

# BSAI Alaska Plaice Stock Assessment (Full)

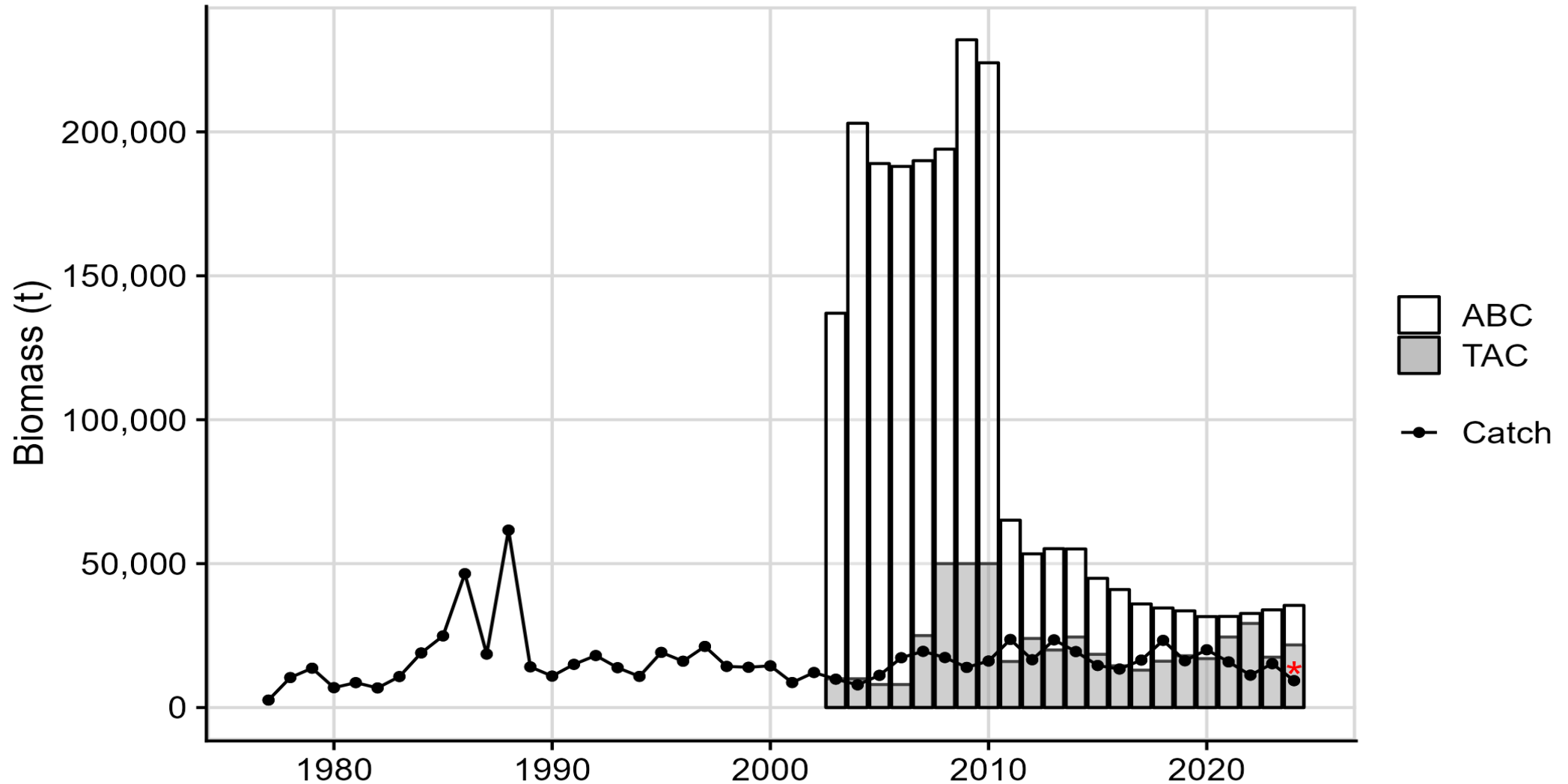
Lee Cronin-Fine



November, 2024, Presentation to the BSAI Groundfish Plan Team



# Stock Overview



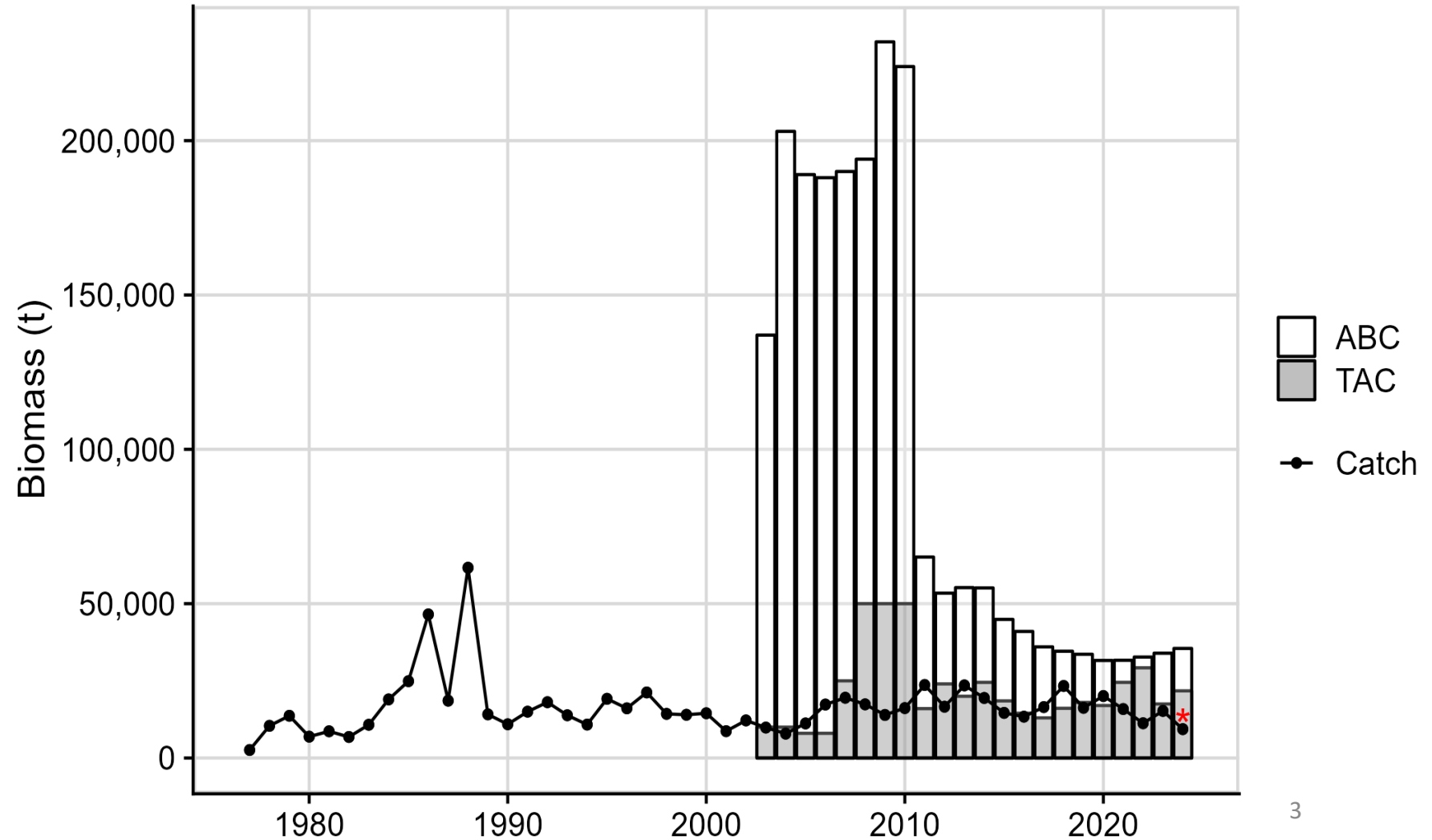
# Stock Overview

## Tier 3a

2024

Total Catch	9,347 t
Projected Catch	13,755 t
TAC	21,752 t
ABC	35,494 t
OFL	42,695 t

\*As of October 5<sup>th</sup>, 2024



# Stock Overview

Year	Target Fishery					TAC	ABC	OFL
	Yellowfin Sole	Rock Sole	other	Total Catch	Total % Retained			
2019	12,954	1,561	1,736	16,251	96%	18,000	33,600	39,880
2020	16,595	2,482	1,001	20,078	93%	17,000	31,600	37,600
2021	11,798	1,631	2,432	15,862	92%	24,500	31,657	37,924
2022	9,732	830	691	11,253	92%	29,221	32,697	39,305
2023	11,871	2,589	792	15,252	93%	17,500	33,946	40,823
2024*	5,050	3,427	870	9,347	96%	21,752	35,494	42,695

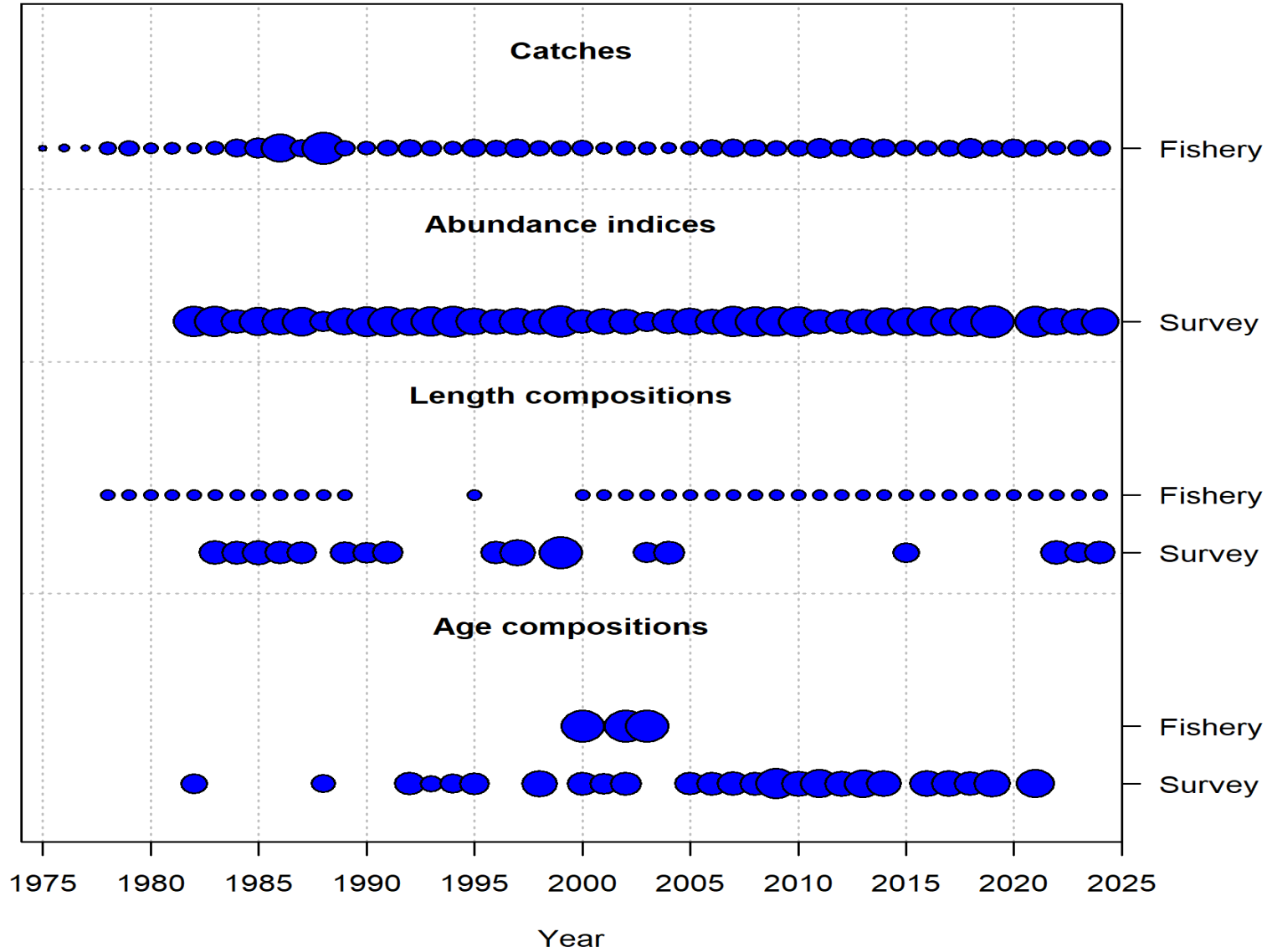
Table 10-1 in SAFE

# Response to SSC and Plan Team Comments

- From the December 2021 SSC minutes:  
*The author continued to investigate biomass in the NBS, noting that over 50% of the survey biomass currently resides in the NBS. While trawling is prohibited in the Northern Bering Sea Research Area, the spatial distribution of Alaska plaice does not suggest any stock separation. The SSC appreciates the authors' investigation of this issue and recommends examining new models that include the use of the NBS data in a similar manner to many other BSAI stocks, perhaps through a combined EBS+NBS VAST index. The author should also consider the potential for differences in age-at-maturity and size-at-age between the EBS and the NBS as they move forward. Additionally, the SSC suggests that the author examine the utility of estimating catchability ( $q$ ) within the model rather than relying on a fixed value (1.2).*
- From the November 2021 BSAI Groundfish Plan Team minutes:  
*The Team recommends that authors explore the relationship of the southern part of the stock in the EBS to the northern part of the stock in the NBS and consider developing models that include the NBS data.*
- From the December 2019 SSC minutes:  
*The SSC ... recommends continuing to track survey biomass trends in the NBS. The assessment indicates that sampling in the NBS in 2017 by a NPRB project showed differential age-at-maturity and size-at-age compared to the EBS. For the next full assessment, the SSC requests that the authors investigate differences in length composition and sex ratios between the NBS and EBS surveys. In addition, the SSC recommends analysis of genetic information to inform whether there is evidence of stock structure between the survey regions.*



# Data



# Analytical Approach

- **Model:** Sex specific, age and length population dynamics model
- **Sex specific:** length-at-age, weight-at-length, weight-at-age, age-length transition matrix (ALK) and selectivity (age-based and logistic).
- **Fixed Parameters:** survey catchability (1.2), natural mortality (0.13, not sex-specific)
- **Recruitment:** Mean recruitment with annual deviations



# September Plan Team Refresher

## **Transition to Stock Synthesis (SS3)**



# September Plan Team Refresher

## Base-3

- Closely matches 2021 assessment model
- Estimates parameters: Recruitment mean, recruitment deviations, selectivity, fishing mortality
- Fixed parameters: Growth
- Weight-at-age determined externally
- Population age range 3-25, length range 10cm – 60cm

# September Plan Team Refresher

## Base-3

- Closely matches 2021 assessment model
- Estimates parameters: Recruitment mean, recruitment deviations, selectivity, fishing mortality
- Fixed parameters: Growth
- Weight-at-age determined externally
- Population age range 3-25, length range 10cm – 60cm

## Model 24.1

- Updated input sample size (ISS) for the survey age-composition data using a general bootstrapping framework.
- Updated ISS for the survey length-composition data with the number of hauls.
- Changing age range to 0-25.
- Including age-1 and -2 fish in the fishery and survey age-composition data.
- Adjusting the maximum age for linear growth to age-3 and estimating all growth parameters except the CVs.
- Updating length-weight relationship parameters values.
- Updating the growth CVs.
- Calculate the weight-at-age relationship within SS3.

# Alternative Models

## Model 24.1a

- Updated ISS for the survey length-composition data using a general bootstrapping framework.
- Re-weighted ISS for the survey age- and length composition data using the Francis data weighting method.
  - Length ISS multiplied by 0.14693
  - Age ISS multiplied by 0.2749

# Alternative Models

## Model 24.1a

- Updated ISS for the survey length-composition data using a general bootstrapping framework.
- Re-weighted ISS for the survey age- and length composition data using the Francis data weighting method.
  - Length ISS multiplied by 0.14693
  - Age ISS multiplied by 0.2749

## Model 24.1b

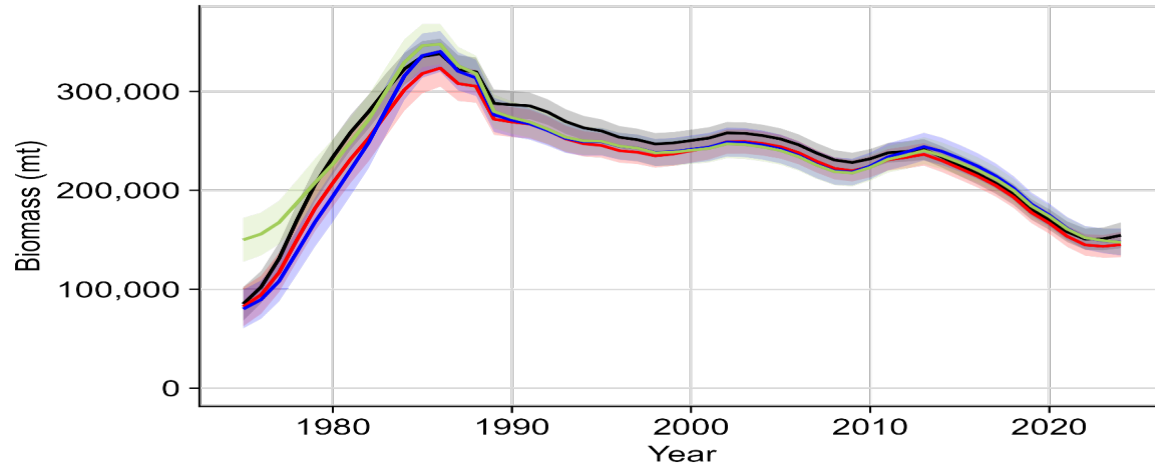
- Tuned the standard deviation for recruitment deviations ( $\sigma_R$ ) using the SS3 recommended value.
  - $\sigma_R$  tuned to 0.4243

# Alternative Models

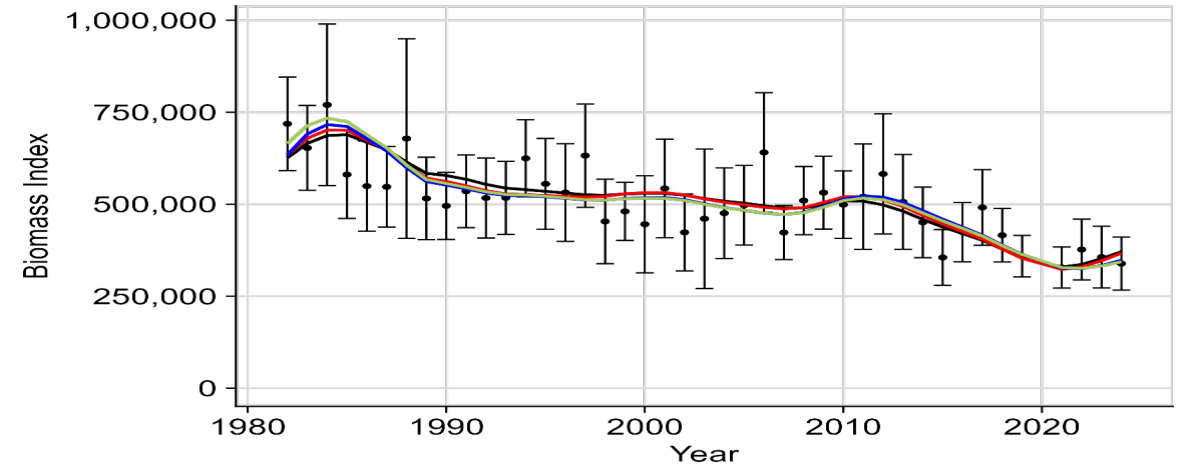
<b>Source</b>	<b>Base-3</b>	<b>Model 24.1</b>	<b>Model 24.1a</b>	<b>Model 24.1b</b>
Mean Recruitment	1	1	1	1
Recruitment Deviations	45	45	45	45
Initial Population	25	25	25	25
Growth	0	6	6	6
Selectivity	8	8	8	8
Fishing Mortality	50	50	50	50
Total # of Parameters	129	135	135	135

# Model Evaluation

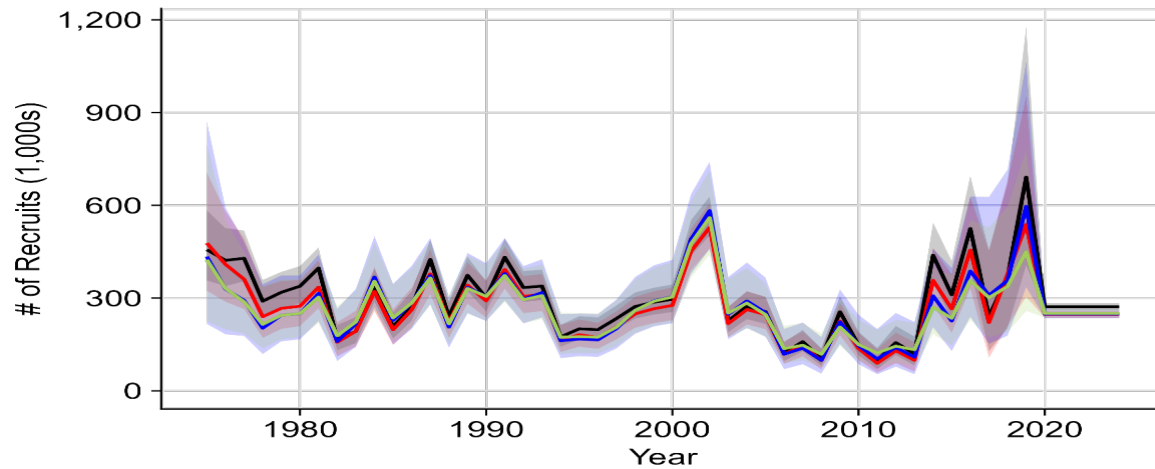
### Spawning Stock Biomass



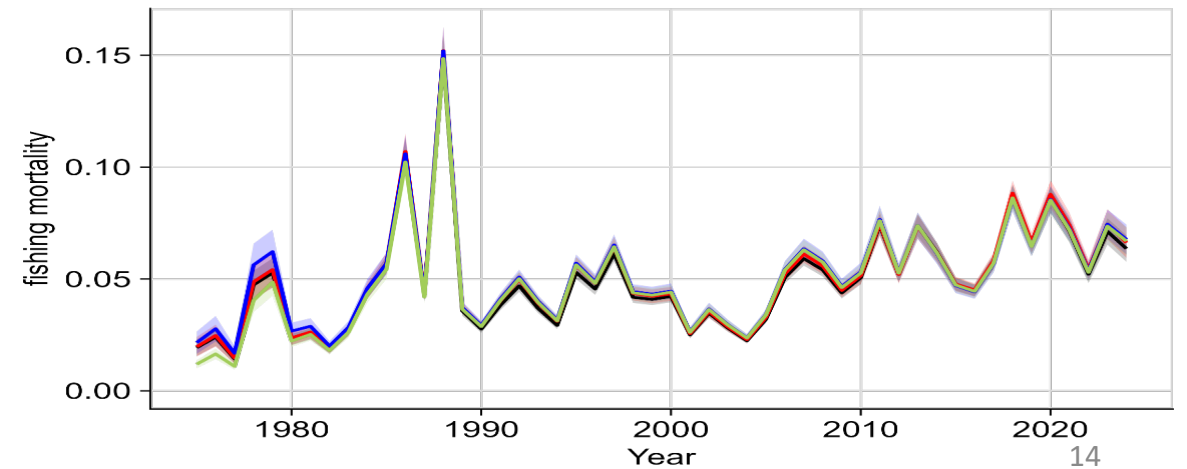
### Biomass Index



### Recruitment to Age-0



### Fishing Mortality

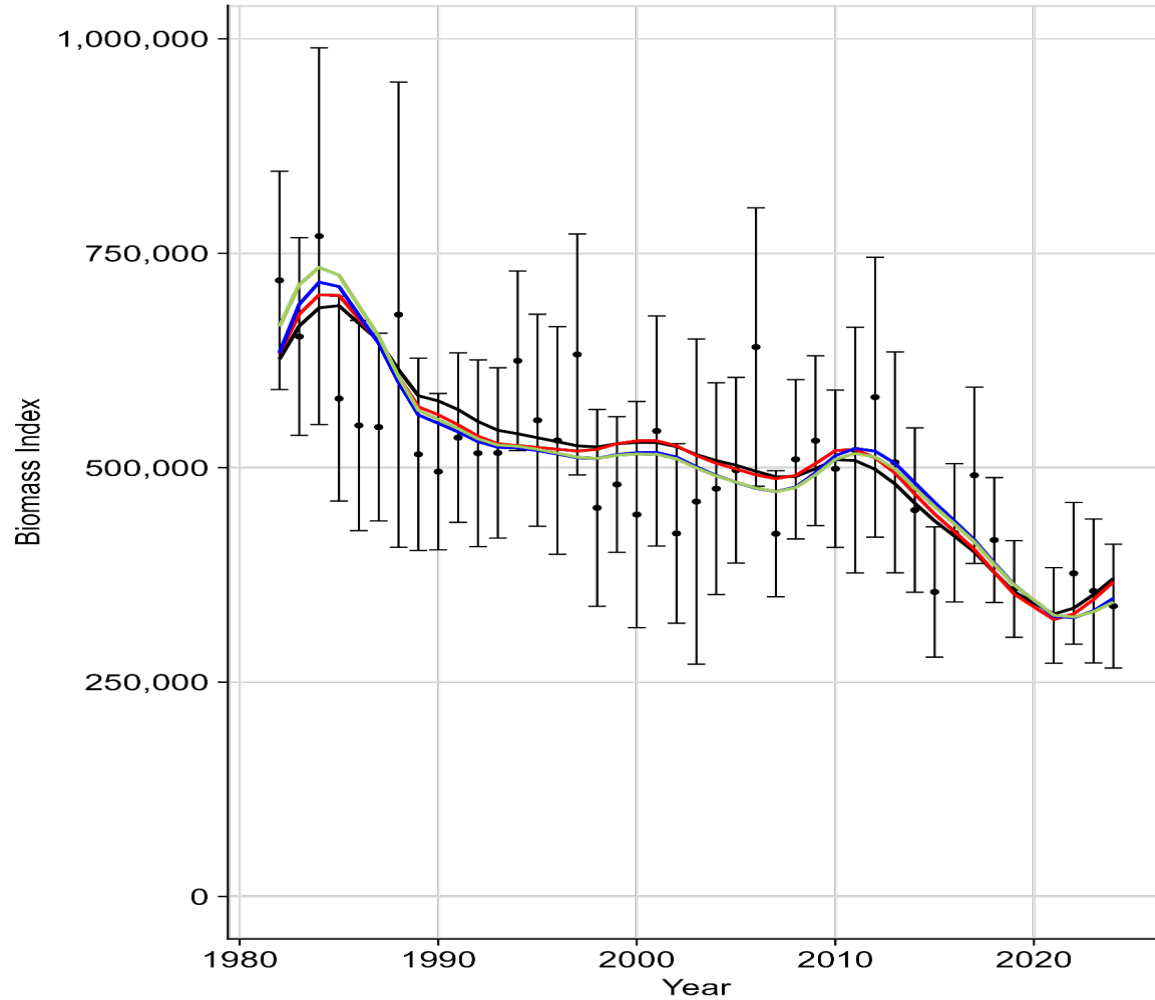


Model — Base-3 — Model\_24.1 — Model\_24.1a — Model\_24.1b

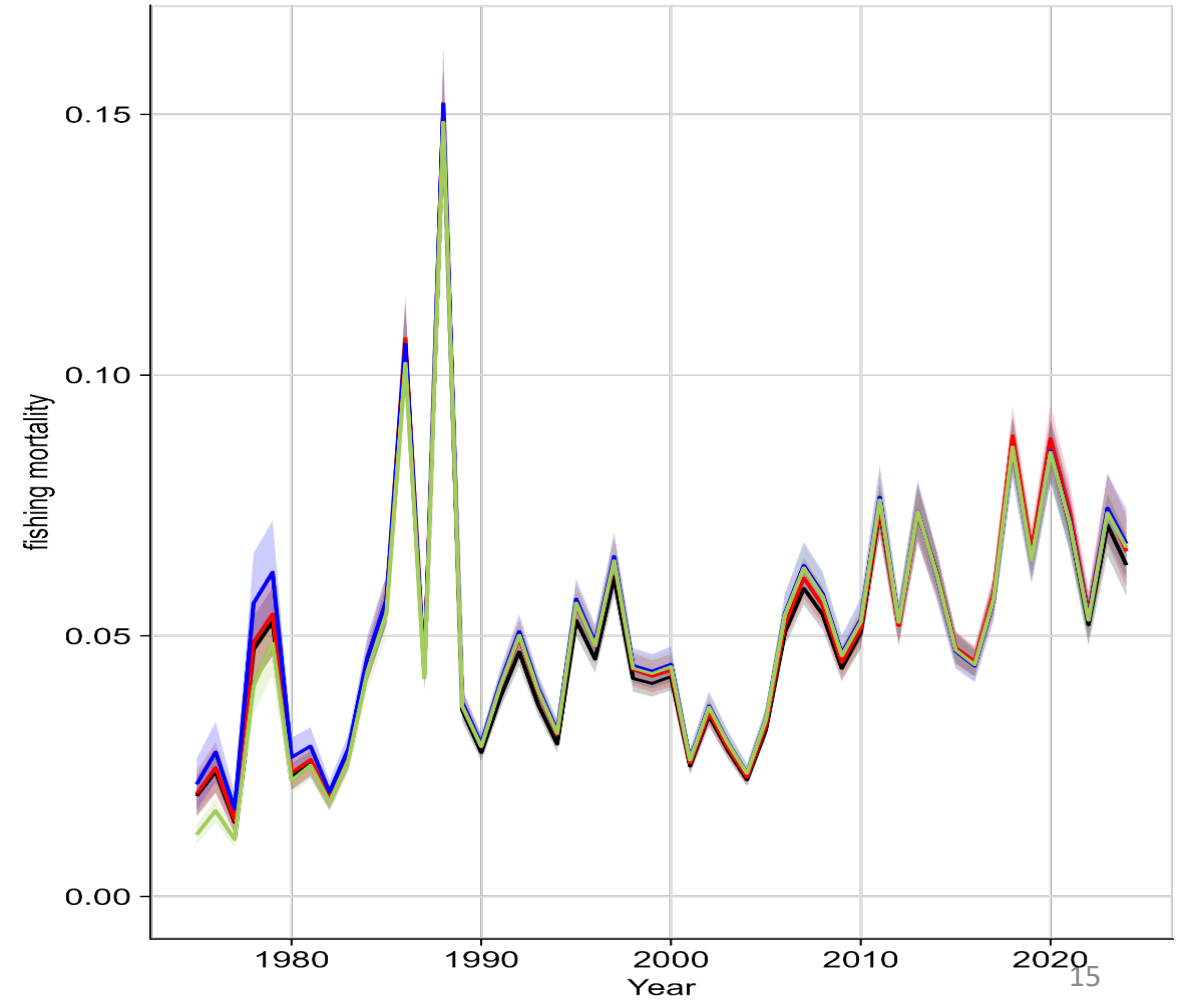


# Model Evaluation

## Biomass Index

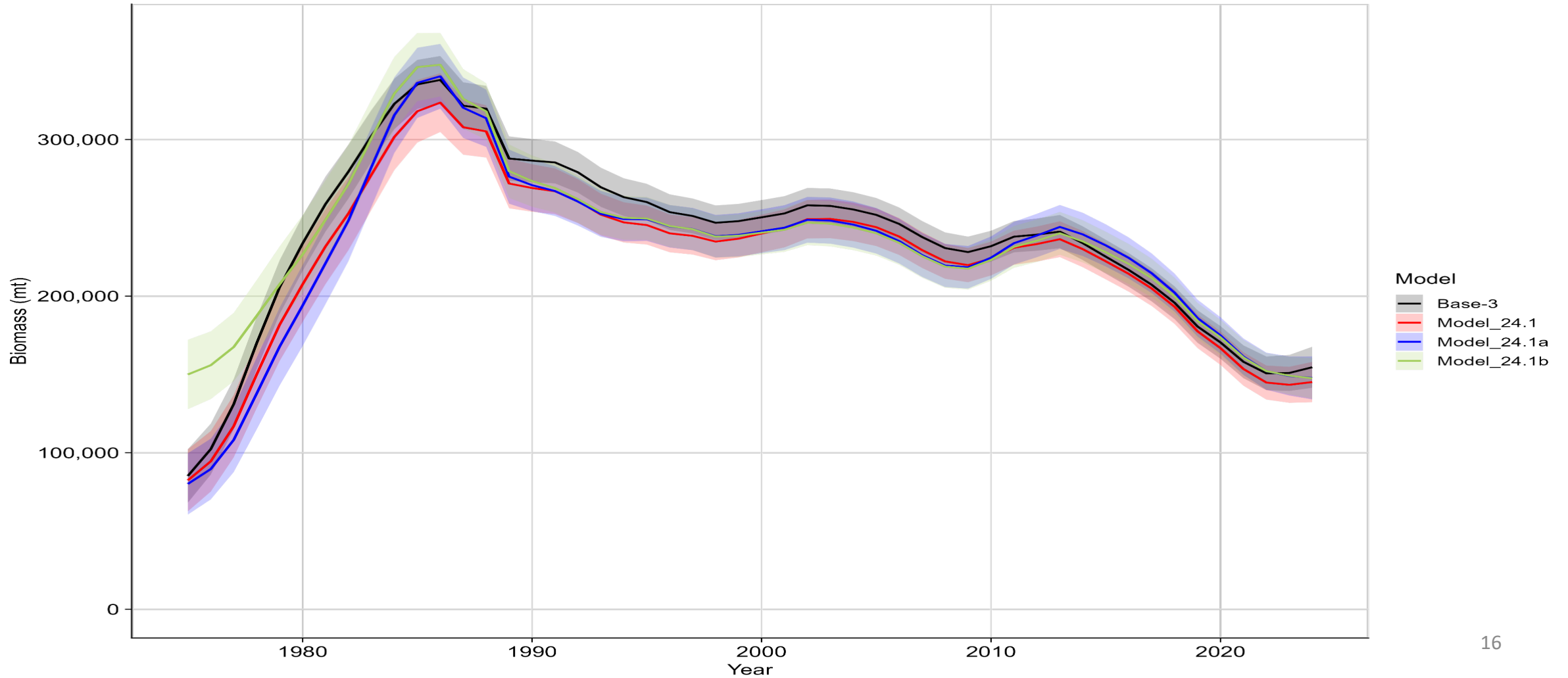


## Fishing Mortality

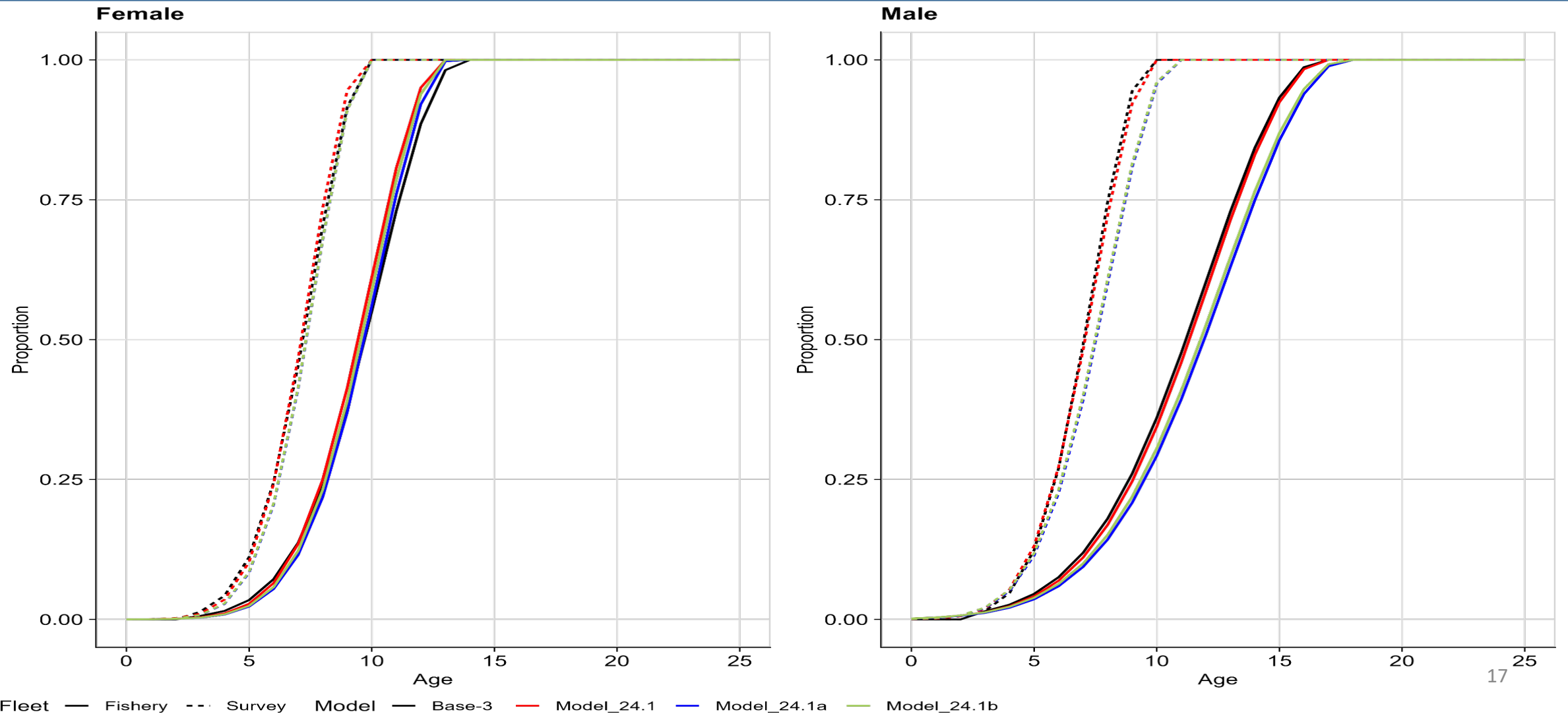


# Model Evaluation

Spawning Stock Biomass

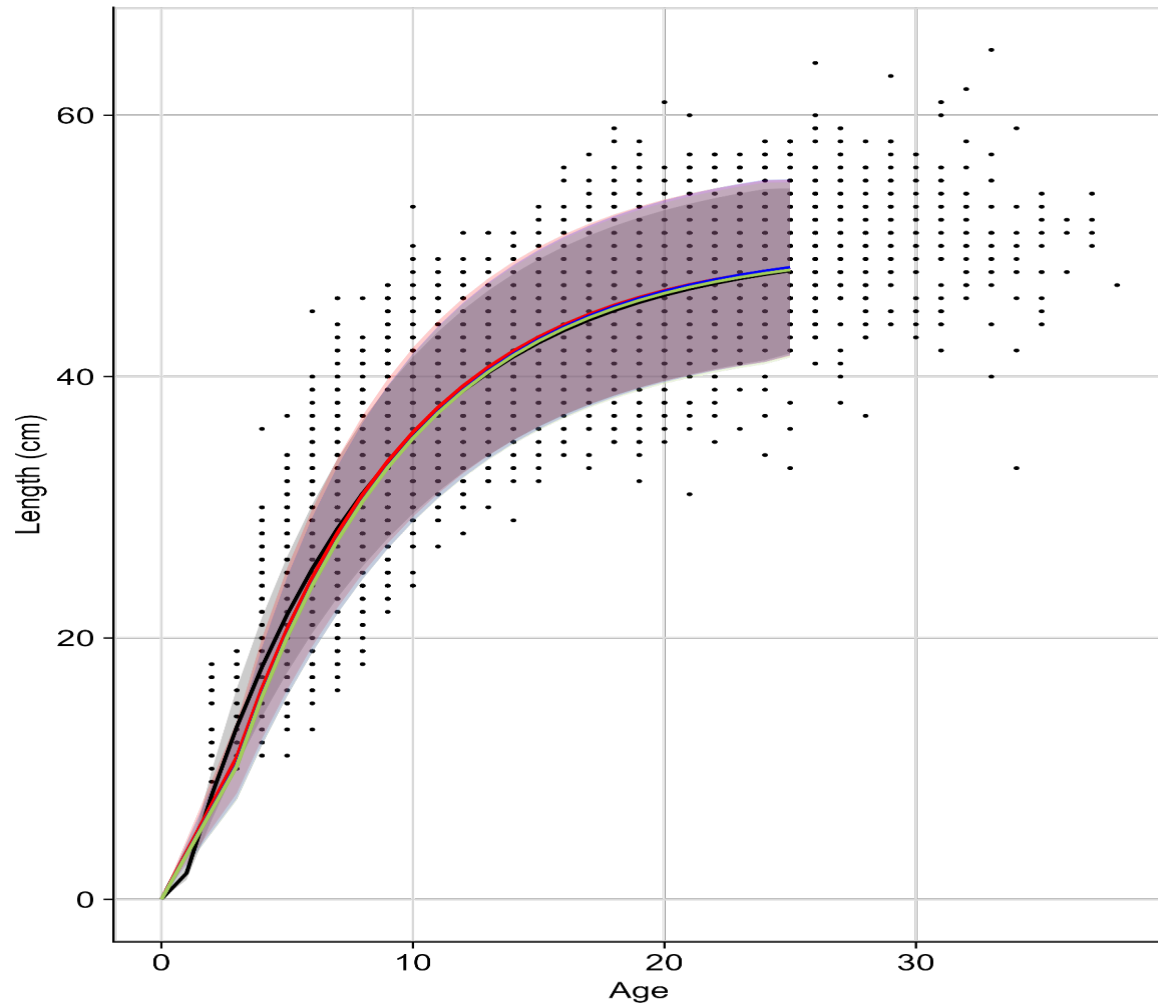


# Model Evaluation

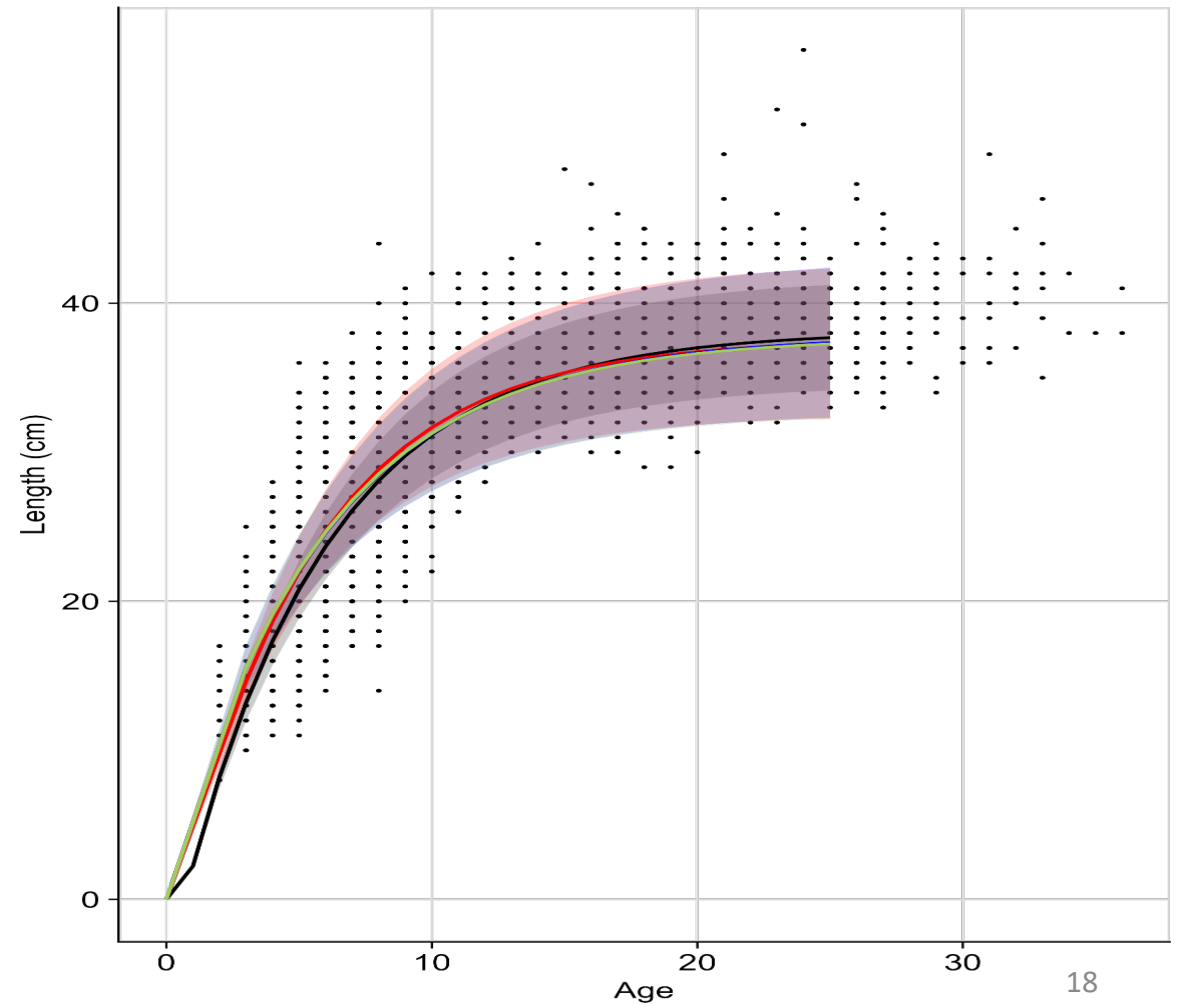


# Model Evaluation

Female

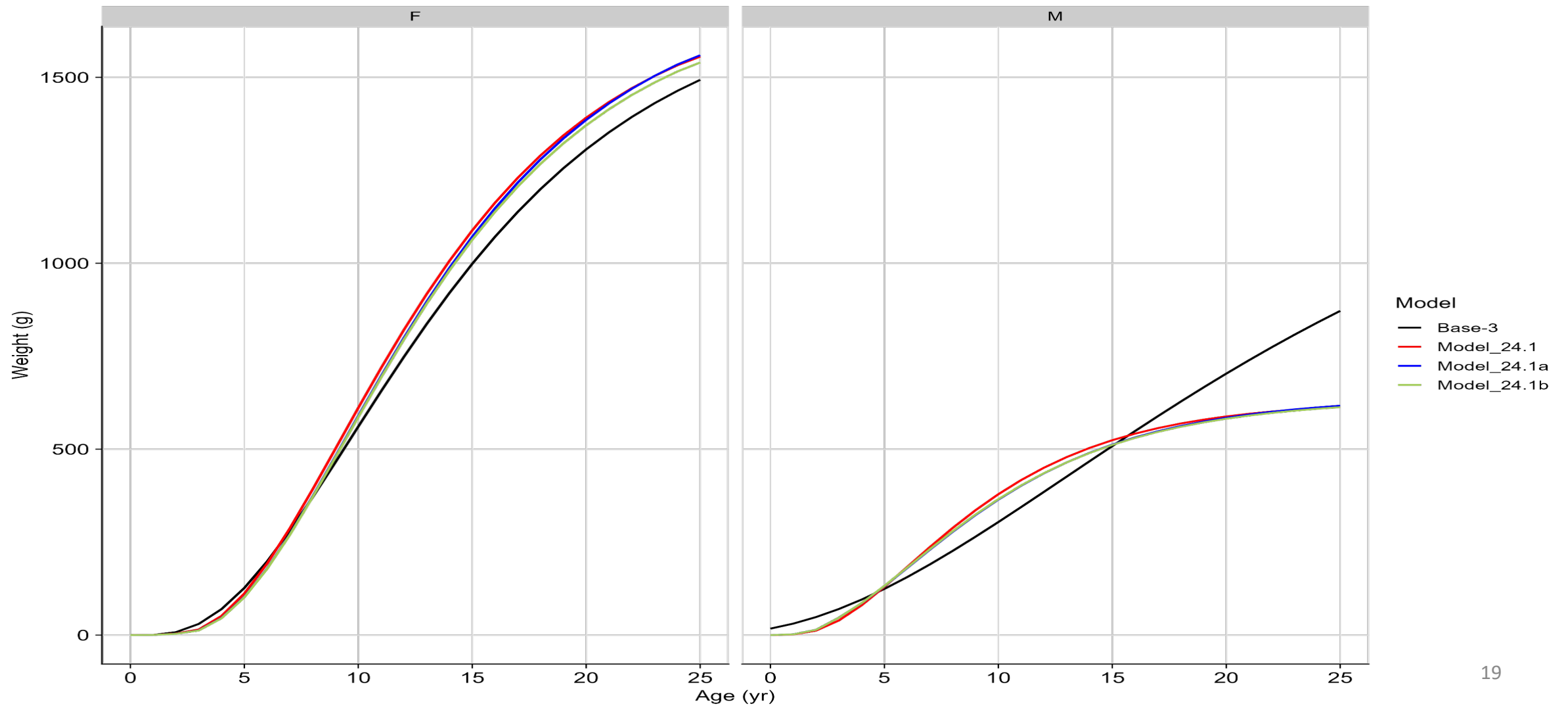


Male



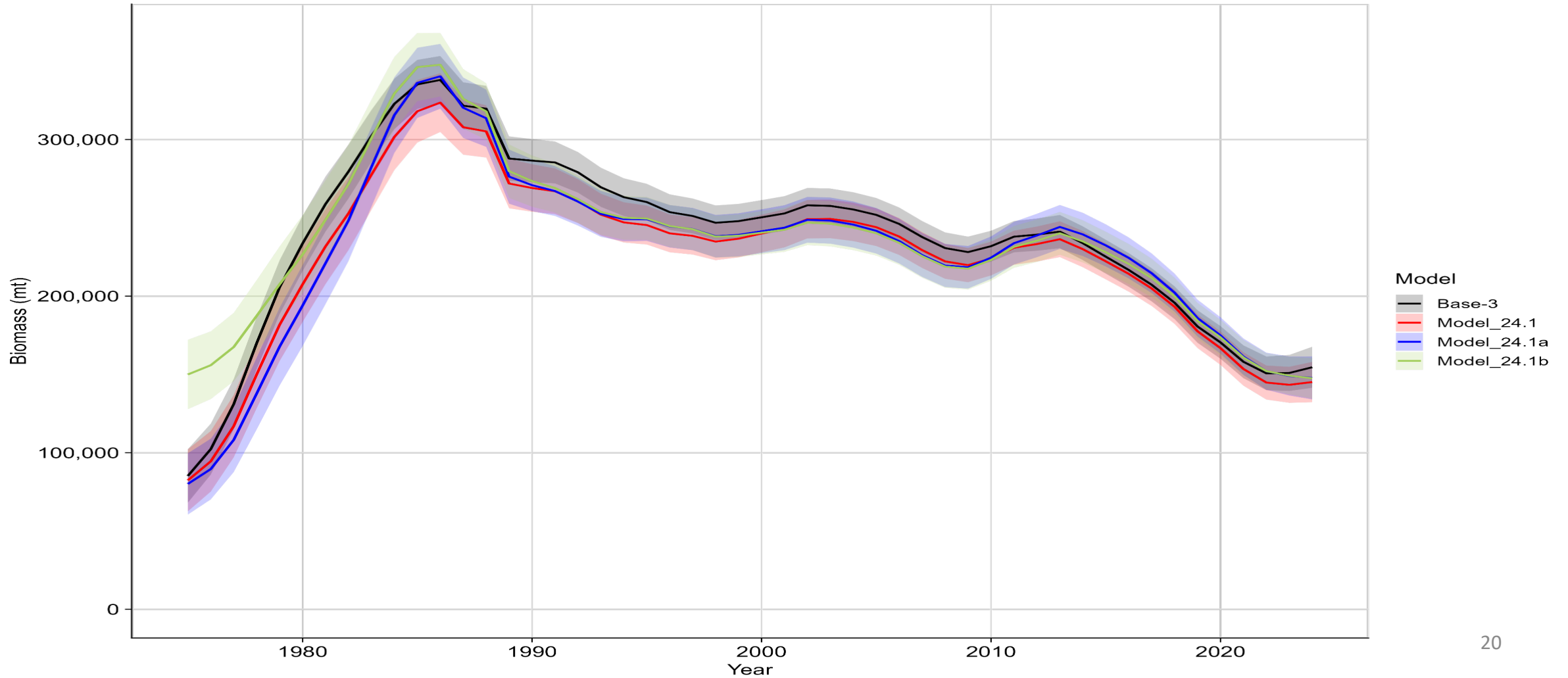
Model — Base-3 — Model 24.1 — Model 24.1a — Model 24.1b

# Model Evaluation



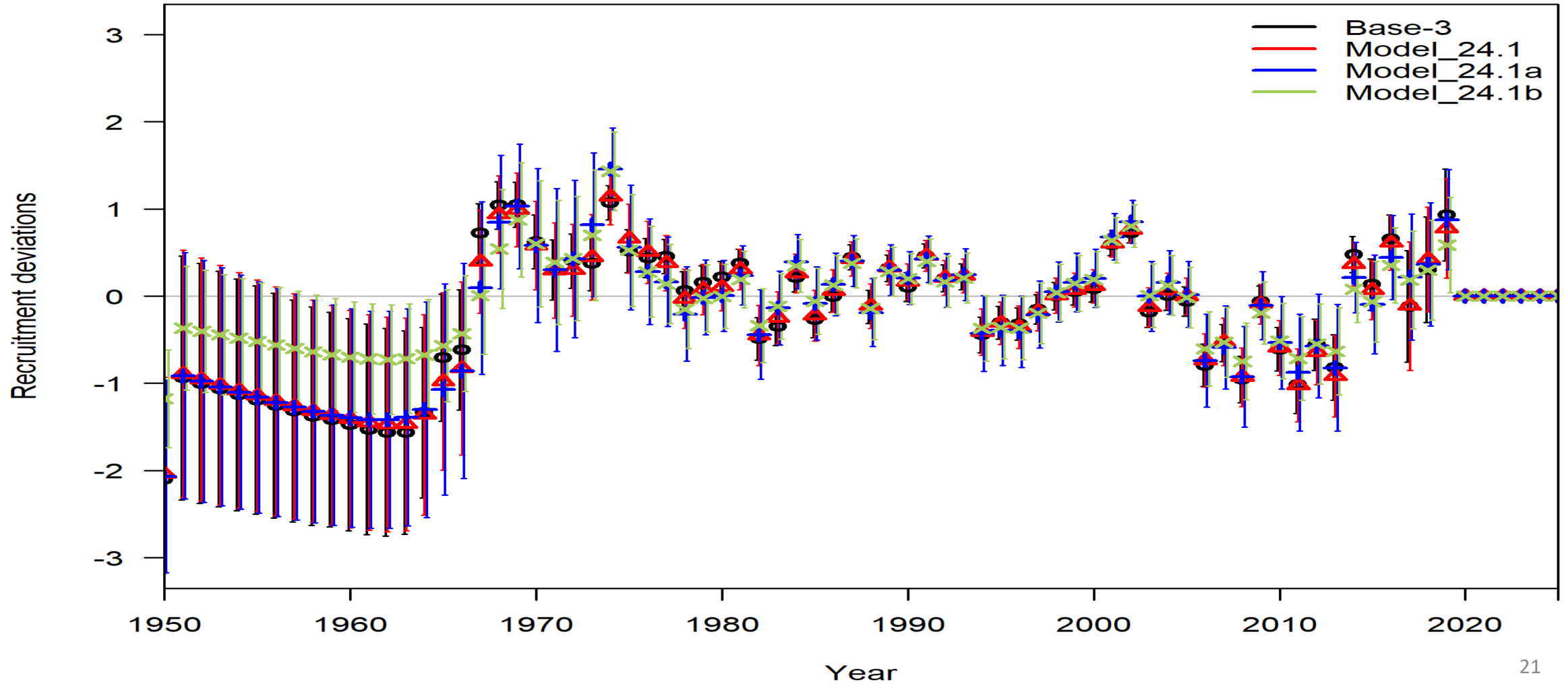
# Model Evaluation

Spawning Stock Biomass

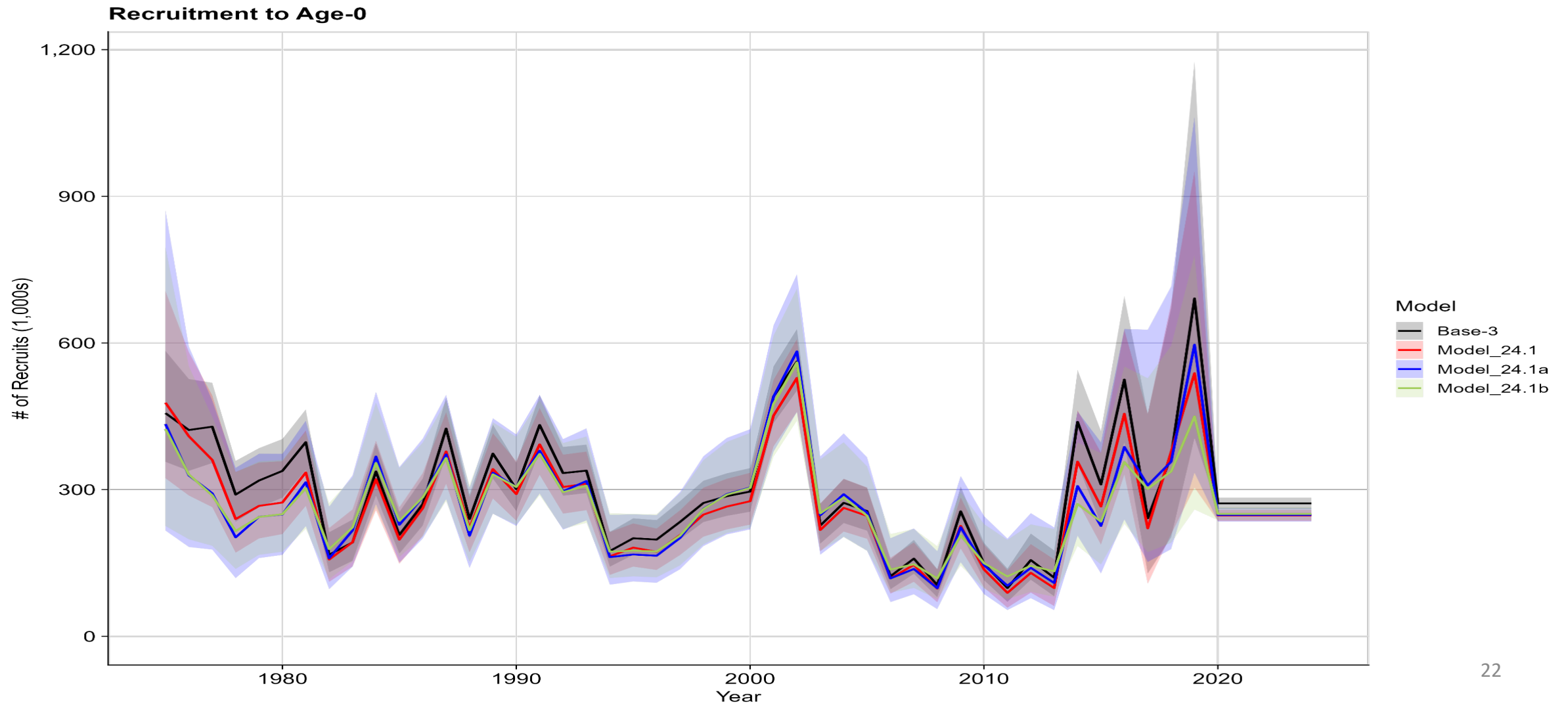




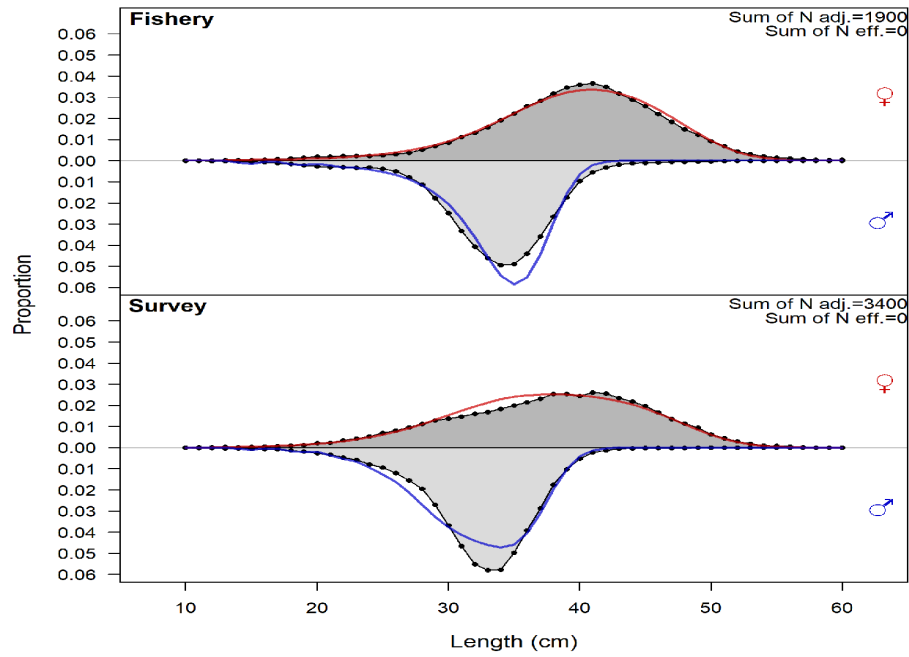
# Model Evaluation



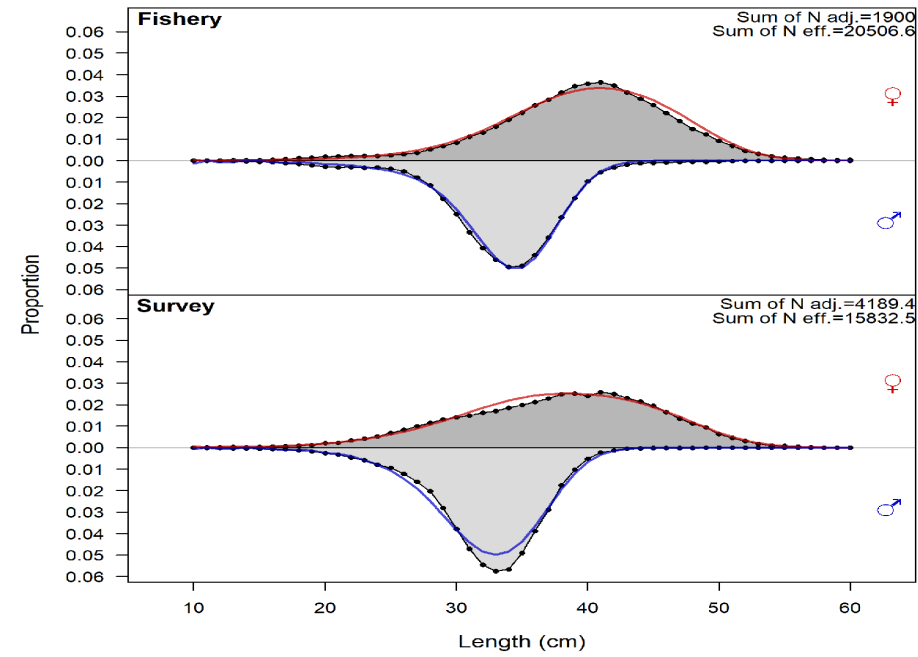
# Model Evaluation



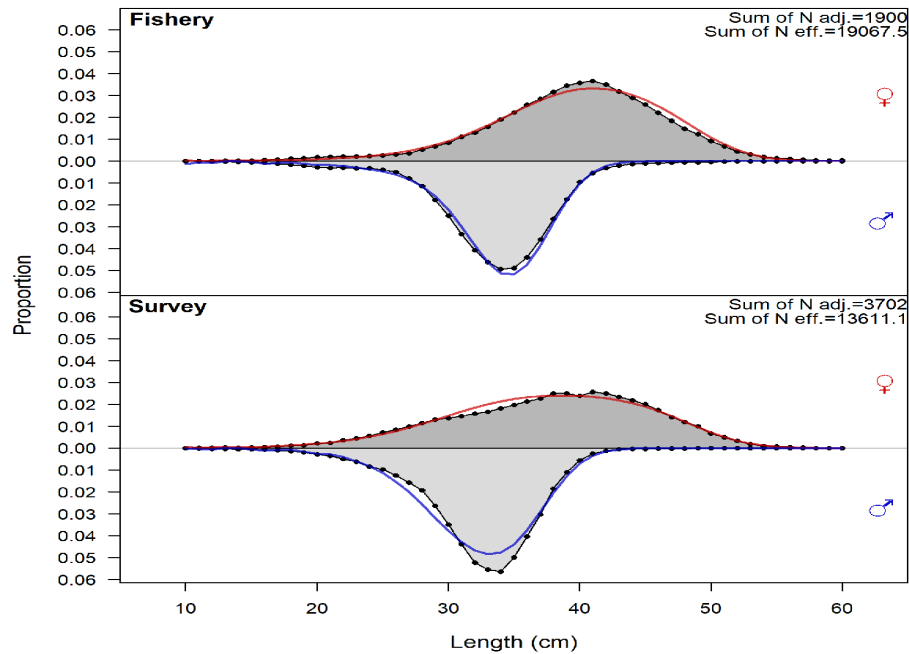
# Base-3



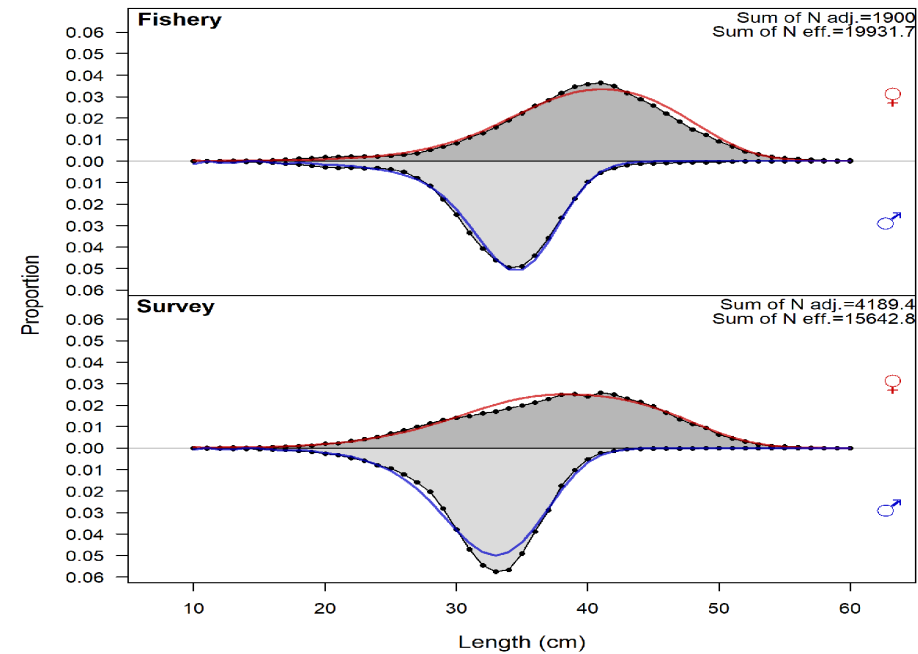
# Model 24.1a



# Model 24.1

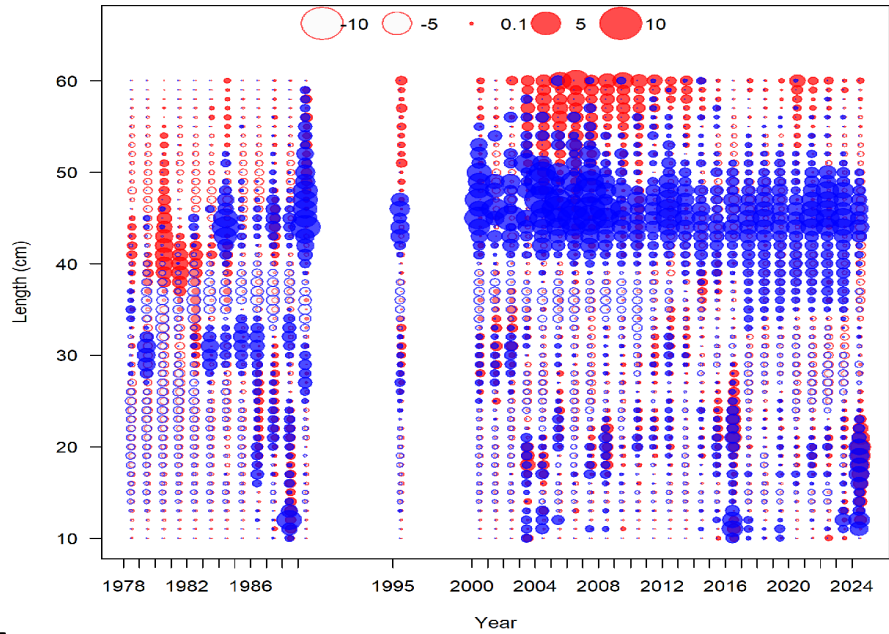


# Model 24.1b

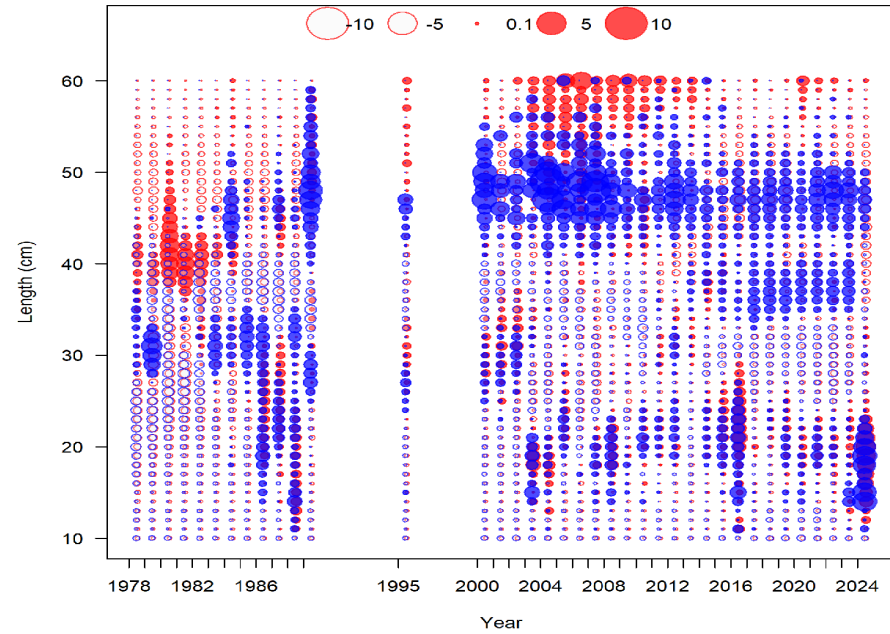


Fit to  
Length  
data

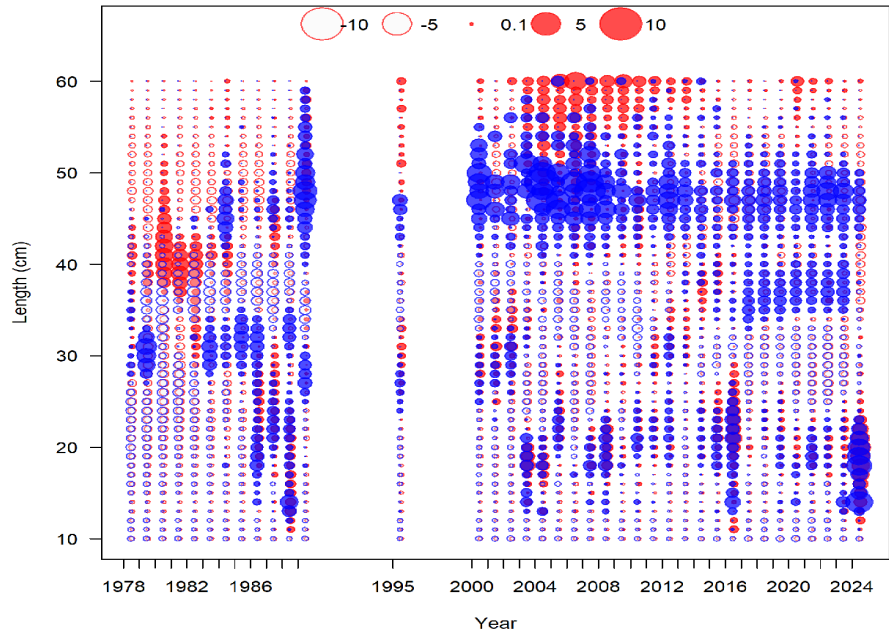
# Base-3



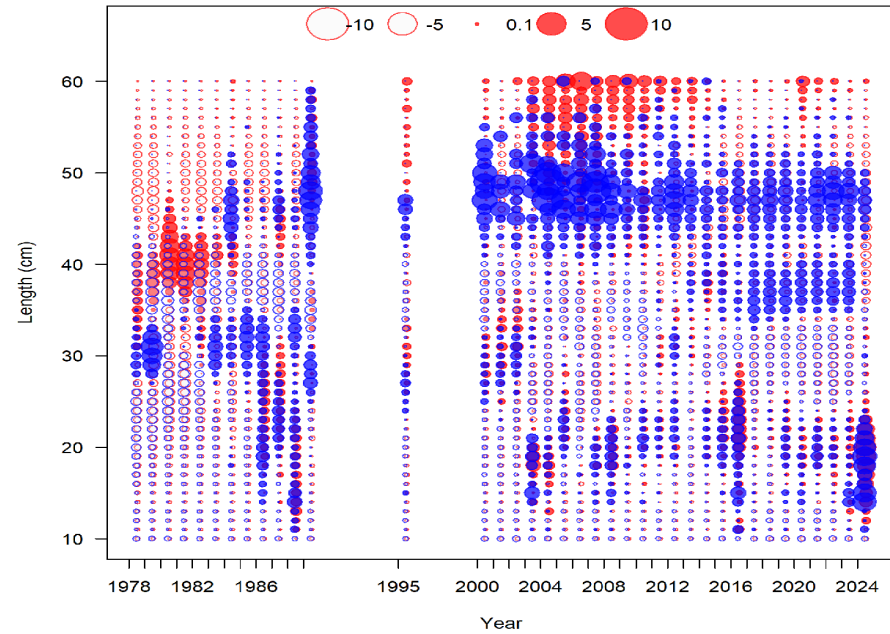
# Model 24.1a



# Model 24.1



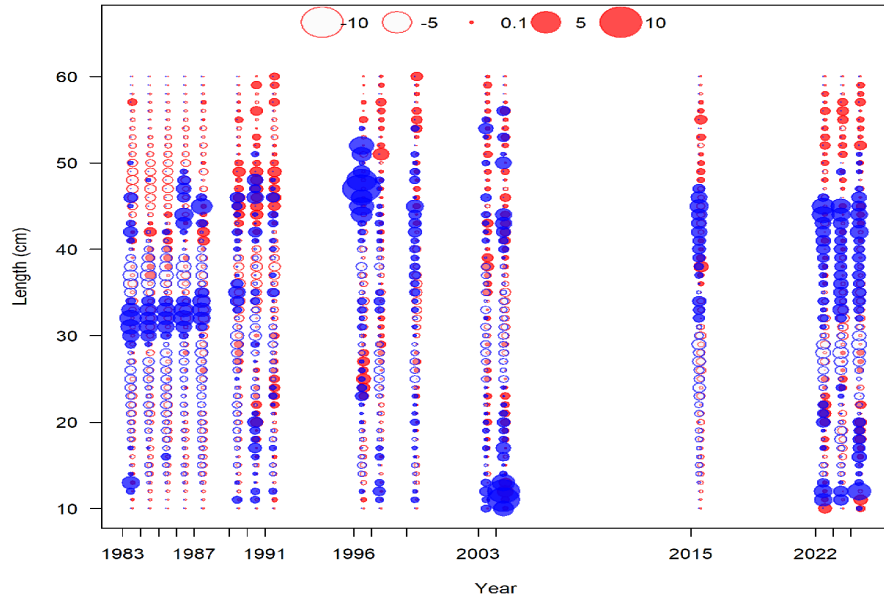
# Model 24.1b



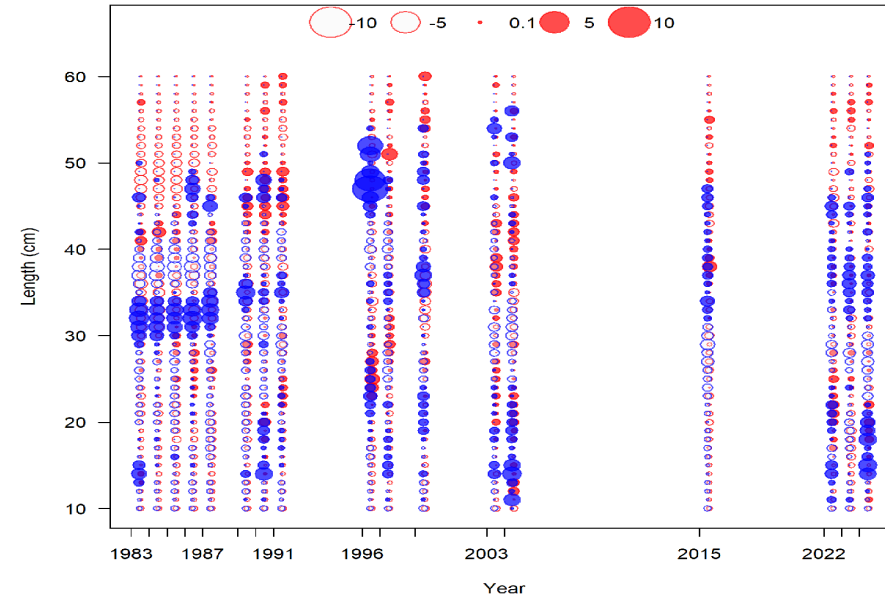
Fit to  
Fishery  
Length  
data



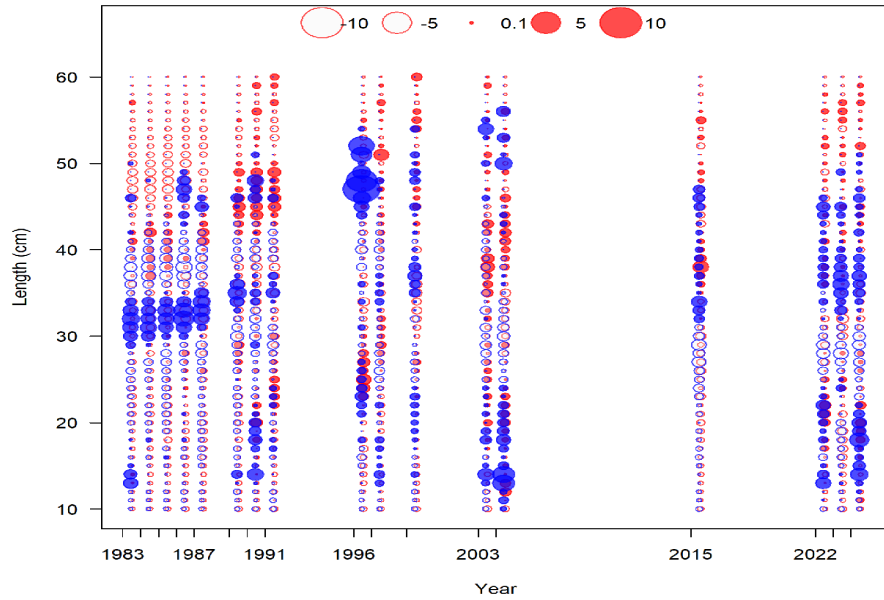
# Base-3



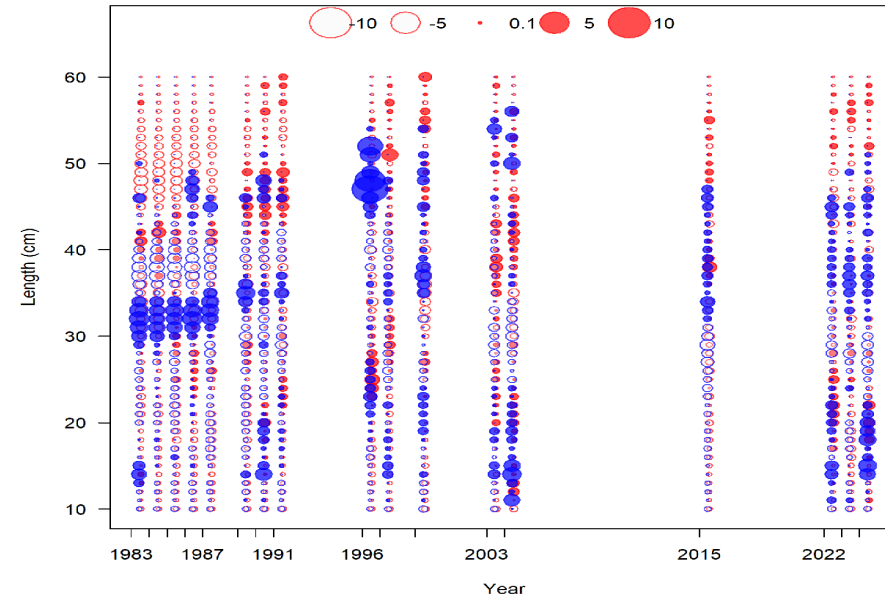
# Model 24.1a



# Model 24.1

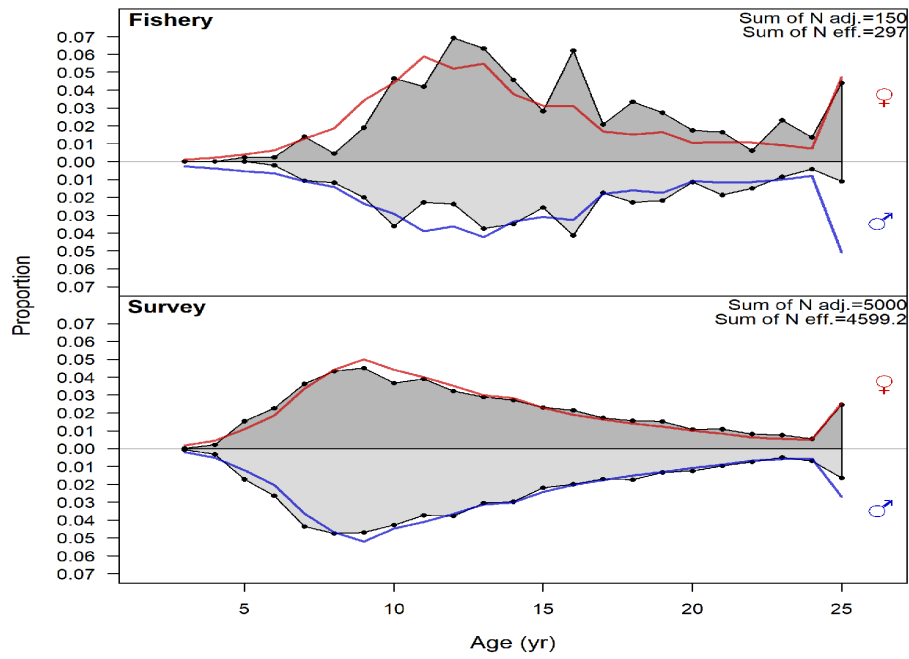


# Model 24.1b

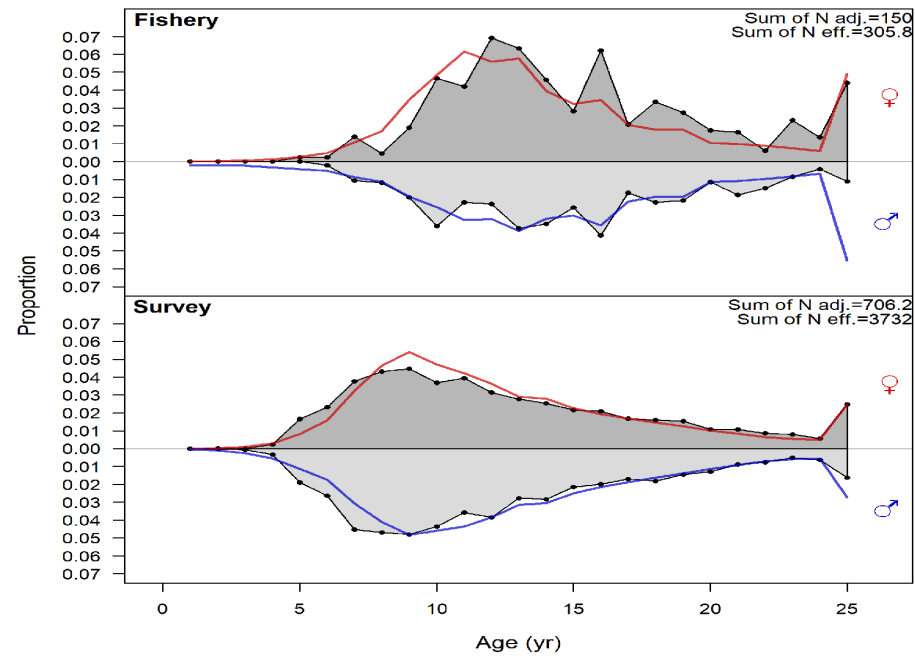


Fit to  
Survey  
Length  
data

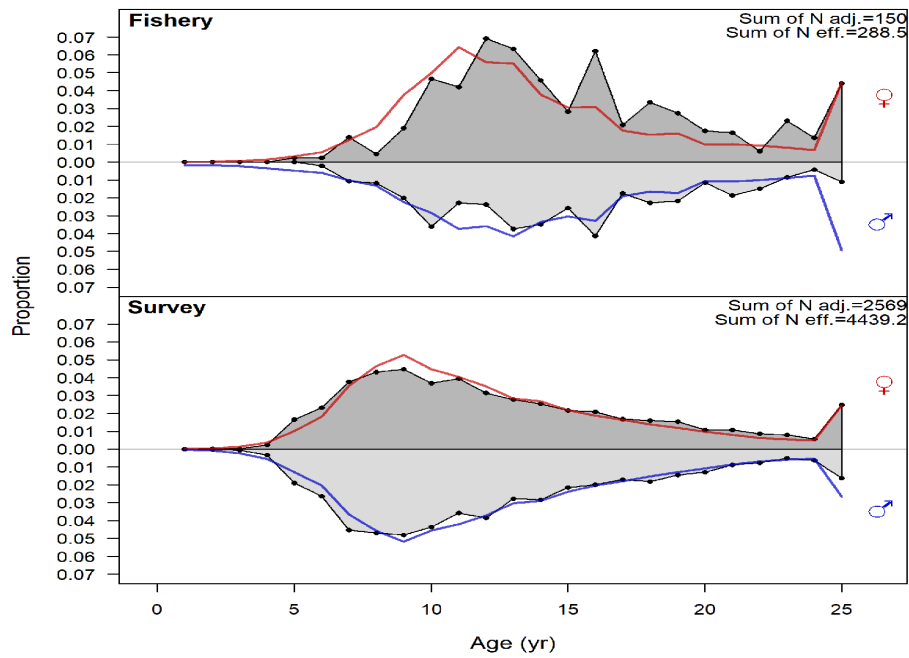
# Base-3



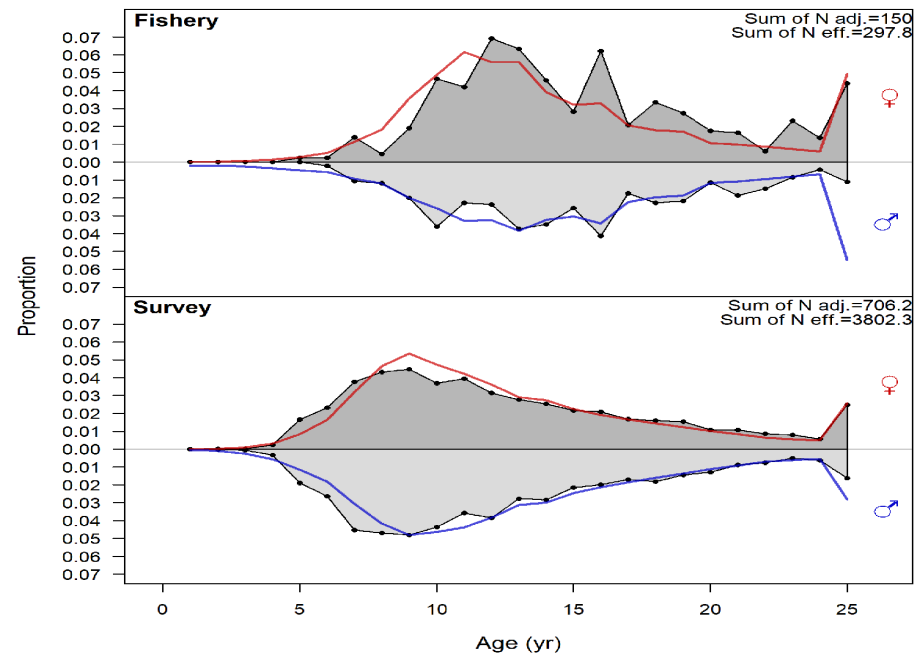
# Model 24.1a



# Model 24.1



# Model 24.1b



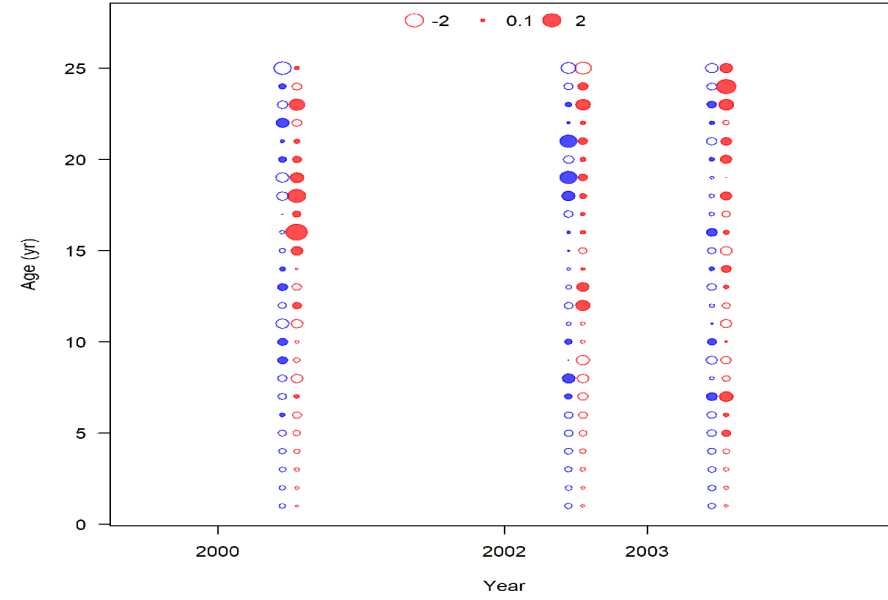
Fit to  
Age  
data



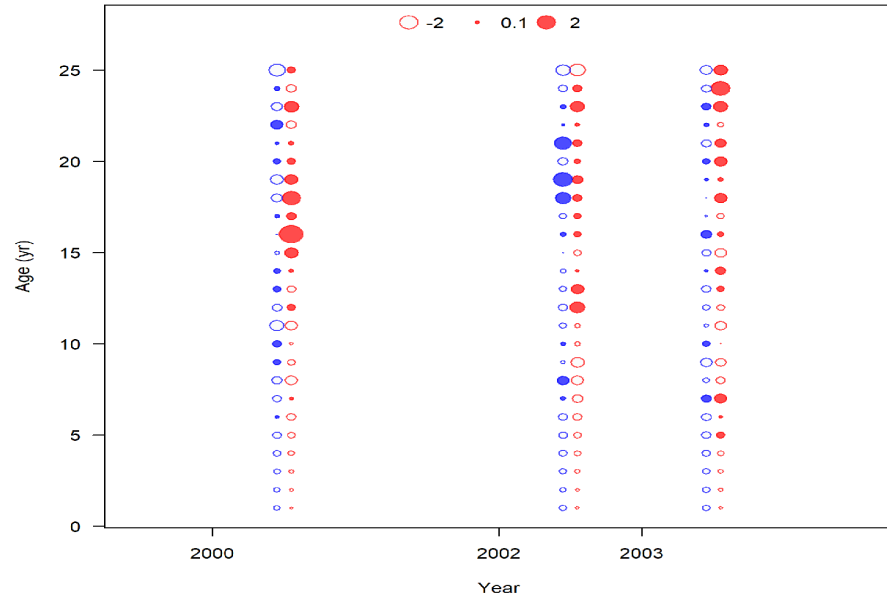
# Base-3



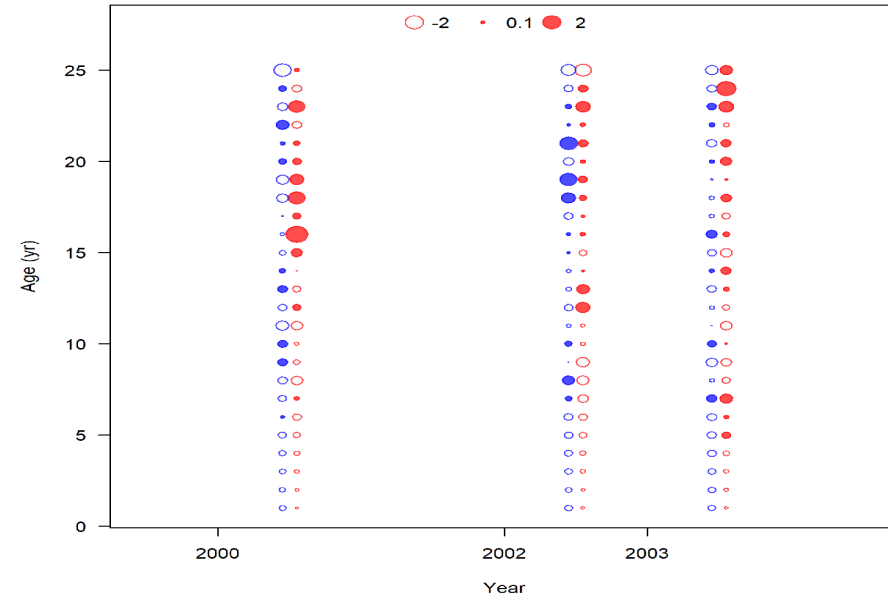
# Model 24.1a



# Model 24.1

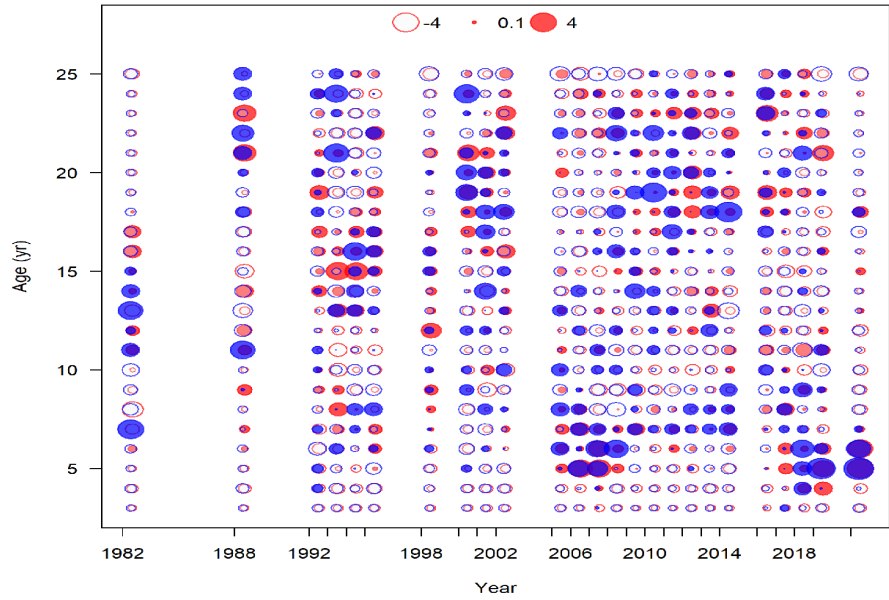


# Model 24.1b

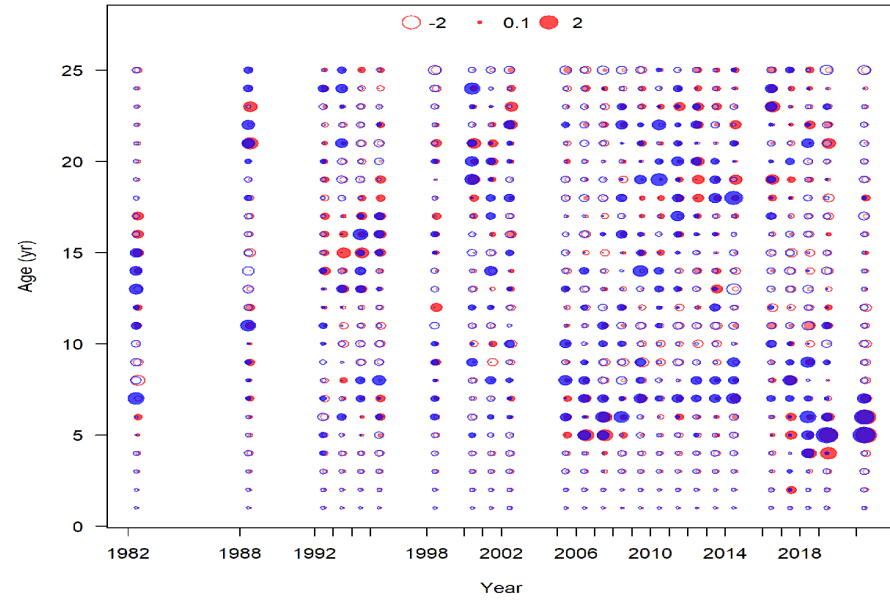


Fit to  
Fishery  
Age  
data

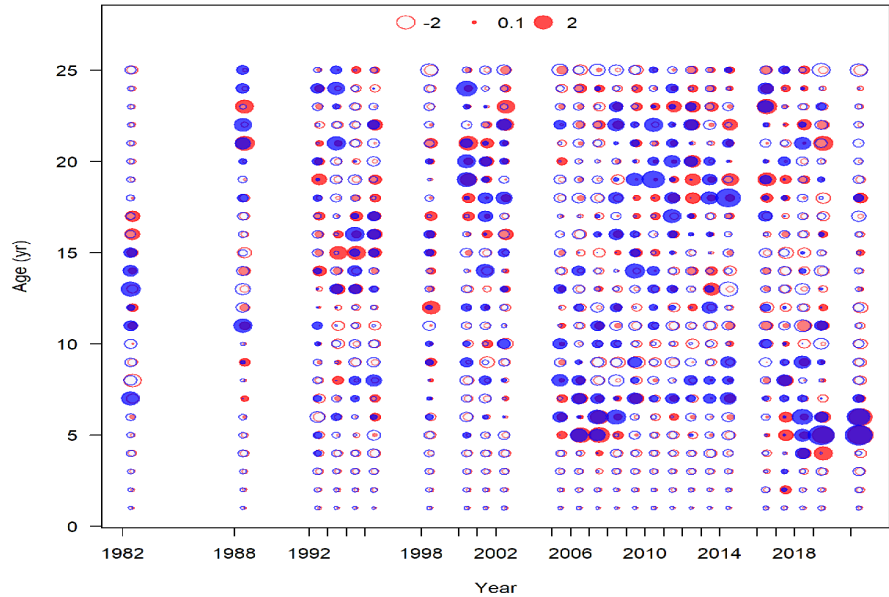
# Base-3



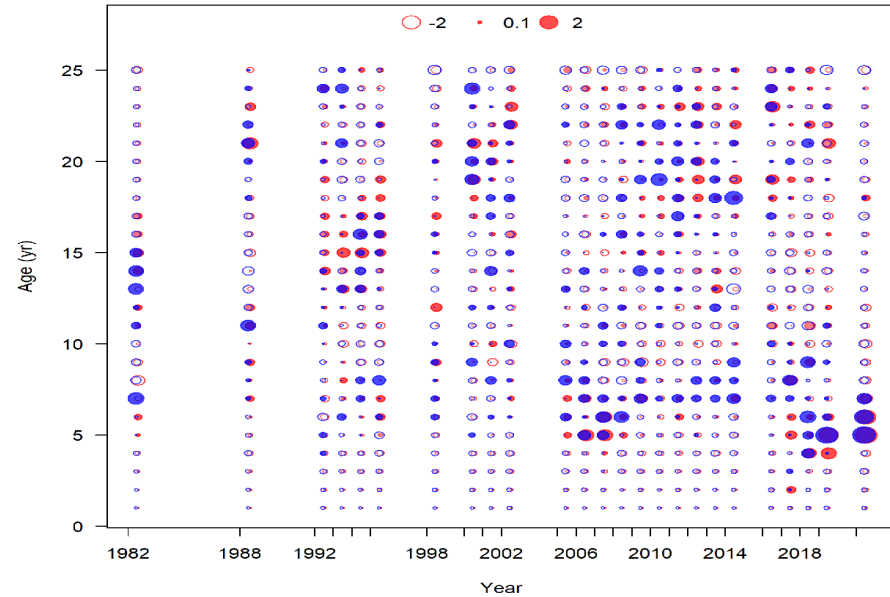
# Model 24.1a



# Model 24.1



# Model 24.1b



Fit to  
Survey  
Age  
data

# Preferred Model

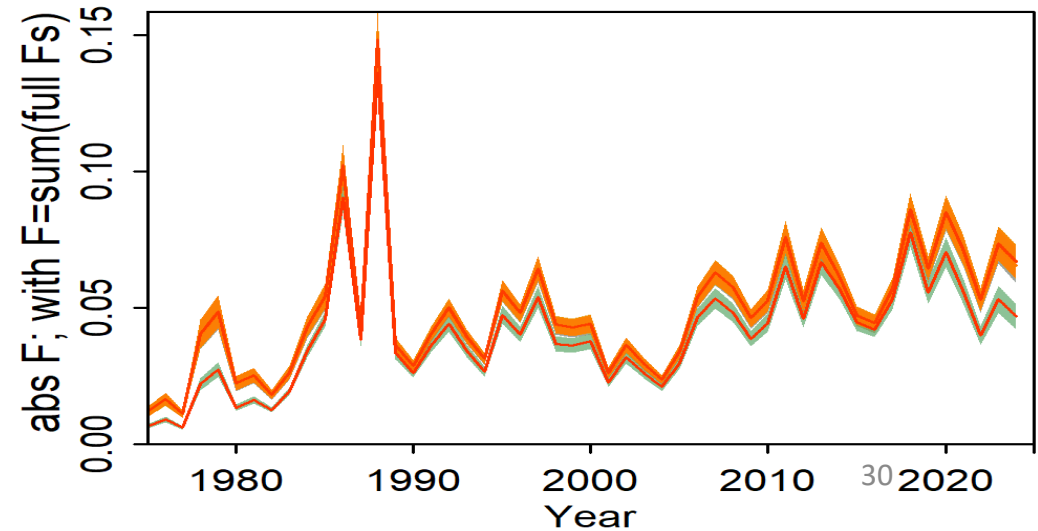
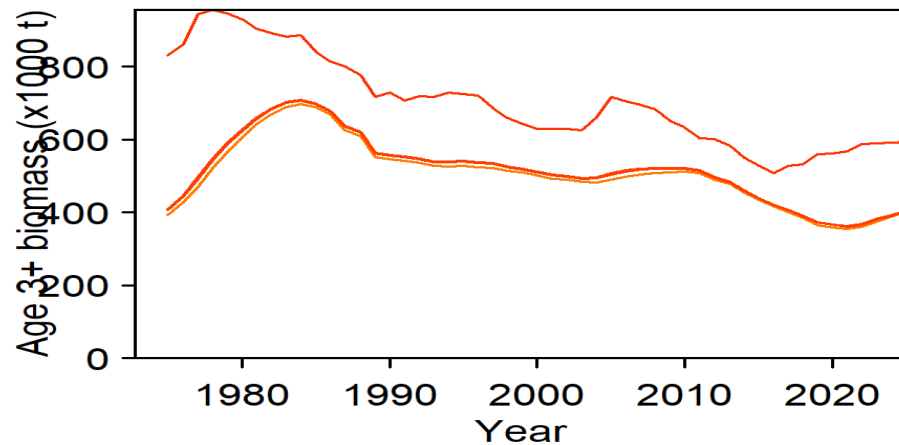
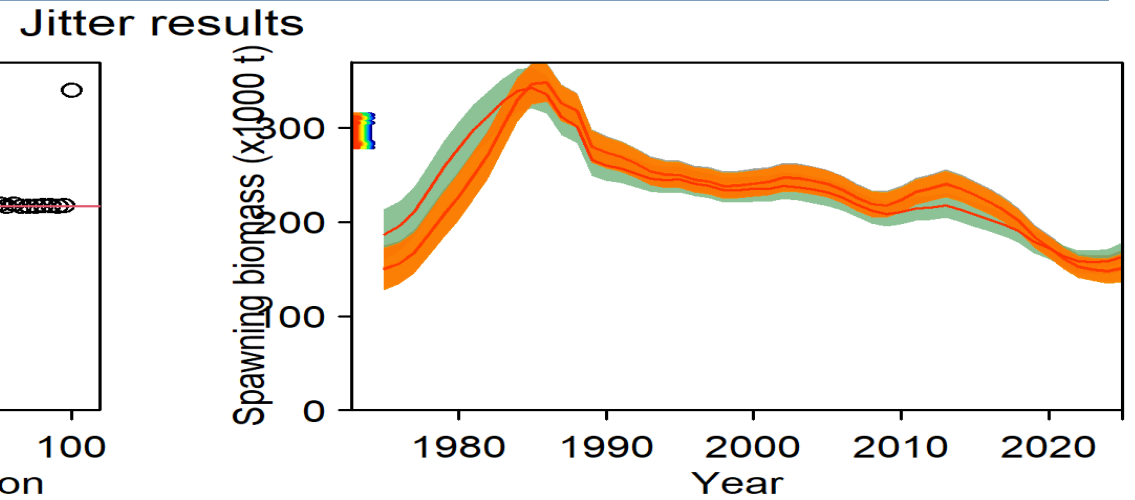
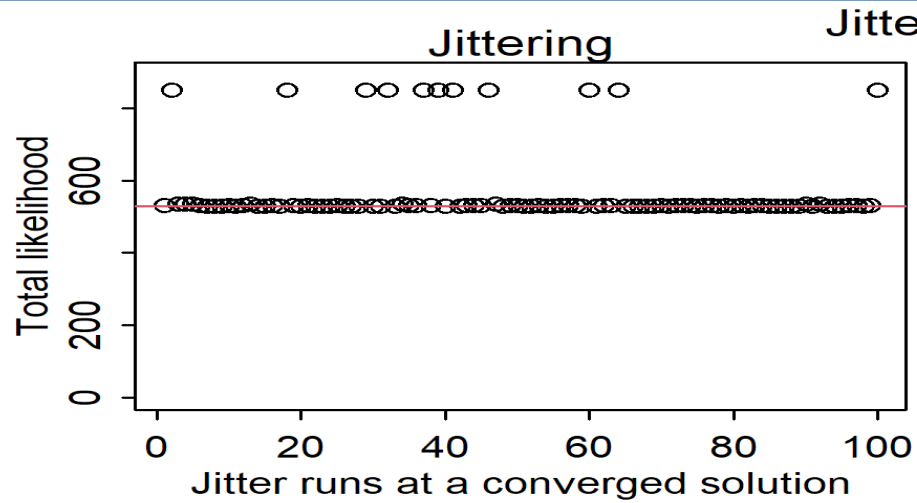
## Model 24.1b

- Fits Composition Data well
- Fits Biomass Index well
- Incorporates more standard practices
  - Francis re-weighting
  - Tuning  $\sigma_R$

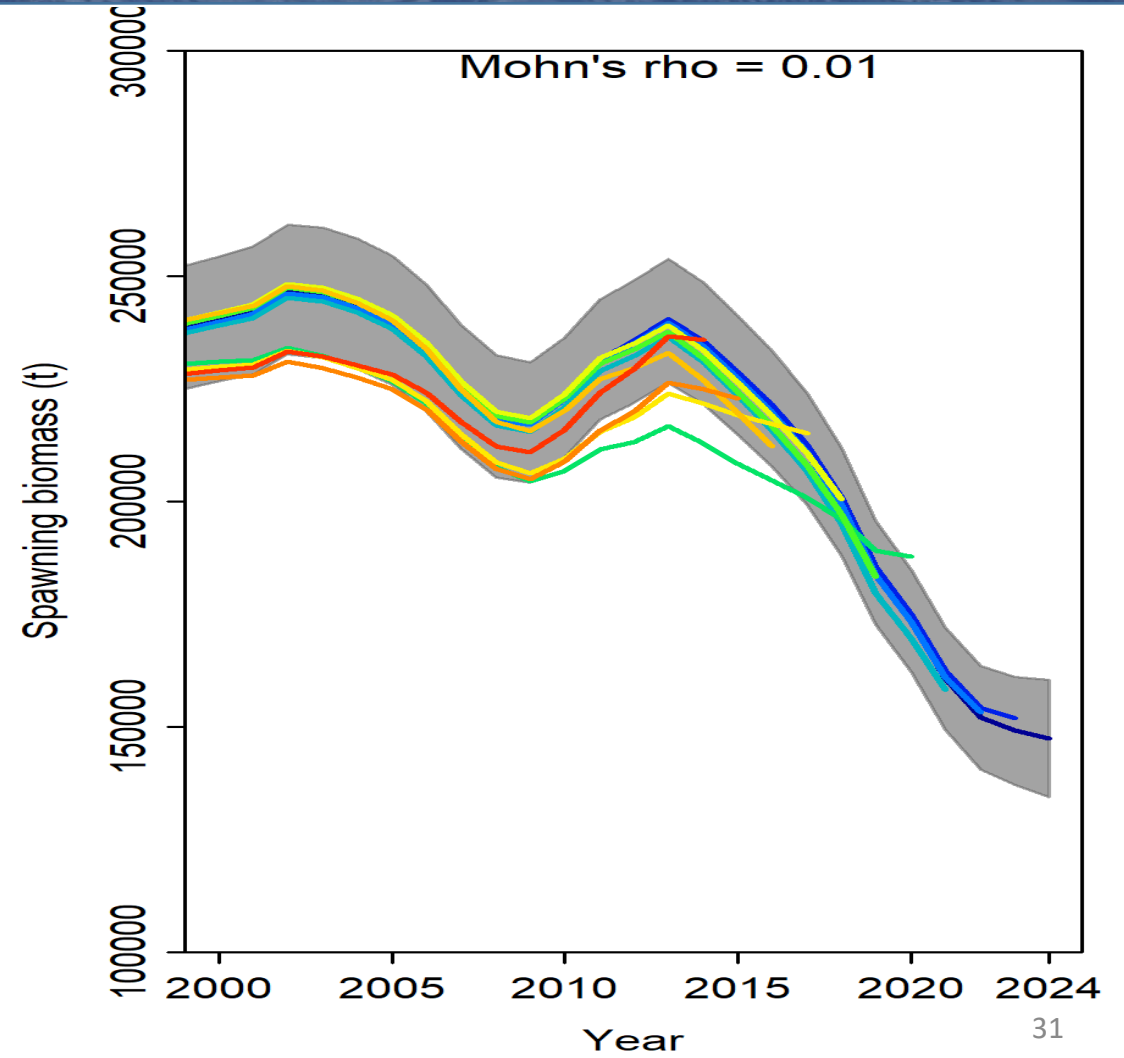
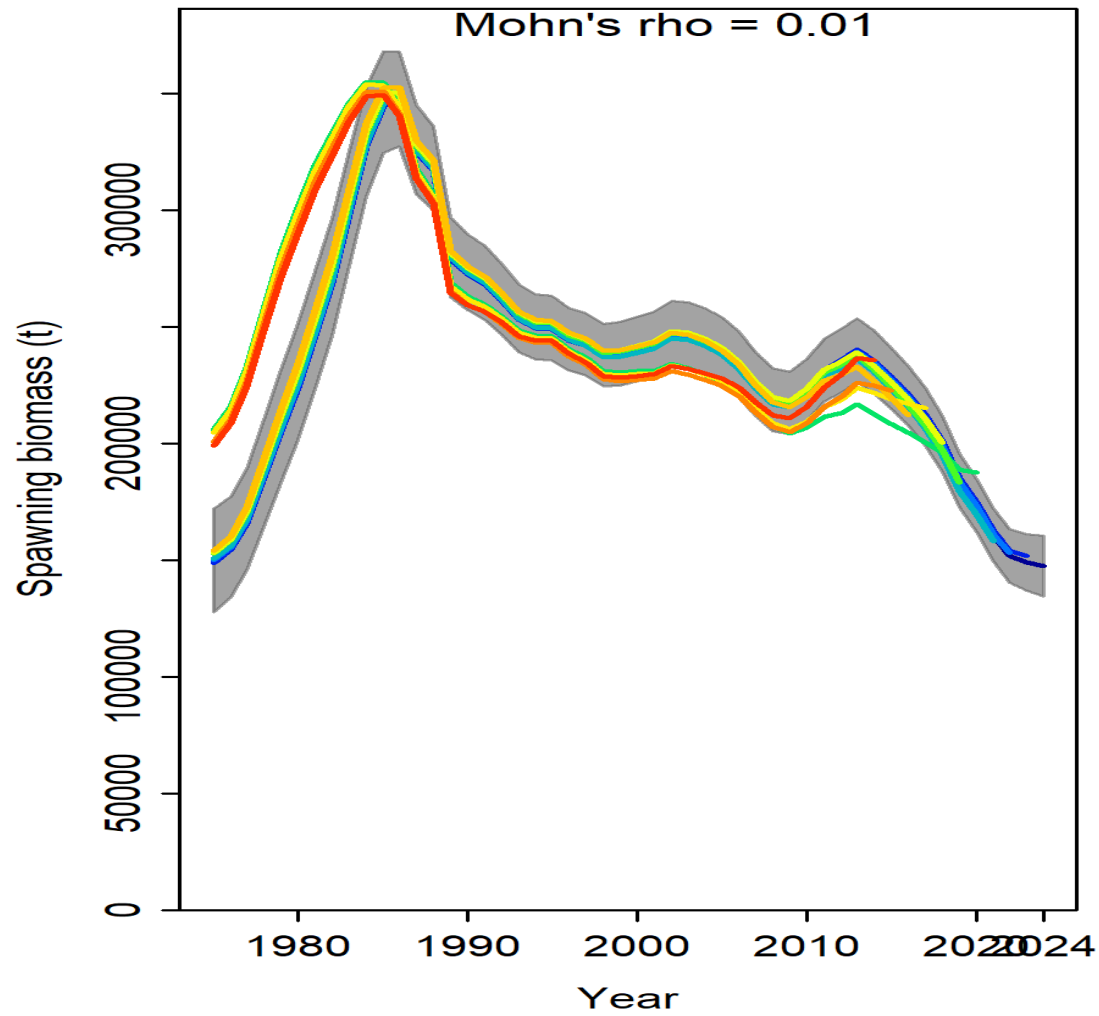
# Jitter Analysis

-100 Jitter runs  
with parameters  
perturbed by  
10%

- Only 11  
converged to a  
different  
likelihood

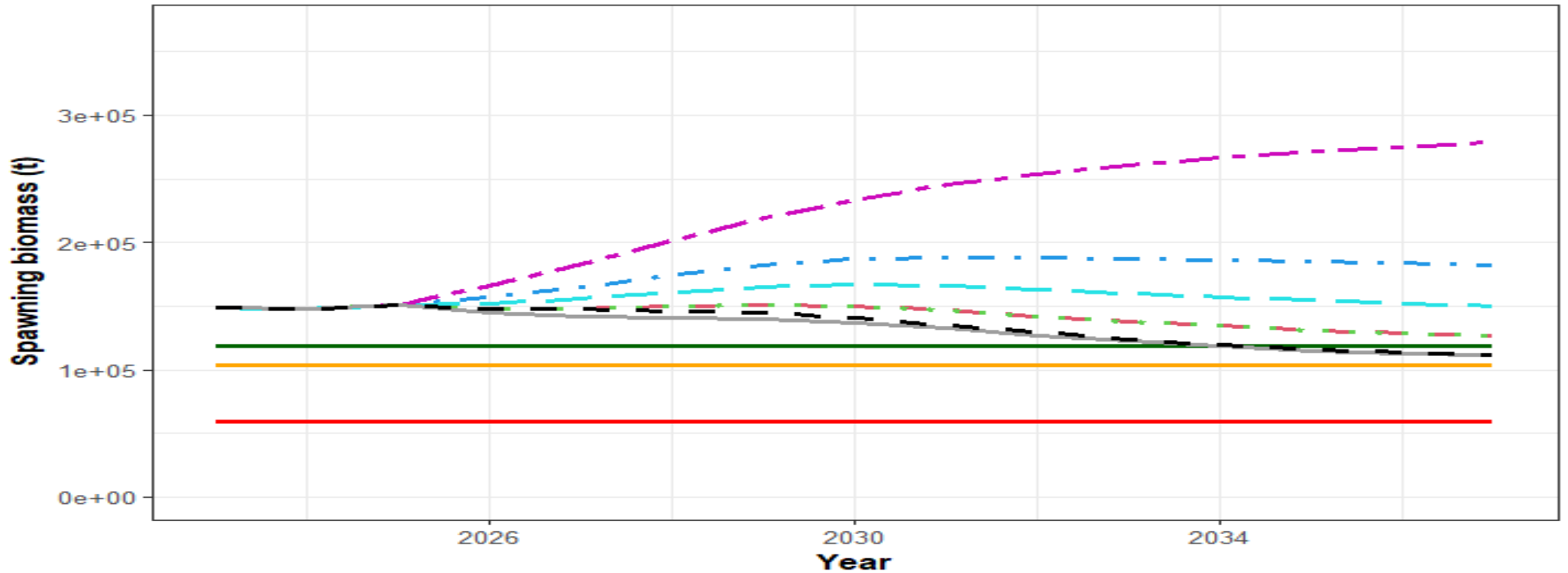


# Retrospective Analysis



# Projections

## Projections

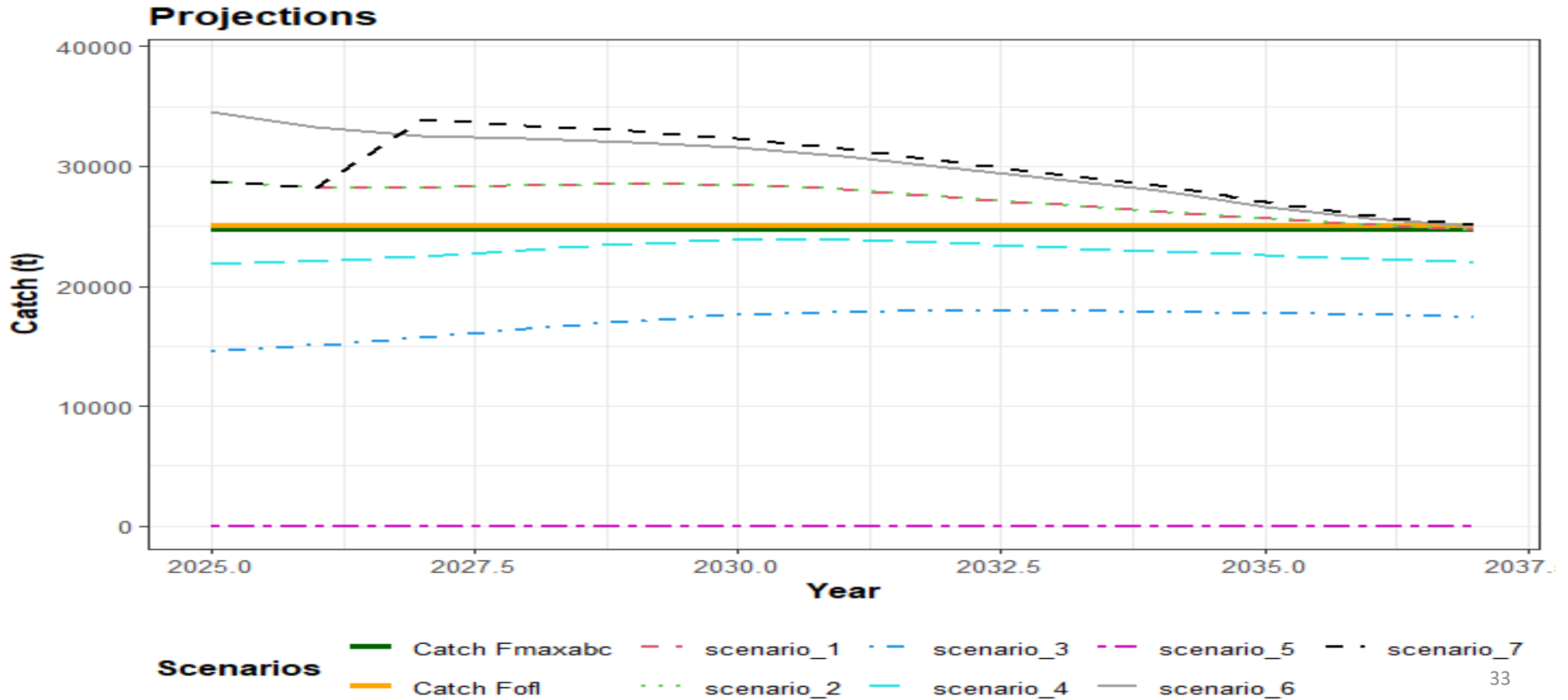


**Scenarios**

SSB40%	SSB20%	scenario_2	scenario_4	scenario_6
SSB35%	scenario_1	scenario_3	scenario_5	scenario_7



# Projections



# Stock Status

*Is the stock being subjected to overfishing?*

*2023 Catch < 2023 OFL*

*15,252 t < 40,823 t*

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*Is the stock being subjected to overfishing?*

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*15,252 t < 40,823 t*

**NO**

*Is the stock currently overfished?*

*Scenario 6 2024 biomass > 2024 B<sub>35%</sub>*

*147,511 t > 103,742 t*

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*15,252 t < 40,823 t*

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*Scenario 6 2024 biomass > 2024 B<sub>35%</sub>*

*147,511 t > 103,742 t*

**NO**

*Is the stock approaching an overfished condition?*

*Scenario 7 2036 biomass > 2024 B<sub>35%</sub>*

*113,528 t > 103,742 t*

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**NO**

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*147,511 t > 103,742 t*

**NO**

*Is the stock approaching an overfished condition?*

*Scenario 7 2036 biomass > 2024 B<sub>35%</sub>*

*113,528 t > 103,742 t*

**NO**



# Risk Table Summary

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<i>Assessment-related considerations</i>	<i>Population dynamics considerations</i>	<i>Environmental/ecosystem considerations</i>	<i>Fishery Performance</i>
Level 1: No Concern	Level 1: No Concern	Level 1: No Concern	Level 1: No Concern

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<b>Quantity</b>	<i>As estimated or specified last year for:</i>		<i>As estimated or recommended this year for:</i>	
	2024	2025	2025	2026
M (natural mortality rate)	0.13	0.13	0.13	0.13
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	473,125	481,959	406,051	402,028
Female spawning biomass (t)	158,087	166,827	150,892	148,177
$B_{100\%}$	286,587	286,587	296,407	296,407
$B_{40\%}$	114,635	114,635	118,563	118,563
$B_{35\%}$	100,306	100,306	103,743	103,743
$F_{OFL}$	0.17	0.17	0.17	0.17
$maxF_{ABC}$	0.17	0.17	0.14	0.14
$F_{ABC}$	0.14	0.14	0.14	0.14
OFL (t)	42,695	45,182	<b>34,576</b>	33,965
maxABC (t)	35,494	37,560	28,745	28,230
ABC (t)	35,494	37,560	<b>28,745</b>	28,230
	<i>As determined last year for:</i>		<i>As determined this year for:</i>	
<b>Status</b>	2022	2023	2023	2024
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No



# QUESTIONS?

Contact:

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# Retrospective Analysis

