SEDAR 82 South Atlantic Gray Triggerfish Review Workshop: Diagnostics and Projections

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National Oceanic and Atmospheric Administration

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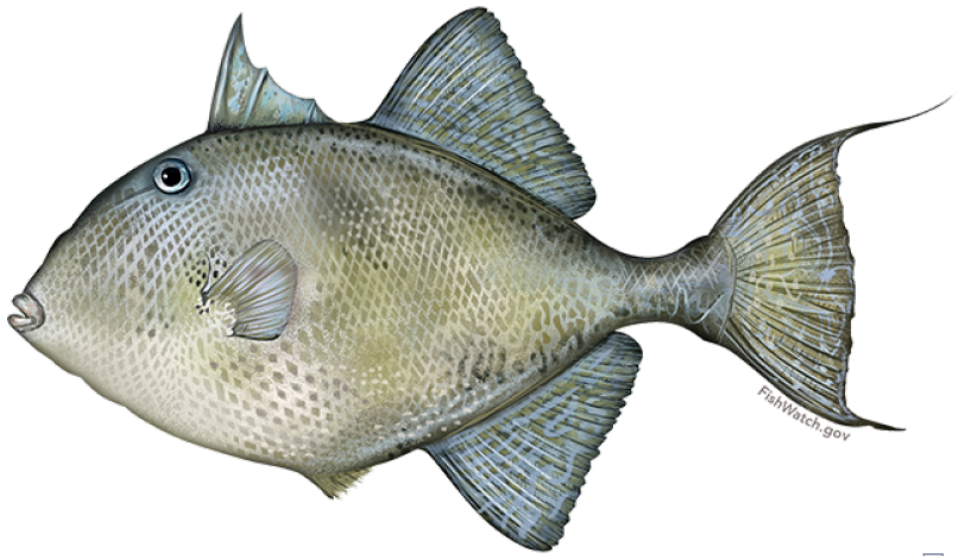

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Monte Carlo Bootstrap Ensemble (MCBE)

Methods

- The Monte Carlo Bootstrap Ensemble (MCBE) analysis is a process of randomizing data inputs and fixed parameters that go into the assessment model
- 2001 sets of randomized inputs were drawn and the assessment model is run each time
- Output from runs is aggregated and summarized.

Monte Carlo Bootstrap Ensemble (MCBE)

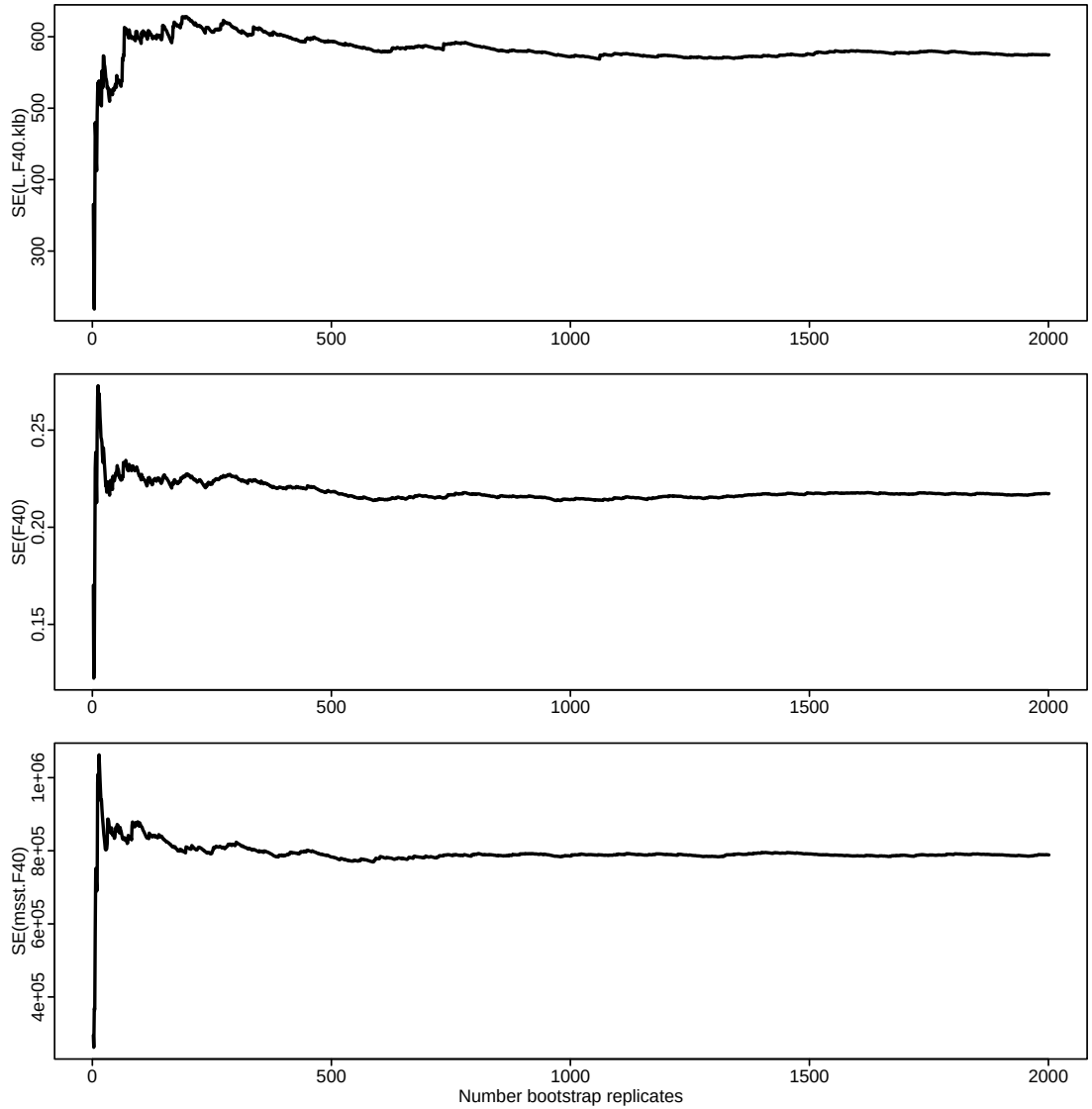
Methods

- Landings and discards resampled from log-normal distributions defined by values provided by data providers
- Indices resampled from log-normal distributions defined by values provided by data providers
- Length and age composition data resampled, with replacement
- Natural mortality constant was sampled from a uniform distribution between 0.2387 and 0.5313, which was then used to rescale M-at-age
- Discard mortalities were sampled from a uniform distribution between 0.364 to 0.814.

Monte Carlo Bootstrap Ensemble (MCBE)

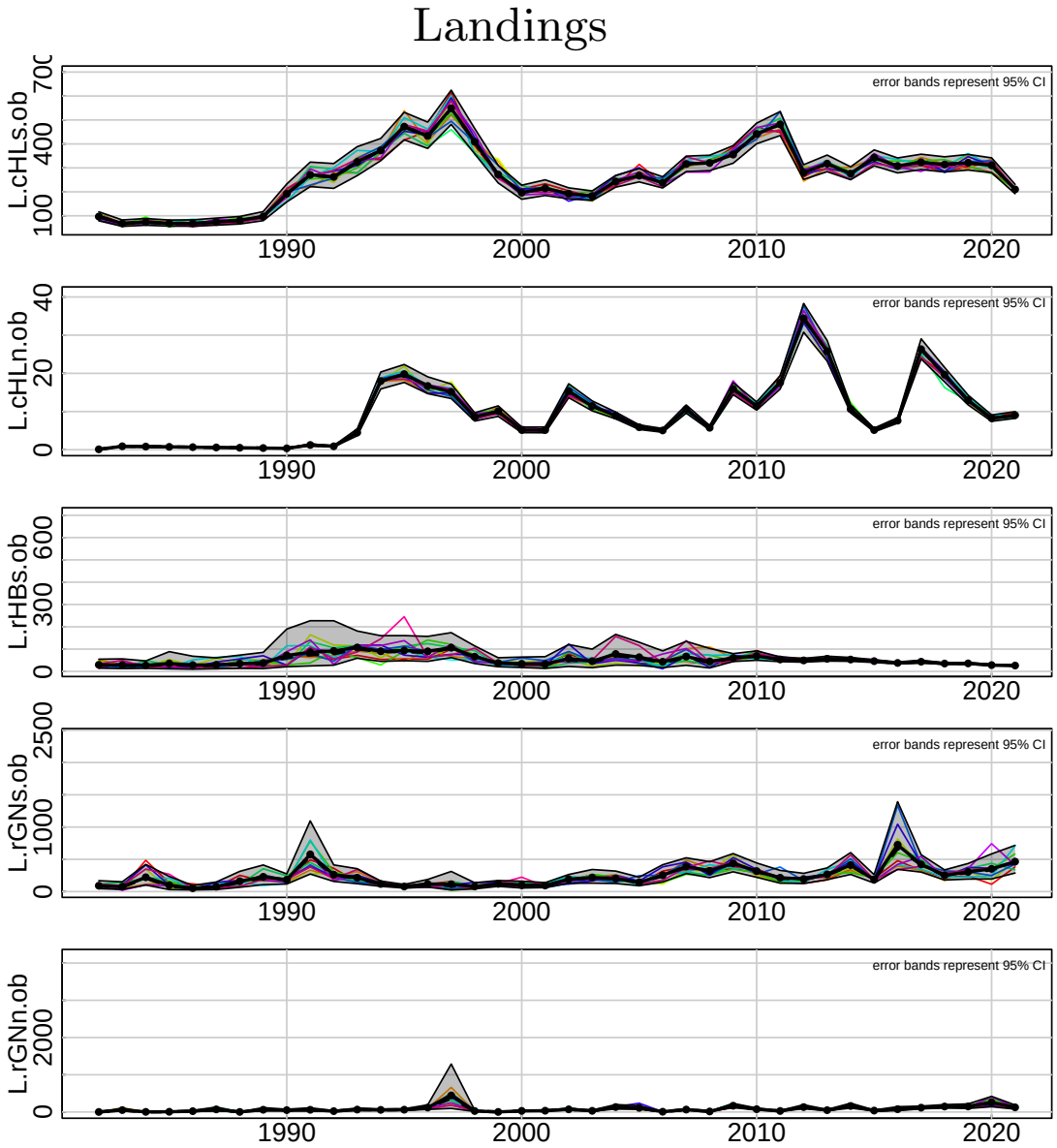
Results

Convergence



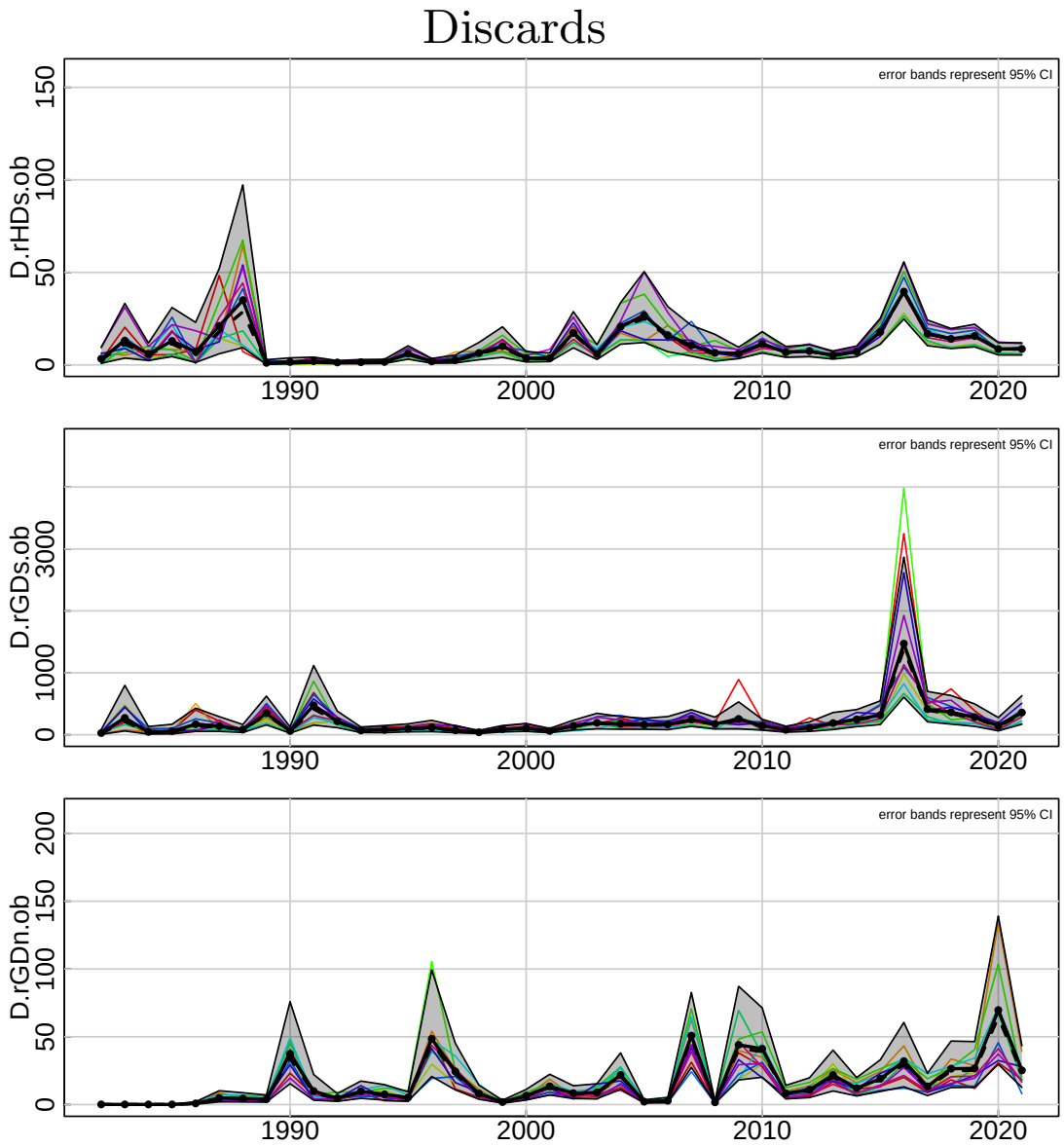
Monte Carlo Bootstrap Ensemble (MCBE)

Results



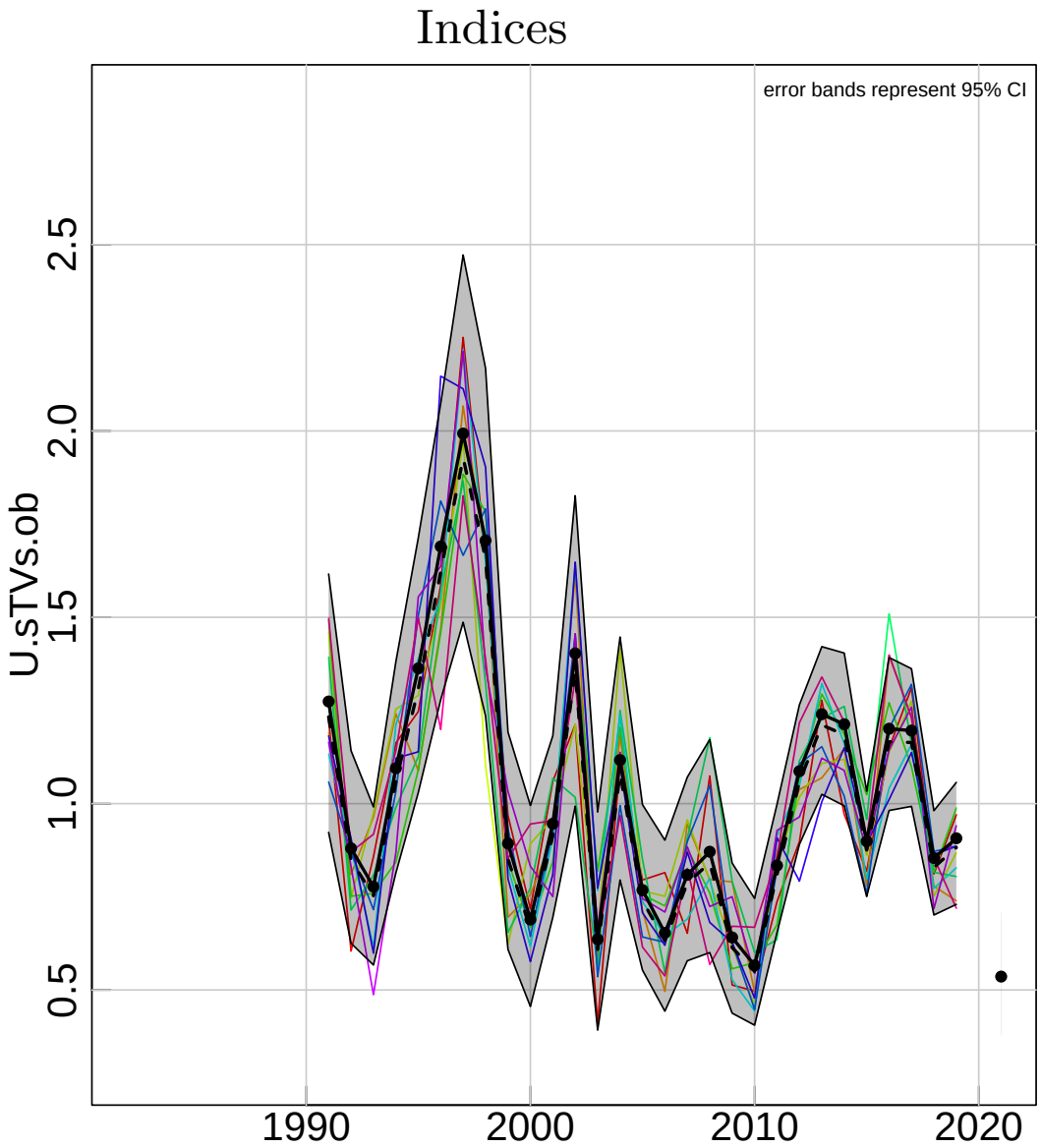
Monte Carlo Bootstrap Ensemble (MCBE)

Results



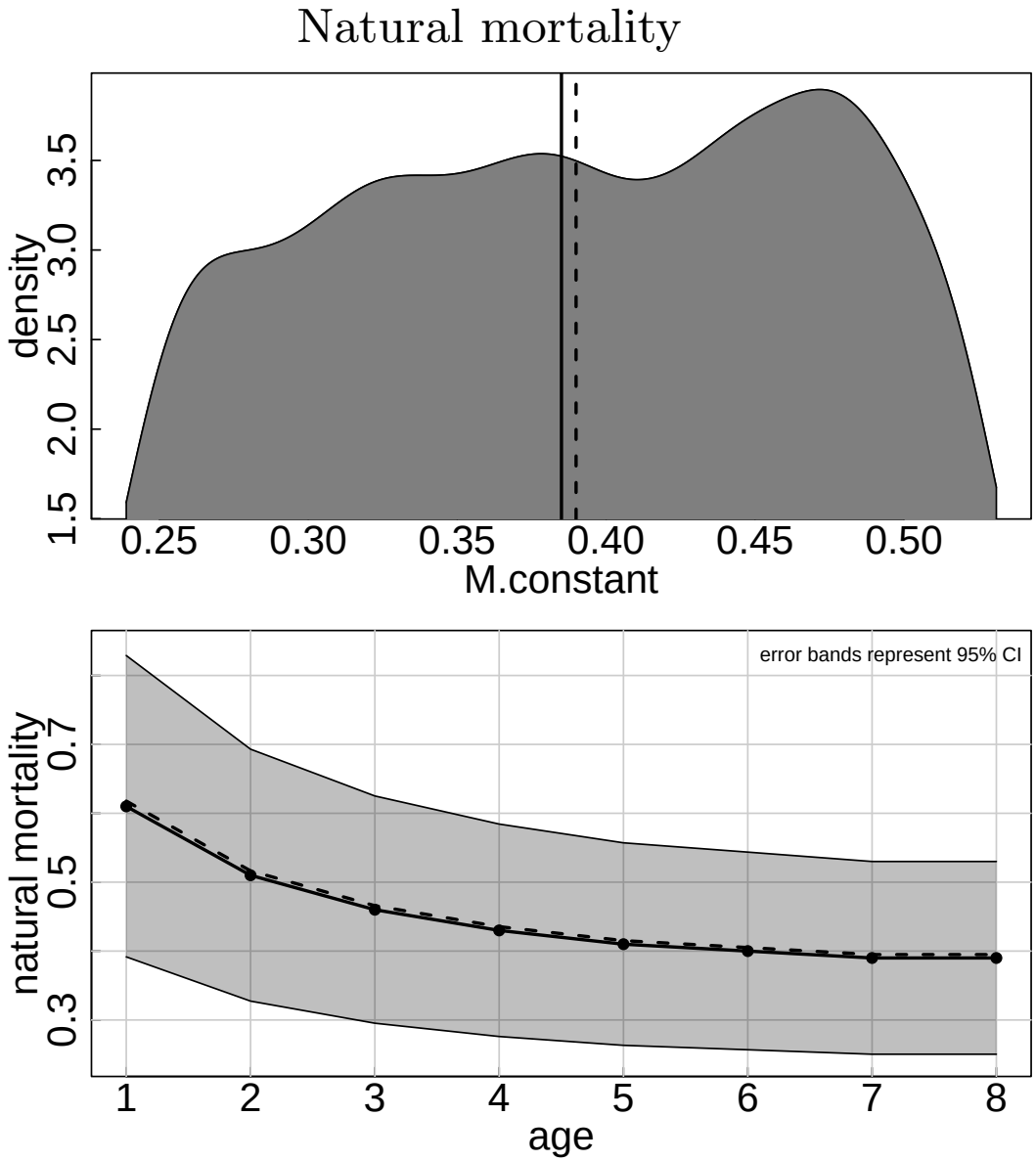
Monte Carlo Bootstrap Ensemble (MCBE)

Results



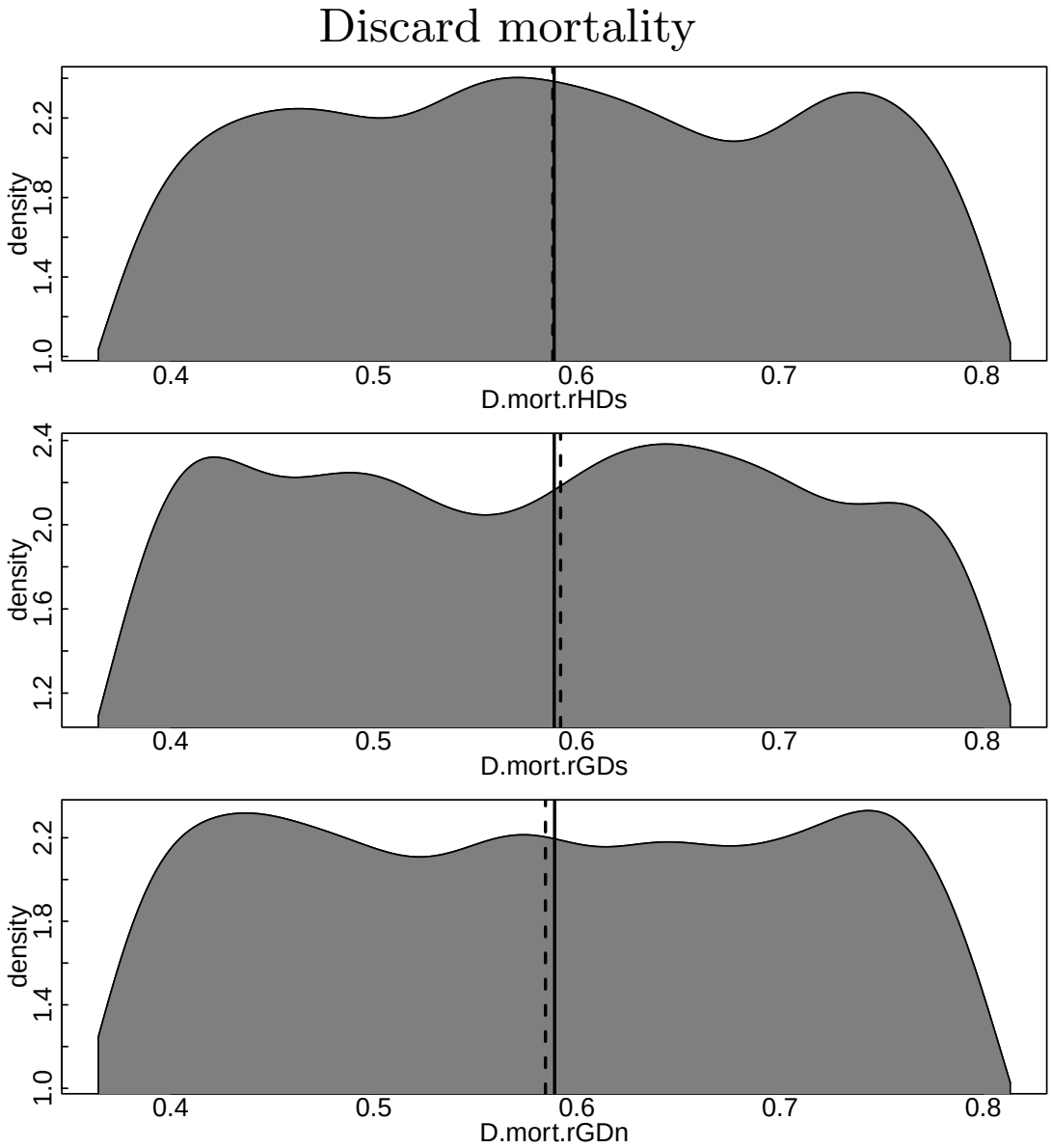
Monte Carlo Bootstrap Ensemble (MCBE)

Results



Monte Carlo Bootstrap Ensemble (MCBE)

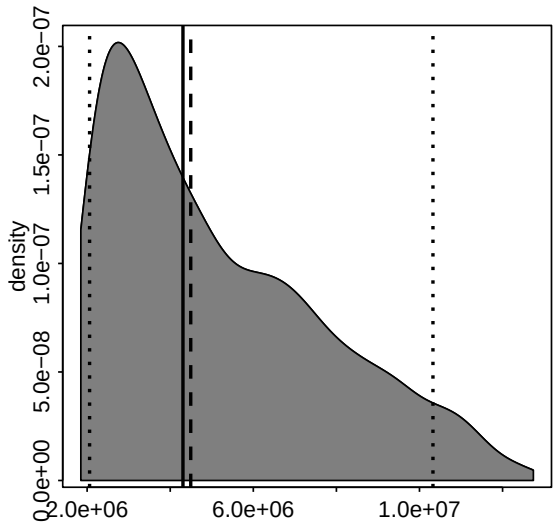
Results



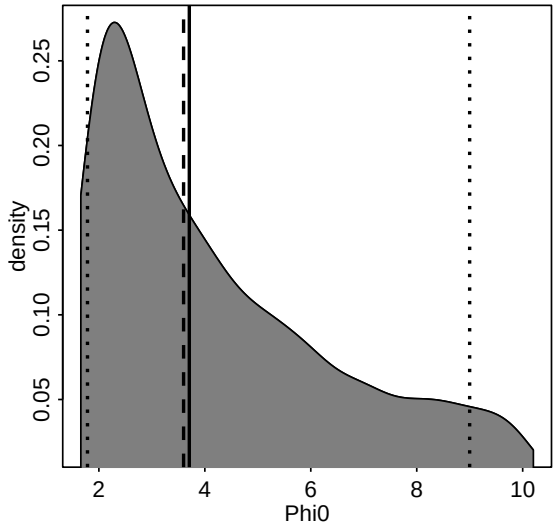
Monte Carlo Bootstrap Ensemble (MCBE)

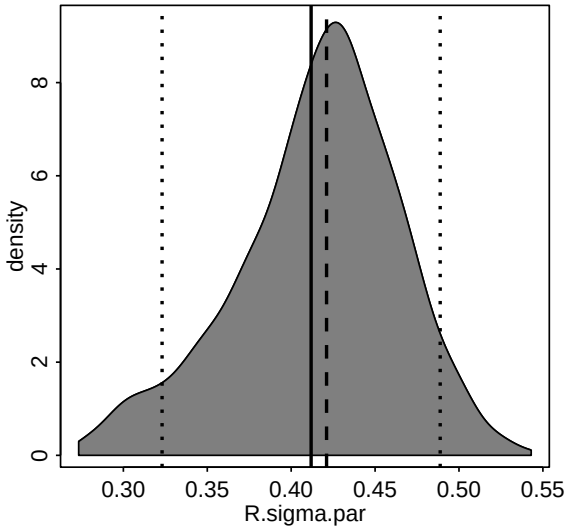
Results

Stock recruit parameters



no plot for BH.steep
no plot for steep

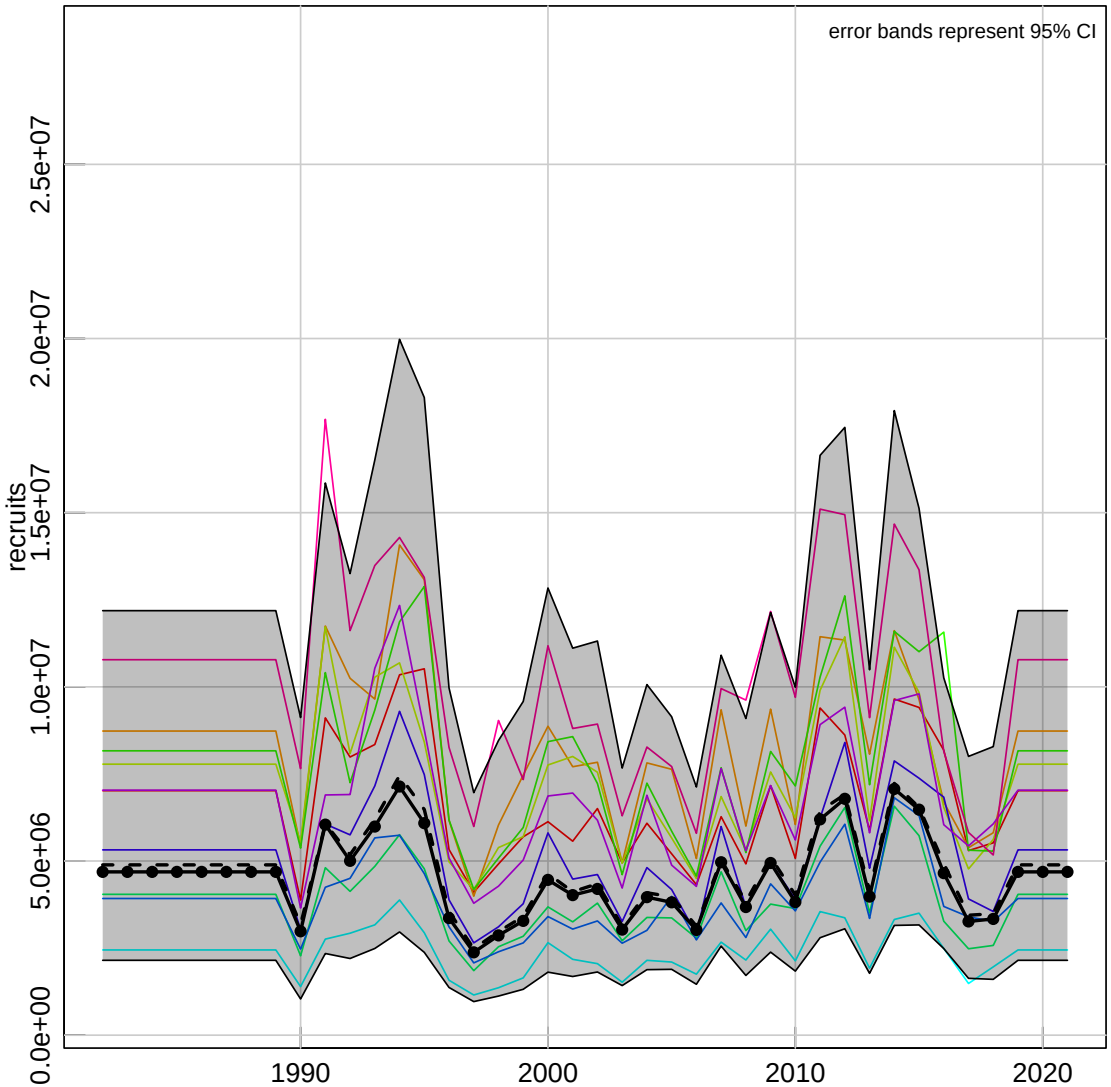




Monte Carlo Bootstrap Ensemble (MCBE)

Results

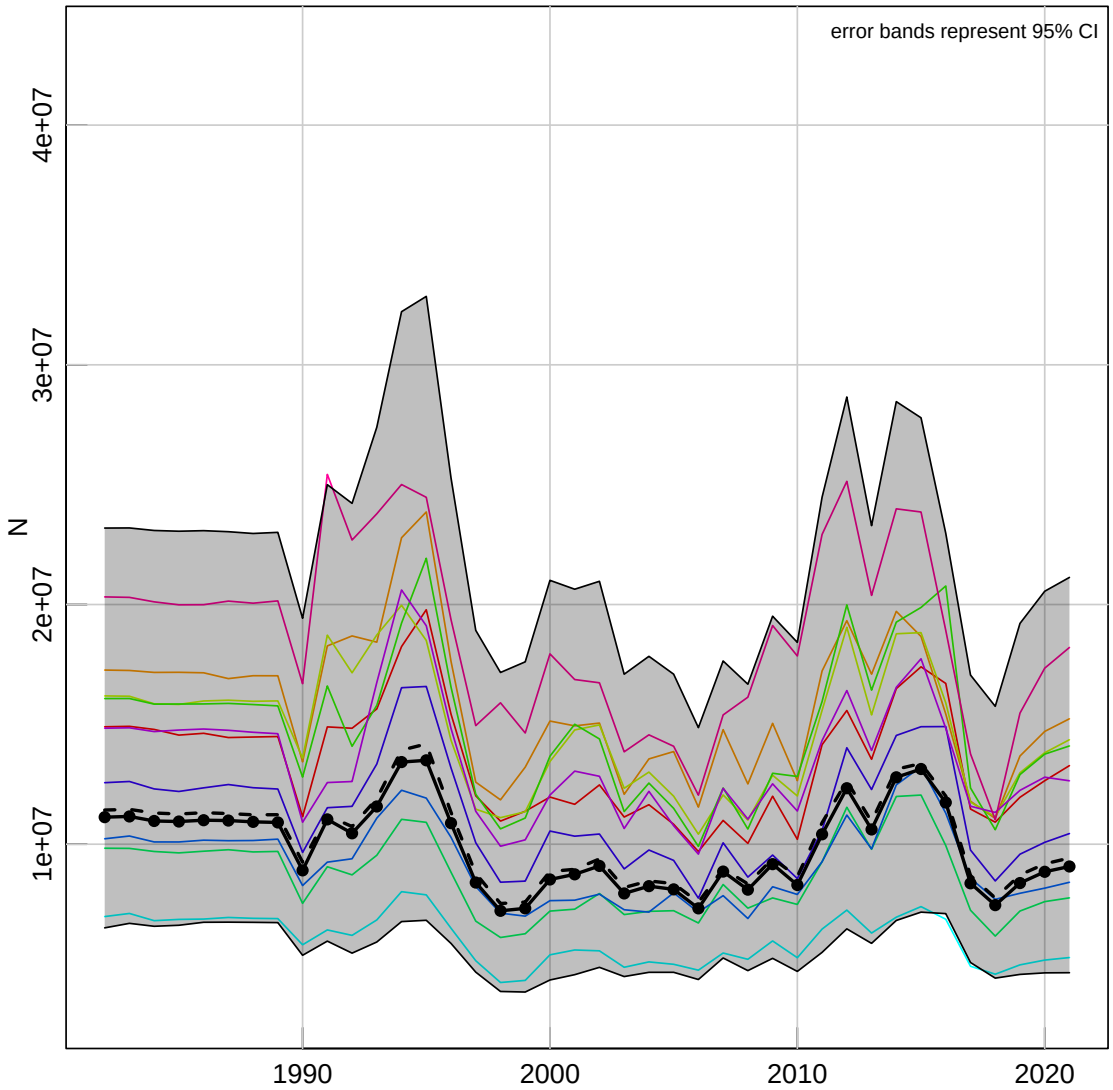
Recruits



Monte Carlo Bootstrap Ensemble (MCBE)

Results

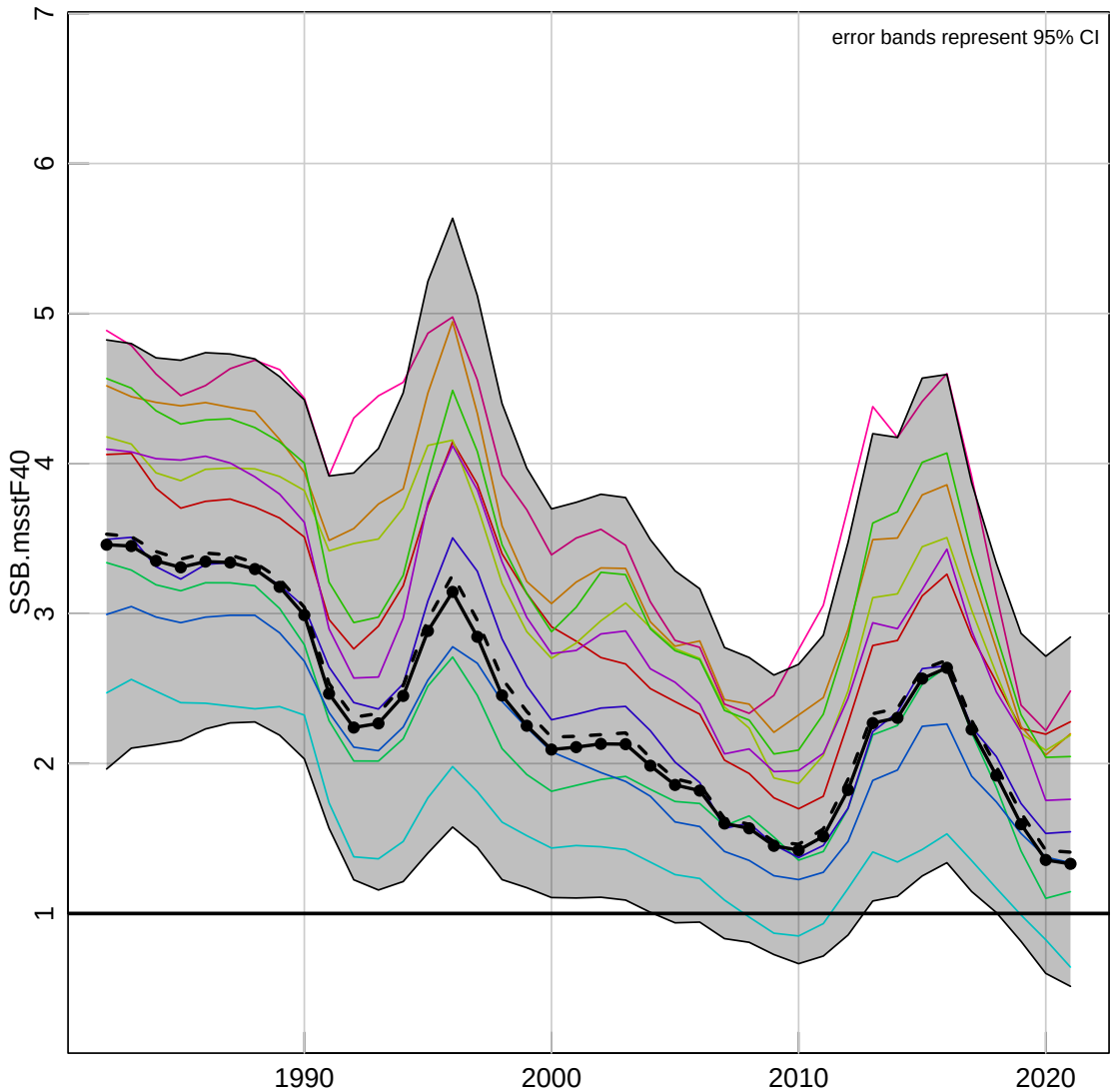
Numbers (N)



Monte Carlo Bootstrap Ensemble (MCBE)

Results

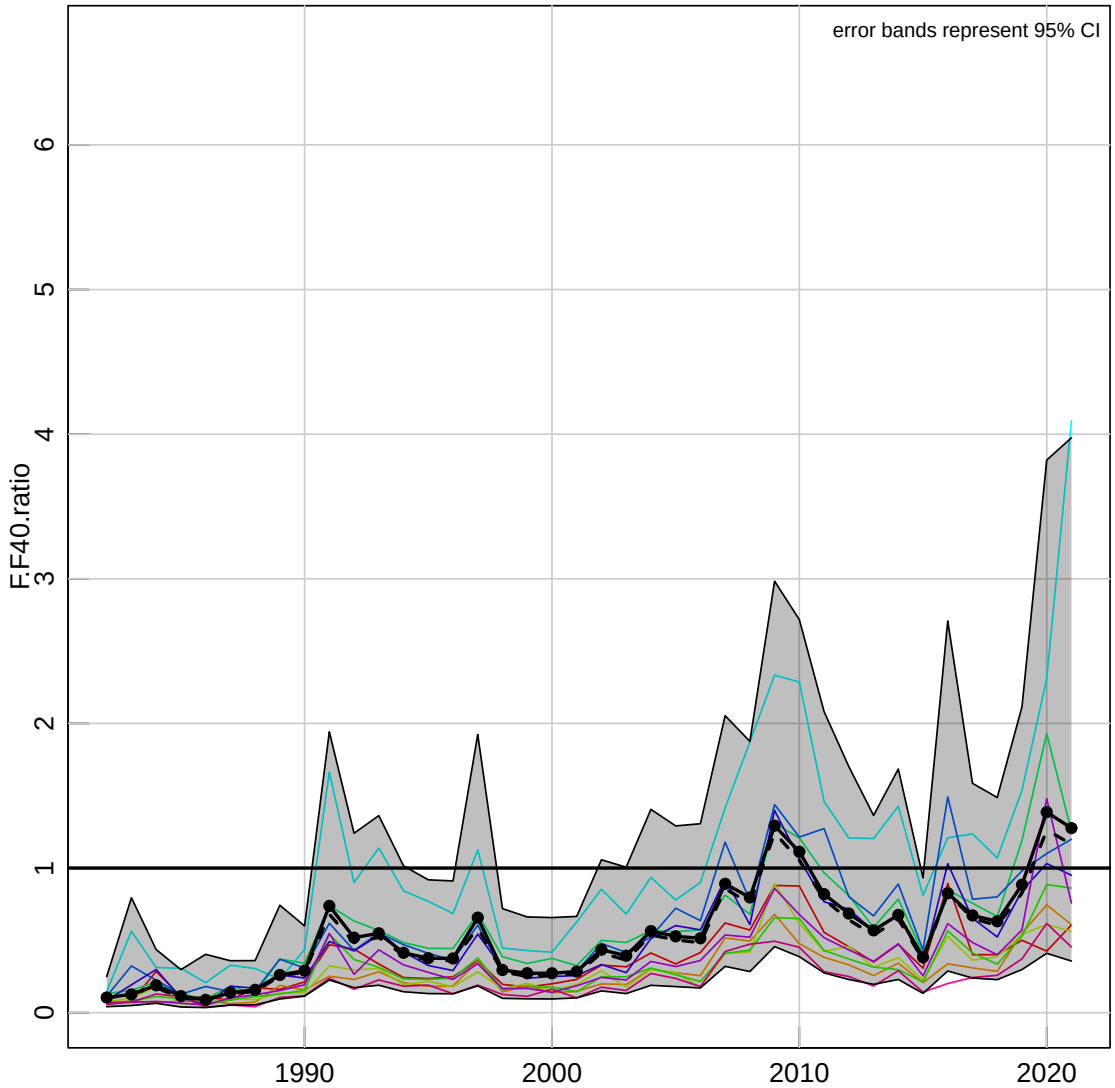
Stock Status



Monte Carlo Bootstrap Ensemble (MCBE)

Results

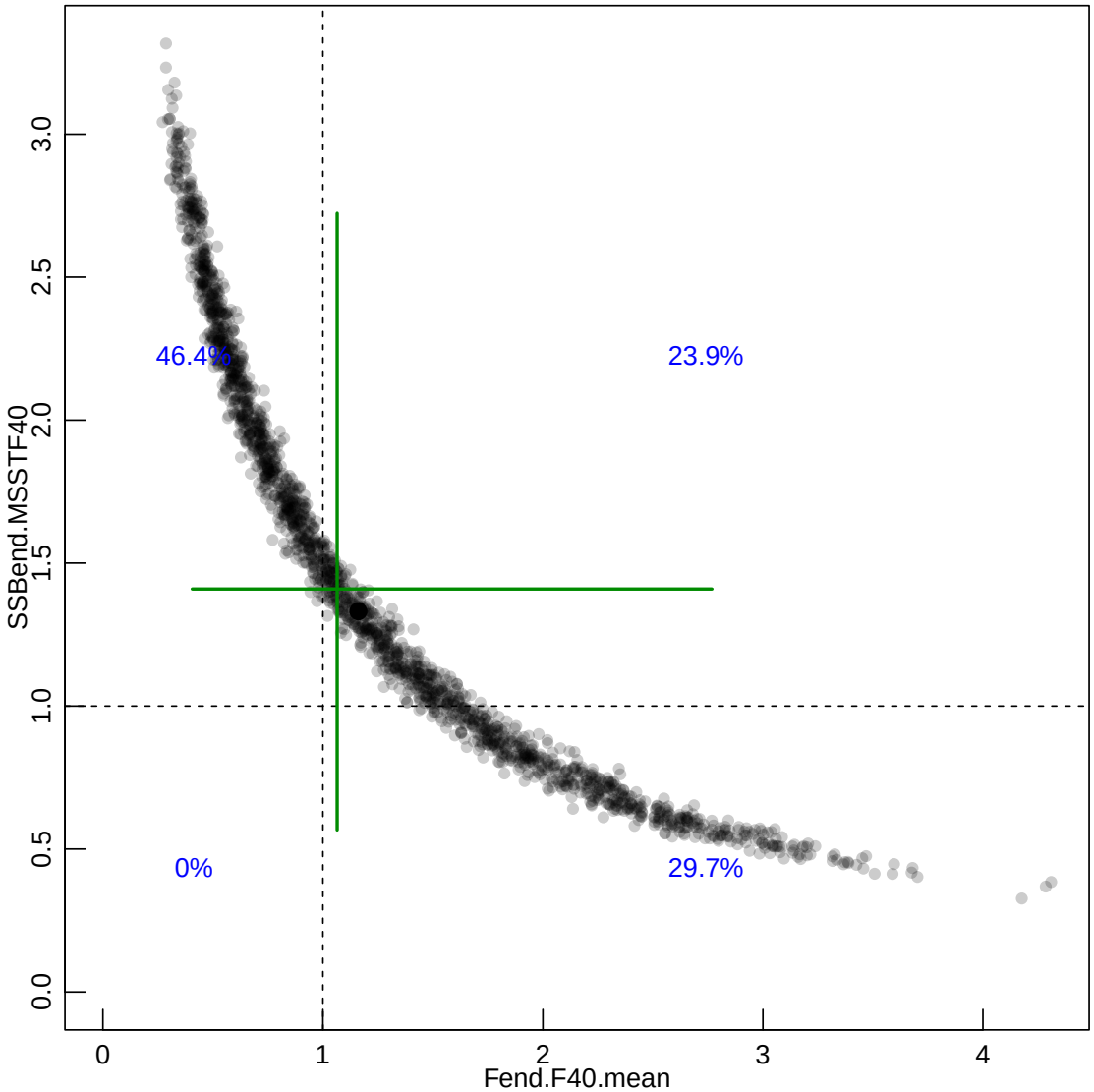
Fishery Status



Monte Carlo Bootstrap Ensemble (MCBE)

Results

Phase plots



Likelihood profiles

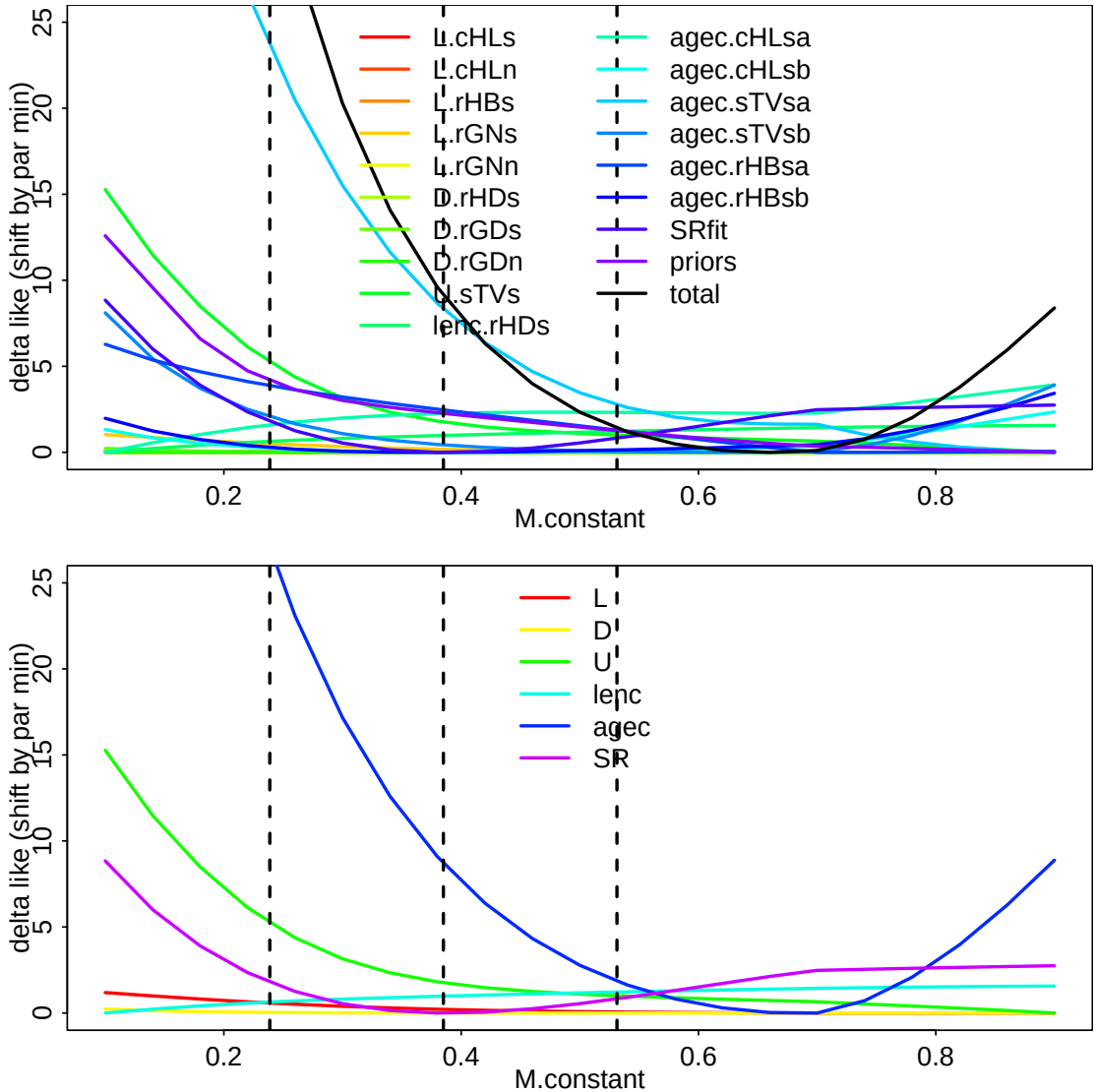
Methods

- Natural mortality (M)
  - Generate a vector of constant M over a wide range
  - Rescale age-varying M based on each M_i
  - Rerun base model with each new set of fixed values
- Average recruitment (R_0)
  - Generate a vector of R_0 over a wide range
  - Rerun base model with each new fixed value
- Initial F (F_{init})
  - Generate a vector of F_{init} over a wide range
  - Rerun base model with each new fixed value
- Beverton-Holt SR curve: fixed steepness
  - Use Beverton-Holt SR curve
  - Generate a vector of steepness values over a wide range
  - Rerun base model with each new fixed value

Likelihood profiles

Results

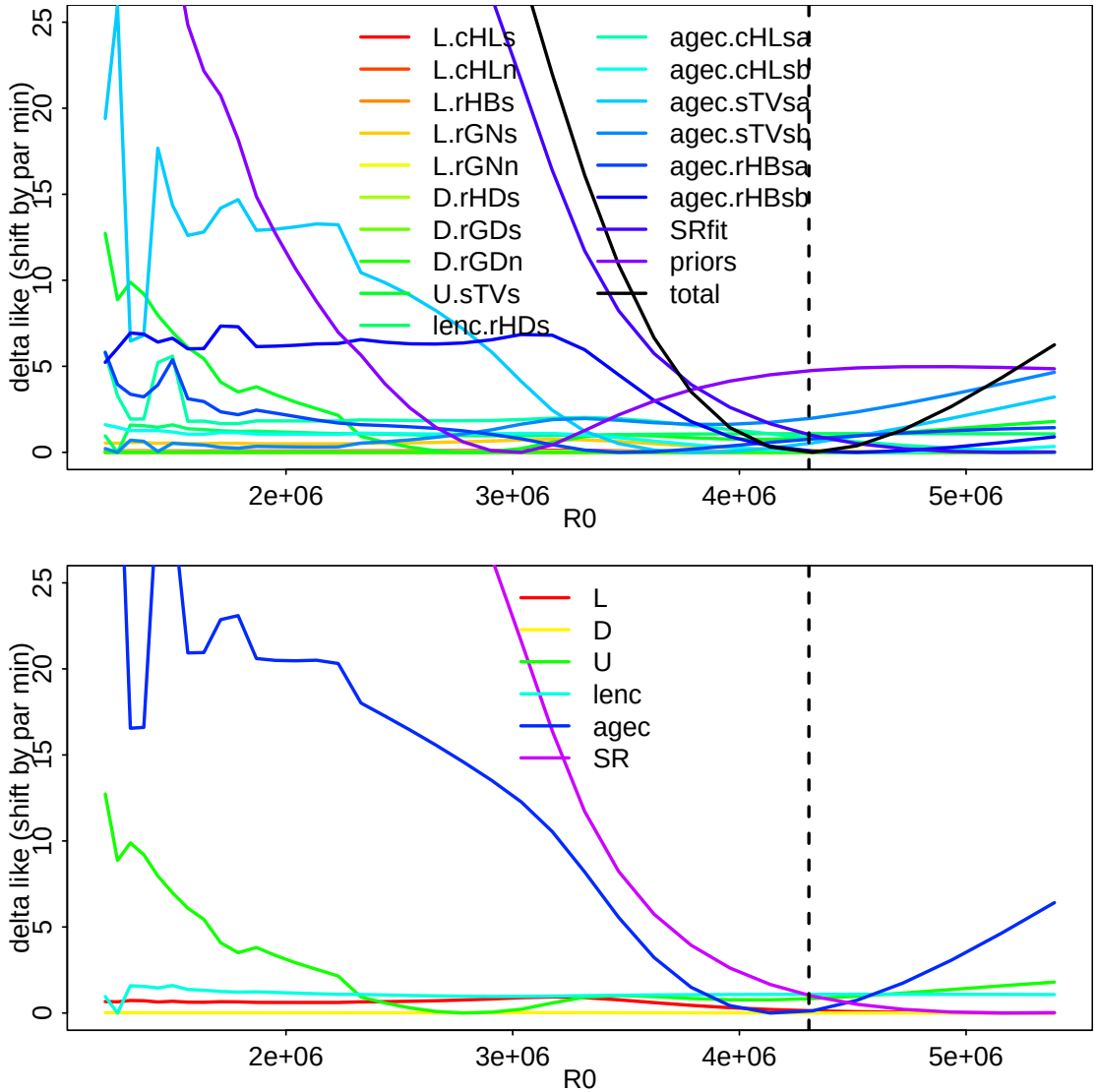
Natural mortality (M)



Likelihood profiles

Results

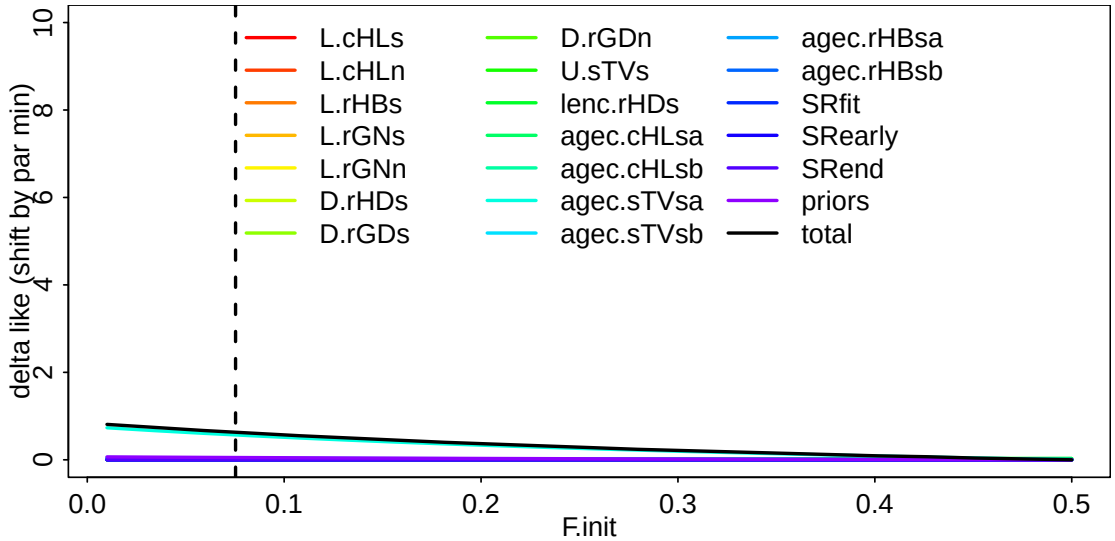
Average recruitment (R_0)

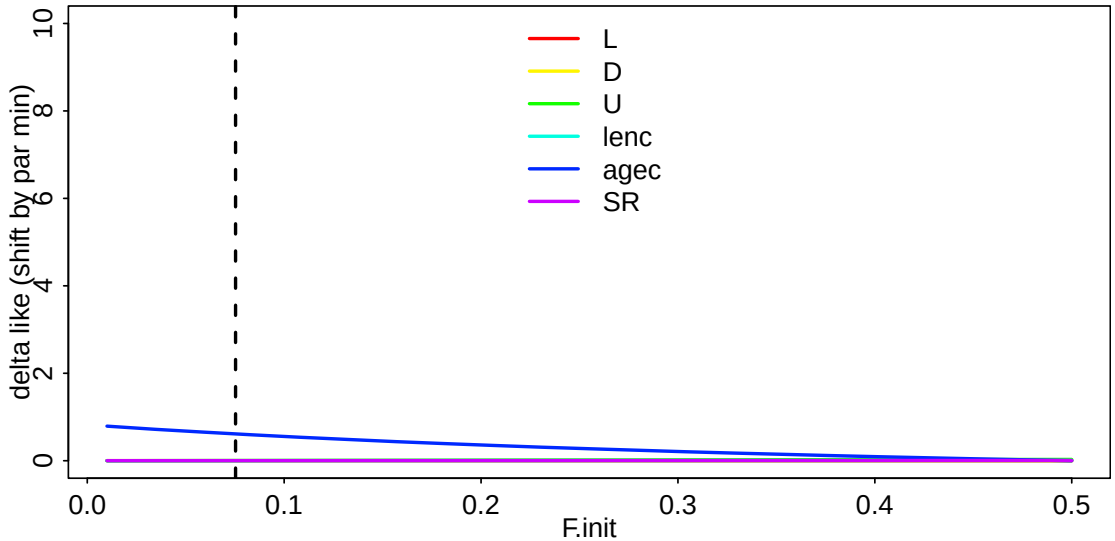


Likelihood profiles

Results

Initial F (F_{init})

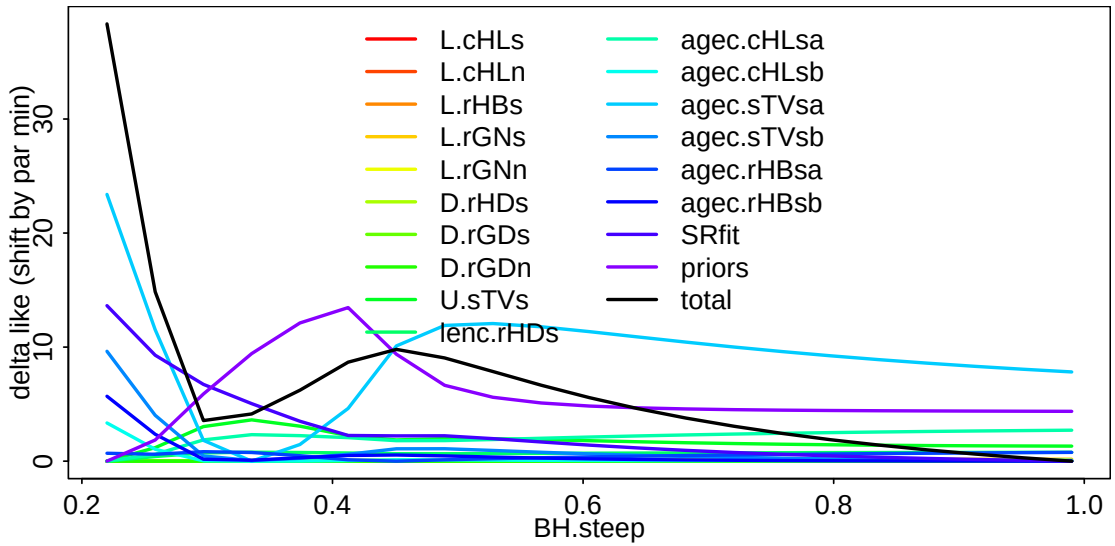


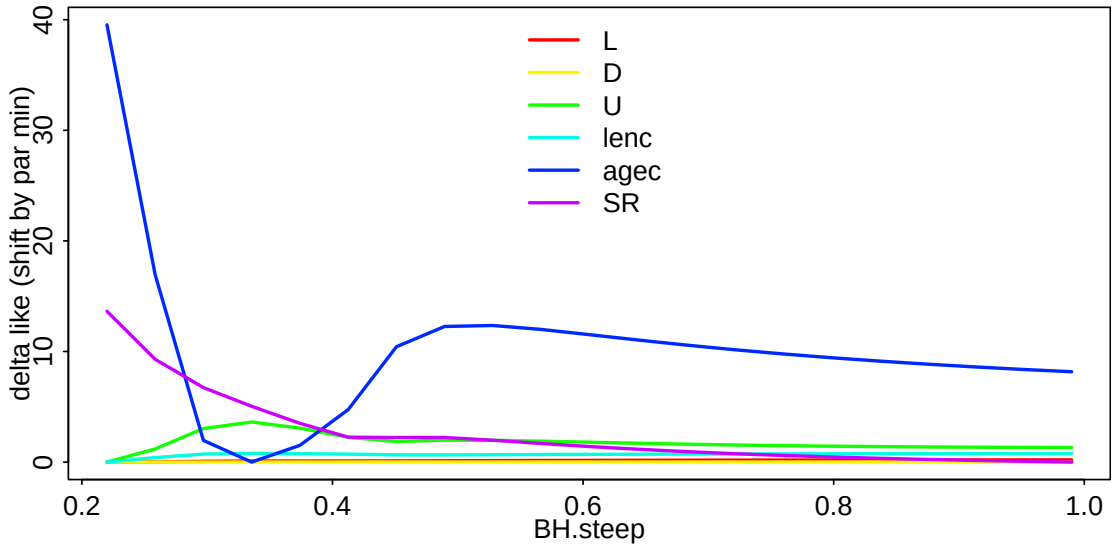


Likelihood profiles

Results

Beverton-Holt steepness





Sensitivity analysis

Methods

- S1-S2: Vary initial F (F_{init}) as a fixed value.
  - F_{init} was fixed over a range from 0.01 (S1) to 0.5 (S2), generating a sequence of 21 runs.
- S3-S4: Vary natural mortality
  - M was fixed over a range from 0.2387 (S3) to 0.5313 (S4), generating a sequence of 5 runs.
- S5-S6: Vary discard mortality rate
  - Discard mortality rate was fixed over a range from 0.364 (S5) to 0.814 (S6) for all discard fleets modeled separately in the base model (i.e. recreational fleets), generating a sequence of 5 runs.
- S7: Assume no age error
- S8: Age comps for all years use age $1-8+$
- S9: Assume that batch fecundity is not age-dependent
- S10: Assume that batch number is not age-dependent
- S11: Assume that batch fecundity and batch number are not age-dependent
- S12: Estimate steepness
  - Use a Beverton-Holt stock-recruit relationship and estimate steepness, with an initial value of 0.8

Sensitivity analysis

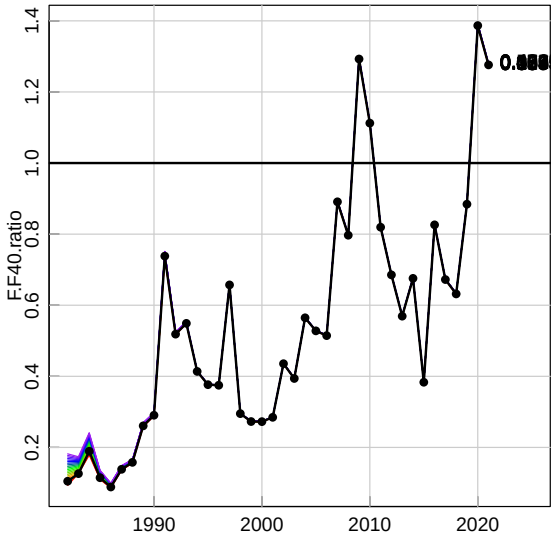
Methods

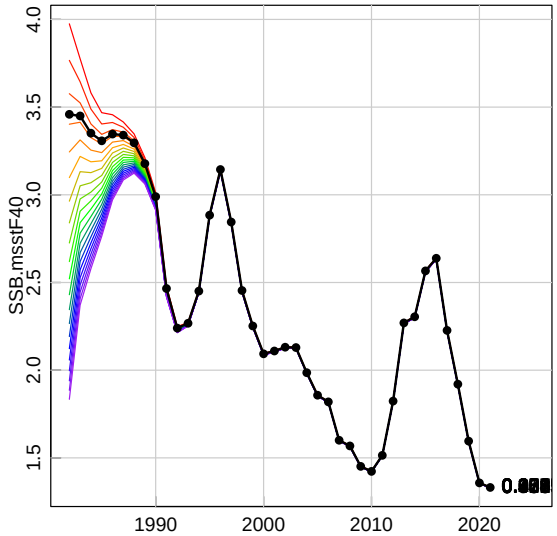
- S13: Smooth general recreational discard value for 2016
- S14: Start SERFS trap/video index in 1990
- S15: Include general recreational (rGN) length compositions and estimate separate selectivity for rGN
- S16-S17: Vary weight of SERFS trap/video index
  - The weighting parameter for the SERFS trap/video index was fixed over a range from 0.2 (S16) to 5 (S17), generating a sequence of 13 runs.
- S18-S19: Vary weight of SERFS trap/video age comps
  - The weighting parameter for the SERFS trap/video age comps was fixed over a range from 0.2 (S18) to 5 (S19), generating a sequence of 13 runs.
- S20-S21: Vary weight of all age comps
  - The weighting parameter for all age comps was fixed over a range from 0.2 (S20) to 5 (S21), generating a sequence of 13 runs.
- S22-S23: Vary weight of all length comps
  - The weighting parameter for all length comps was fixed over a range from 0.2 (S22) to 5 (S23), generating a sequence of 13 runs.

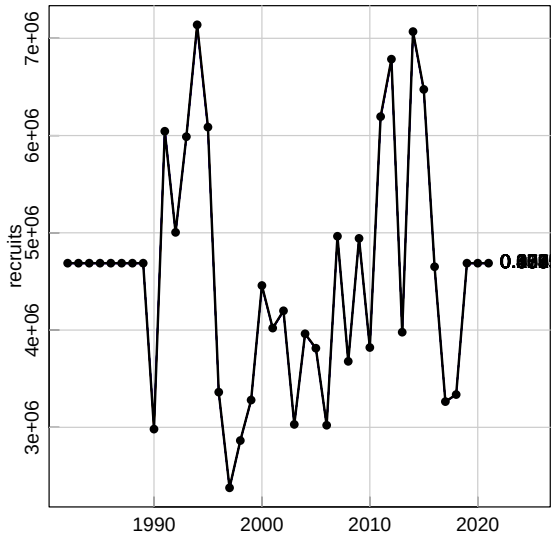
Sensitivity analysis

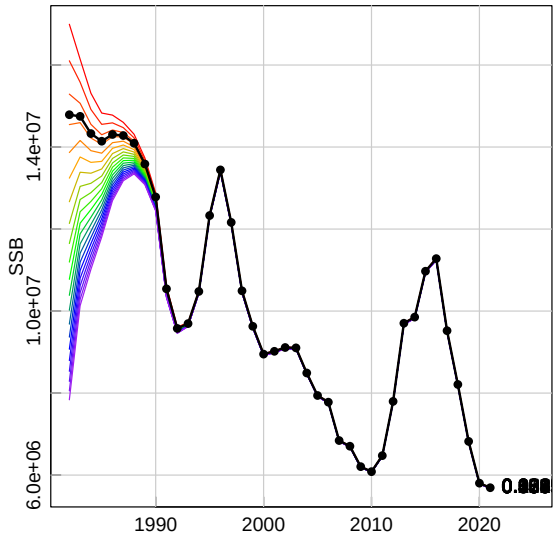
Results

S1-S2: Vary F_{init} (0.01 - 0.5)





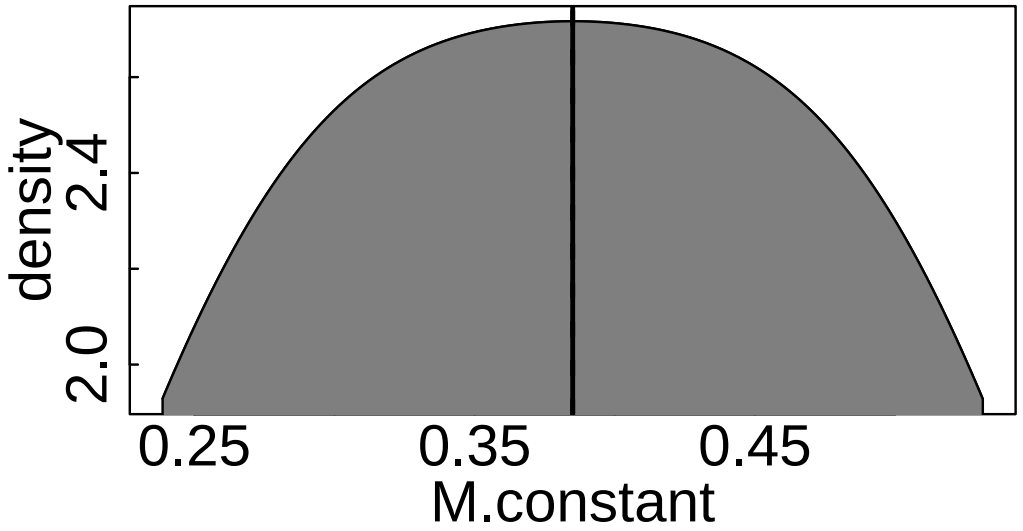


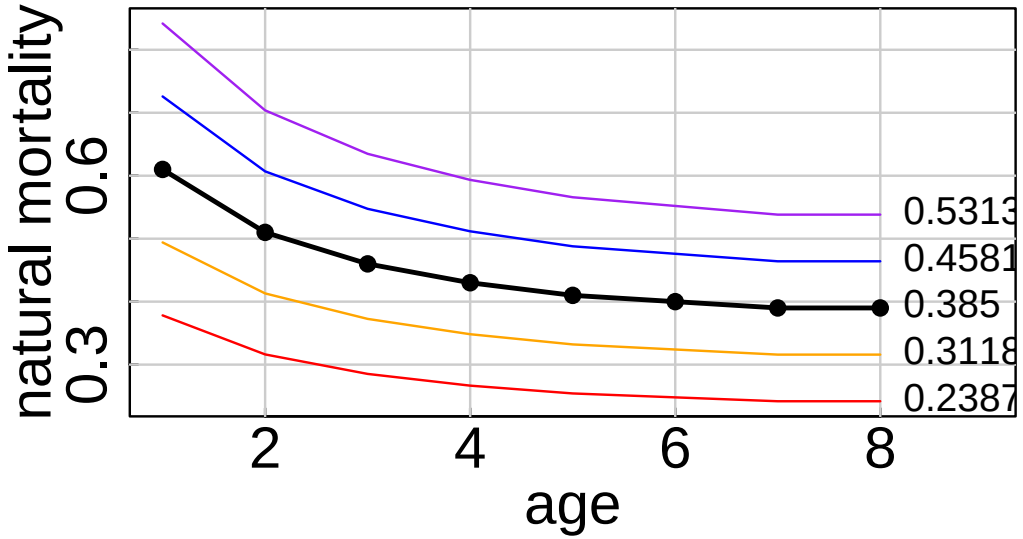


Sensitivity analysis

Results

S3-S4: Vary constant natural mortality

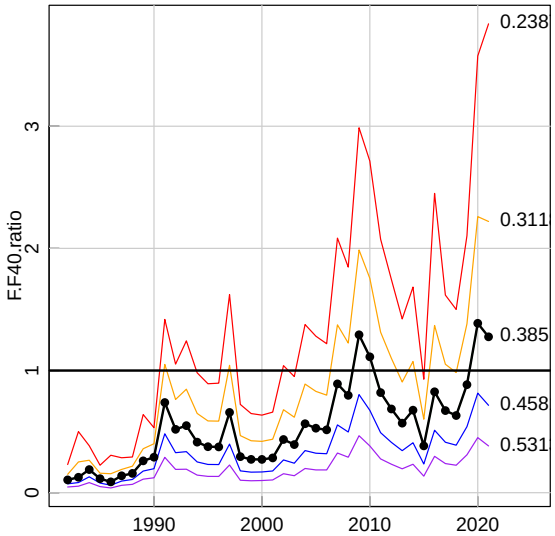


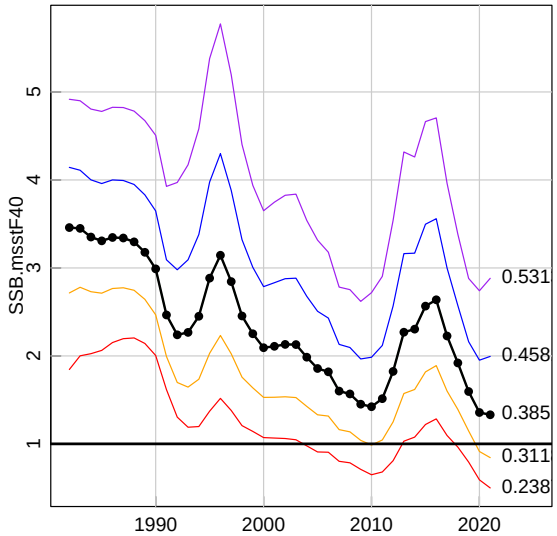


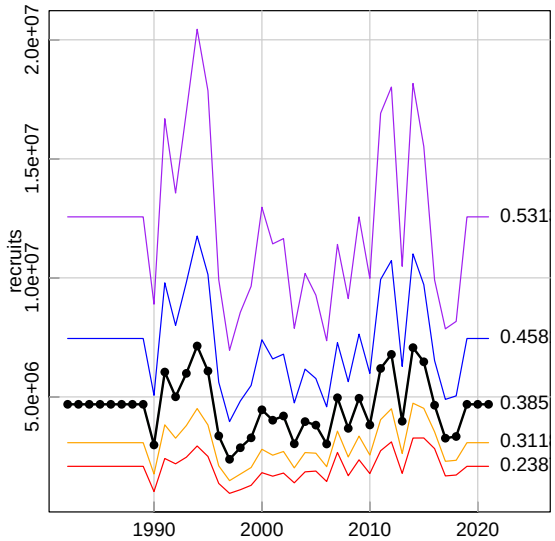
Sensitivity analysis

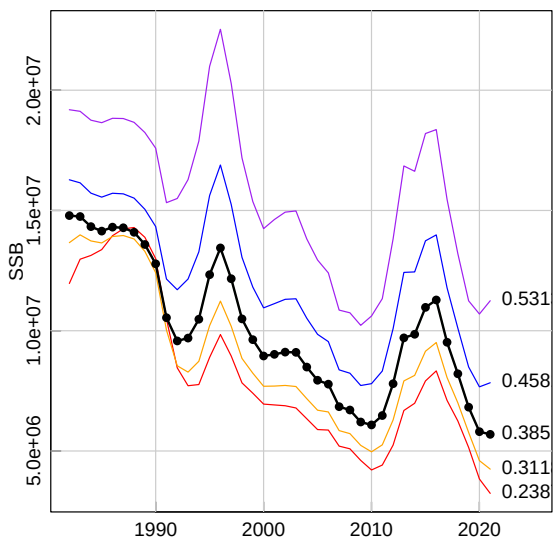
Results

S3-S4: Vary constant natural mortality





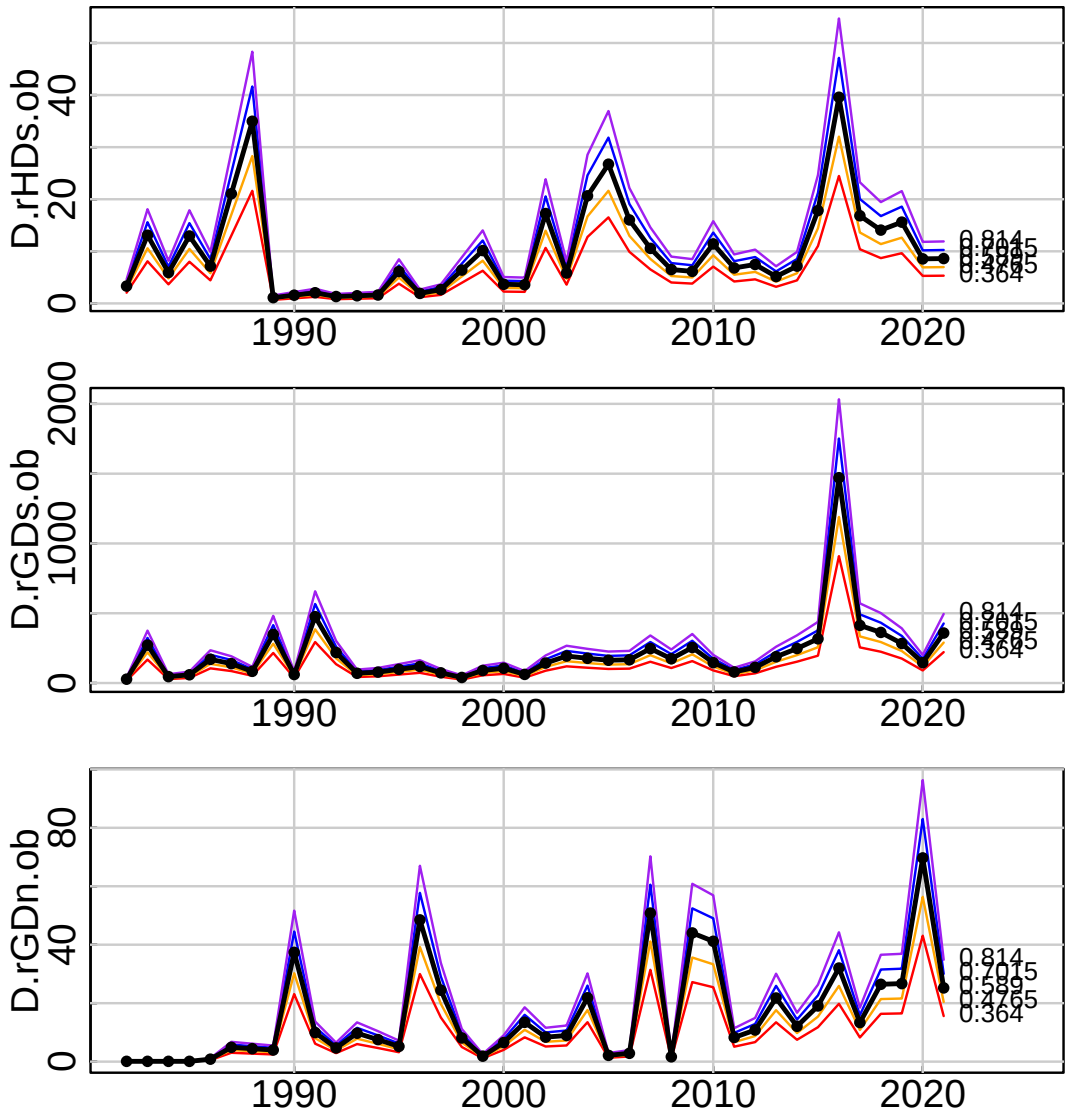




Sensitivity analysis

Results

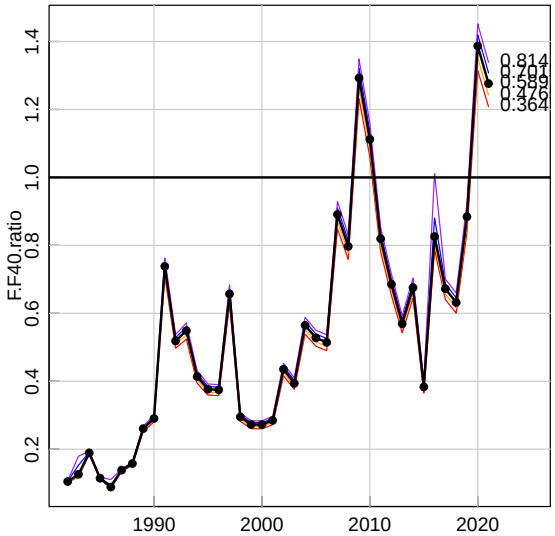
S5-S6: Vary discard mortality rate

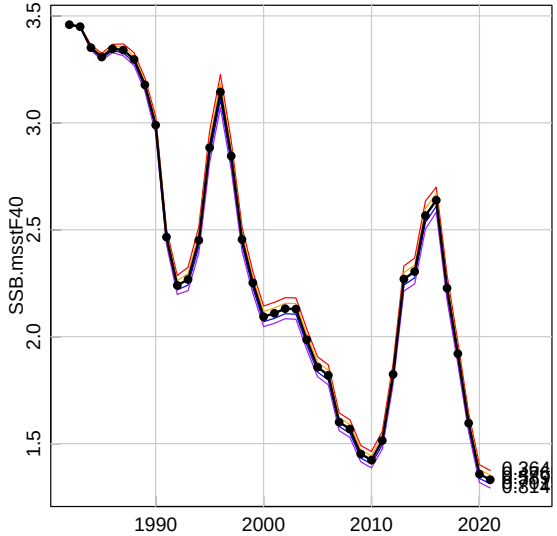


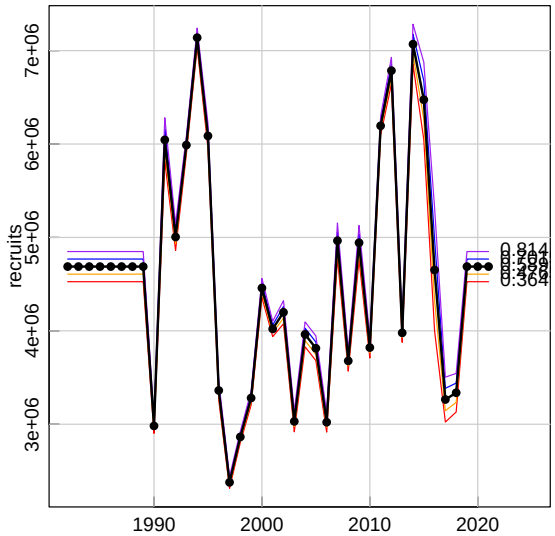
Sensitivity analysis

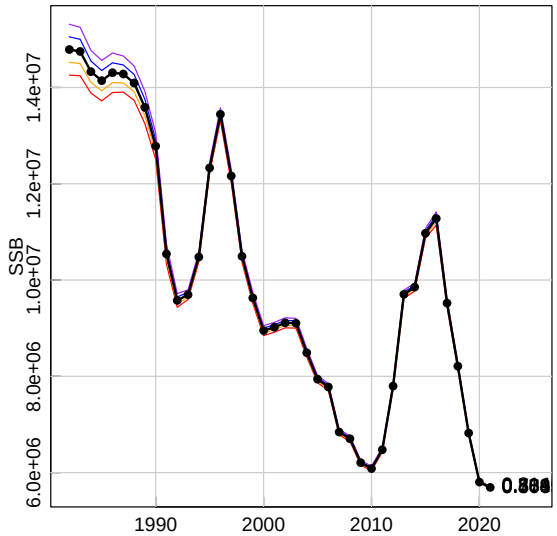
Results

S5-S6: Vary discard mortality rate







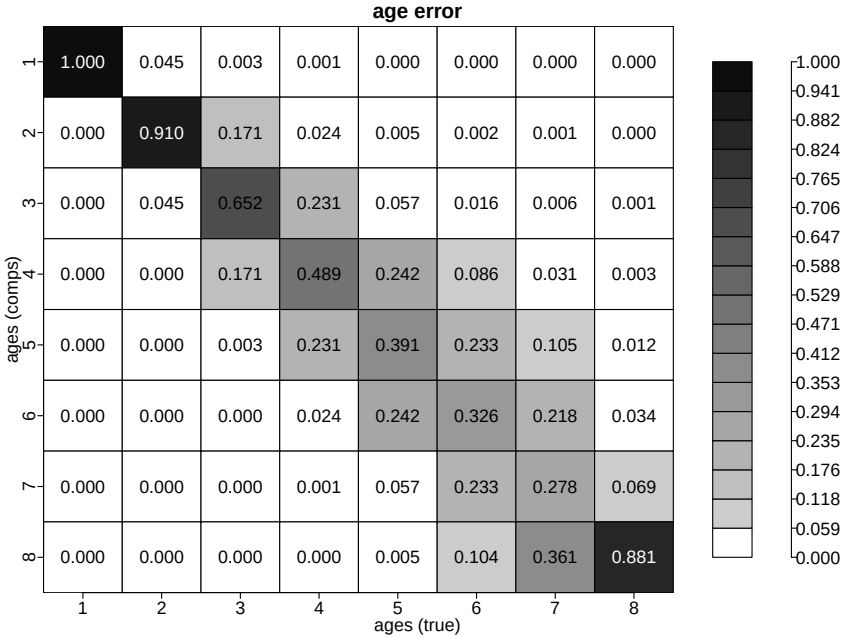


Sensitivity analysis

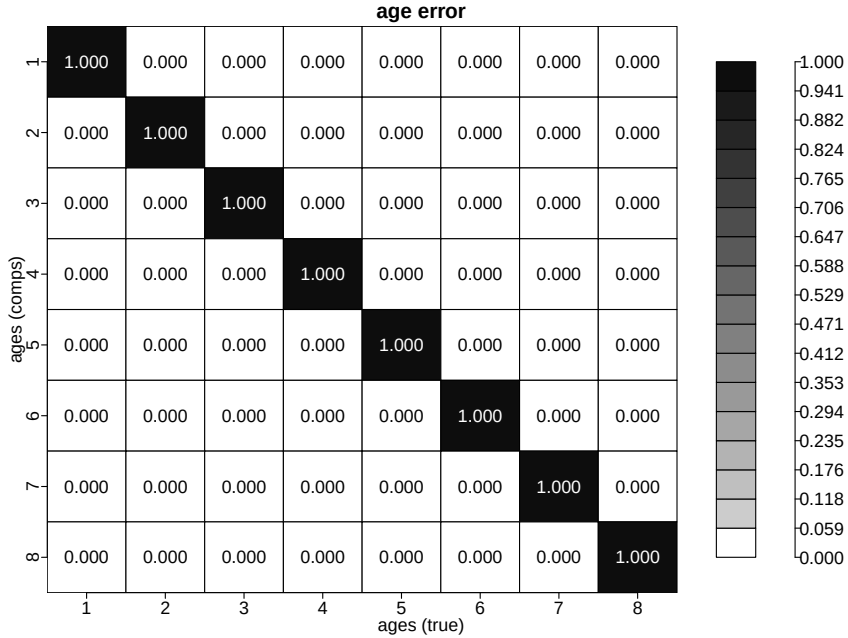
Results

S7: Assume no age error

base



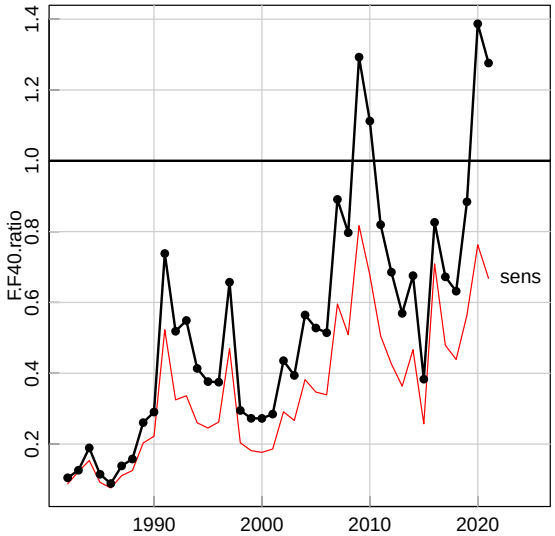
none

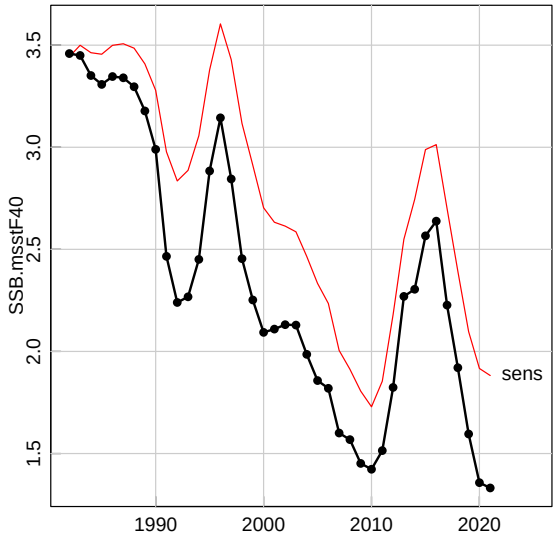


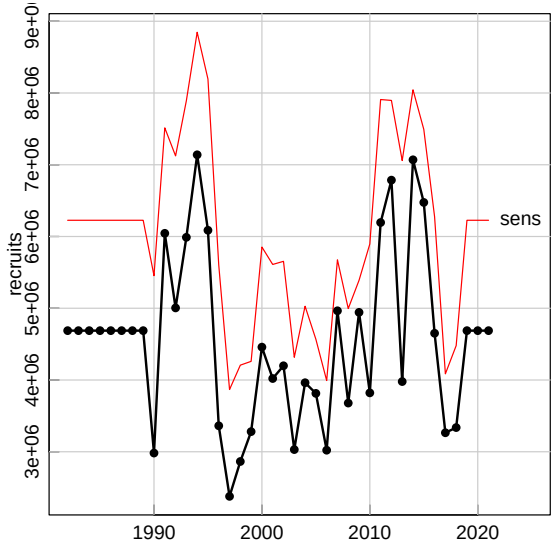
Sensitivity analysis

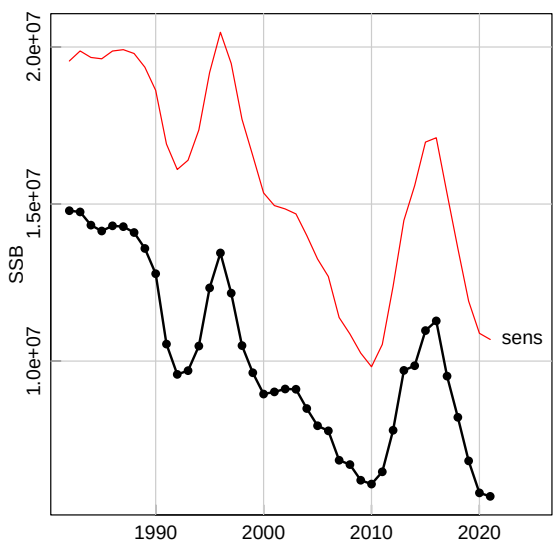
Results

S7: Assume no age error





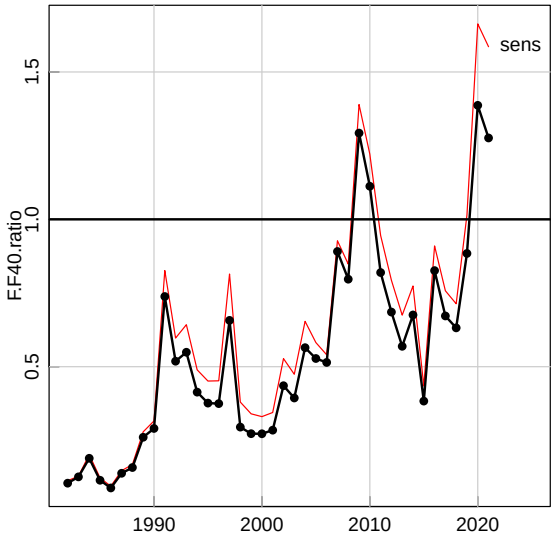


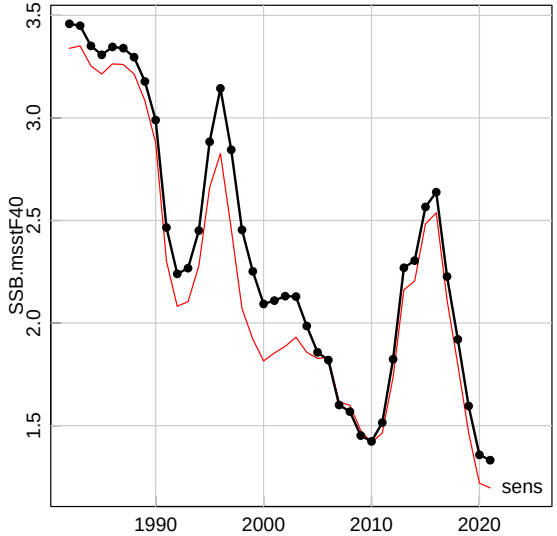


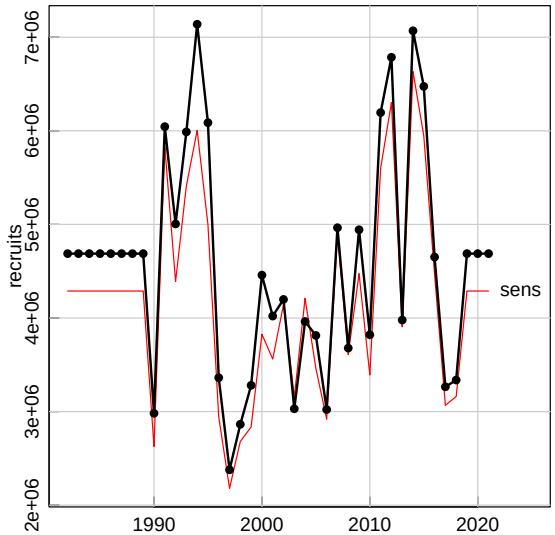
Sensitivity analysis

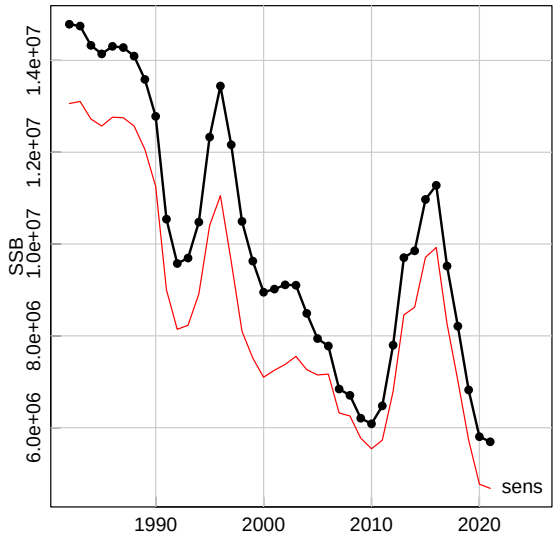
Results

S8: All years use age 1-8+





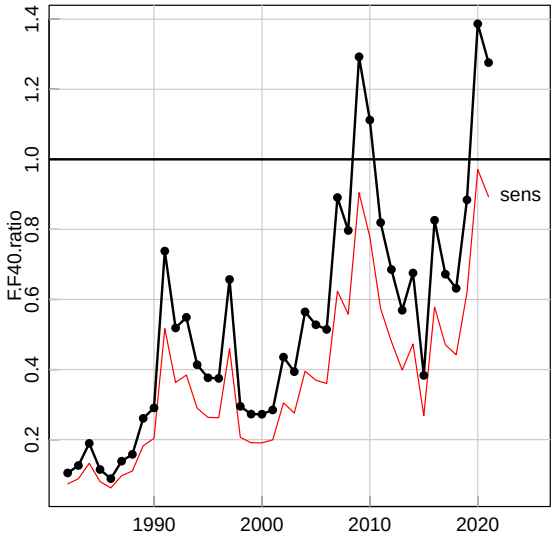


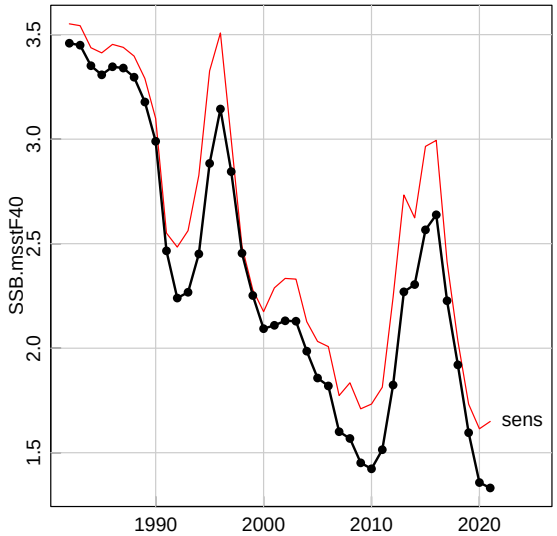


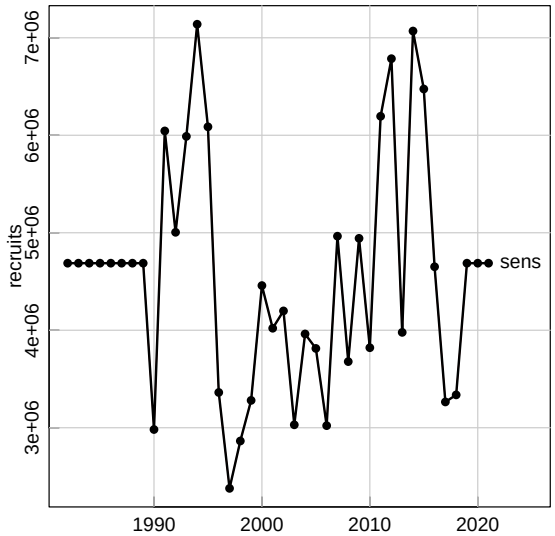
Sensitivity analysis

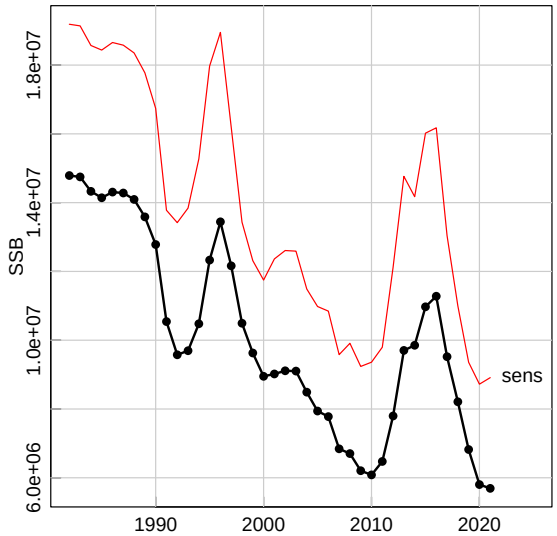
Results

S9: Assume that batch fecundity is not age-dependent





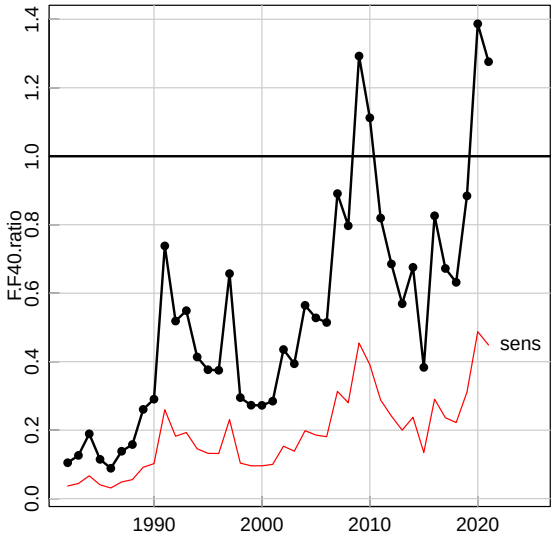


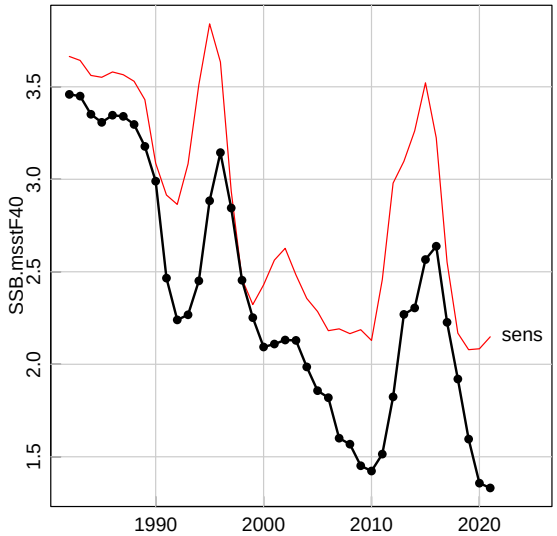


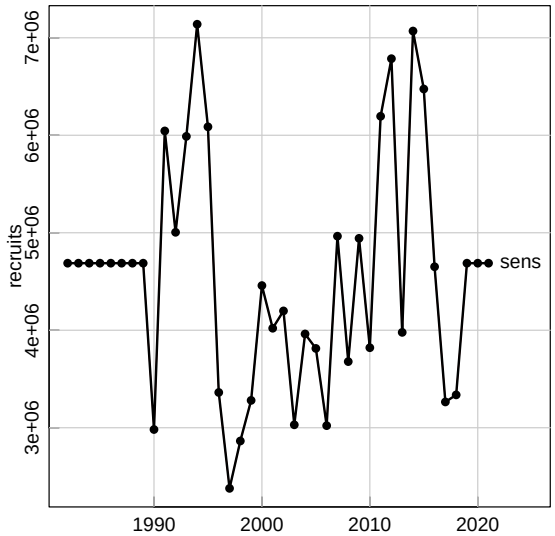
Sensitivity analysis

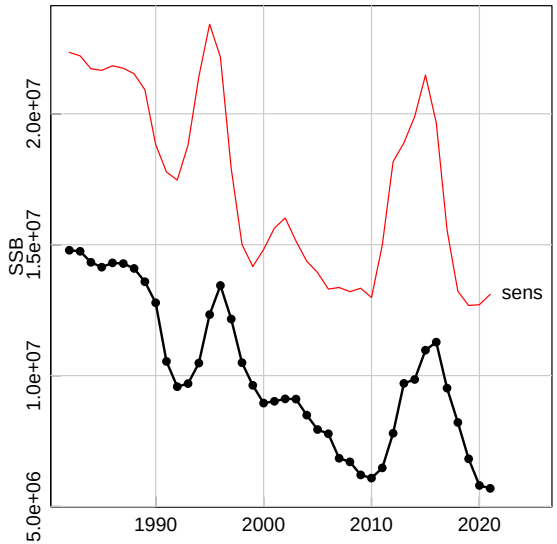
Results

S10: Assume that batch number is not age-dependent





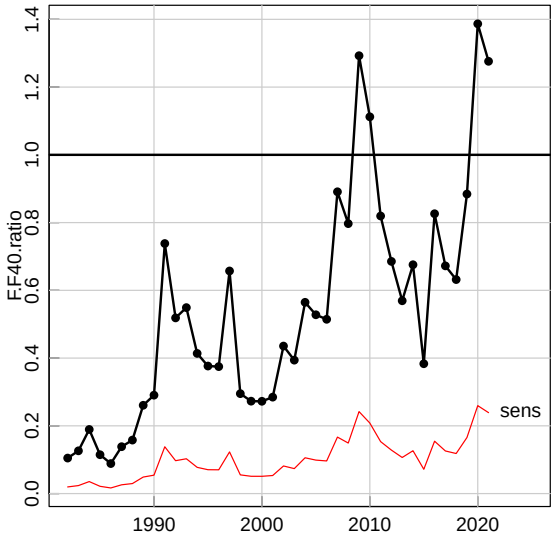


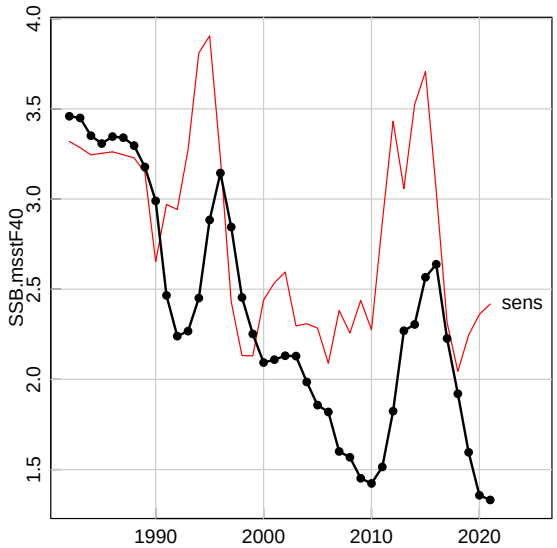


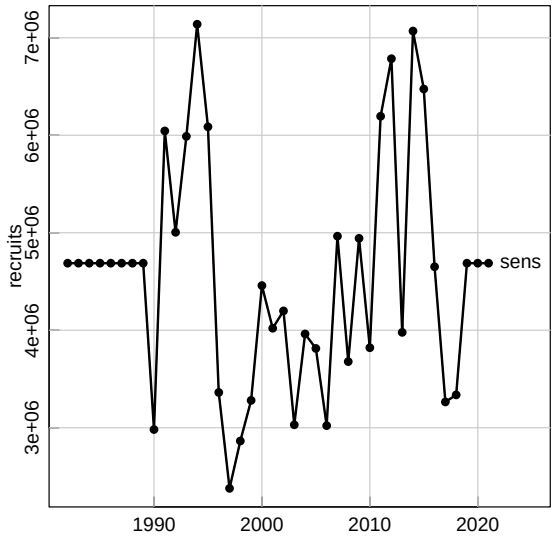
Sensitivity analysis

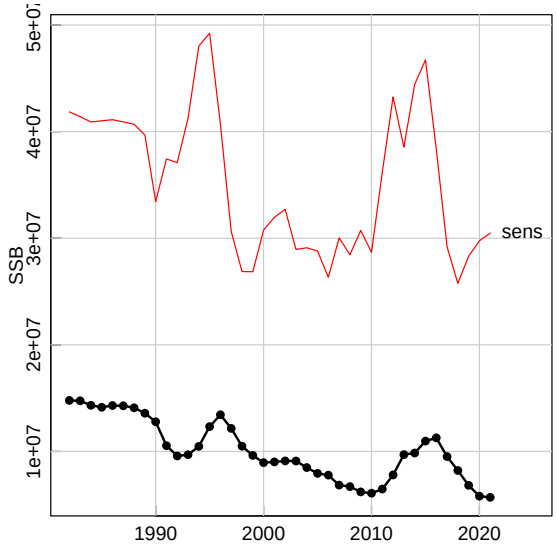
Results

S11: Assumer that batch fecundity and batch number are not age-dependent





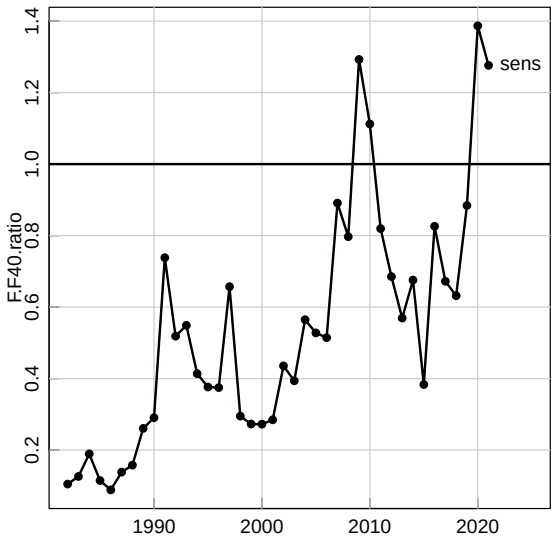


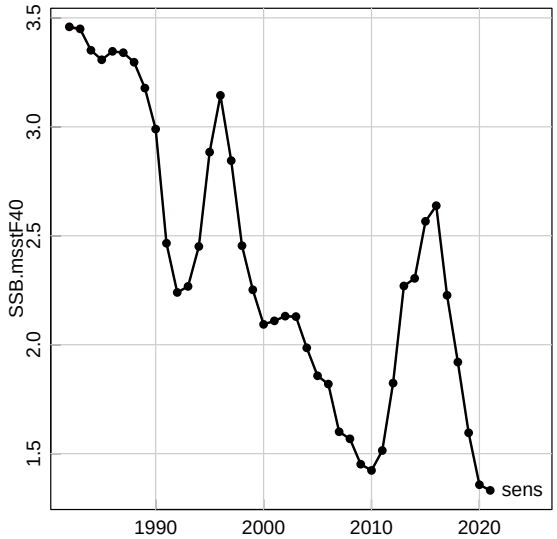


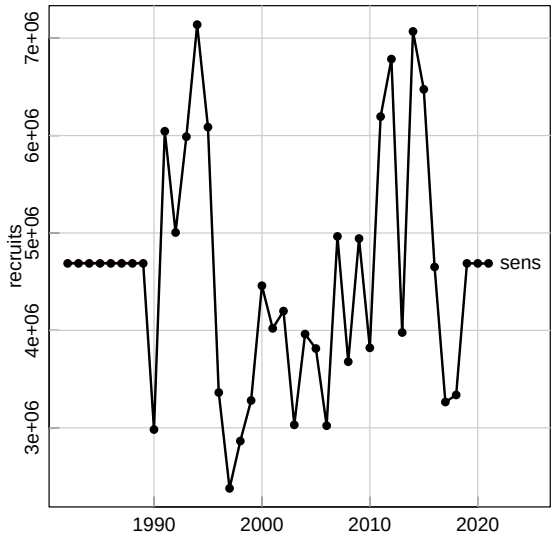
Sensitivity analysis

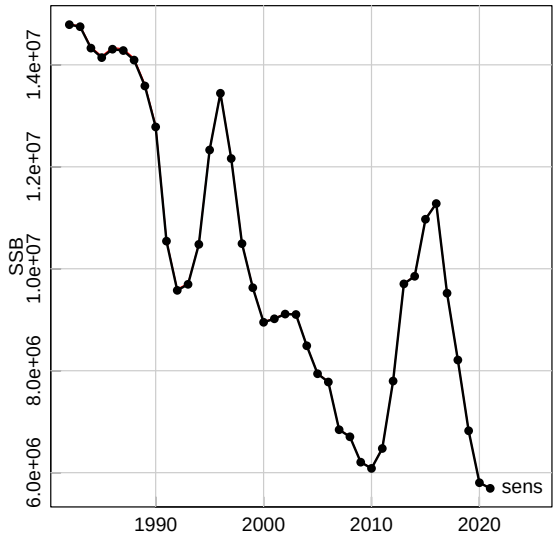
Results

S12: Estimate Beverton-Holt steepness





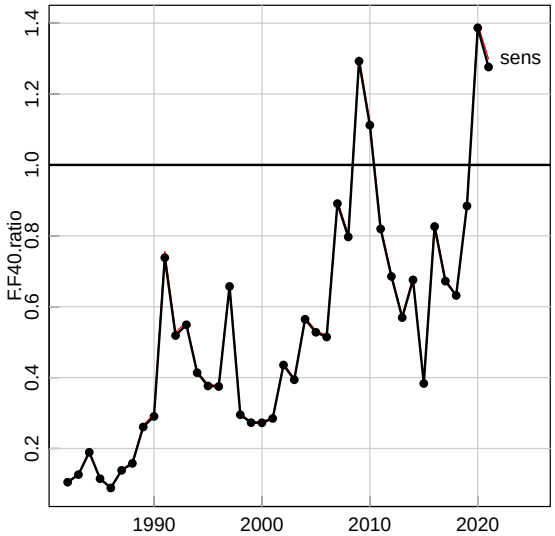


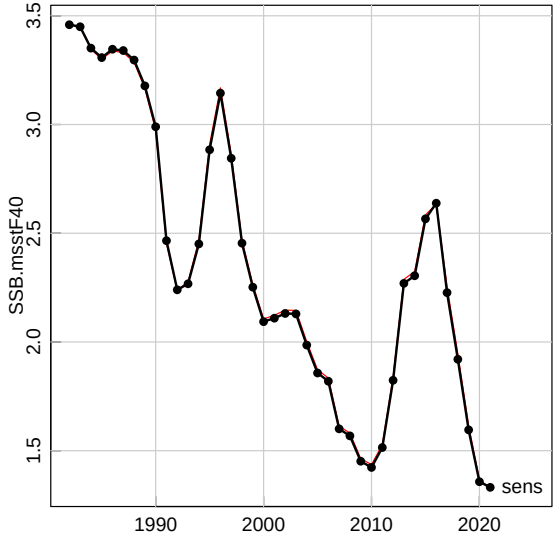


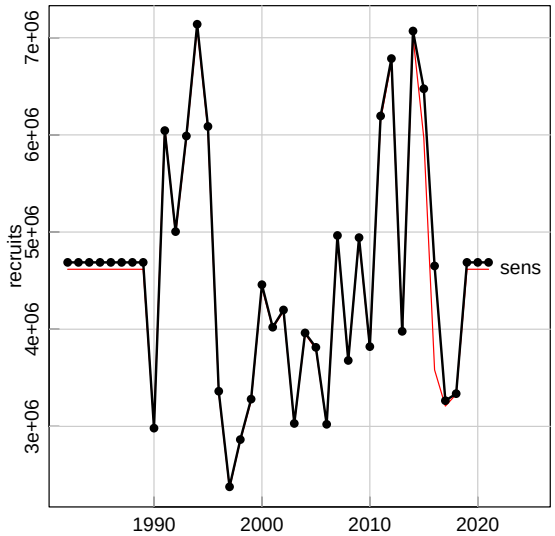
Sensitivity analysis

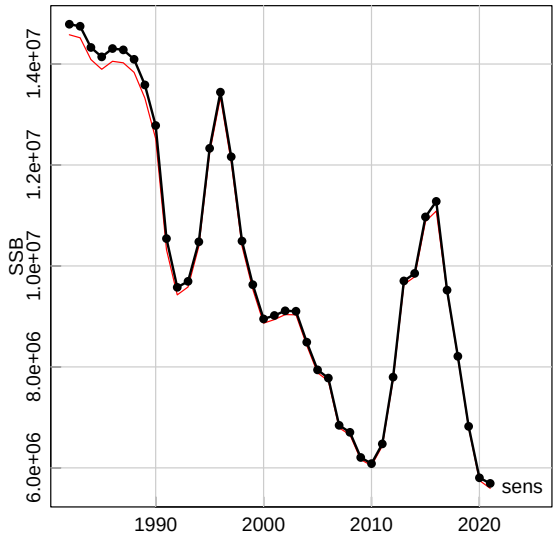
Results

S13: Smooth general recreational discard value for 2016





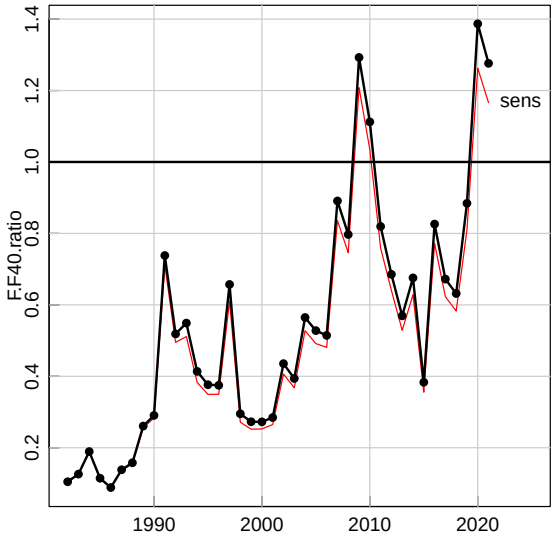


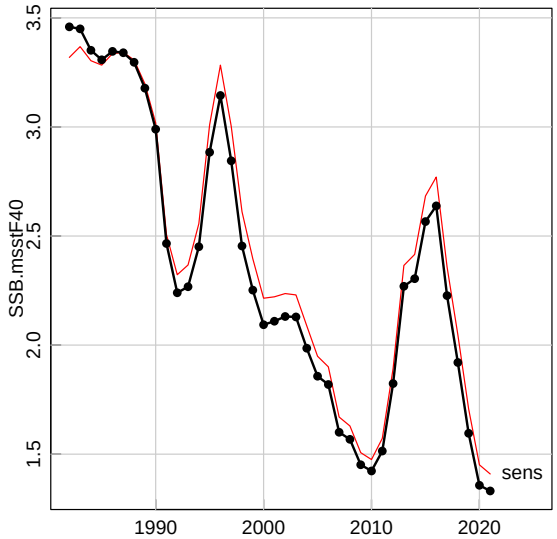


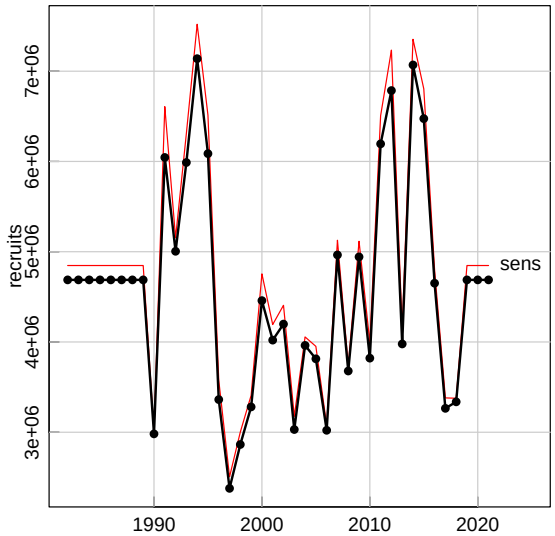
Sensitivity analysis

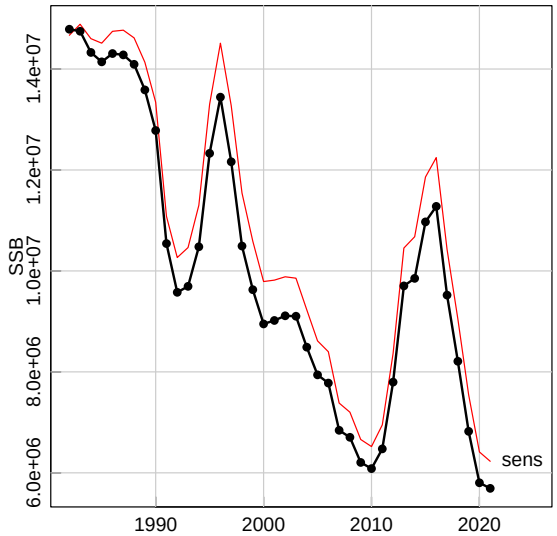
Results

S14: Start SERFS trap/video index in 1990





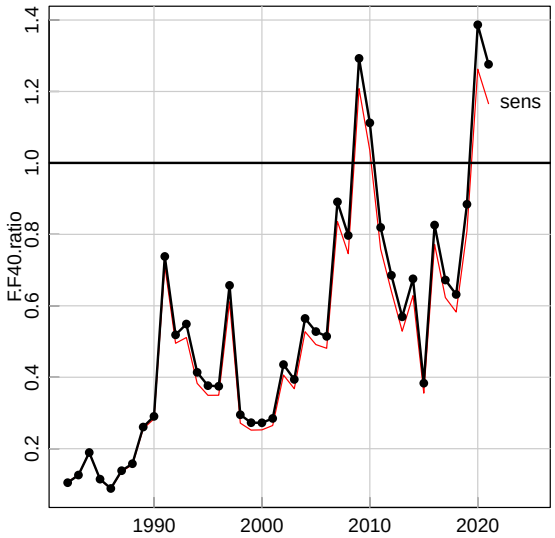


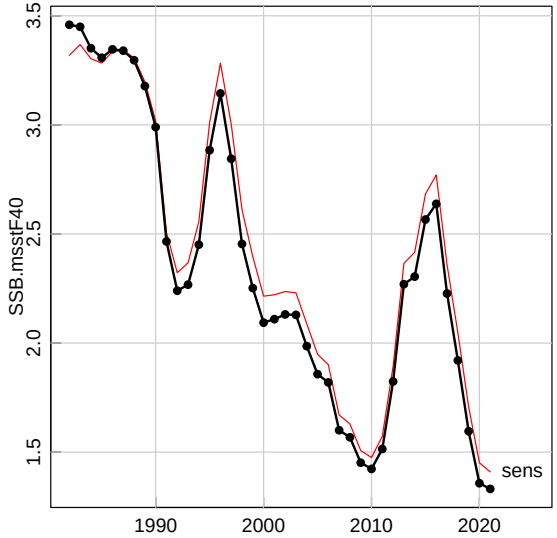


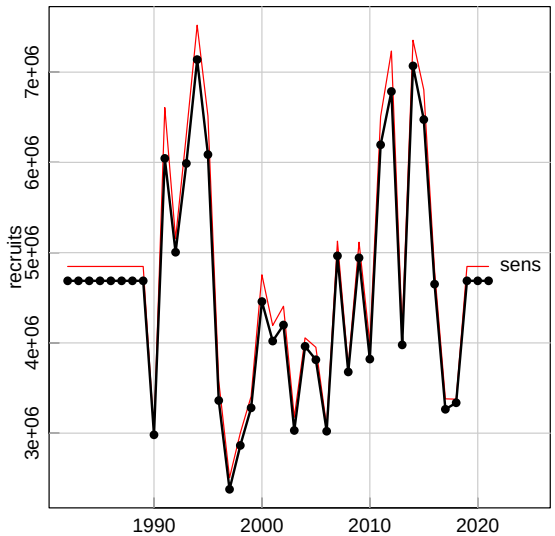
Sensitivity analysis

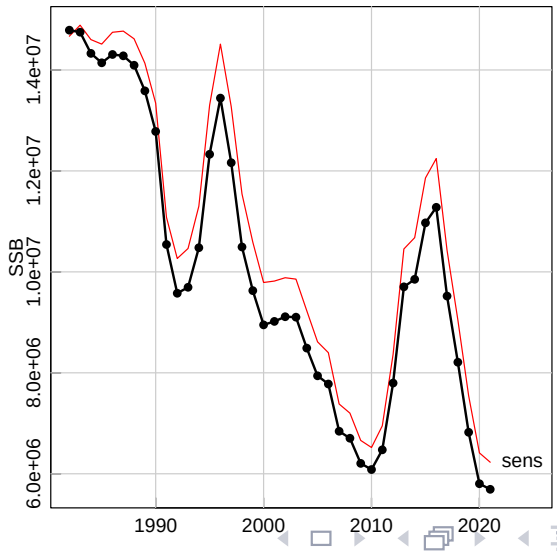
Results

S15: Include general recreational (rGN) length compositions and estimate separate selectivity for rGN





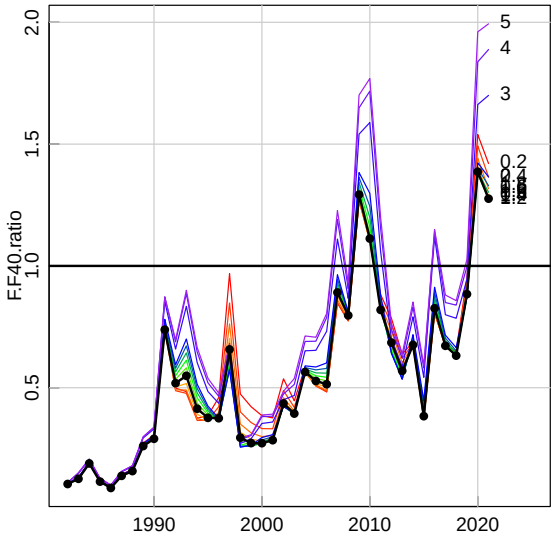


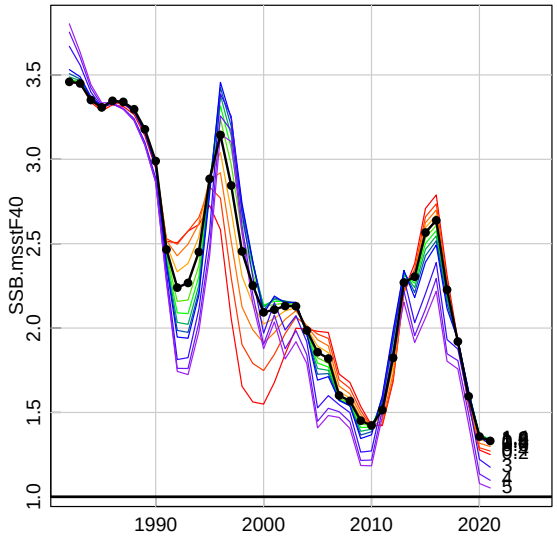


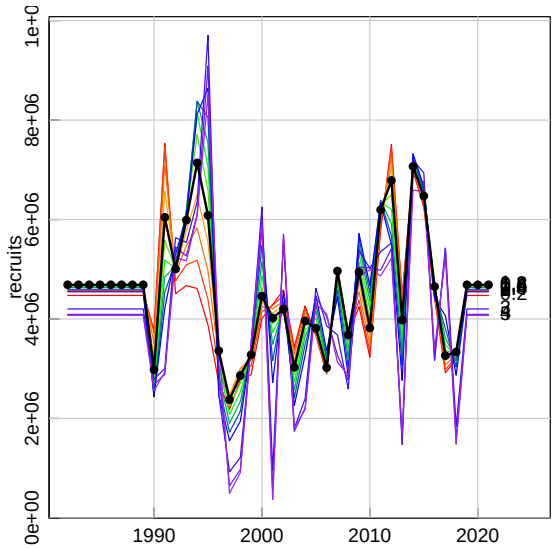
Sensitivity analysis

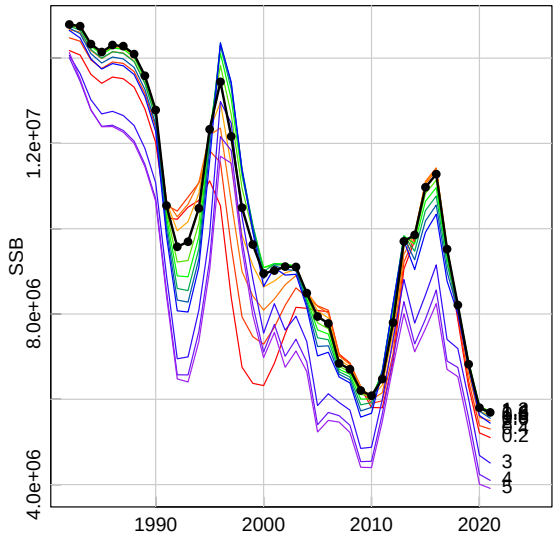
Results

S16-S17: Vary weight on sTVs index





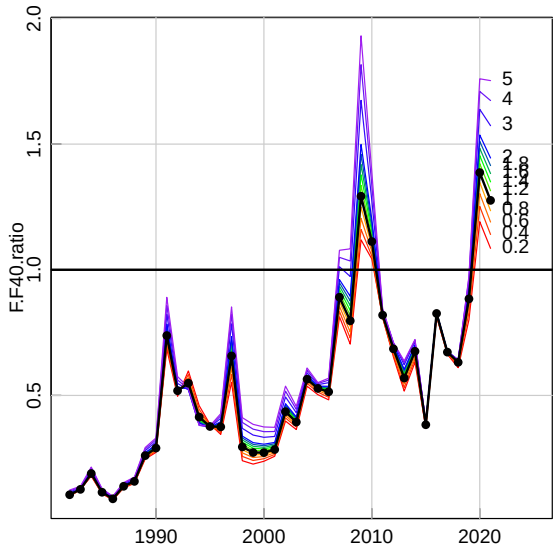


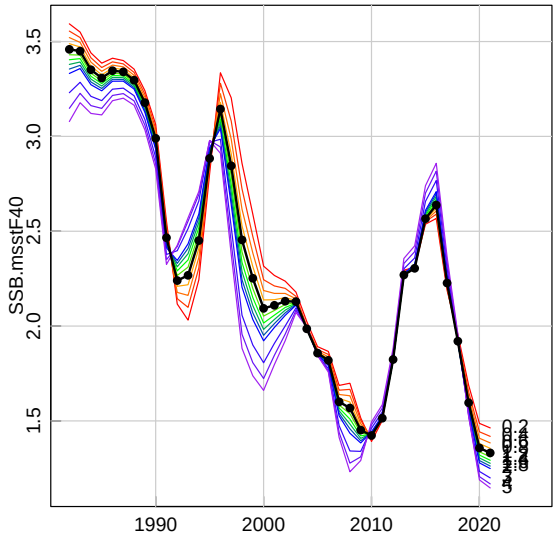


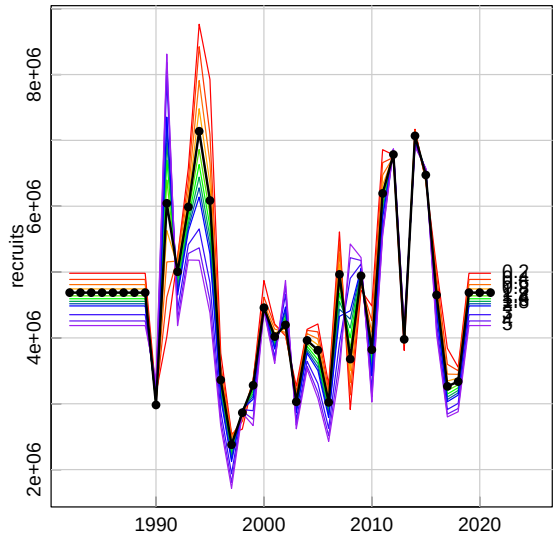
Sensitivity analysis

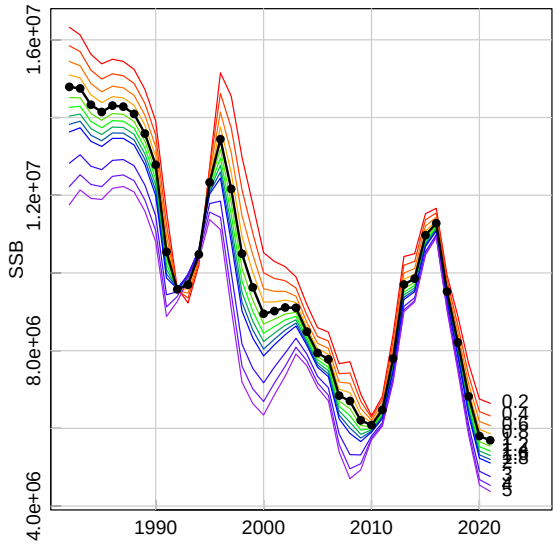
Results

S18-S19: Vary weight on sTVs age comps





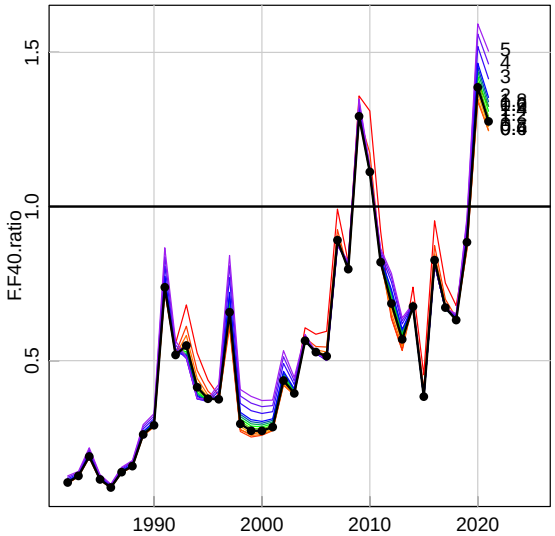


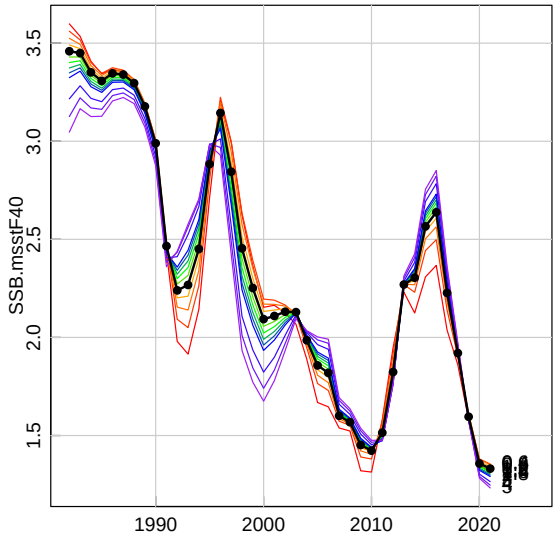


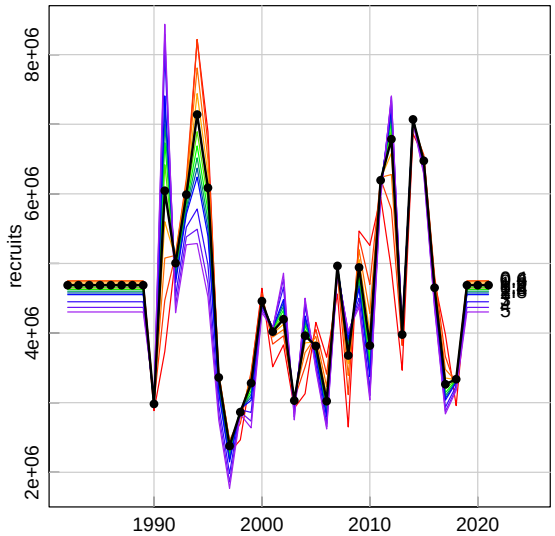
Sensitivity analysis

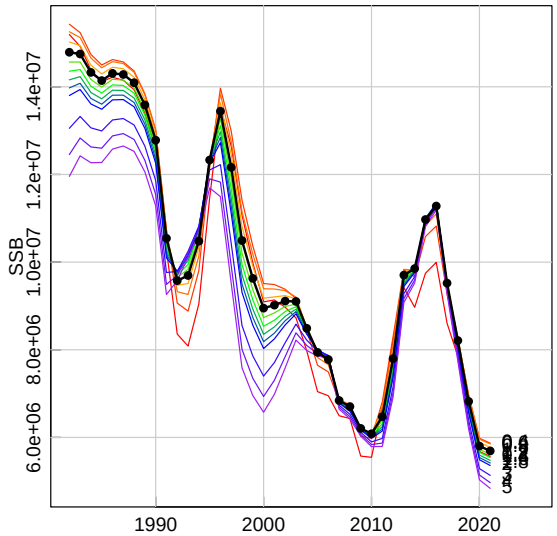
Results

S20-S21: Vary weight on all age comps





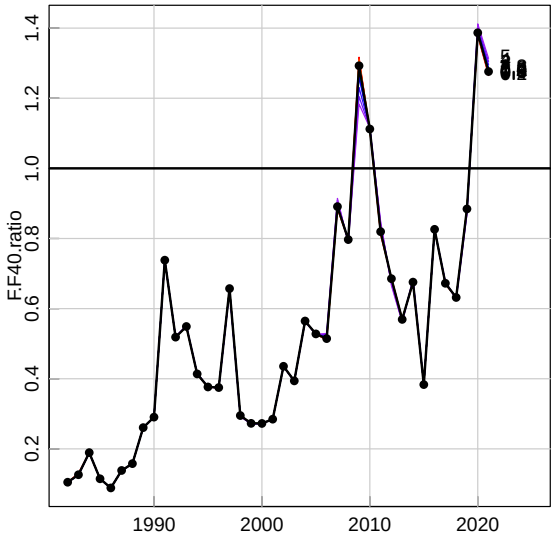


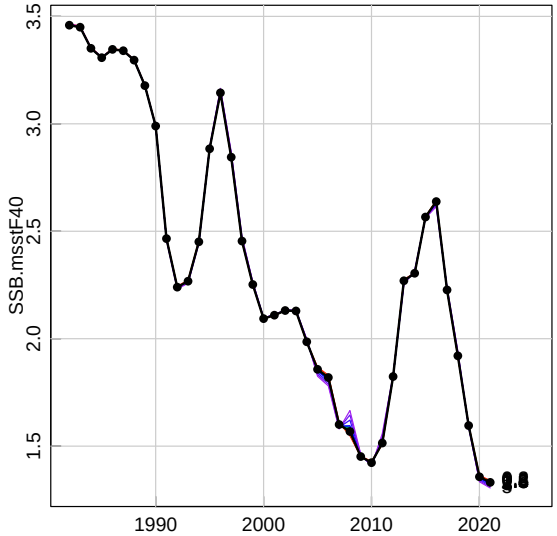


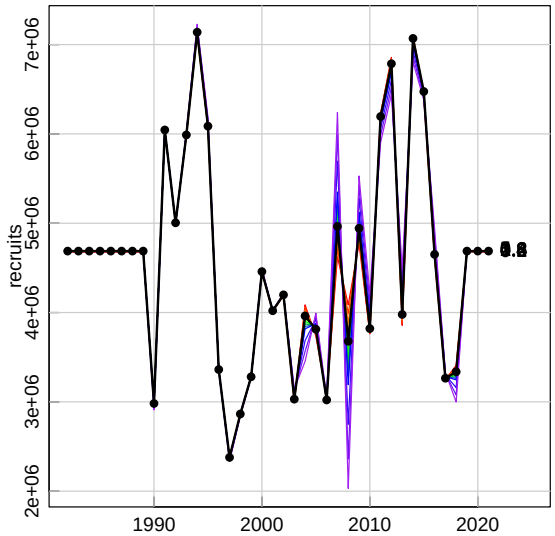
Sensitivity analysis

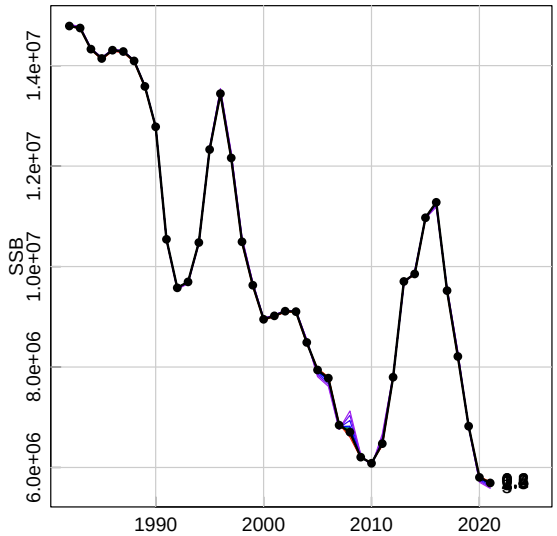
Results

S22-S23: Vary weight on all length comps





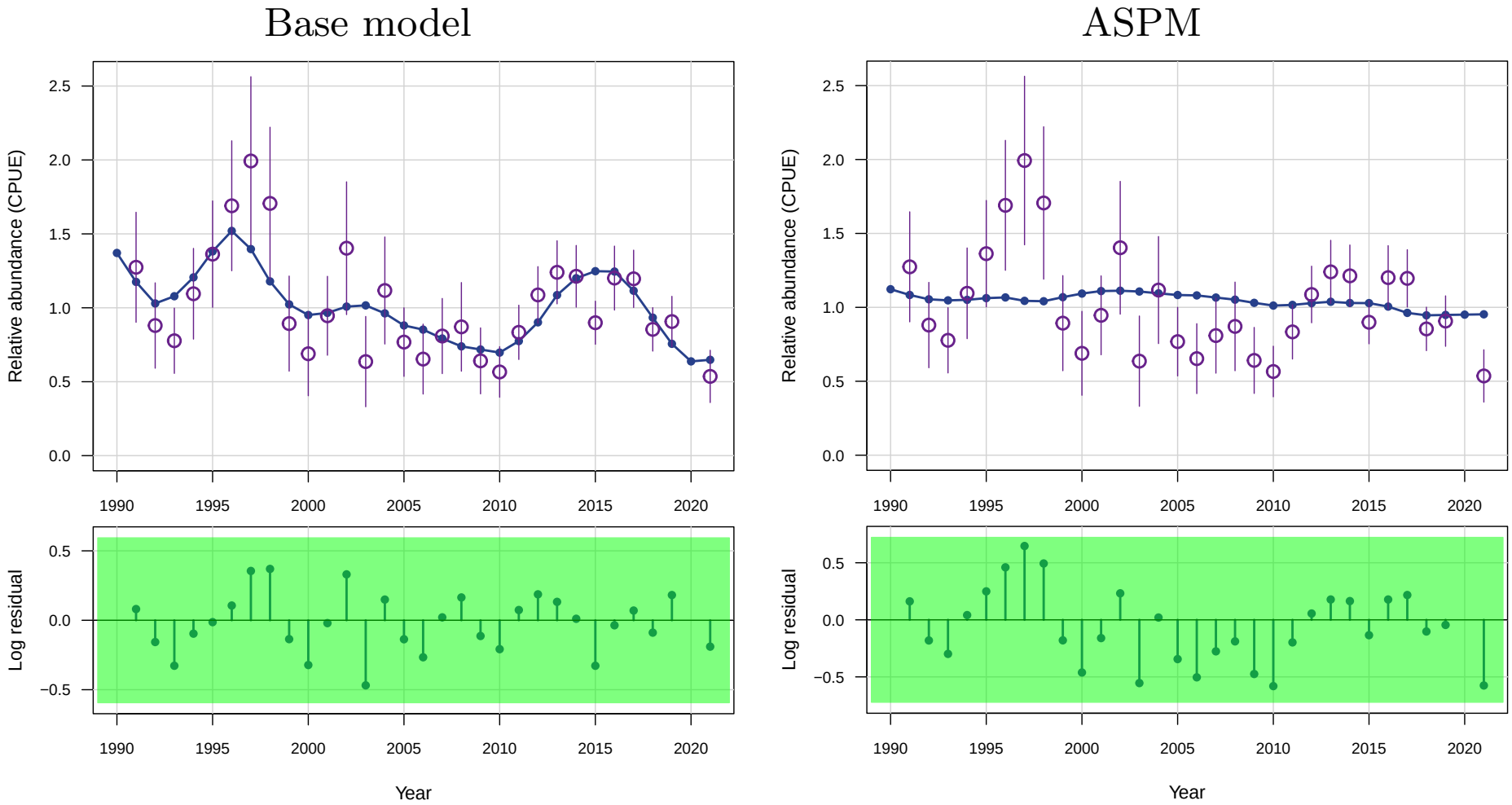




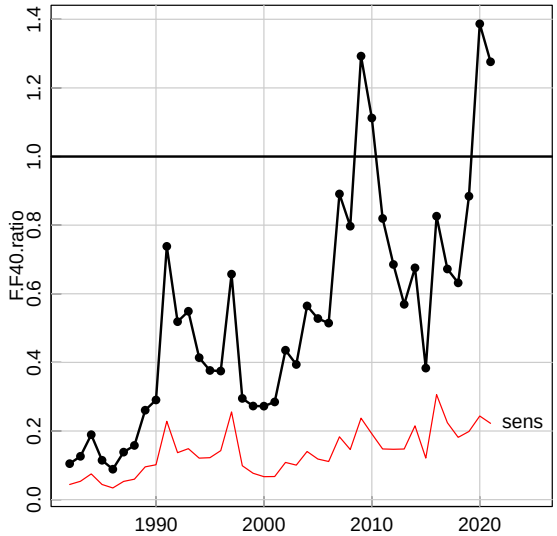
Age Structured Production Model (ASPM)

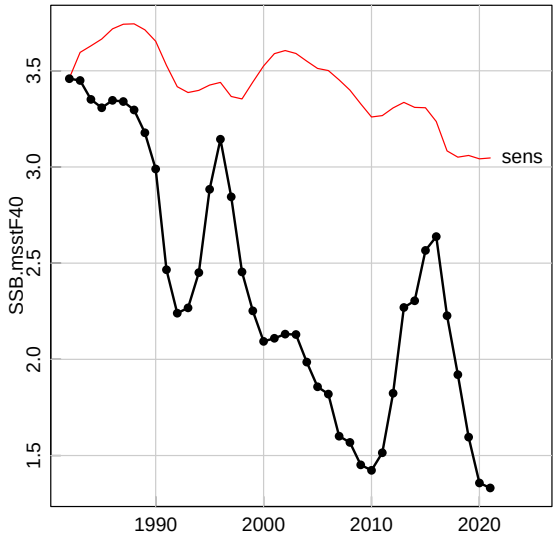
- Fixed some parameters at estimates from base run:
  1. Selectivity parameters
  2. F_{init}
- Not estimating recruitment deviations
- Weights of age and length comps set to zero
- Dirichlet-multinomial overdispersion parameters removed
- Set rec_sigma to small value
- The ASPM estimated fishing mortality (Fs), catchability (q), and unfished recruitment (R_0)

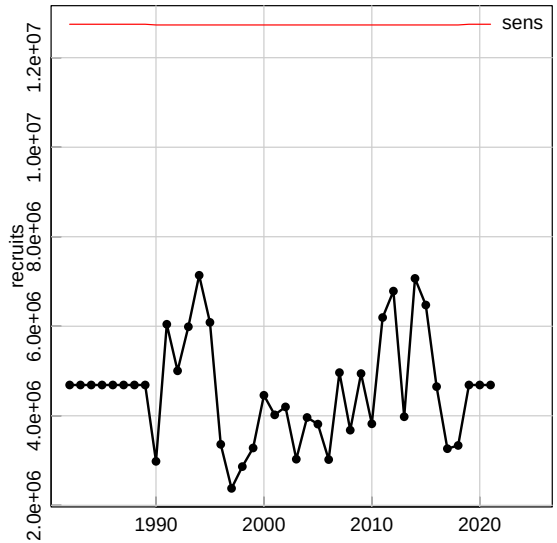
Age Structured Production Model (ASPM): Fit to sTVs index

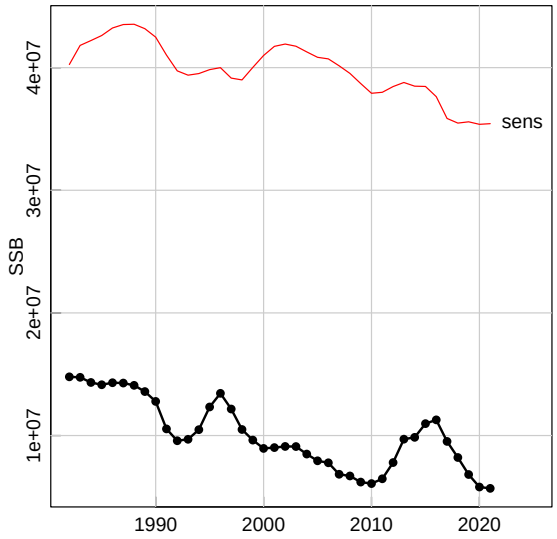


Age Structured Production Model (ASPM)









Retrospective analysis

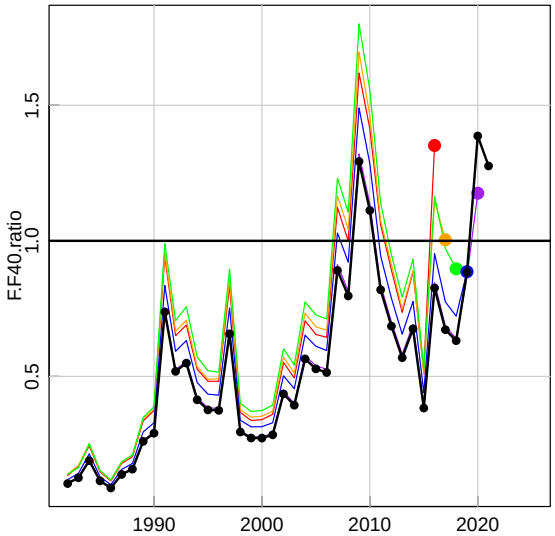
Methods

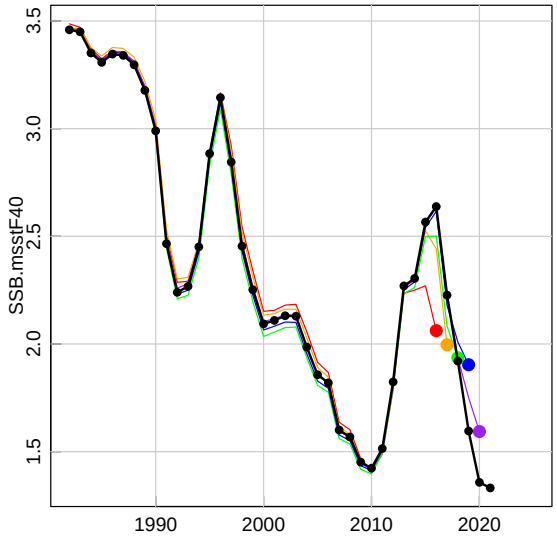
- Methods similar to sensitivity analysis
- Data in assessment model were truncated to new terminal years of 2016 – 2020
  - Attempts to go further back were unsuccessful, perhaps due to the time blocking of the age composition data
- The base model was rerun with truncated data
- Results of retrospective runs were plotted together to look for patterns in terminal year values

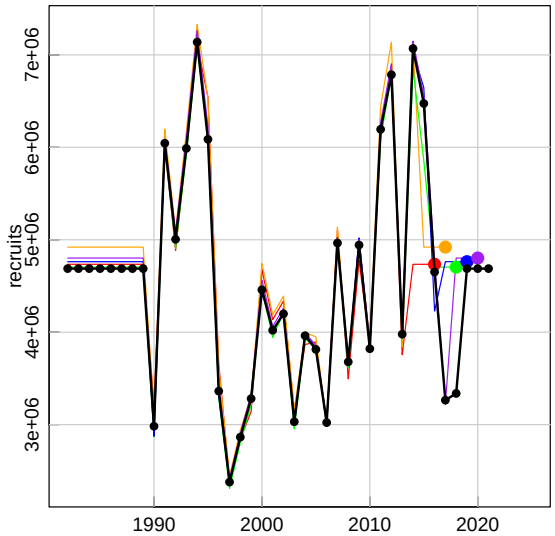
Retrospective analysis

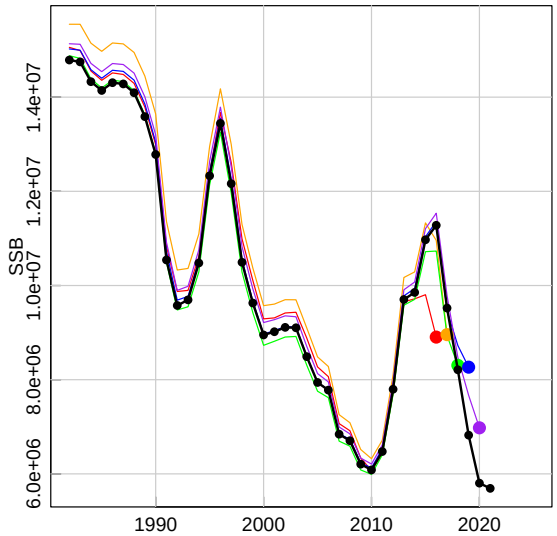
Results

Retrospective plots









Projections

Methods

- Projections are not part of the SEDAR 82 Terms of Reference for the Assessment Process, but will be important in the upcoming operational assessment
- Projections were made to 2031, with projected fishing level changes beginning in 2025.
- Fishing mortality for 2022-2024 was set at $F_{\text{current}} = 0.65$ (geometric mean F from 2019-2021)
- Projections at fixed F from $2022 - 2031$
  - $F = F_{40\%}$
  - $F = 75\% F_{40\%}$
- Stochastic projections randomly draw an MCBE run ($n = 20,001$) and project forward
- Recruitment deviations were randomly drawn for projection years

Projections

Methods

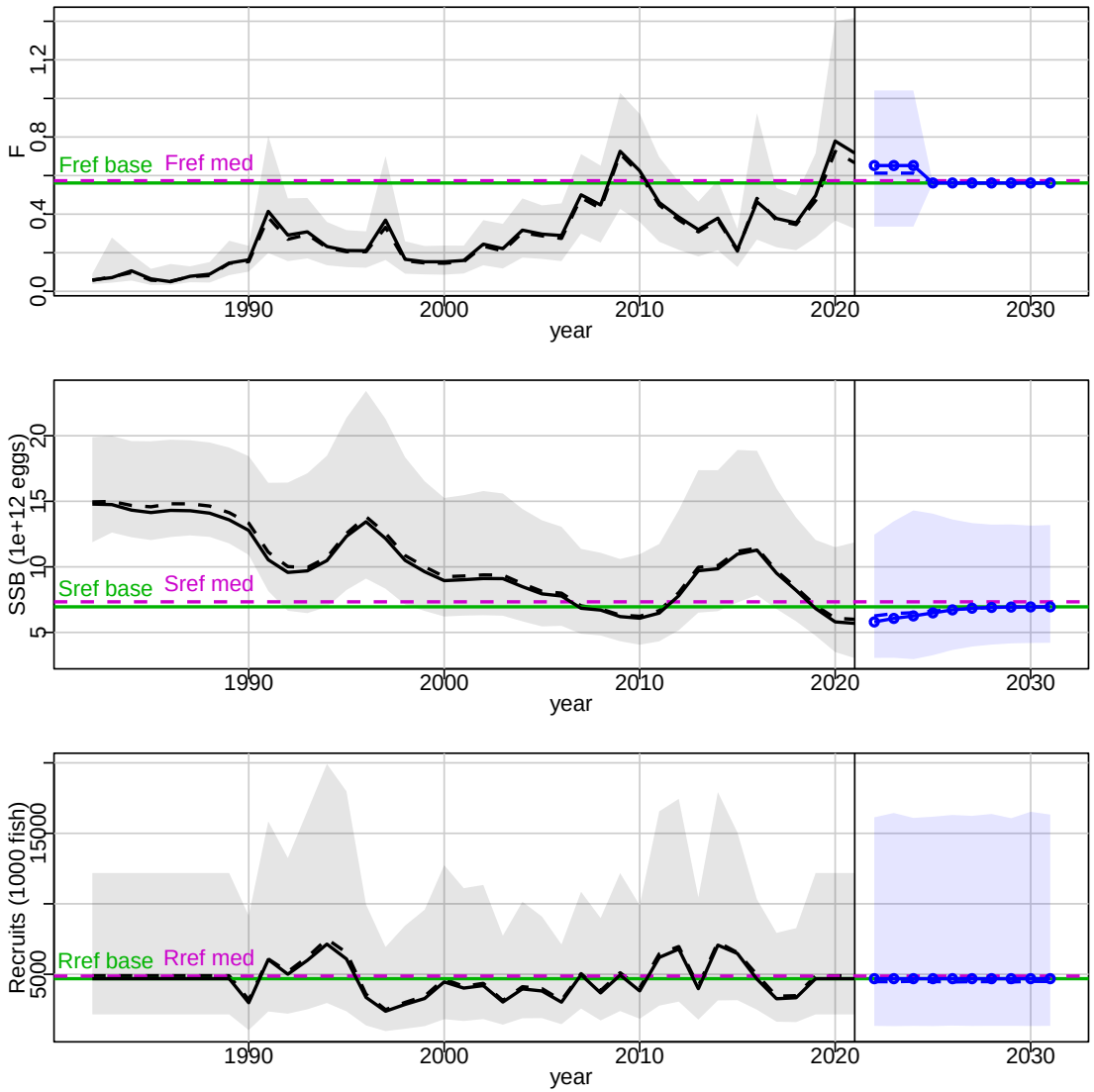
- Scenario 1-2: $F = F_{\text{current}}$ from 2022 to 2023
- Scenario 1: $F = F_{40\%}$ from 2025 to 2031
- Scenario 2: $F = 75\%F_{40\%}$ from 2025 to 2031

Projections

Results

Scenario 1: $F = F_{40\%}$ from 2025 to 2031

- black lines with gray shading = assessment years
- blue lines with light blue shading = projection years
- solid lines = base run values
- dashed lines = stochastic median
- horizonal green dashed lines = base reference
- horizonal magenta dashed lines = stochastic median reference

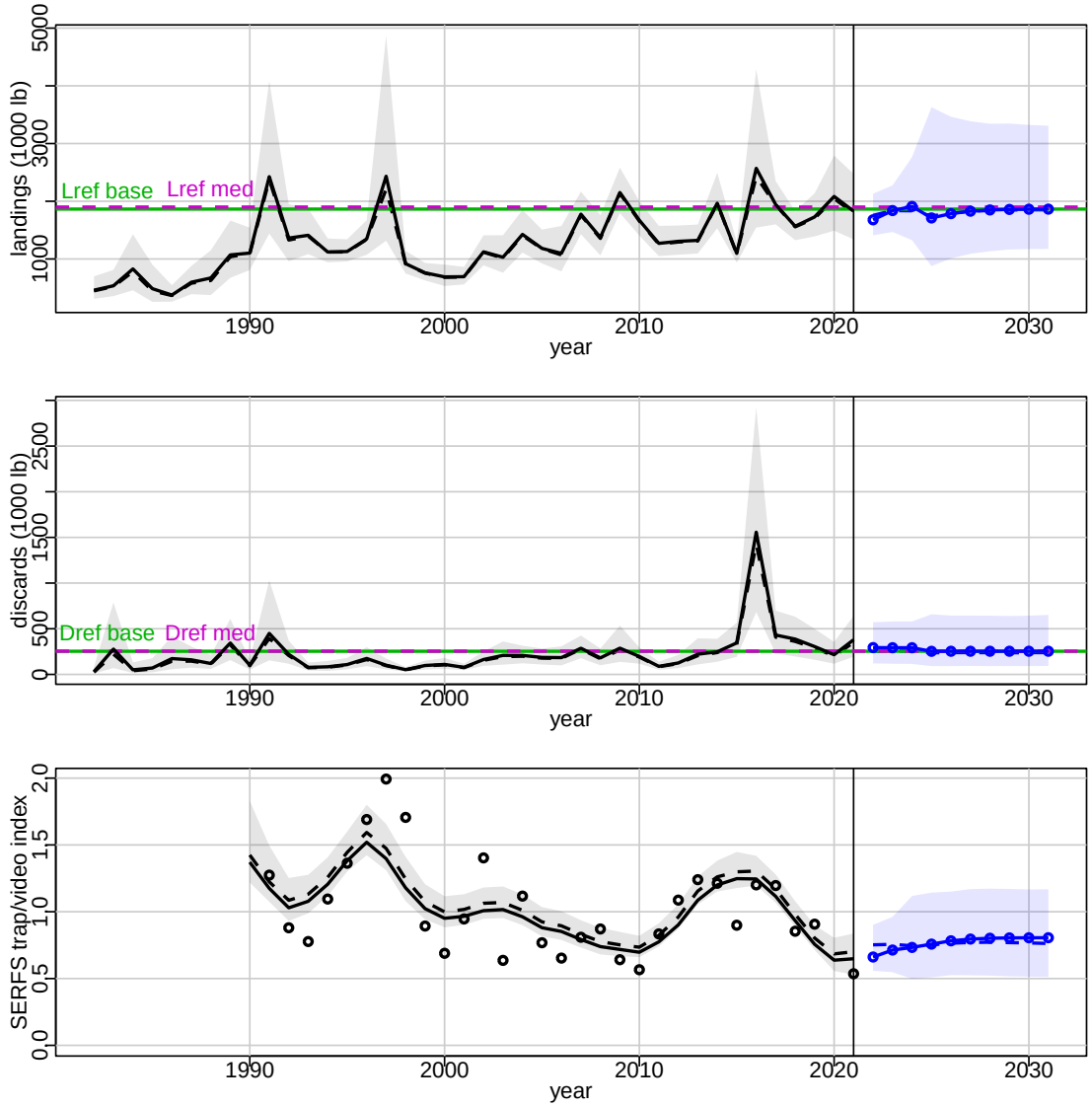


Projections

Results

Scenario 1: $F = F_{40\%}$ from 2025 to 2031

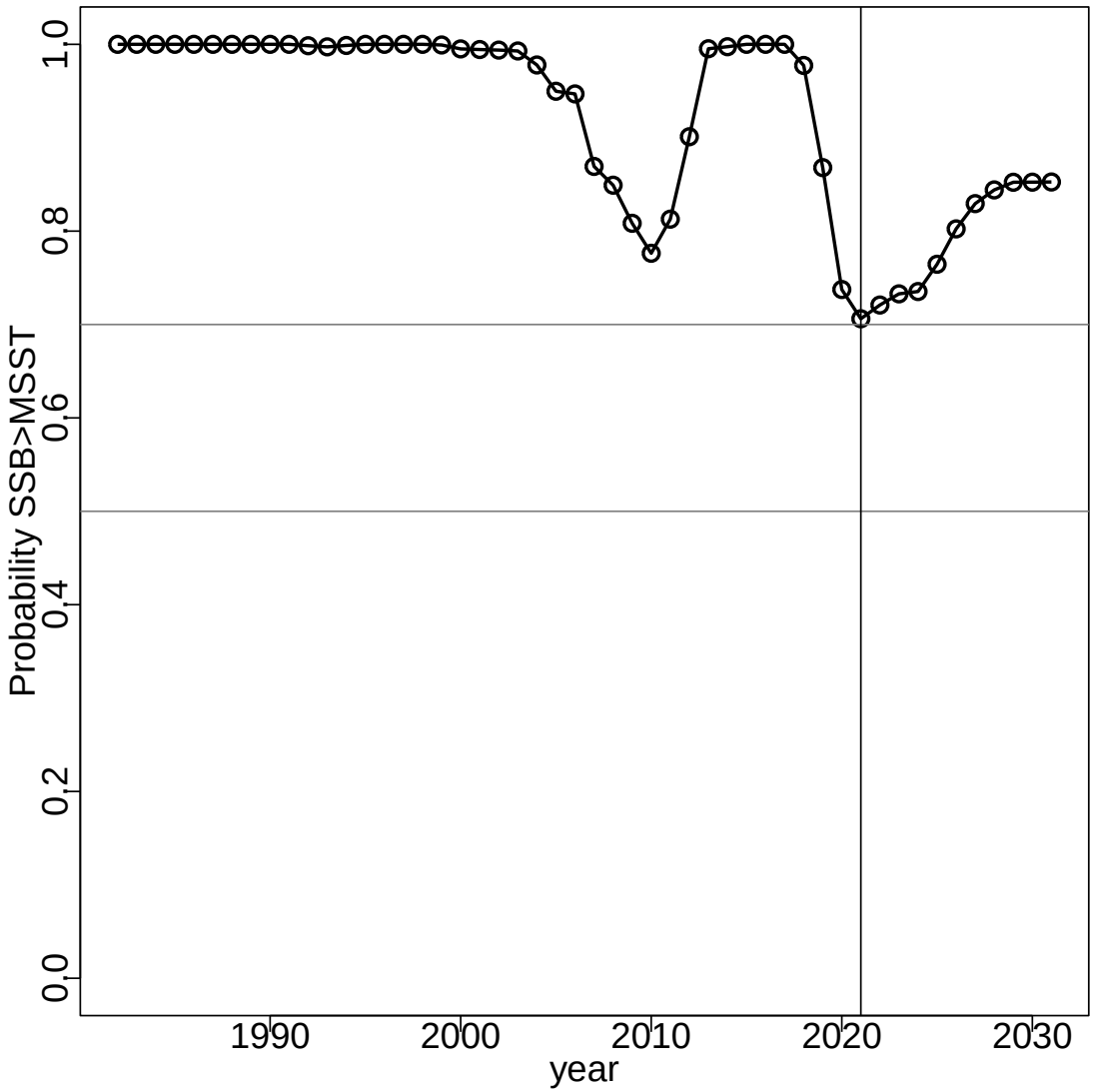
- black lines with gray shading = assessment years
- blue lines with light blue shading = projection years
- solid lines = base run values
- dashed lines = stochastic median
- horizonal green dashed lines = base reference
- horizonal magenta dashed lines = stochastic median reference



Projections

Results

Scenario 1: $F = F_{40\%}$ from 2025 to 2031

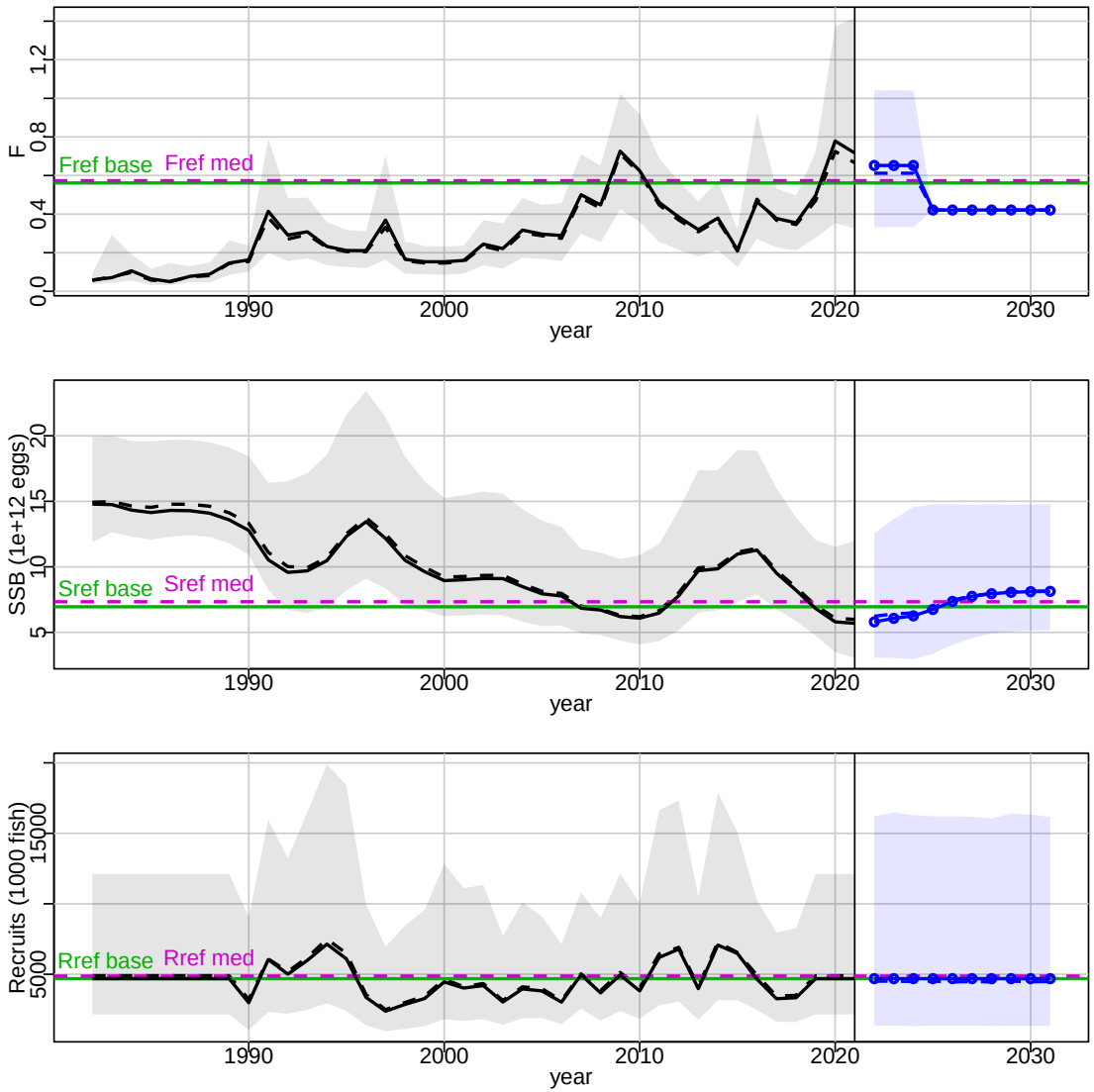


Projections

Results

Scenario 2: $F = 75\%F_{40\%}$ from 2025 to 2031

- black lines with gray shading = assessment years
- blue lines with light blue shading = projection years
- solid lines = base run values
- dashed lines = stochastic median
- horizonal green dashed lines = base reference
- horizonal magenta dashed lines = stochastic median reference

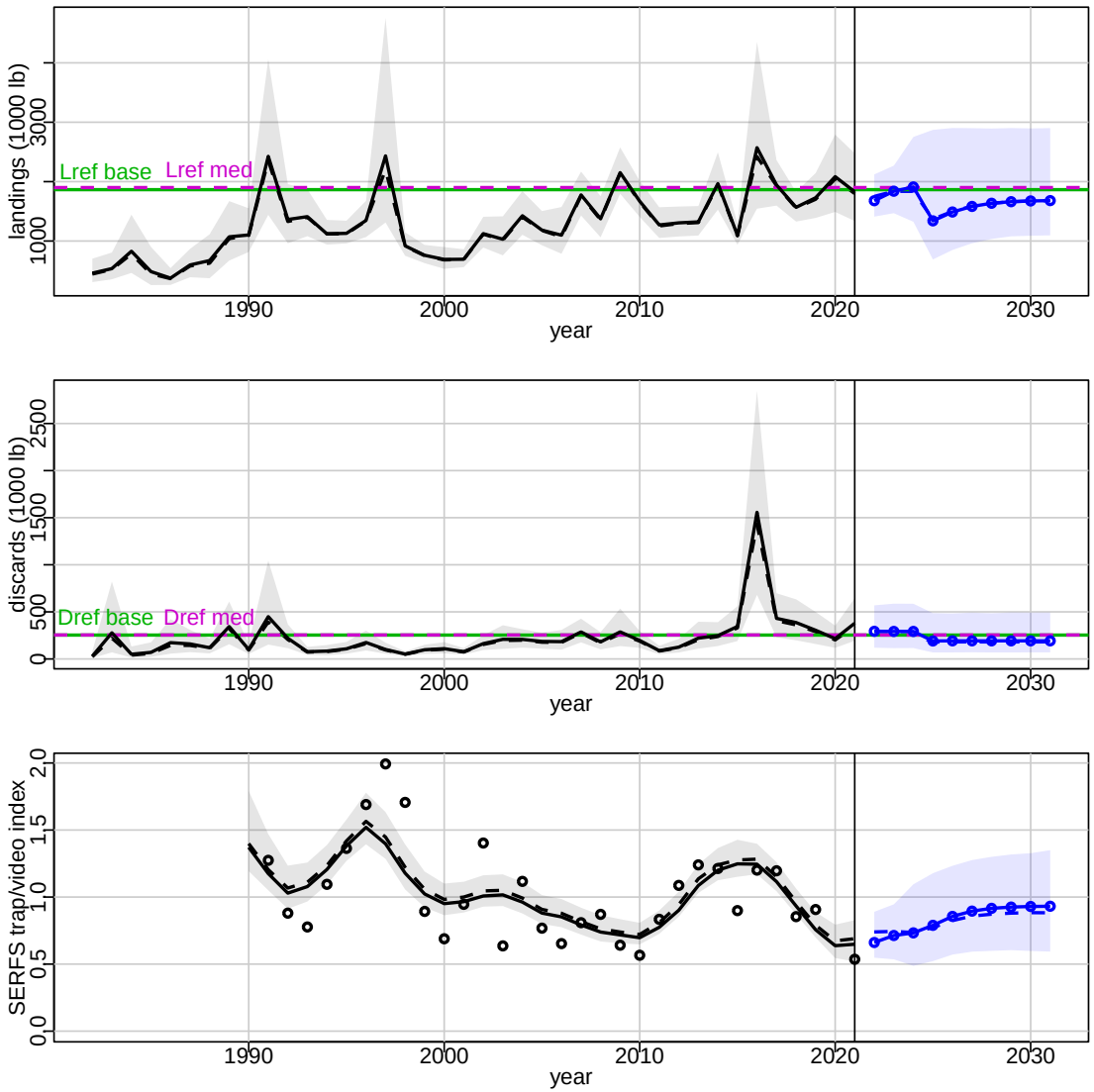


Projections

Results

Scenario 2: $F = 75\%F_{40\%}$ from 2025 to 2031

- black lines with gray shading = assessment years
- blue lines with light blue shading = projection years
- solid lines = base run values
- dashed lines = stochastic median
- horizonal green dashed lines = base reference
- horizonal magenta dashed lines = stochastic median reference



Projections

Results

Scenario 2: $F = 75\%F_{40\%}$ from 2025 to 2031