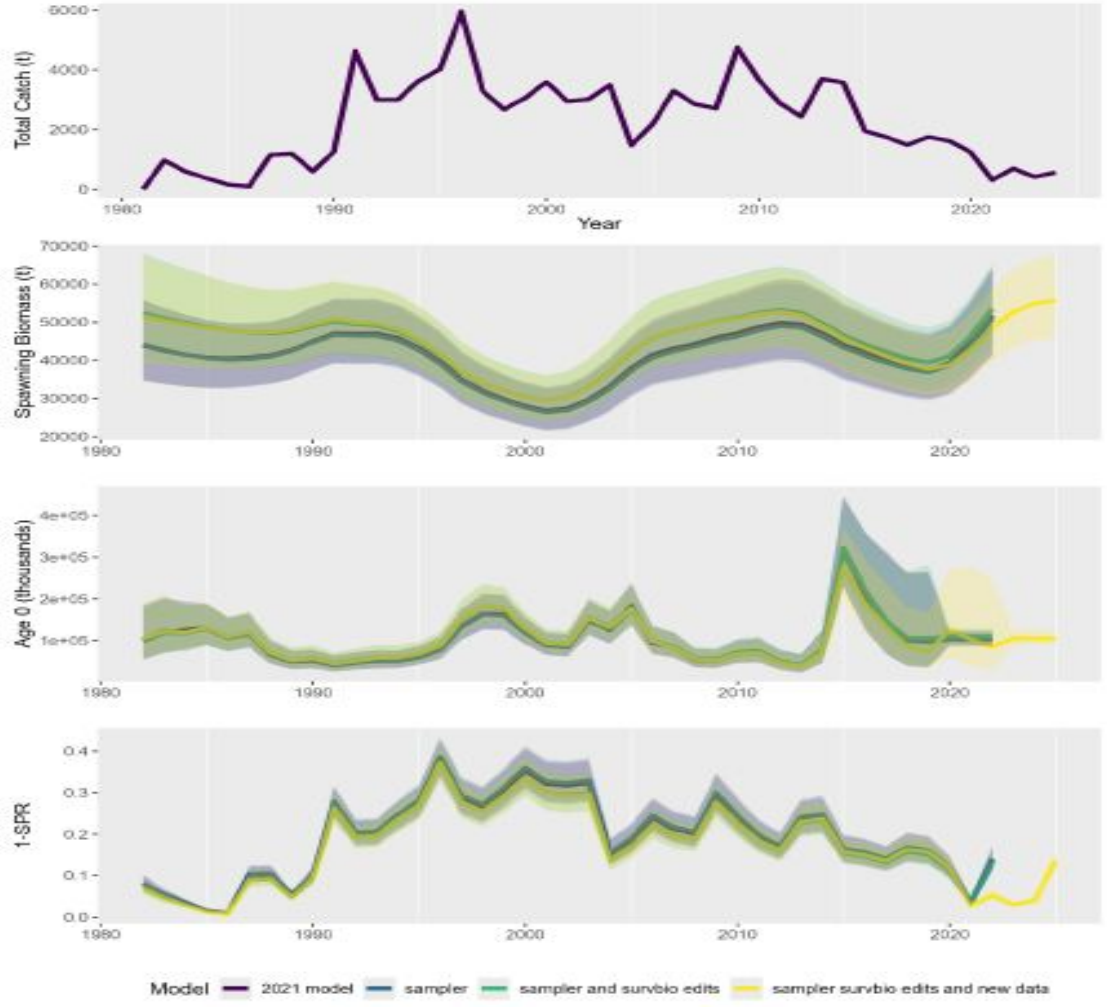
Model 25.0
- purple line



Bridging analysis to Model 25.0 (yellow line)

Observed catches,
Estimated spawning biomass,
Age-0 recruitment,
Fishing intensity (1- SPR)

Shaded areas indicate 95% asymptotic uncertainty intervals



Decision points: acceptance of bridging analysis and move to “updated base” Model 25.0 and explore Model 25.1 (add age error)

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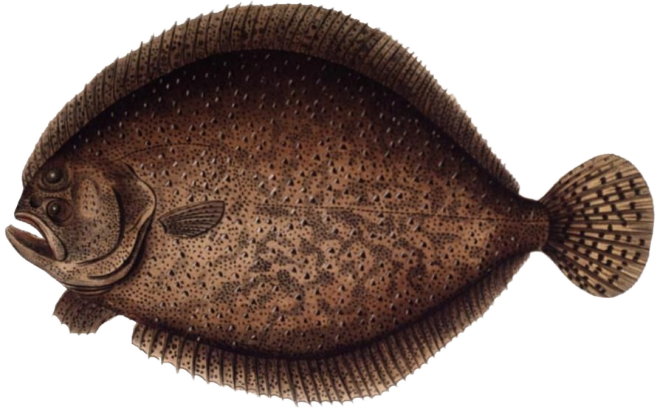
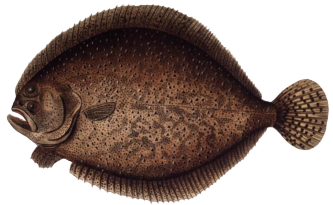
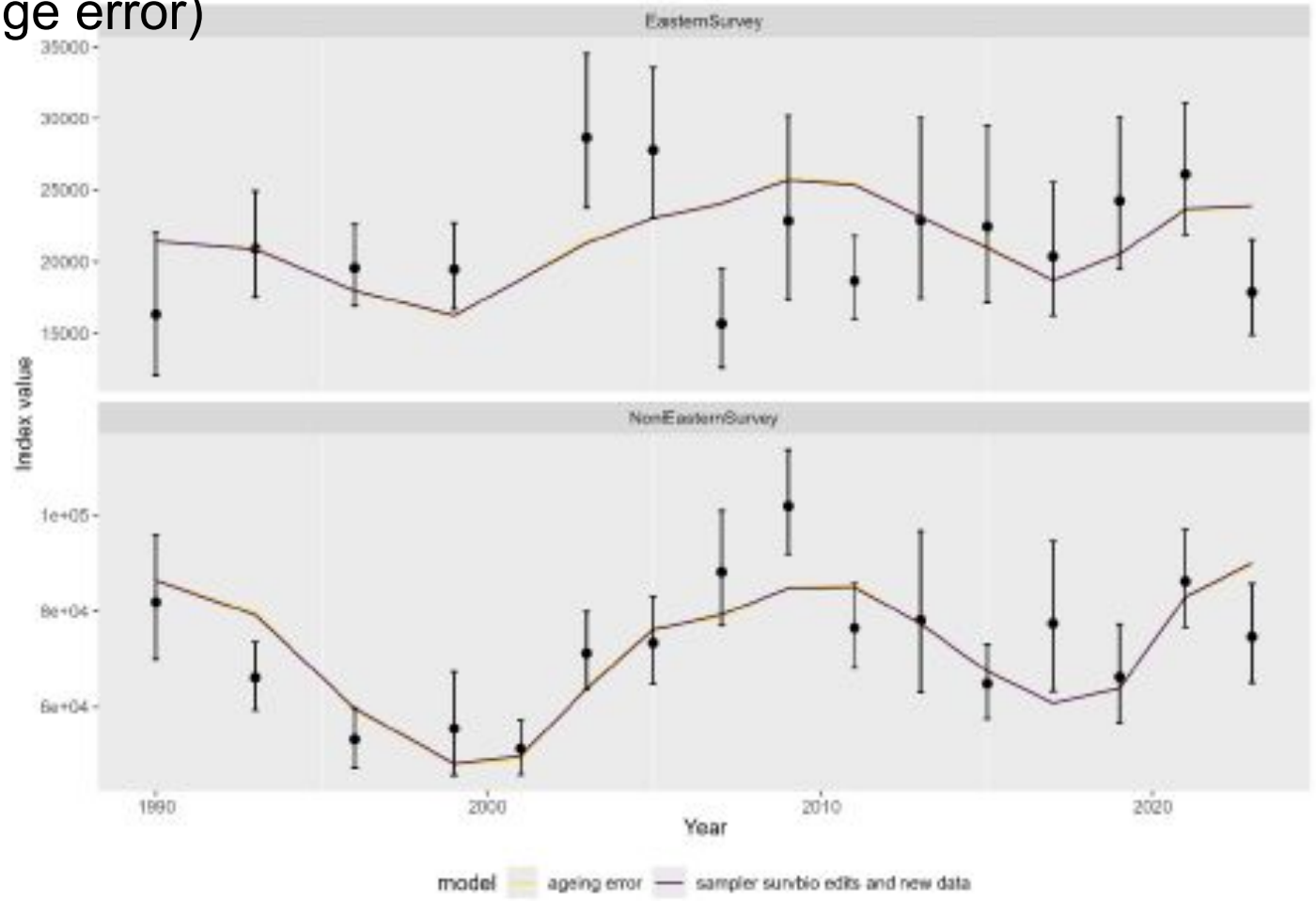


Main document discusses/compares results from:

- Model 25.0 (updated base model)
- Model 25.1 (updated base model with ageing error matrix)
  - Age double reads were analyzed and an ageing error matrix accounting for ageing uncertainty was added to the model



Fits to Survey Indices: Models 25.0 (sampler survey bio+new data) and 25.1(age error)



Models 25.0 (sampler survey bio+new data) and 25.1 (age error)

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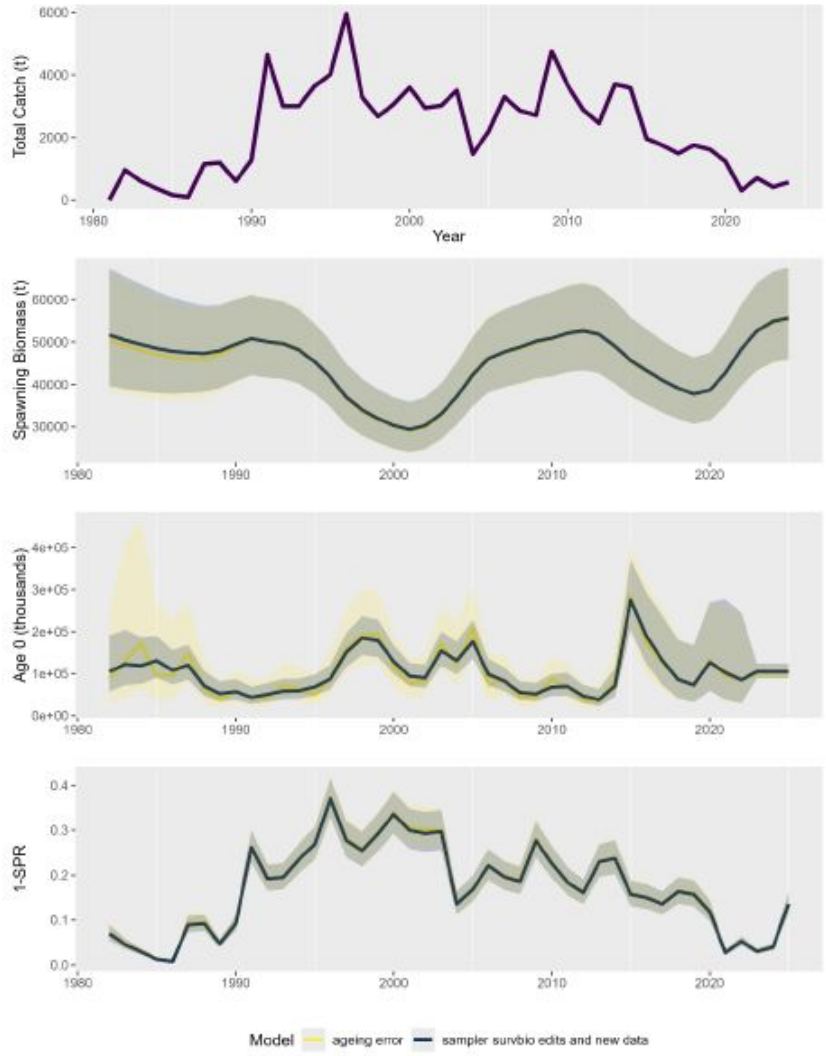


Fits to Composition Data

Fig. 5. Fits (lines) to female and male fishery length composition with data aggregated by year (green shaded regions) for Model 25.0 (labeled sampler and survbio edits) and Model 25.1 (labeled ageing error).

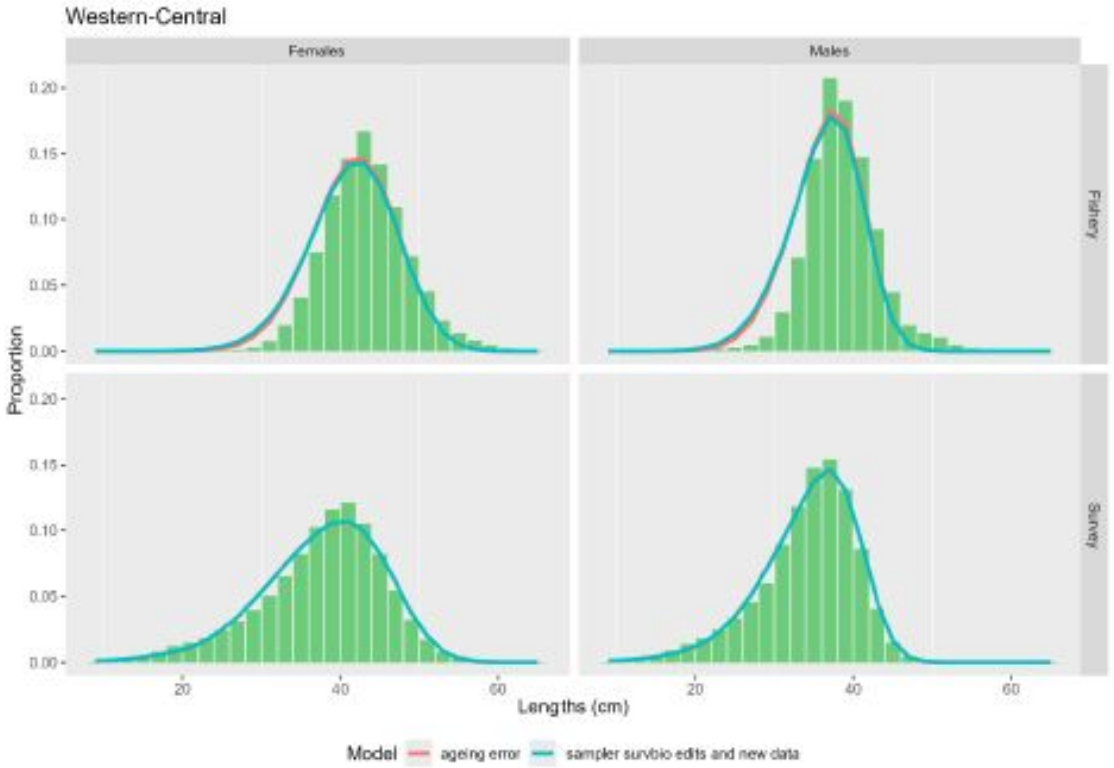
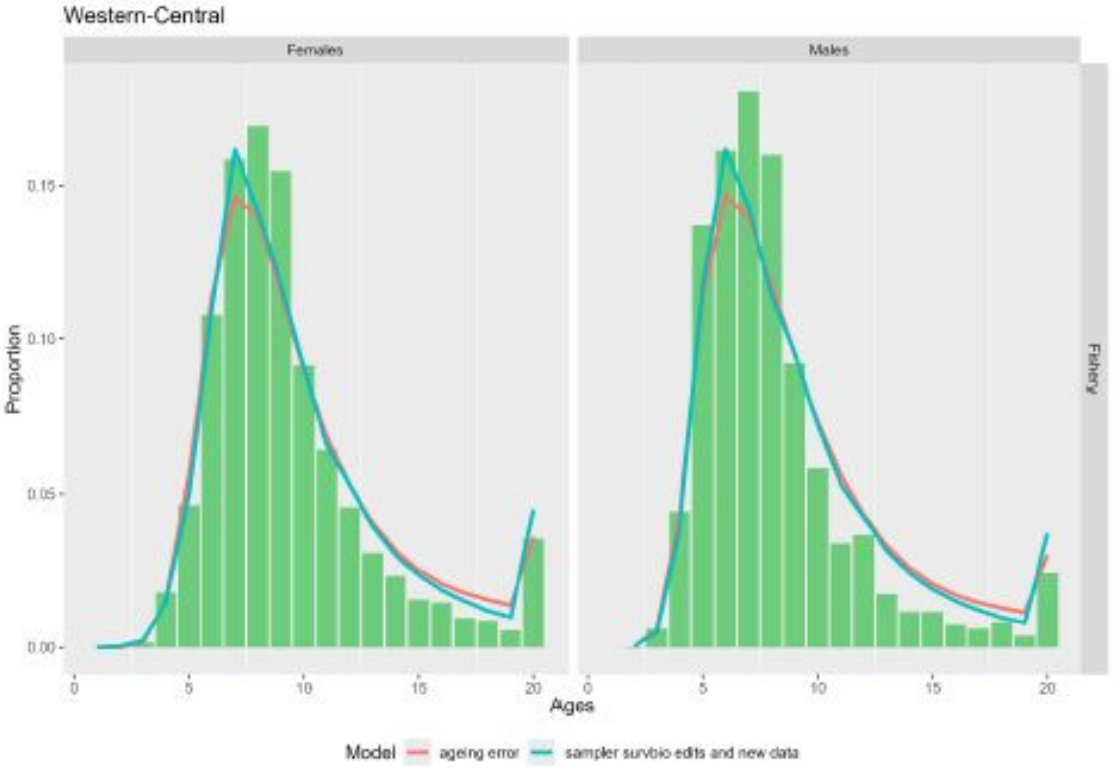


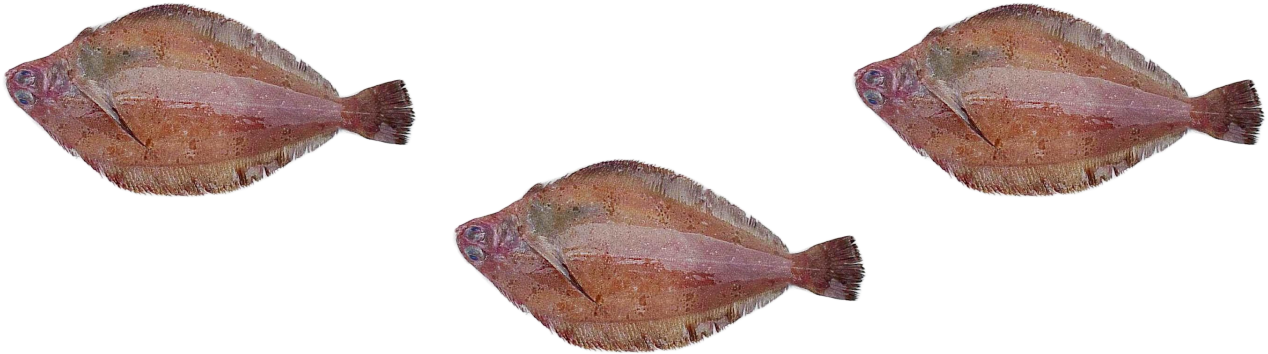
Fig. 6. Fits (lines) to female and male fishery age composition with data aggregated by year (green shaded regions) for Model 25.0 (labeled sampler survbio edits and new data) and Model 25.1 (labeled ageing error).

The fishery occurs only in the Western-Central GOA.



“Given the similarities across models in spawning biomass, recruitment, and fishing intensity in the Appendix 6A bridging analysis and between Model 25.0 and Model 25.1 (Figure 2, Appendix 6A Figure A2) and the nature of model changes as minor, but necessary updates, an updated set of time series results will be provided in November 2025.”

Author recommends moving forward with Model 25.1



Questions, feedback for Carey??

Disclaimer: Carey is not responsible for the quality of this presentation!

Fig. 4. Fishery and survey selectivity-at-age across models for males and females for Model 25.0 (labeled “sampler survbio edits and new data) and Model 25.1 (labeled ageing error). Plots for females are overlaid on the maturity-at-age curve