SEDAR 91

SSC Webinar

September 23-25, 2025

Outline

- Review terms of reference
- SEDAR 91 approach overview
- By island, St. Thomas/St. John (STTJ); St. Croix (STX)::
  - Data review
  - SEDAR 91 results

Summary of the DW Terms of Reference

- Review available data inputs including, but not limited to:
  - Commercial and recreational catches and/or discards
  - Length/age composition data
  - Life history and ecological information
  - Indices of abundance
- Provide recommendations for future research in areas such as sampling, fishery monitoring, and stock assessment
- Prepare the Data Workshop Report

SEDAR 91 USVI Sources of data

- Landings from self-reported fisher logbooks
- Length compositions from shore-based port sampling
- Life history parameters carried over from SEDAR 57

Summary of the AW Terms of Reference

- Develop and apply assessment tools that are compatible with available data and consistent with standard practices.
- To the extent possible given data limitations, provide management benchmarks and status determination criteria.
- To the extent possible, develop projections to support estimates of maximum sustainable yield (MSY, the overfishing limit (OFL) and acceptable biological catch (ABC)
- Provide recommendations for future research and data collection
- Provide an Assessment Workshop Report

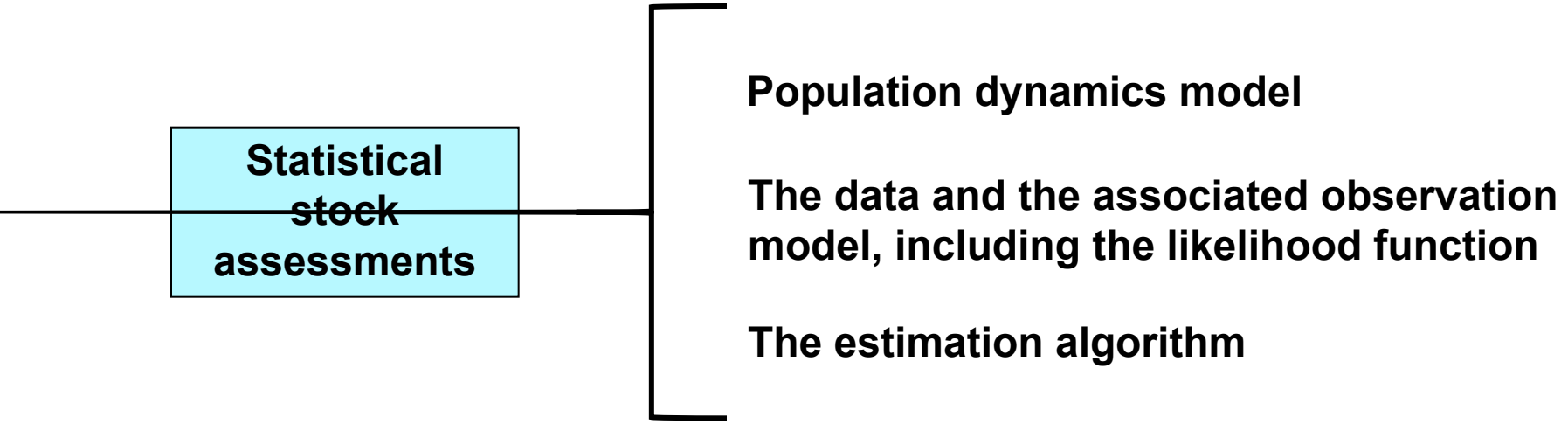
SEDAR 91 USVI assessment approach

- Iterate on existing SEDAR 57 (S57), SEDAR57 Update (S57U) length-based statistical catch at age models using Stock Synthesis 3.0 software (SS3)
- Still the most appropriate framework given the data that are available
- The underlying SS3 framework is identical

SS3 implemented as a length-based statistical catch-at-age model. Forward-projecting, age-structured population dynamics model that is fit to landings (removals), length composition data (and an index of abundance if available)

Integrated analysis approach

- Principle: integrate as many sources of available data as possible in order to estimate quantities of interest (stock status, target biomass and fishing mortality)



Integrated analysis approach

- Model results depend on: model fit to the data; model parameters (estimated and fixed)
- Estimation accomplished by integrating a (log) likelihood function (LL) for each data source and parameter prior/penalty into a total LL (objective function)
- LL_total = LL_data1 + LL_data2 +…
- Estimation algorithm minimizes the -LL

S57 & S57U Data and life history assumptions:

Data and life history assumptions:

- Landings: lognormal error
- Composition: multinomial error
- No indices of relative abundance
- Two-sex model; 50-50 sex ratio
- Island-specific length-weight relationships
- Puerto Rico growth parameters estimated using VBGF, applied to other islands
- M = 0.34; point estimate based on Pauly's equation (Cruz et al. 1981), used for all age classes
- Fecundity relationships based on relationship from SW Cuba (SEDAR 8), maturity parameters derived by Die (2005)

S57 & S57U Data and life history assumptions:

Additional model assumptions and decisions:

- No recreational fishing ~ recreational fishing constant, ignored
- Release (discard) mortality ignored due to selective nature of trap/pot and dive fisheries
- Age structure: 0 to 15+
- Size bins: 51mm – 248mm (2 – 9.8 inches)
- One area models; single spawning population and associated stock recruitment function (Beverton-Holt; h set to 0.95)
- Length-based selectivity and retention for primary fleets
- Complete catch history; assumed commercial landings known, precisely

S91 USVI Summary

Three sensitivity analyses:

- *selex1*: logistic selectivity (fixed)
- *selex2*: estimated selectivity (initiated as logistic)
- *lw*: US Caribbean regional length-weight relationship

Diagnostics

- Reviewed fit, gradients, residuals
- Conducted retrospective, likelihood profiles, and jitter

S91 USVI Summary

For each island platform (STTJ and STX), results indicate that overfishing is not occurring and the stocks are not overfished.

Diagnostics indicate consistent and relatively robust model estimates.

S91 Next Steps

- SSC Review SEDAR 91 model methods and results
- Decisions for OFL and ABC for STTJ and STX
  - necessary assumptions for recent landings (2024 & 2025)
  - P* = 0.45 - CFMC input for management uncertainty
  - σ = 0.5 - SSC input scientific uncertainty

ABC-OFL Relationship **Using 2* sigma_min with sigma_min = 0.5 (mt)**		
ABC P* = 0.40	***77.62%***	LOGNORM.INV(0.4,0,2*0.5)
ABC P* = 0.41	***79.65%***	LOGNORM.INV(0.41,0,2*0.5)
ABC P* = 0.42	***81.72%***	LOGNORM.INV(0.42,0,2*0.5)
ABC P* = 0.43	***83.83%***	LOGNORM.INV(0.43,0,2*0.5)
ABC P* = 0.44	***85.99%***	LOGNORM.INV(0.44,0,2*0.5)
ABC P* = 0.45	***88.19%***	LOGNORM.INV(0.45,0,2*0.5)

STTJ – Data Review

STTJ – Data Review

Data updated through 2023

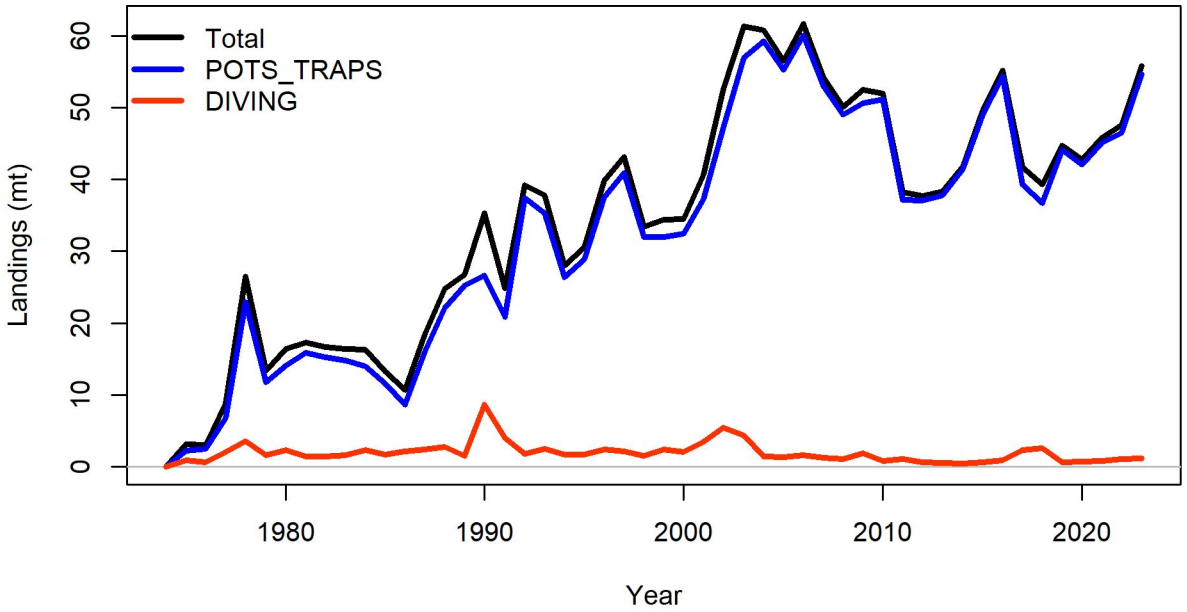
- Landings from self-reported fisher logbooks
- Length compositions from shore-based port sampling

New data considered, but not used

- SEAMAP-C dive survey – Not recommend by AW Panel due to low sample size

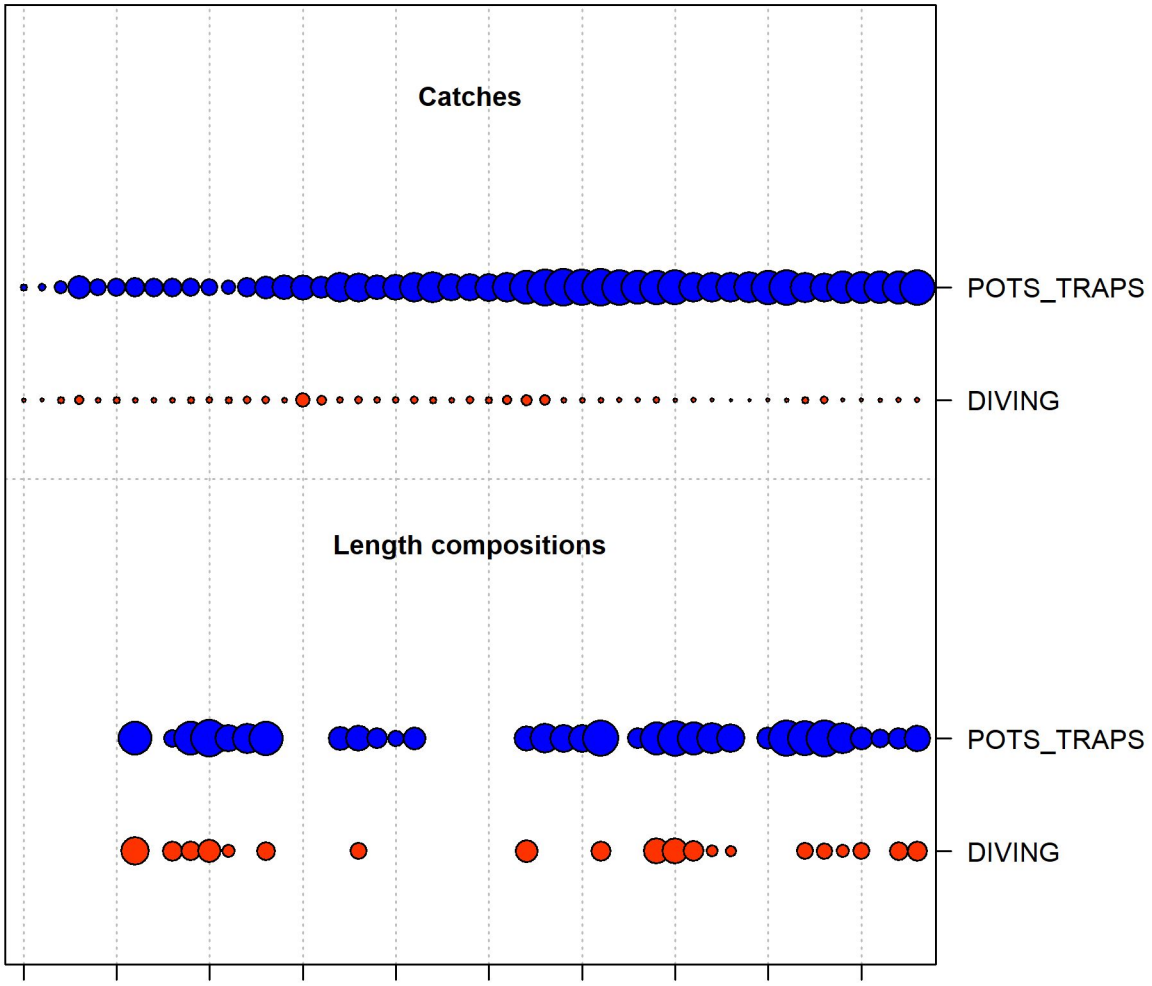
STTJ – Data review
Commercial logbook landings

- Landings from diving and pots/traps fleets

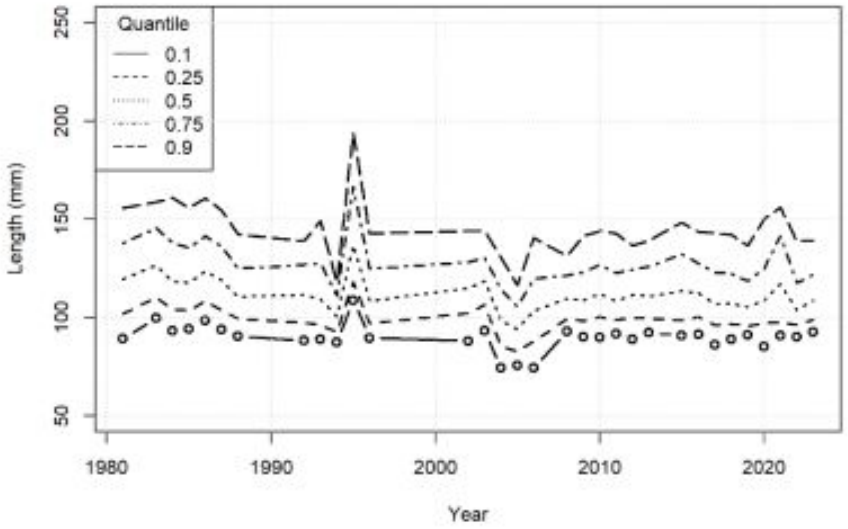


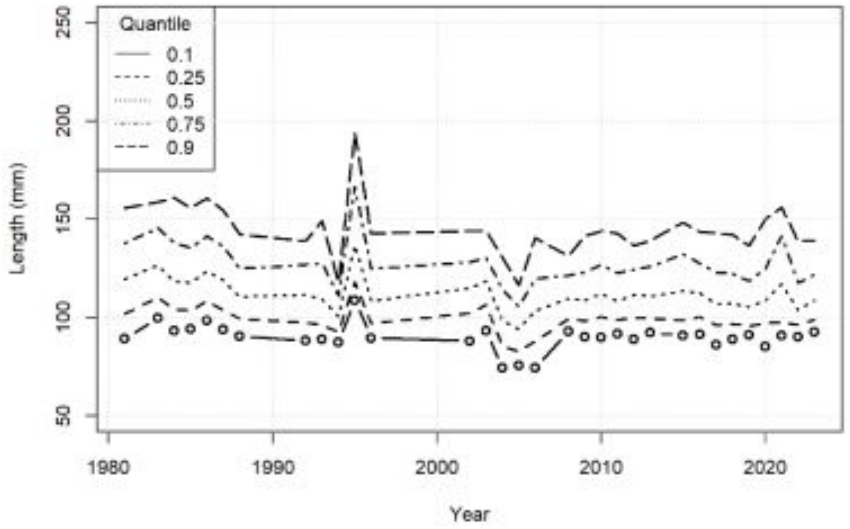
STTJ – Data review
TIP length composition

- Somewhat sporadic data from 1981-2023
- Sample sizes generally larger for pots/traps

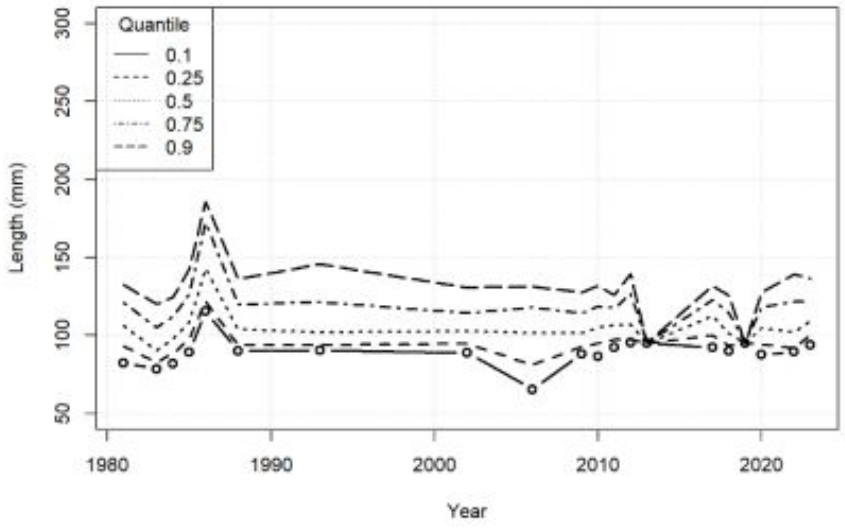


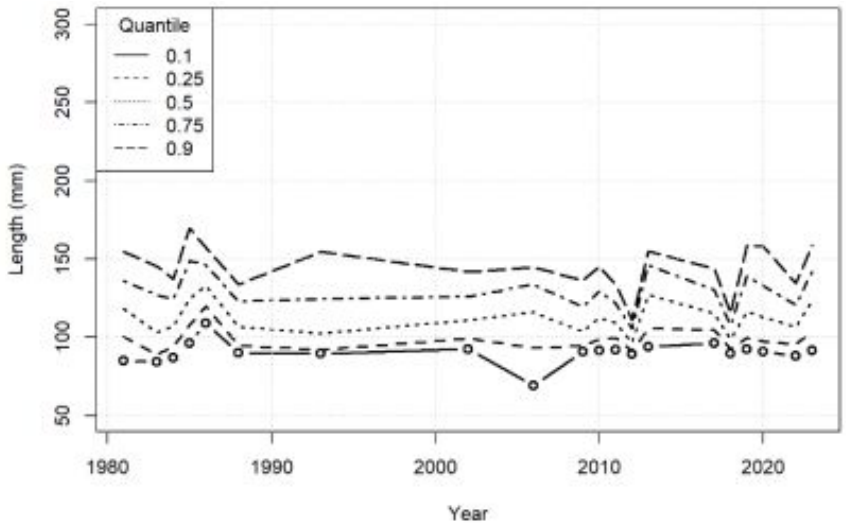
STTJ – Data review
TIP length composition – Pot/Trap
Female (left) and male (right)





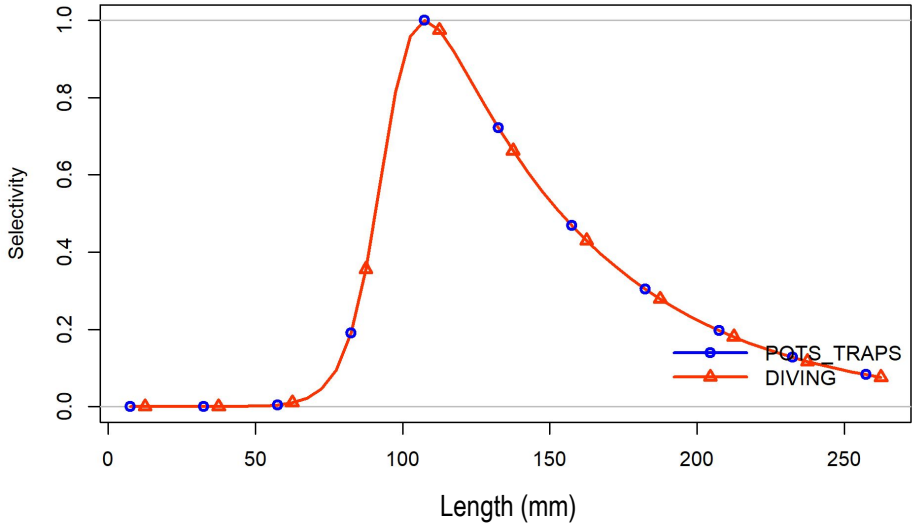
STTJ – Data review
TIP length composition – Dive
Female (left) and male (right)

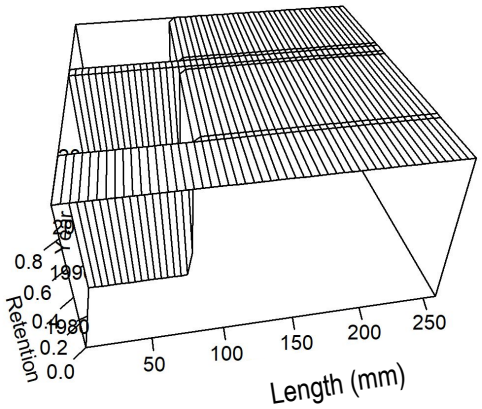




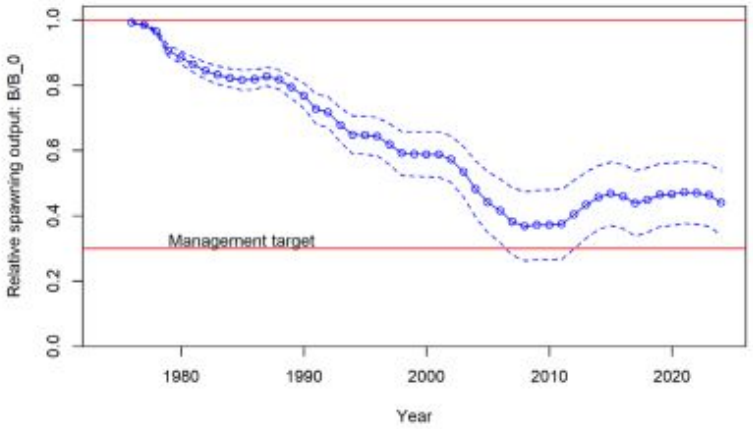
STTJ – SEDAR 91 Results

STTJ Selectivity and Retention – Base model

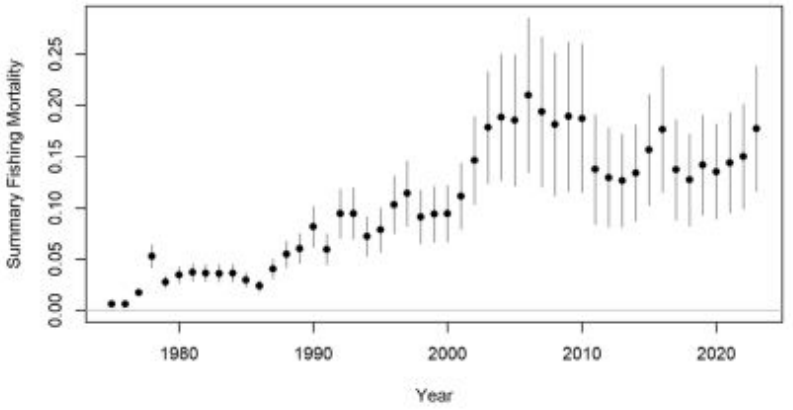




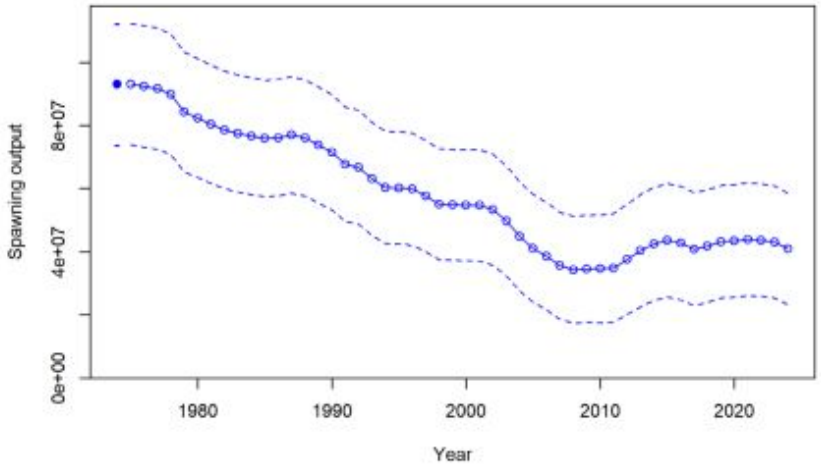
STTJ (a) Spawning Biomass Ratio, (b) Spawning Biomass (mt), (c) Fishing Mortality and (d) Recruitment (thousands of fish)



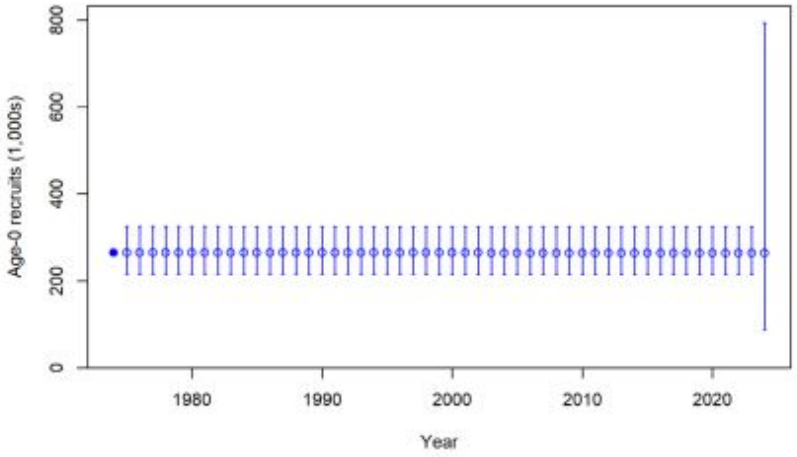
a. Spawning Biomass Ratio



c. Fishing Mortality

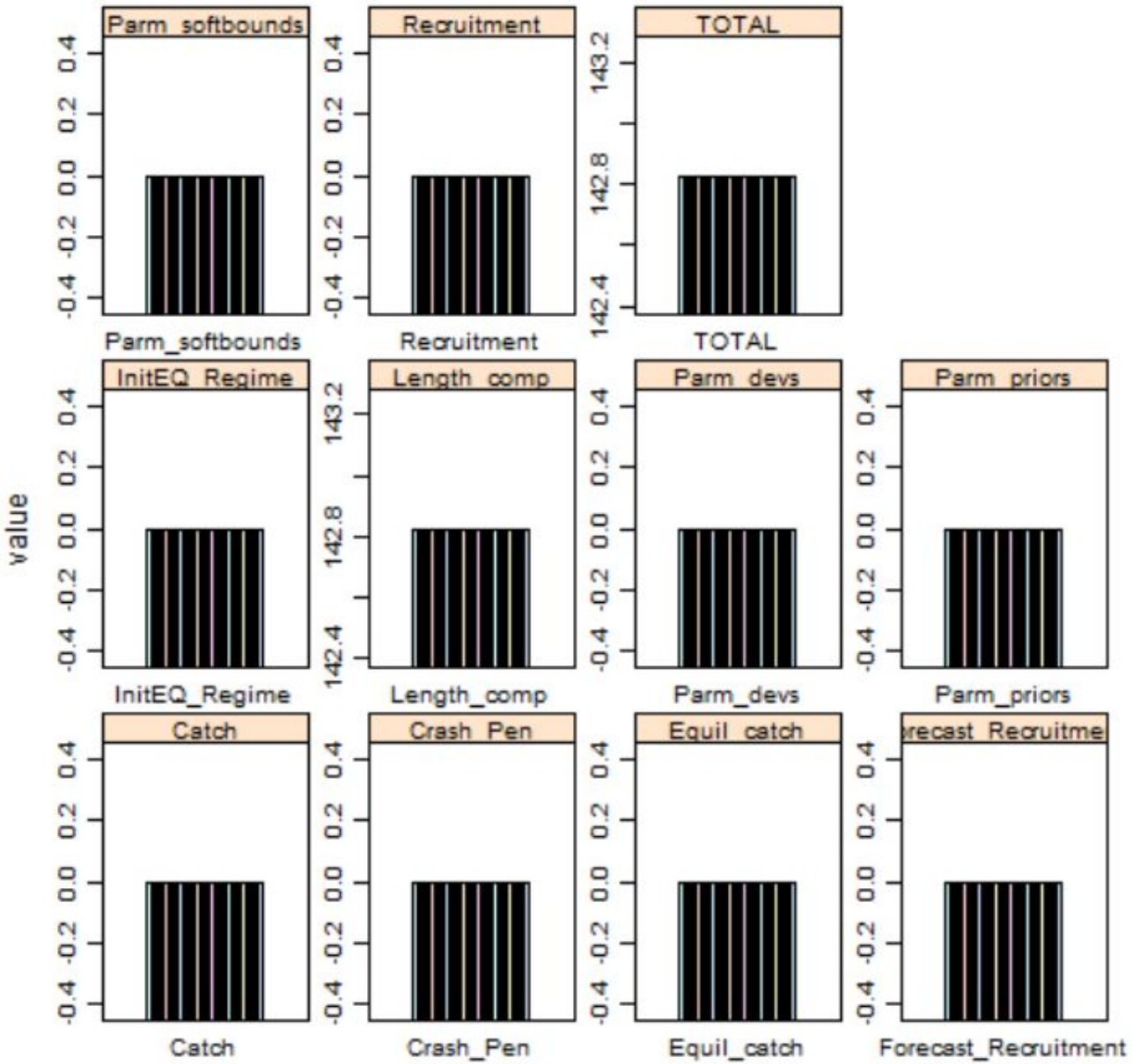


b. Spawning Biomass

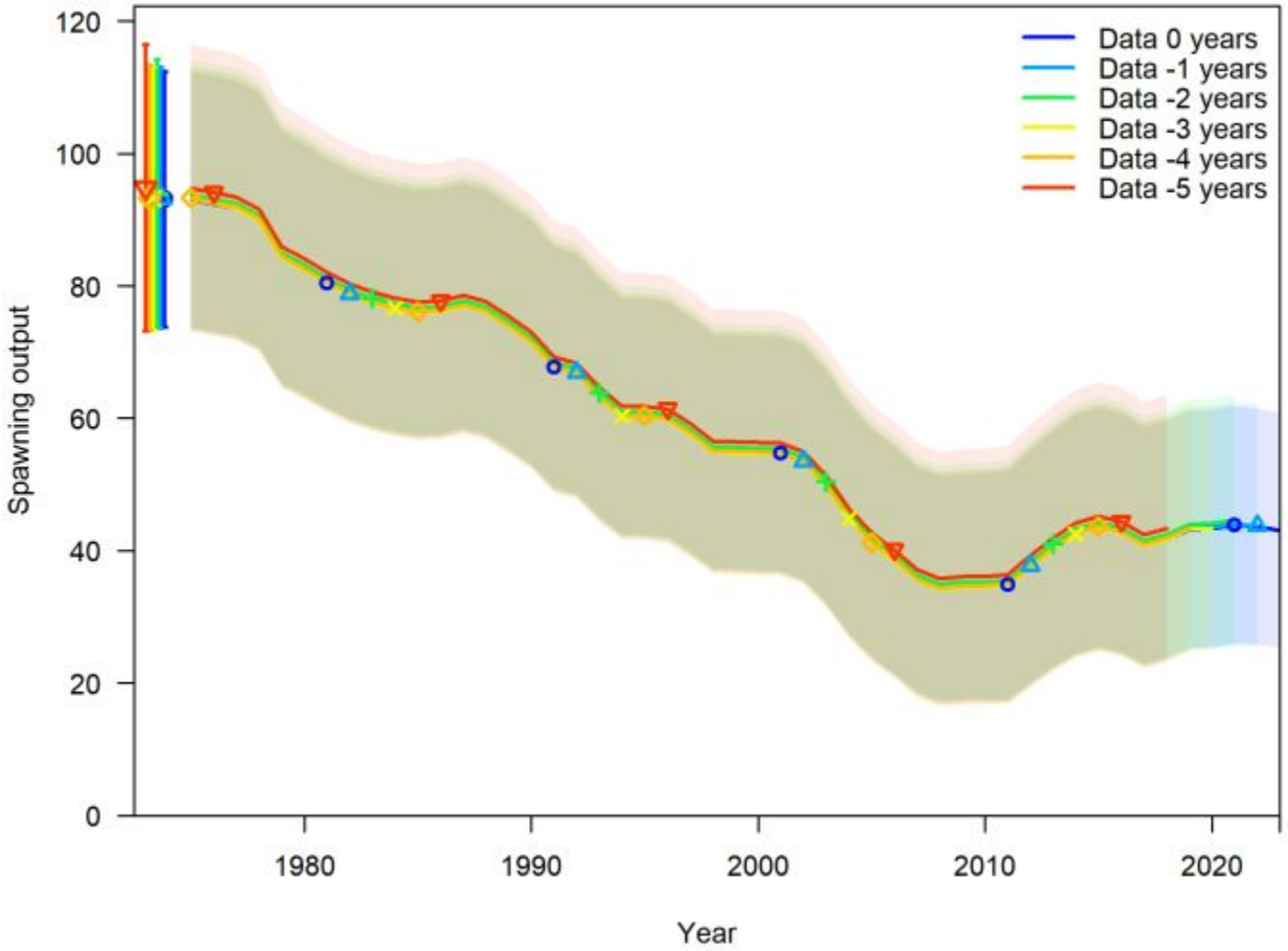


d. Recruitment

STTJ Jitter


Parm_softbounds
Recruitment
TOTAL
InitEQ_Regime
Length_comp
Parm_devs
Parm_priors
Catch
Crash_Pen
Equil_catch
Forecast_Recruitment
value

STTJ Retrospective



Hindcast Cross Validation (Carvalho et al. 2021)

- Used to assess the model's prediction skill
- Similar algorithm to that used in retrospective analysis
  - Same procedure of peeling the observations and refitting the model to the truncated data series
  - Involves the additional steps of projecting forward (hindcasts) and cross-validating the forecasts using the observations that were left out of the fit to the truncated time series

Mean Absolute Scaled Error (MASE)

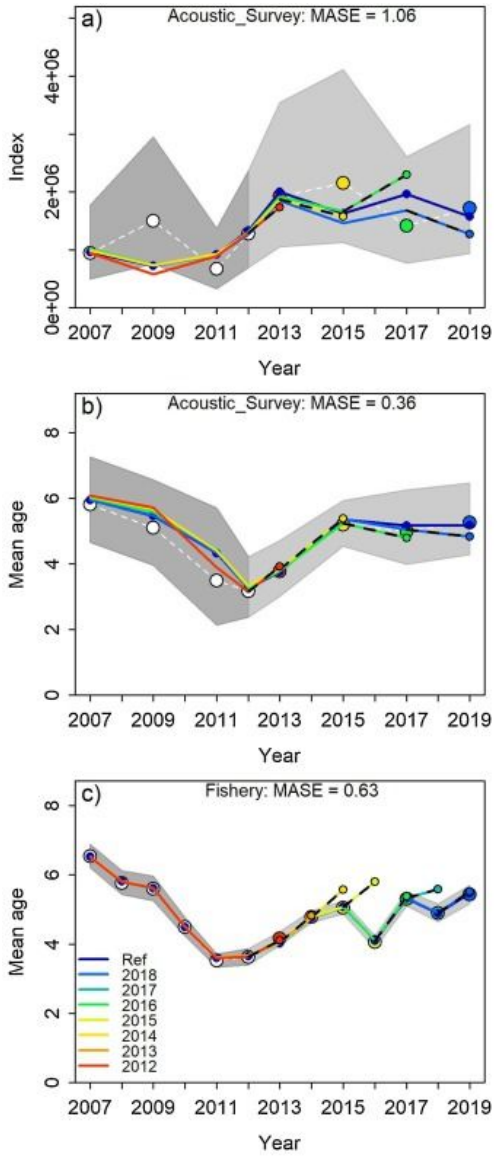
- Measures prediction skill by comparing a model's Mean Absolute Error to the Mean Absolute Error of a naive forecast
  - MASE of less than 1 indicates the model is more accurate than the naive benchmark
  - MASE greater than 1 suggests the naive forecast is better

Hindcast Cross Validation (Carvalho et al. 2021)

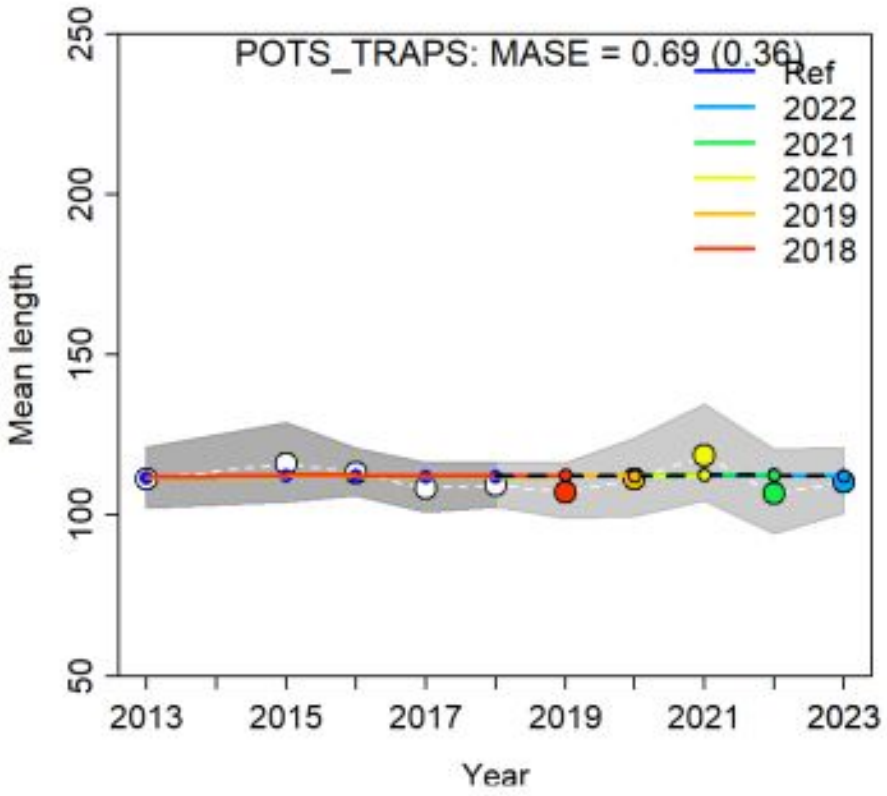
"Fig. 10. Hindcasting cross-validation (HCxval) results for the fits to (a) the acoustic biomass survey index, and (b) annual mean age estimates from the survey, and (c) the fishery for the **Pacific Hake (HAKE) model**, showing observed (large points connected with dashed line), fitted (solid lines) and one-year-ahead forecast values (small terminal points)...

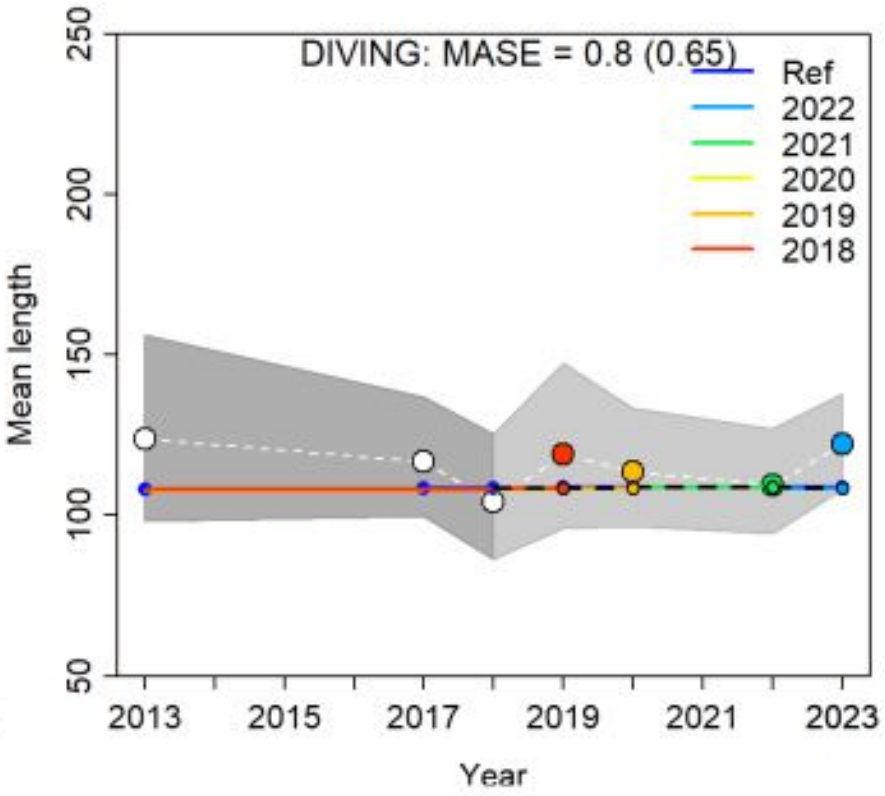
The model reference year refers to the endpoints of each one-year-ahead forecast and the corresponding observation (i.e., year of peel + 1).

The mean absolute scaled error (MASE) score associated with the survey index and age-composition time series is denoted in each panel."

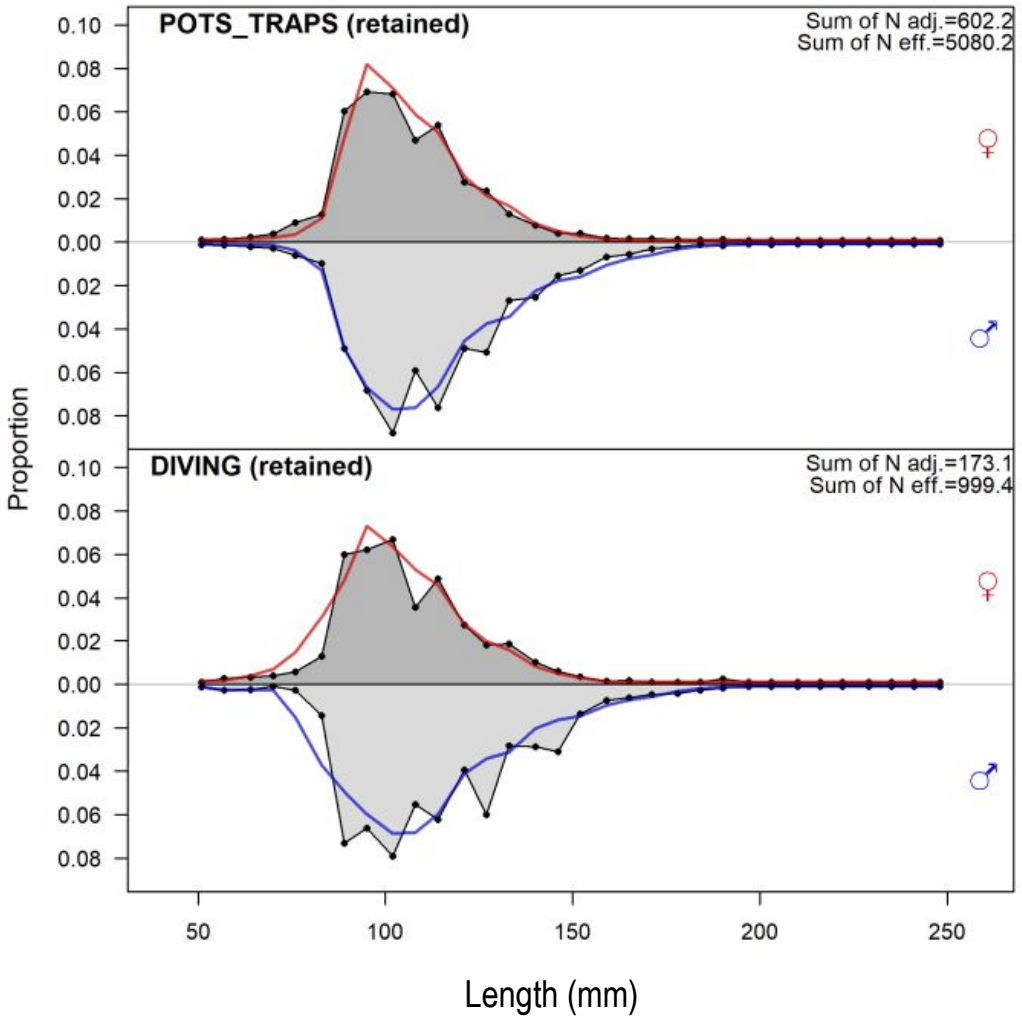


STTJ Hindcast Cross Validation

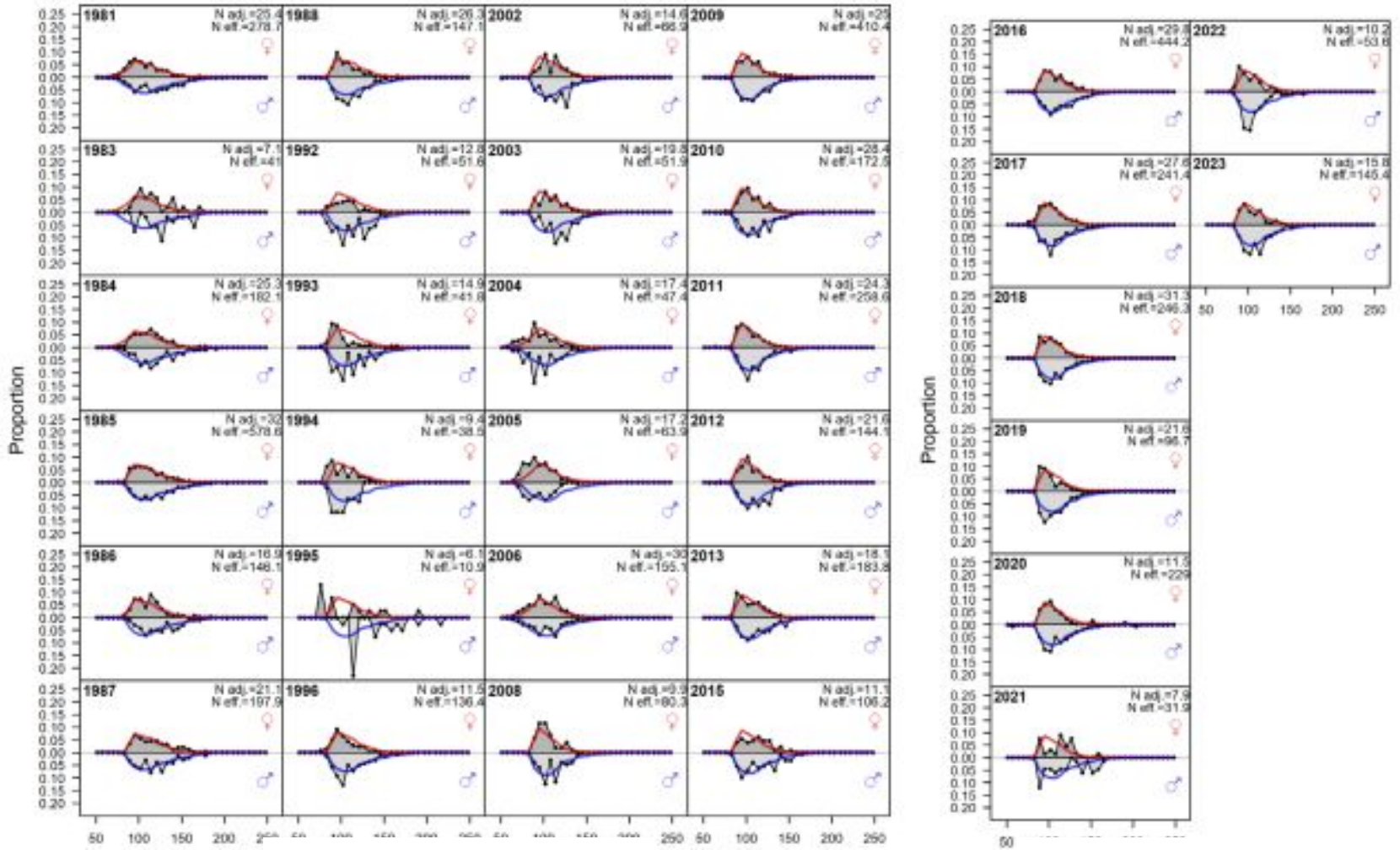




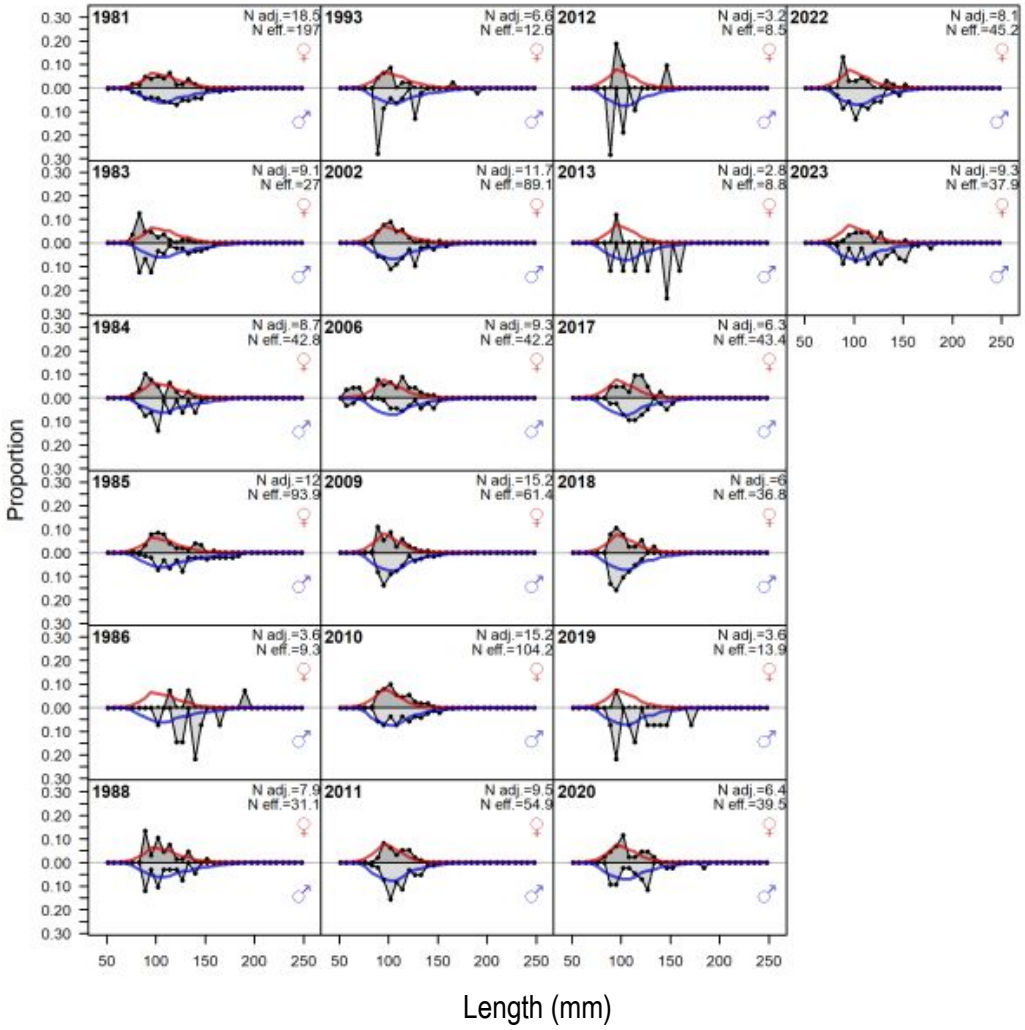
STTJ Observed and predicted length distributions



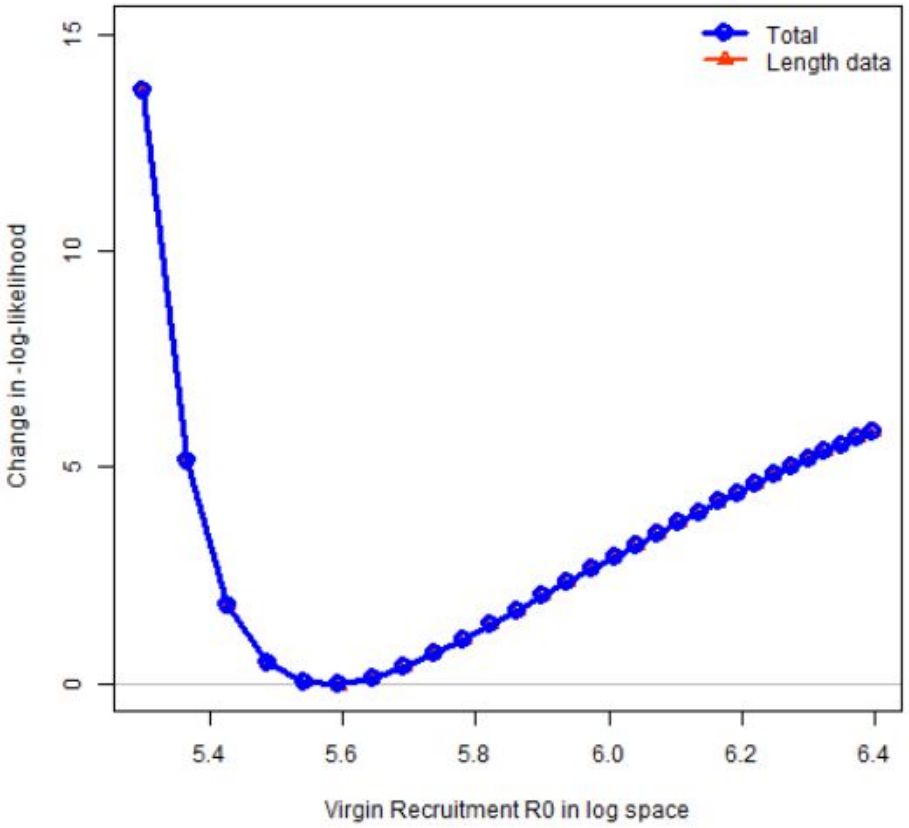
STTJ Observed and predicted length distributions – Pots/Traps

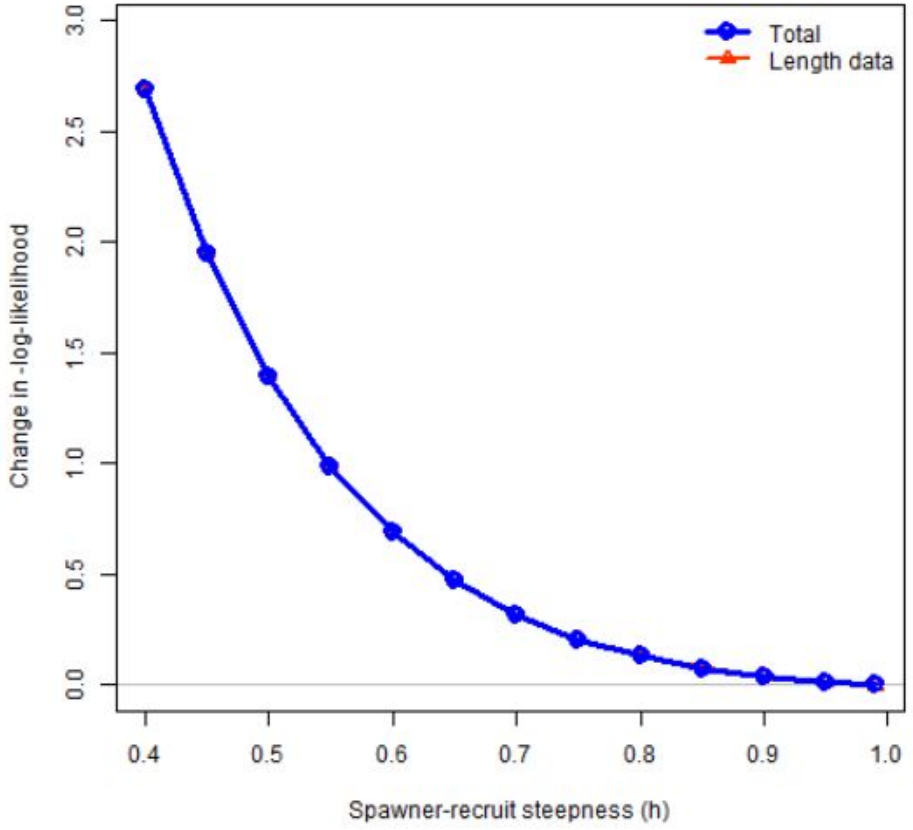


STTJ Observed and predicted length distributions – Dive

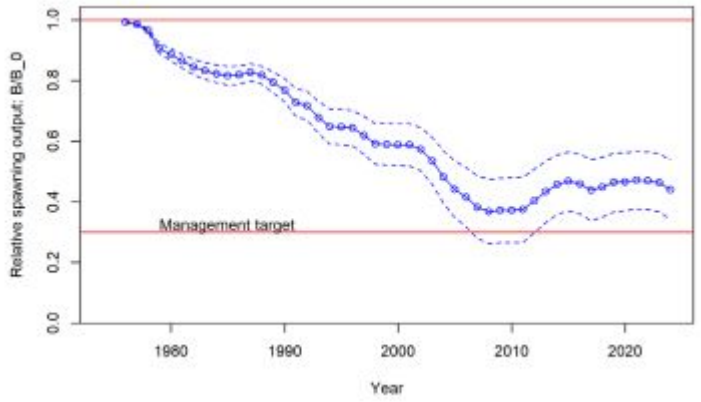


STTJ Likelihood Profiles
R0 (left) and Steepness (right)

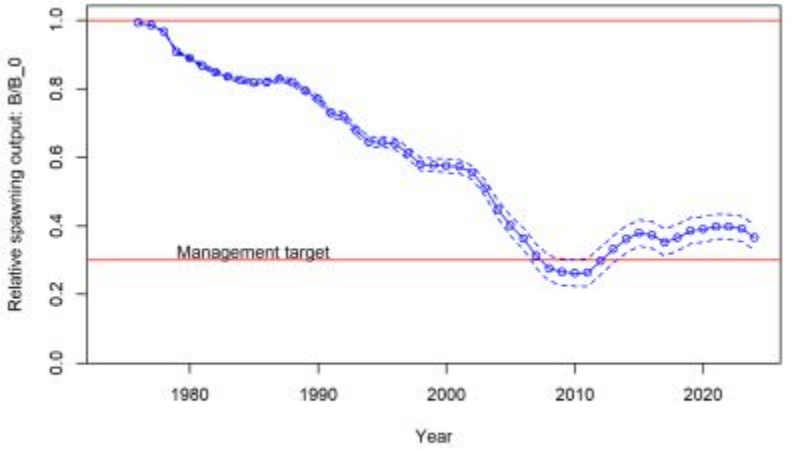




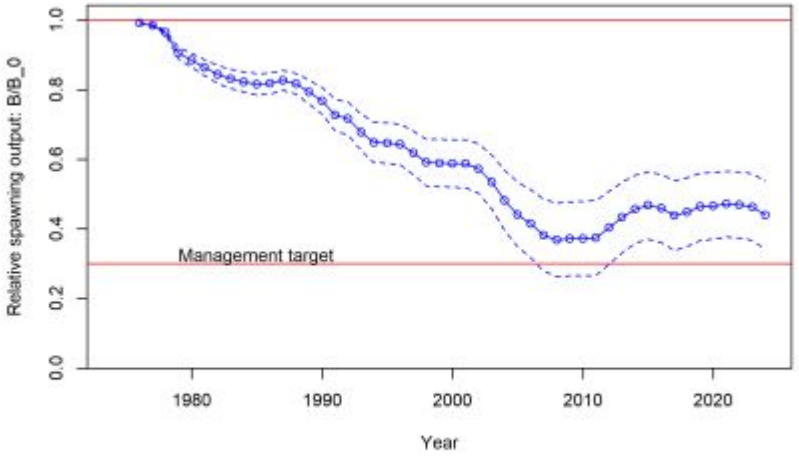
STTJ Spawning Biomass Ratio Sensitivities



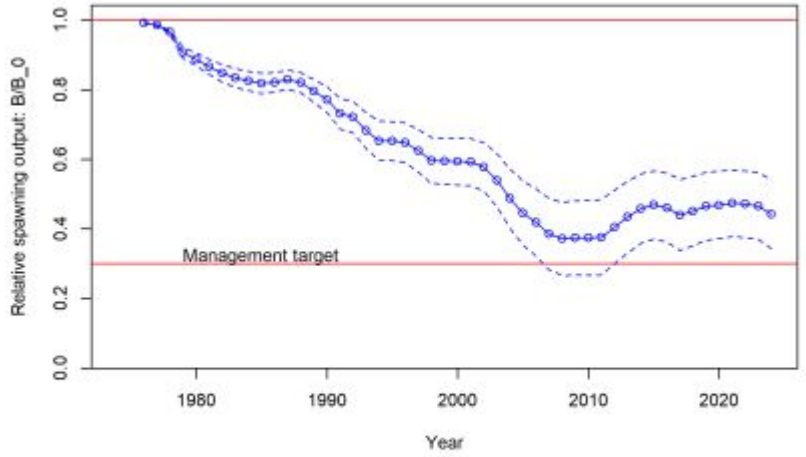
(base)



(selex 1)



(selex 2)

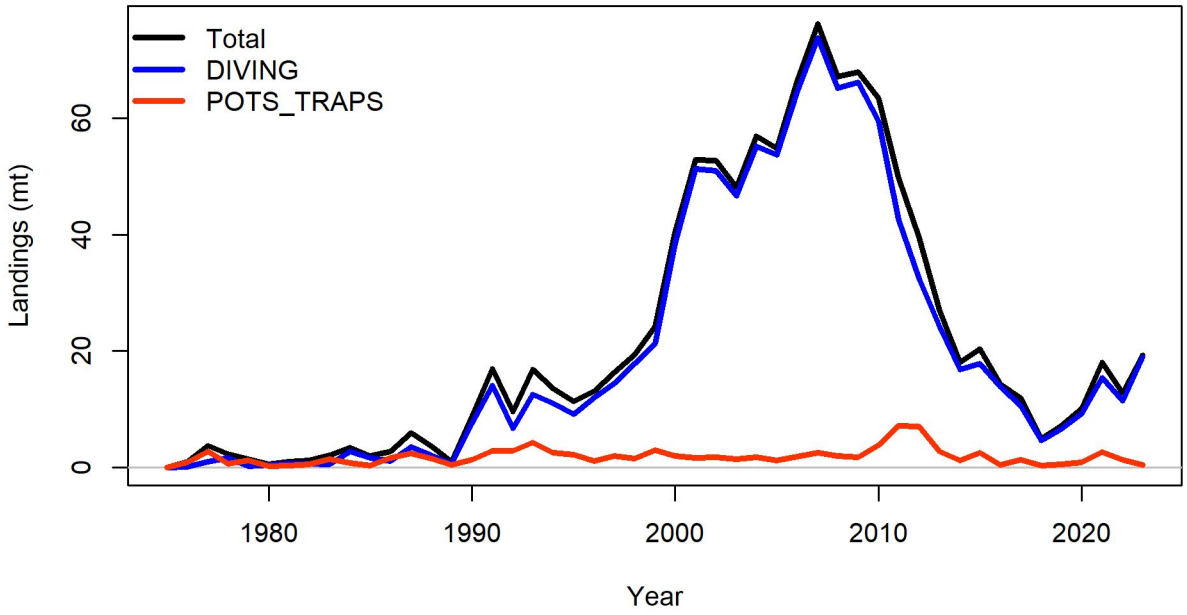


(*lw*)

STX – SEDAR 91 Data Review

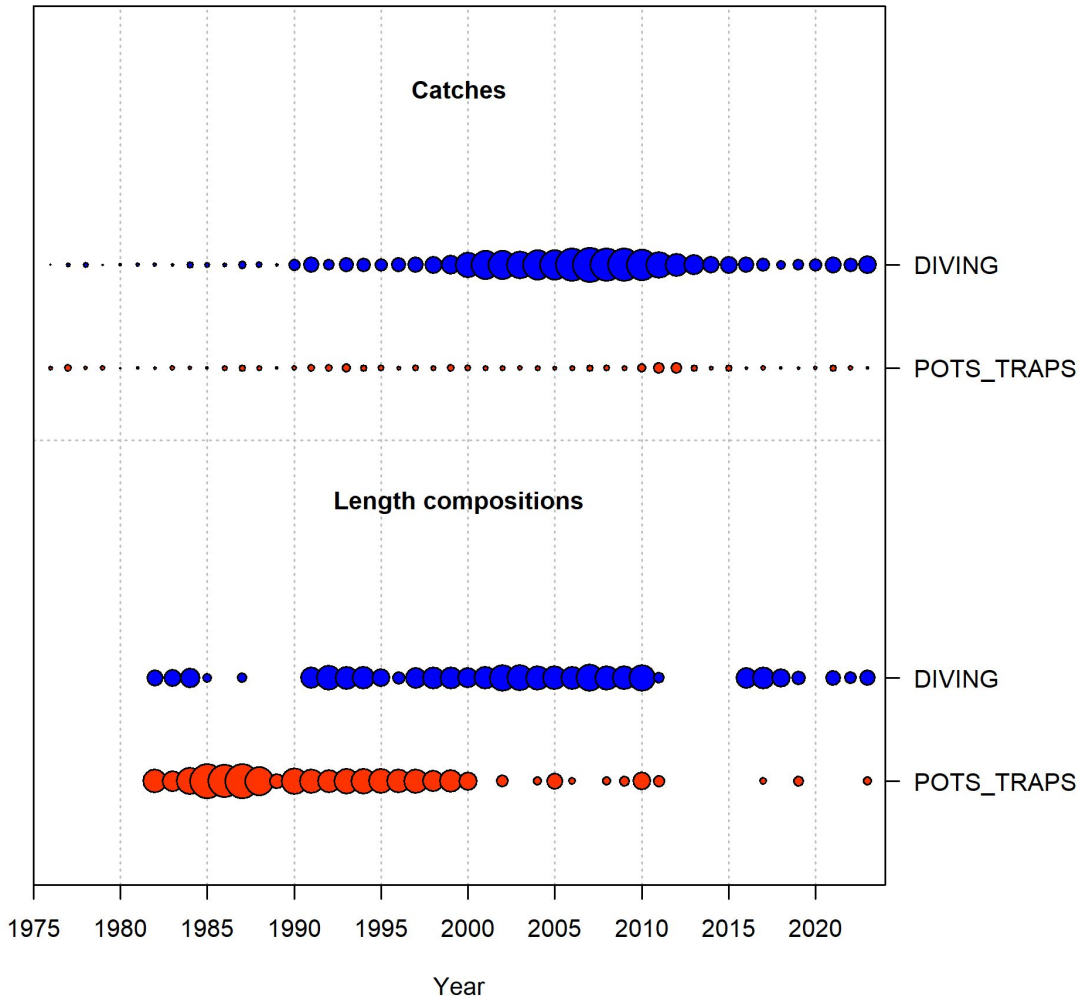
STX – Data review
Commercial logbook landings

- Landings from diving and pots/traps fleets

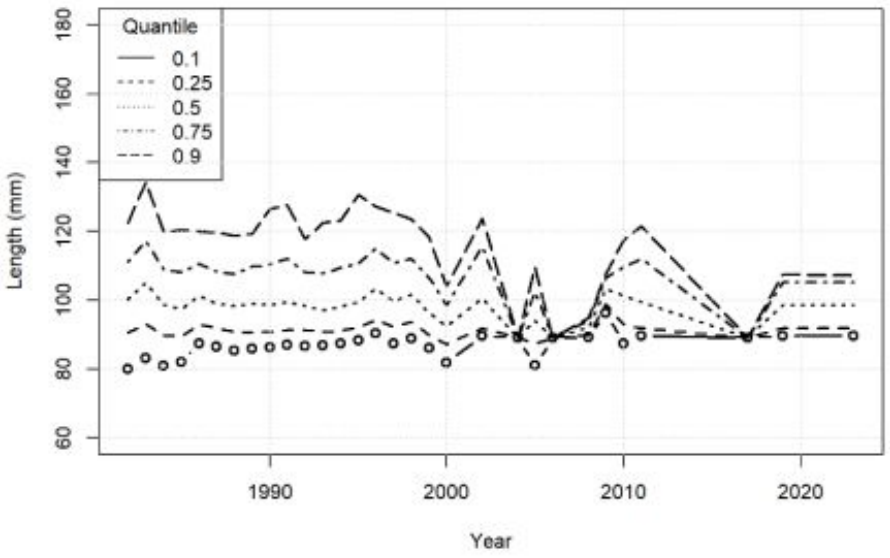


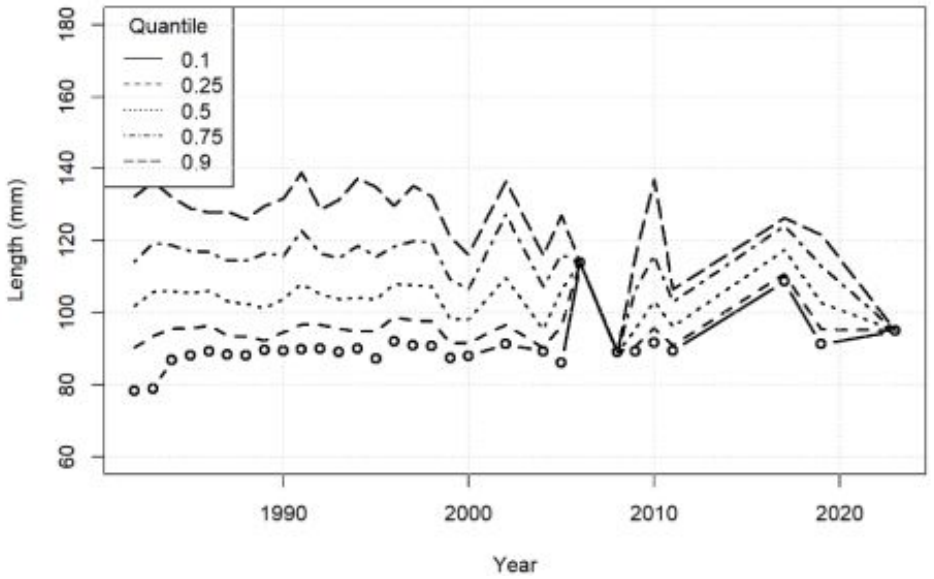
STX – Data review
TIP length composition

- Data from 1982-2023
- Highly sporadic since 2010
- Variable sample sizes

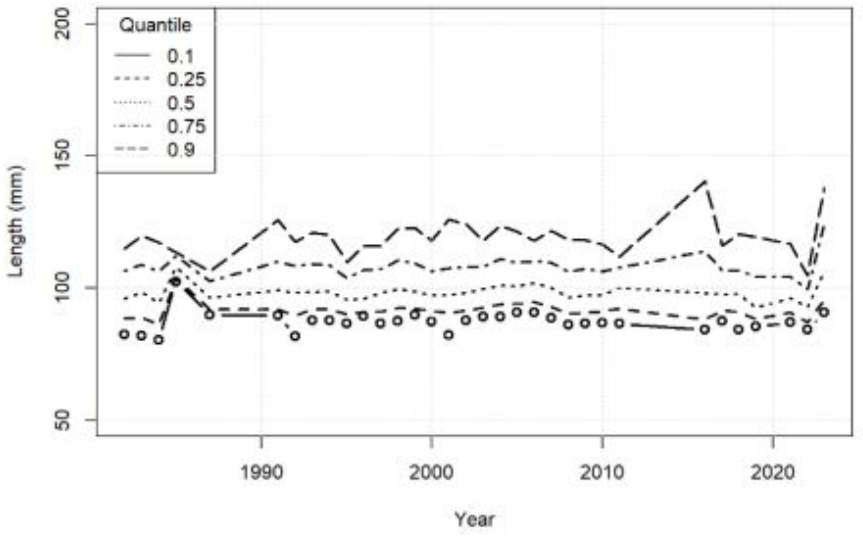


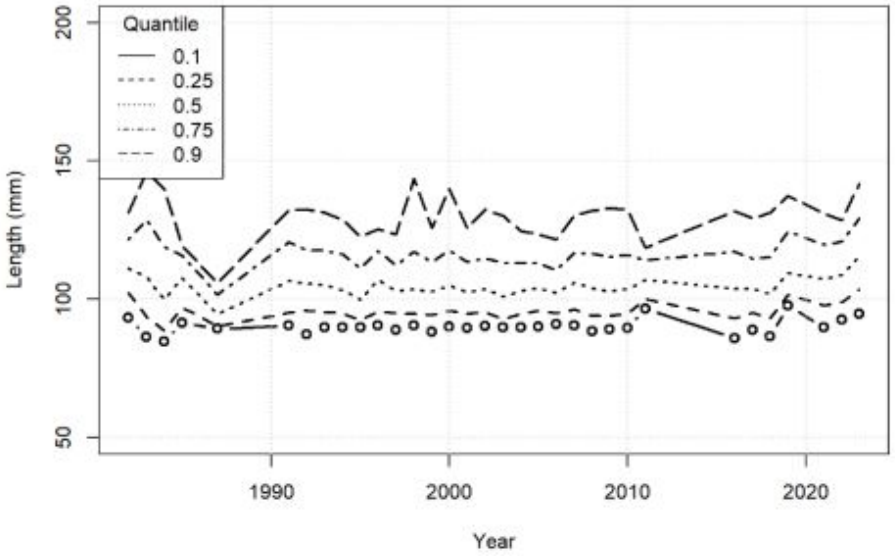
STX – Data review
TIP length composition – Pot/Trap
Female (left) and male (right)





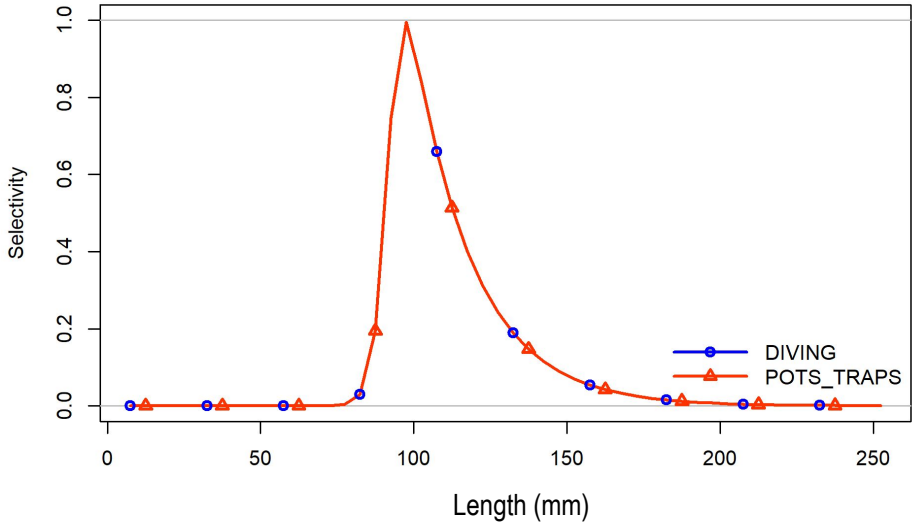
STX – Data review
TIP length composition – Dive
Female (left) and male (right)

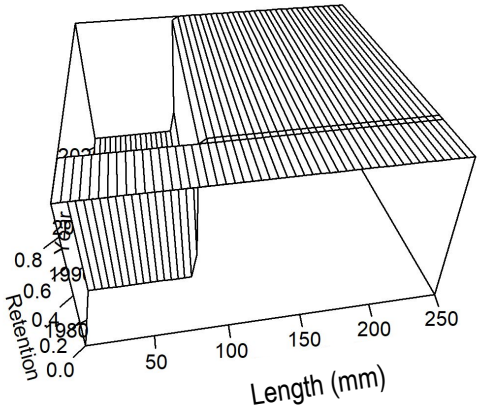




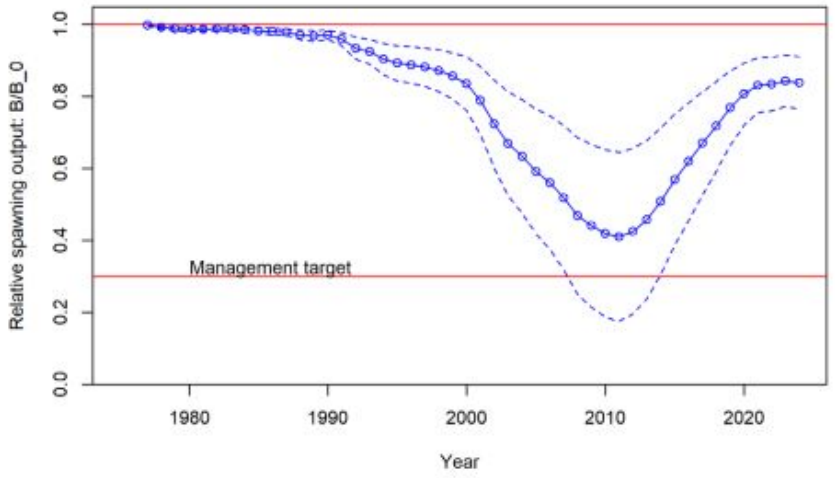
STX – SEDAR 91 Results

STX Selectivity and Retention – Base Model

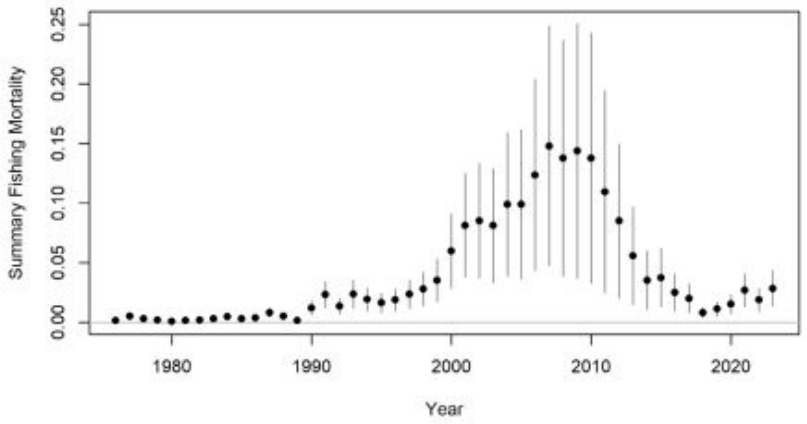




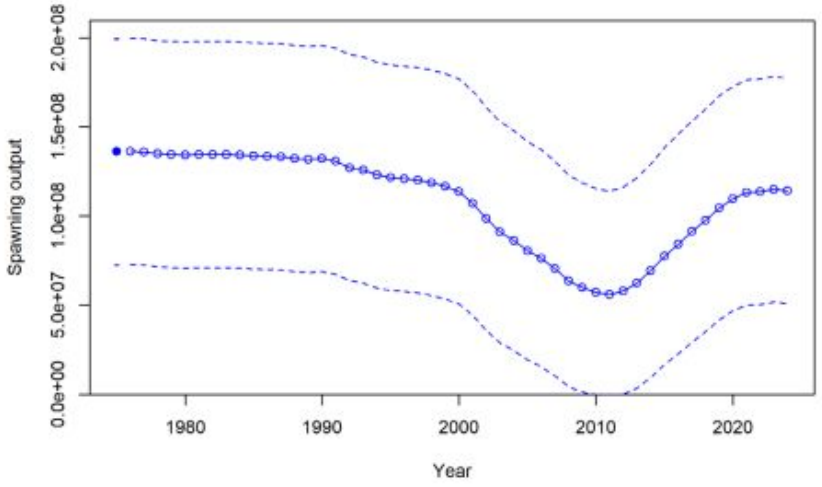
STX (a) Spawning Biomass Ratio, (b) Spawning Biomass (mt), (c) Fishing Mortality and (d) Recruitment (thousands of fish)



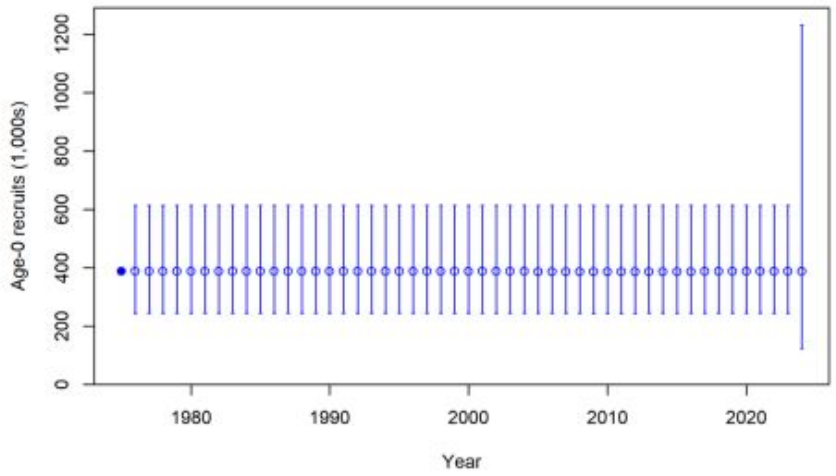
a. Spawning Biomass Ratio



c. Fishing Mortality

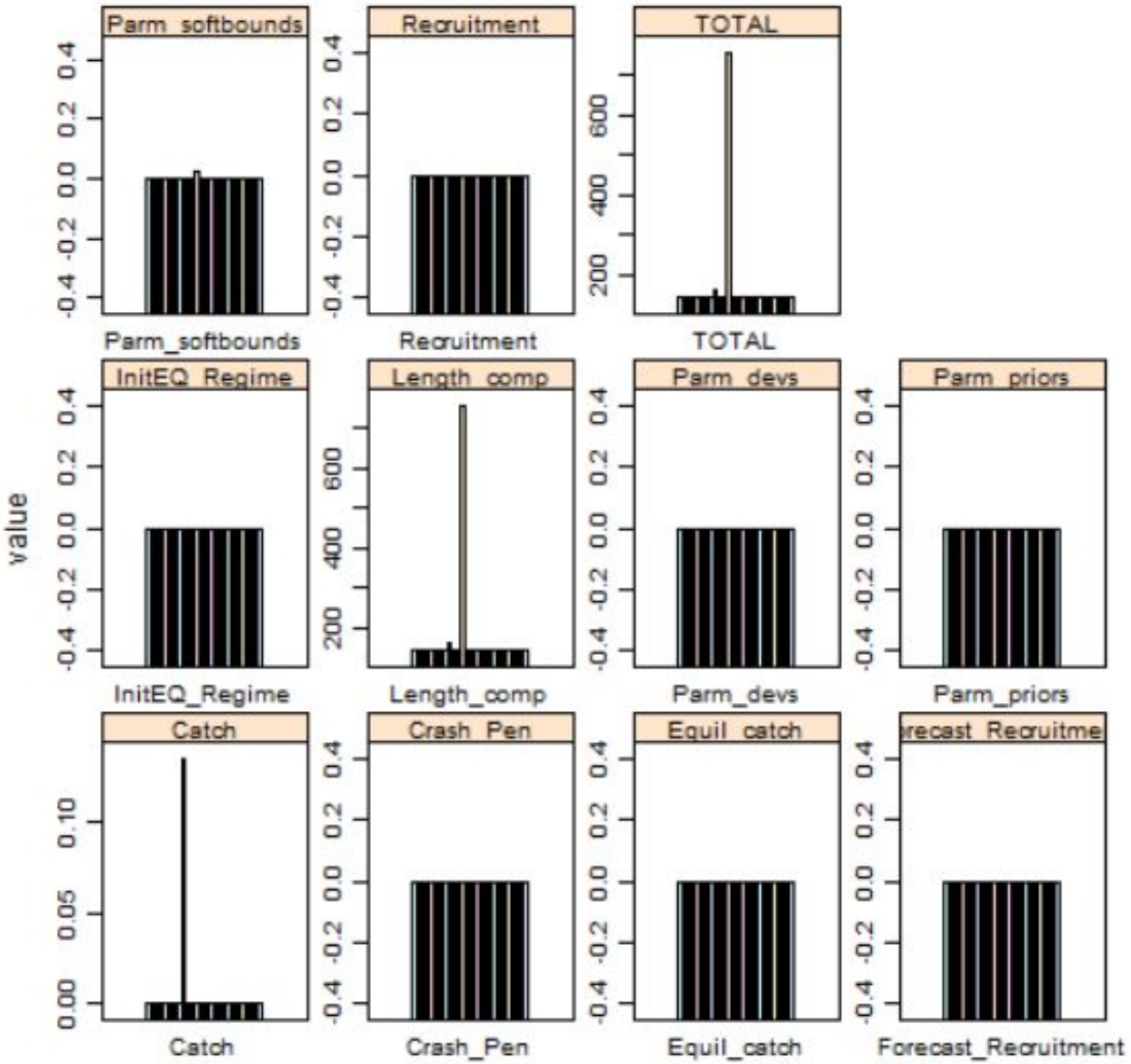


b. Spawning Biomass

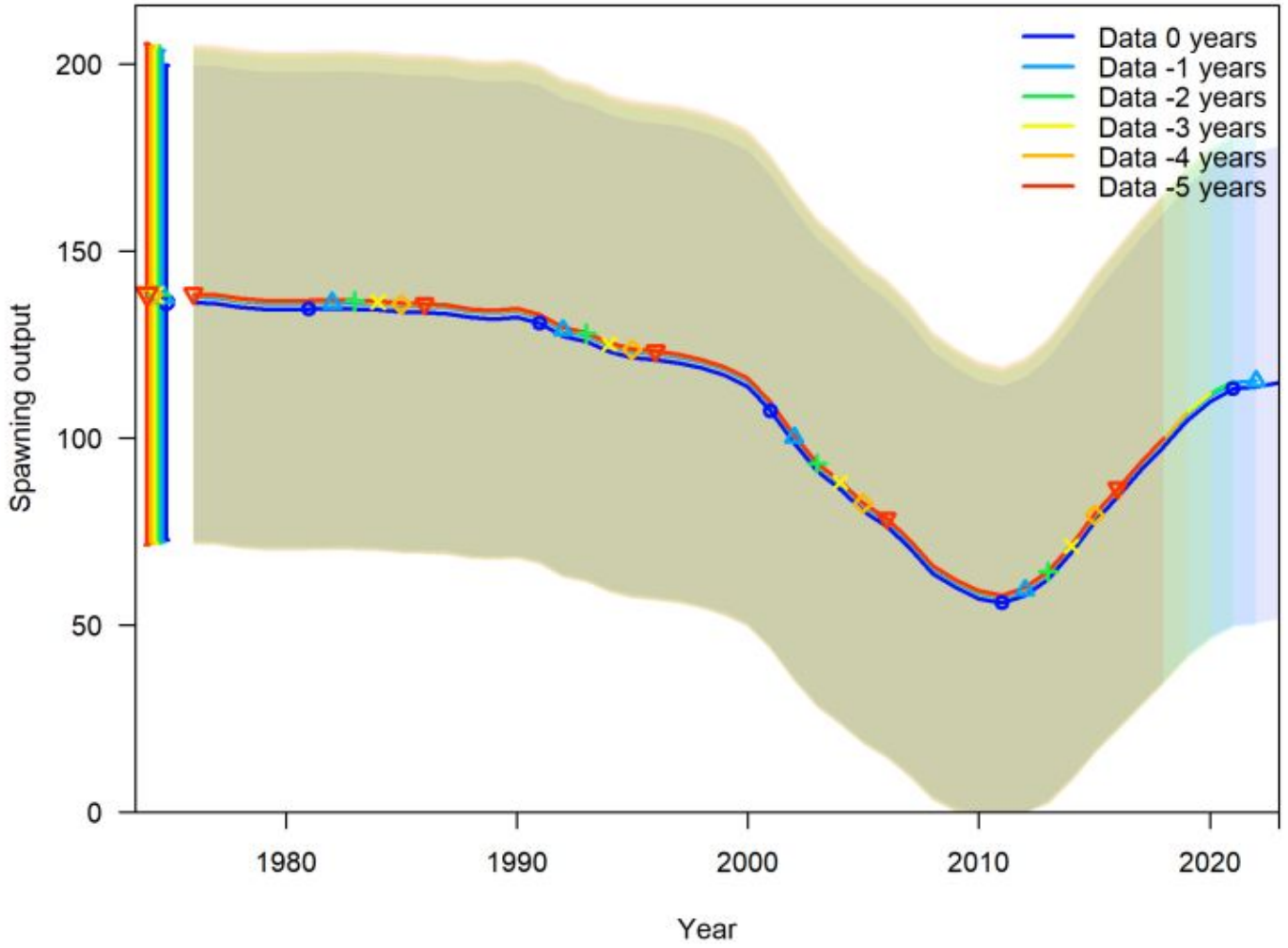


d. Recruitment

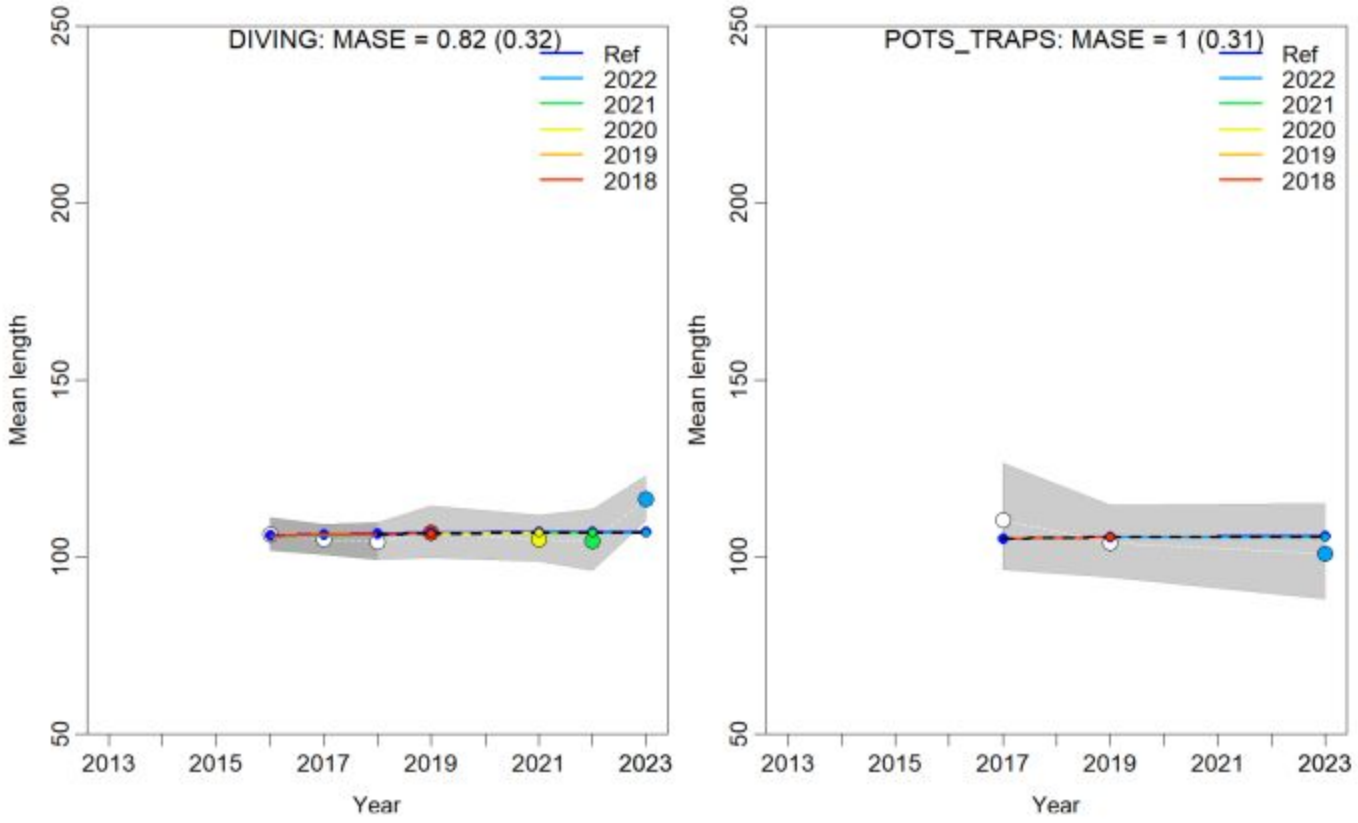
STX Jitter


Parm_softbounds
Recruitment
TOTAL
InitEQ_Regime
Length_comp
Parm_devs
Parm_priors
Catch
Crash_Pen
Equil_catch
value

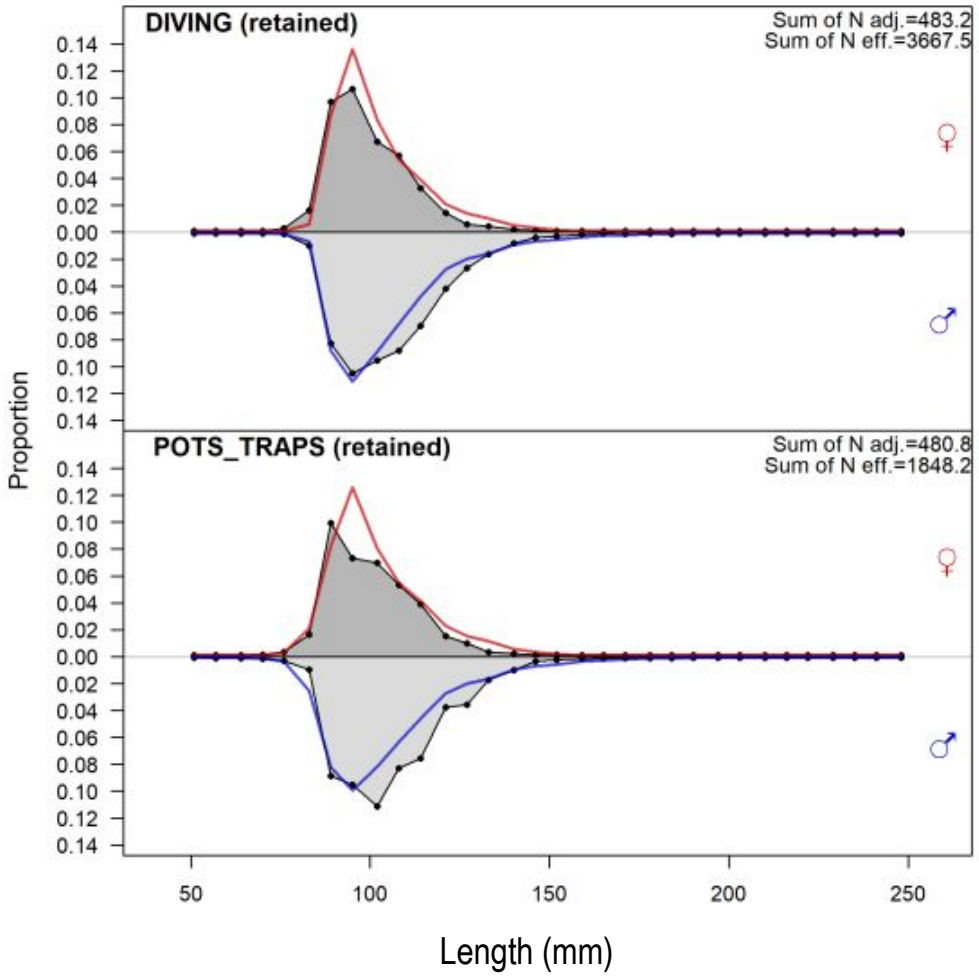
STX Retrospective



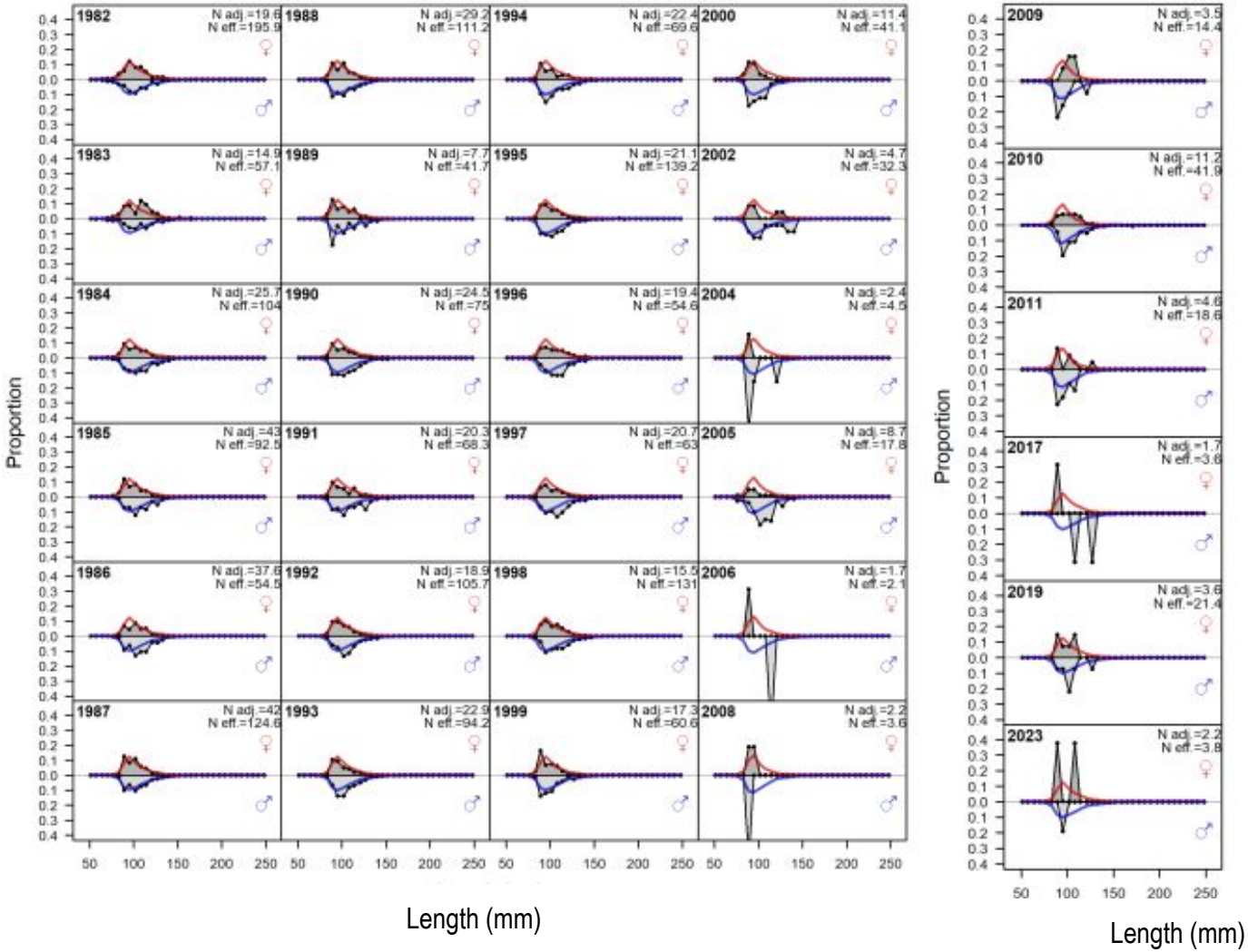
STX Hindcast Cross Validation



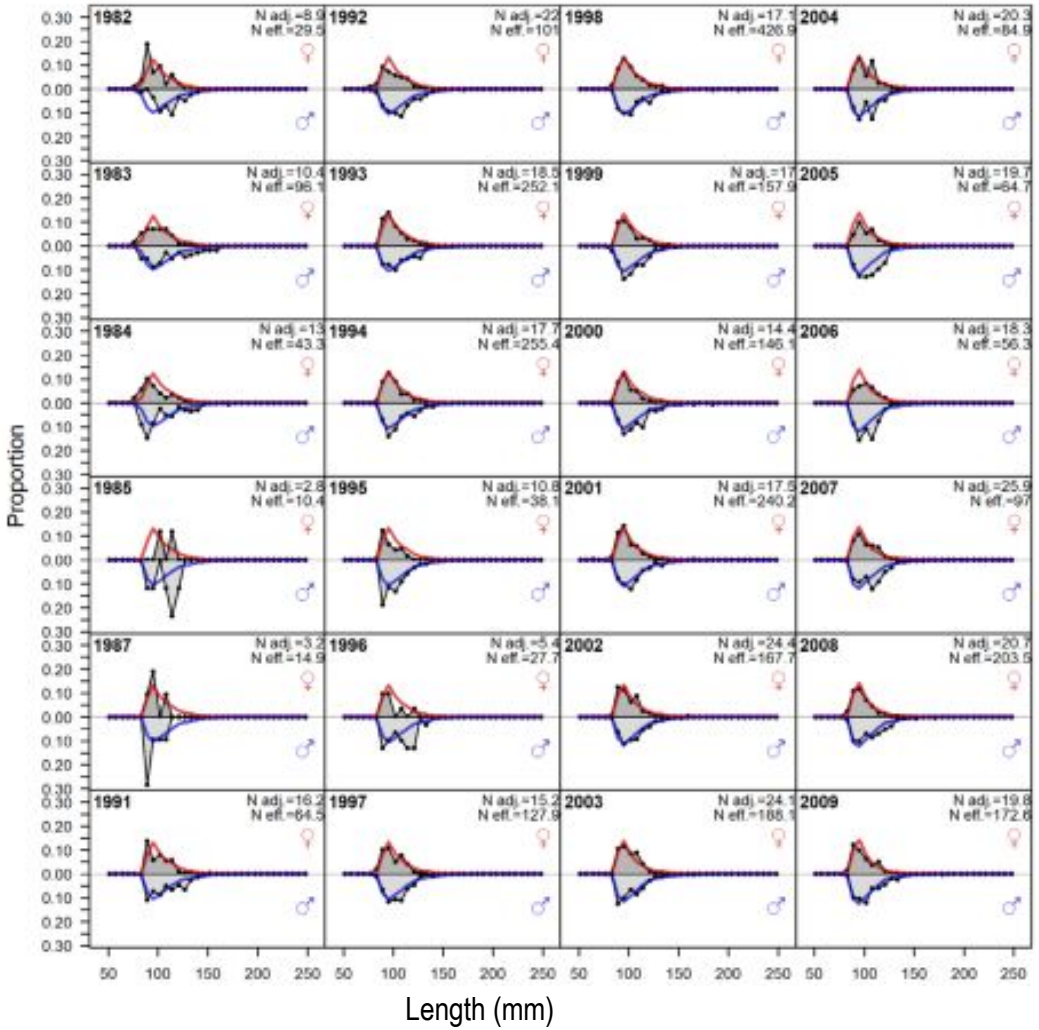
STX Observed and predicted length distributions

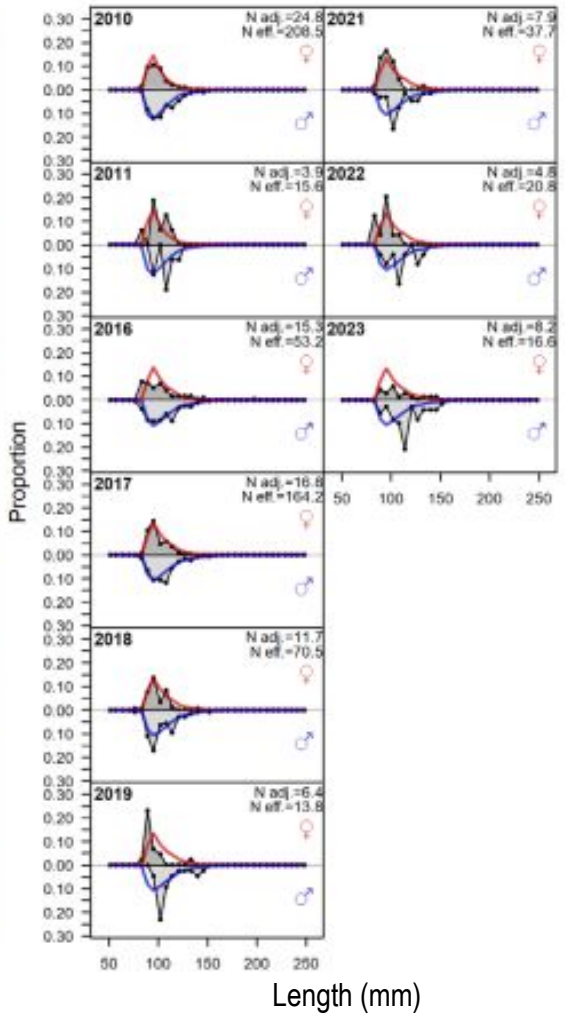


STX Observed and predicted length distributions – Pots/Traps

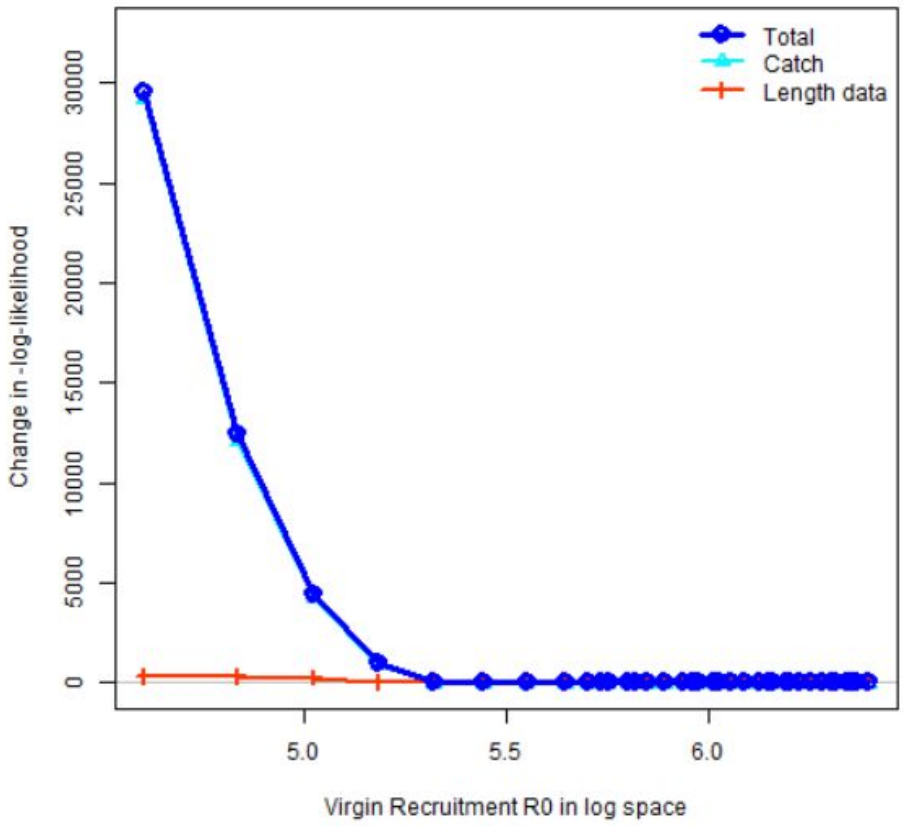


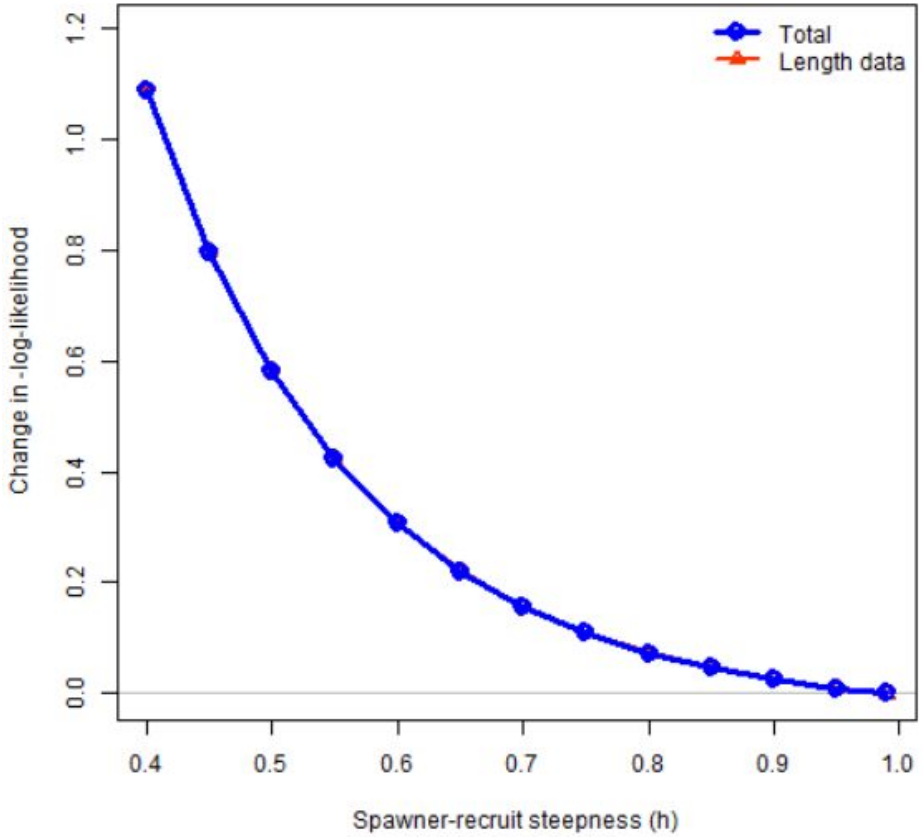
STX Observed and predicted length distributions – Dive



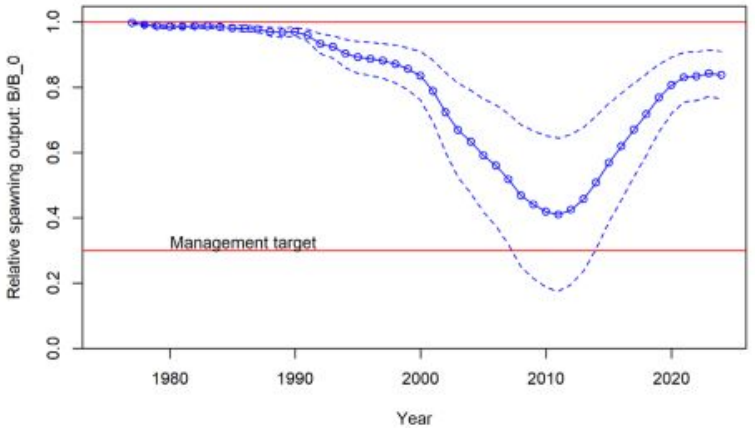


STX Likelihood Profiles
R0 (left) and Steepness (right)

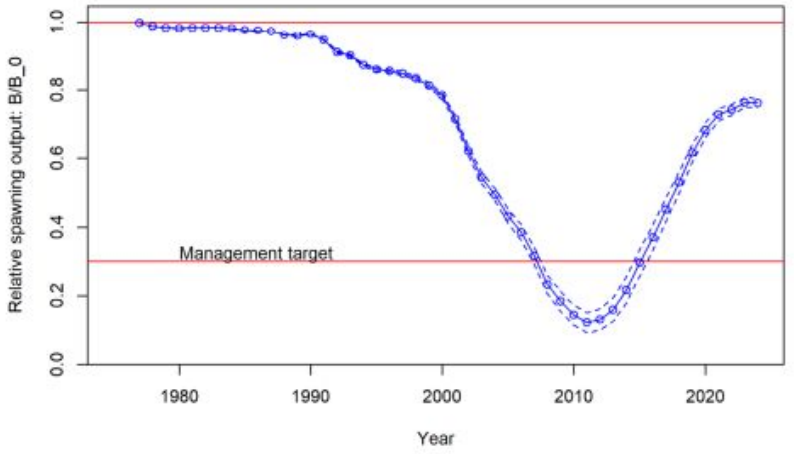




STX Spawning Biomass Ratio Sensitivities



(base)



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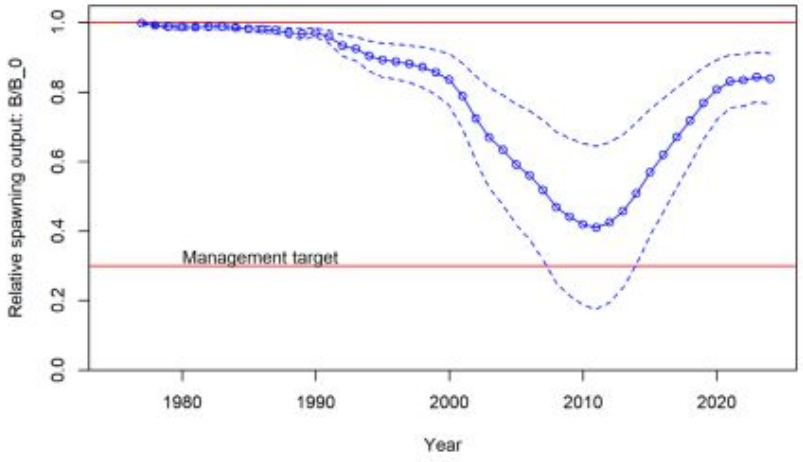

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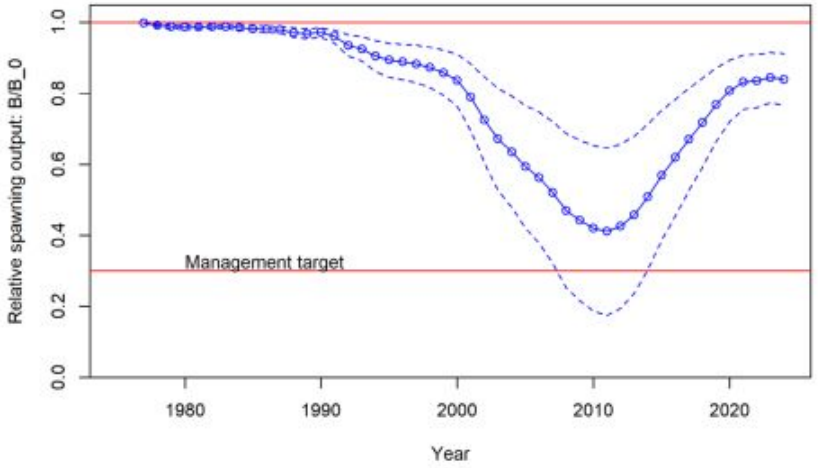

(lw)