Skate Stock Complex

BSAI Groundfish Plan Team Presentation
November 2026

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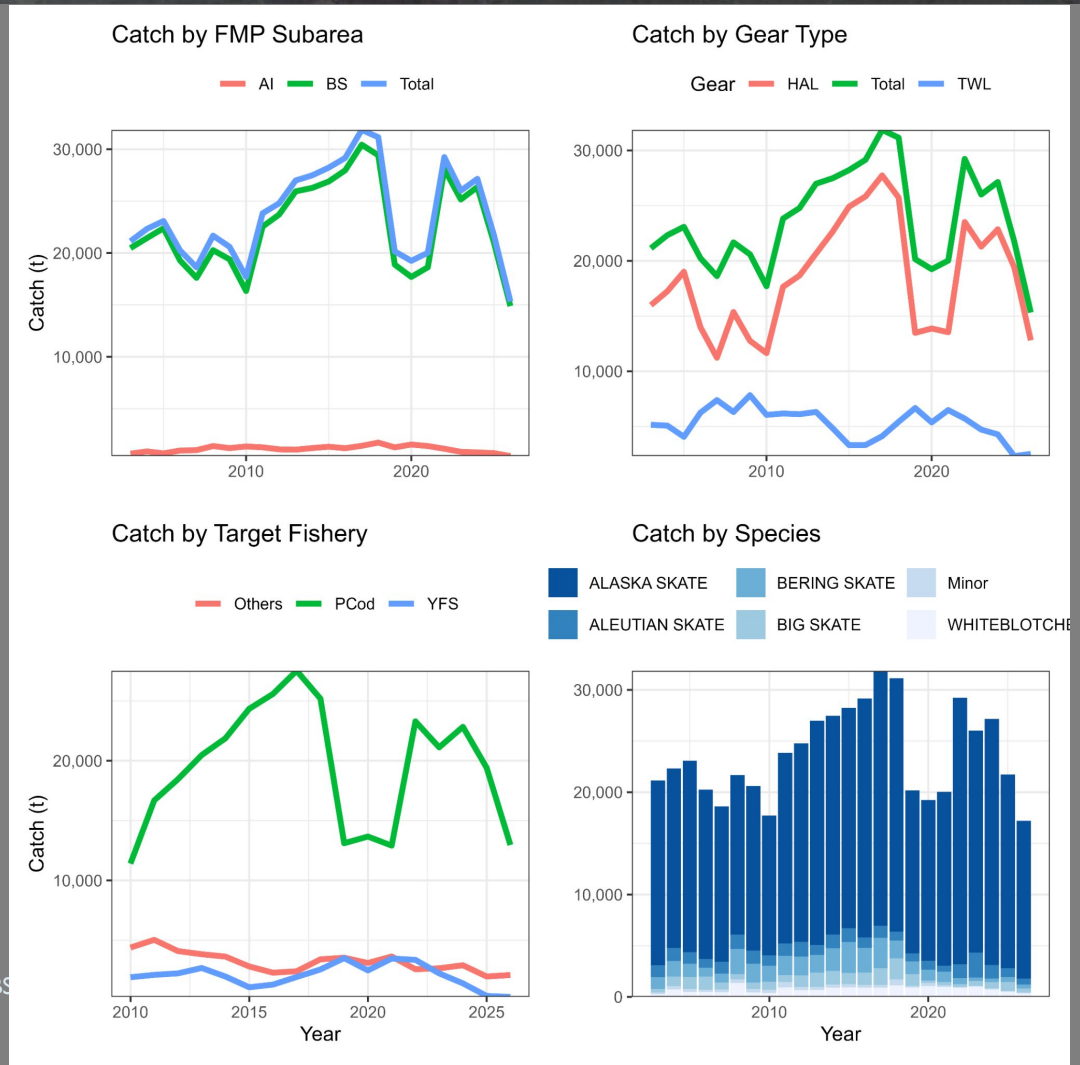
BSAI SKATE STOCK COMPLEX OVERVIEW

- Last Operational Assessment
  - Update (Tribuzio et al. 2023)
- Preliminary models for this Operational Full Assessment presented in Sept 2025 (Tribuzio et al. 2025)
- **No final assessment in Nov 2025**
- Continuing from Sept 2025 proposed models as per SSC request



BSAI SKATE STOCK COMPLEX OVERVIEW

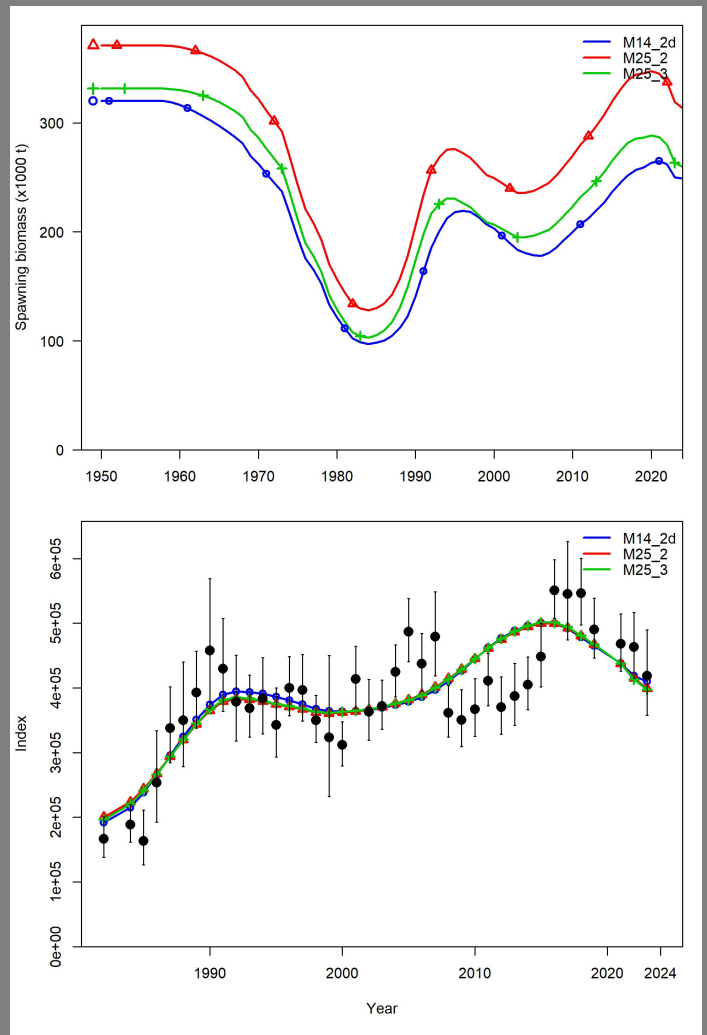


- Tier 3 AK skate (shelf)
- Tier 5 everything else
- Bering Sea catch >> Aleutian Islands catch
- No directed fishing, high discards (*Table 18.2*)
- Primarily in hook-and-line fisheries
- Bycatch in Pacific cod, yellowfin sole to a lesser extent
- Complex catch is dominated by Alaska skate

Figure 18.1

TIER 3 – ALASKA SKATE

- From Sept 2025 (Tribuzio et al. 2025)
  - Model 14.2d1: Updated base model to new SS3 and fixed minor procedural errors
  - Model 25.2: fixed growth and selectivity parameters, changed catchability
  - Model 25.3: same as 25.2, but q = 1



Tribuzio et al. 2025
Figures 2 & 3

TIER 3 – ALASKA SKATE

- From Sept 2025 (Tribuzio et al. 2025)
  - Model 14.2d1: Updated base model to new SS3 and fixed minor procedural errors
  - [redacted]
  - Model 25.3: same as 25.2, but q = 1



Spoiler Alert: This model is not brought forward at this time and will be explained in the Risk Table section

RELEVANT PT AND SSC COMMENTS

Paraphrased:

- **Explore catchability tuned to temperature; Explore updating natural mortality (*M*)**
  - In progress
- **Concern over declining trend for leopard skate in AI survey**
  - Discussed in stock structure
  - Special project fishery sampling in the AI to attempt to track species-specific catch and estimate leopard skate life history parameters
- **Bring forward the base model (14.2d1) + 25.2 or 25.3 and Tier 4/5**
  - Models 14.2d1 and 25.3 are presented herein. Development of Model 25.2 is in progress and will be discussed in the risk table section
  - Harvest recommendations for Tiers 4 and 5 are included in Appendix 18.A, but not recommended for management purposes at this time. They are provided for context.
- **Collection and ageing of Alaska skate vertebrae, explore a Bayesian framework for external growth estimates**
  - Future collections on surveys are unlikely, fishery collections were conducted in 2025 and 2026, with a special project planned for 2027.
  - No capacity for ageing at this time
  - Plan to explore the Bayesian approach for external growth estimates for the next operational full assessment

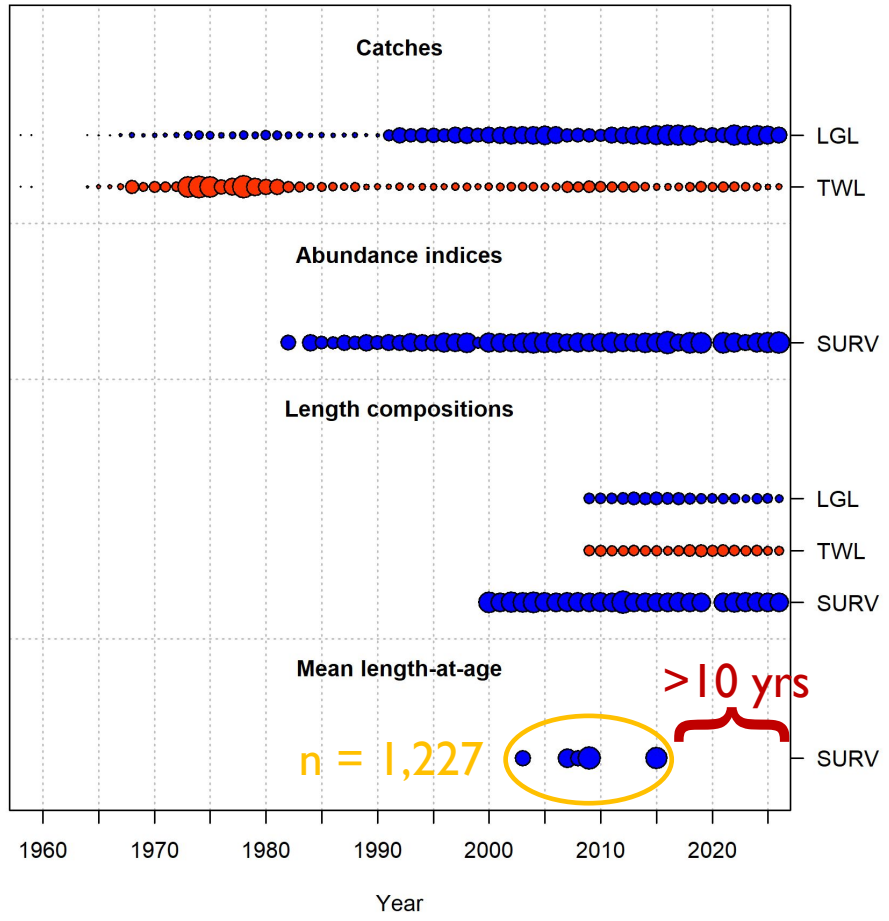
TIER 3 – ALASKA SKATE

- Model 14.2d (base model)
  - Statistical catch at age
  - Accepted in 2023
  - Minor updates (14.2d1)
    - SS3 (v.3.30.23.2)
    - recruitment ramp
    - optimization
  - Single sex
  - Two fleets



TIER 3 – ALASKA SKATE

- Model 14_2d1
  - Relying on a small amount of ageing age data



TIER 3 – ALASKA SKATE

- Model 14_2d1
  - Relying on a small amount of ageing age data
  - Parameters not converged
    - Hitting bounds
    - Large gradients

Parameter	Value	Phase	Min	Max	Init	Status	Parm_StDev	Gradient	Pr_type	Afterbound
L_at_Amin_Fem_GP_1	14.2908000	1	-10.00	30.00	14.150600	OK	0.3882170	0.000113493	No_prior	OK
L_at_Amax_Fem_GP_1	101.7900000	1	70.00	150.00	101.491000	OK	0.3172920	0.000203889	No_prior	OK
VonBert_K_Fem_GP_1	0.3756530	4	0.05	0.50	0.379486	OK	0.0056077	0.000118484	No_prior	OK
Richards_Fem_GP_1	-1.0000000	1	-1.00	2.00	-1.000000	LO	0.0000138	-1.14229e-06	No_prior	CHECK
CV_young_Fem_GP_1	0.3500000	3	0.05	0.35	0.350000	HI	0.0001838	4.42038e-07	No_prior	CHECK
CV_old_Fem_GP_1	0.0500000	3	0.05	0.25	0.050000	LO	0.0000055	-2.46035e-06	No_prior	CHECK
SR_LN(R0)	10.0193000	1	5.00	15.00	10.035800	OK	0.0221428	0.000221067	No_prior	OK
Size_DblN_peak_LGL(1)	91.2005000	2	7.60	126.20	90.309000	OK	3.5087200	2.2981e-05	No_prior	OK
Size_DblN_top_logit_LGL(1)	-1.0755400	3	-6.00	4.00	-0.987164	OK	0.8096800	-3.14622e-06	No_prior	OK
Size_DblN_ascend_se_LGL(1)	6.9891100	3	-1.00	9.00	6.969100	OK	0.1525040	-3.4667e-05	No_prior	OK
Size_DblN_descend_se_LGL(1)	0.7595370	3	-1.00	9.00	-0.293095	OK	7.2548600	-1.22562e-07	No_prior	OK
Size_DblN_start_logit_LGL(1)	-4.9987400	2	-5.00	9.00	-4.998680	LO	0.0429704	7.72111e-08	No_prior	OK
Size_DblN_end_logit_LGL(1)	1.3526000	2	-5.00	9.00	1.820100	OK	1.0948500	7.93898e-06	No_prior	OK
Size_DblN_peak_TWL(2)	54.9263000	2	7.60	126.20	53.976400	OK	3.9702400	1.84072e-05	No_prior	OK
Size_DblN_top_logit_TWL(2)	1.7284400	3	-6.00	4.00	1.756490	OK	24.7343000	2.24603e-08	No_prior	OK
Size_DblN_ascend_se_TWL(2)	6.1042200	3	-1.00	9.00	6.039600	OK	0.3213000	-1.35216e-05	No_prior	OK
Size_DblN_descend_se_TWL(2)	4.4887800	3	-1.00	9.00	4.495930	OK	98.3485000	5.27108e-09	No_prior	OK
Size_DblN_start_logit_TWL(2)	-4.9971800	2	-5.00	9.00	-4.997100	LO	0.0922667	4.59216e-07	No_prior	OK
Size_DblN_end_logit_TWL(2)	5.9244600	2	-5.00	9.00	5.829500	OK	57.8677000	-3.94528e-08	No_prior	OK
Size_DblN_peak_SURV(3)	58.9480000	2	7.60	126.20	59.054400	OK	1.7815700	7.8118e-05	No_prior	OK
Size_DblN_top_logit_SURV(3)	0.5810660	3	-6.00	4.00	-1.176320	OK	0.3141210	3.73513e-05	No_prior	OK
Size_DblN_ascend_se_SURV(3)	6.3381000	3	-1.00	9.00	6.338220	OK	0.1304120	-6.52413e-05	No_prior	OK
Size_DblN_descend_se_SURV(3)	-0.0245149	3	-1.00	9.00	0.466739	OK	13.6910000	4.41735e-07	No_prior	OK
Size_DblN_start_logit_SURV(3)	-4.9996200	2	-5.00	9.00	-4.999640	LO	0.0151125	-2.59709e-07	No_prior	CHECK
Size_DblN_end_logit_SURV(3)	1.4899300	2	-5.00	9.00	3.031450	OK	0.8961350	3.98354e-06	No_prior	OK

TIER 3 - Proposed Model (Growth)

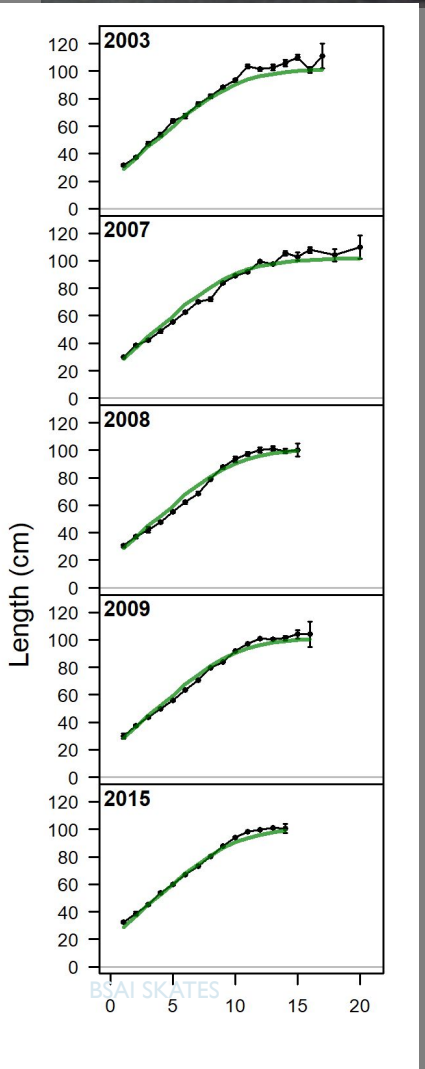


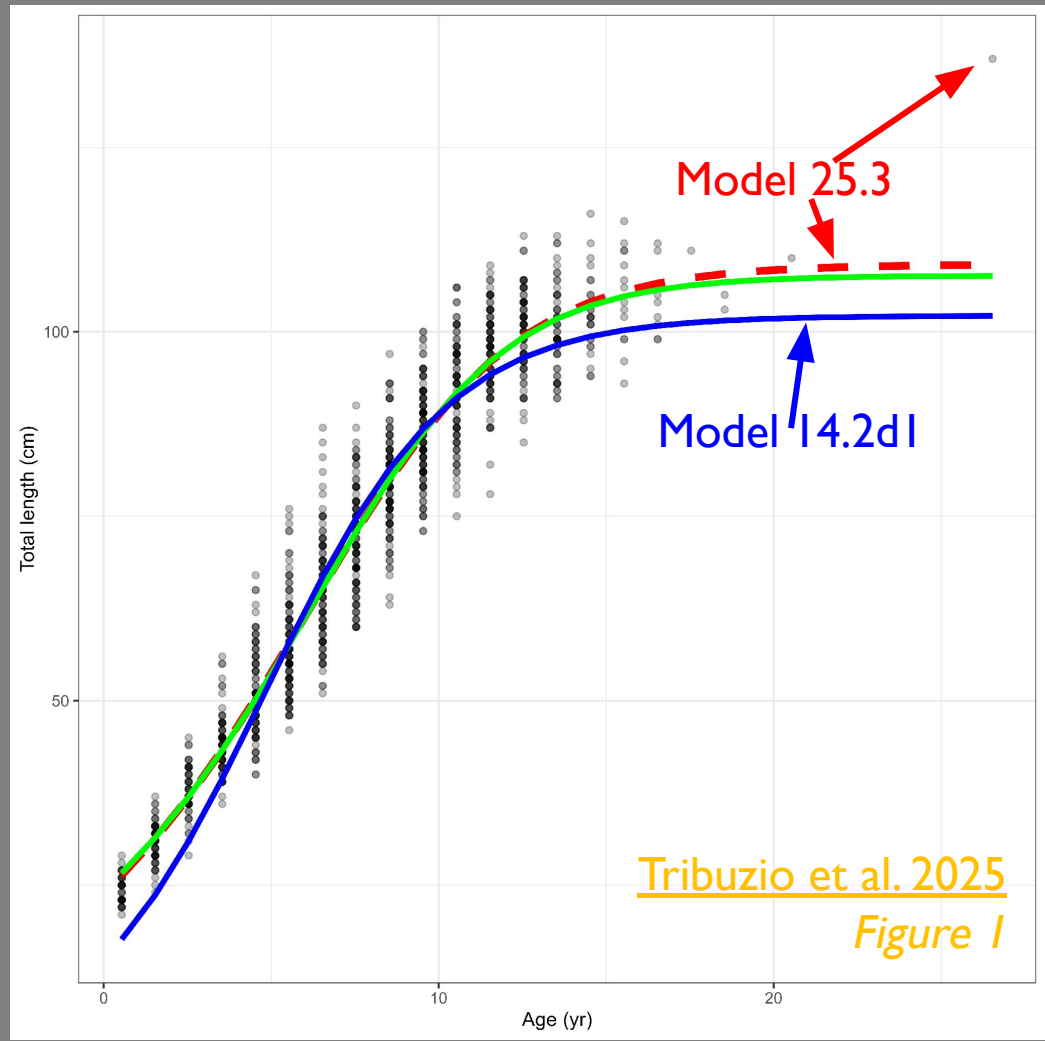
Figure 18.5

Model 14.2d1

- No new age data since 2015

Model 25.3

- Growth parameters estimated externally
- Included all available survey ages
  - Adjusted ages to represent mid-year age, not ages at Jan 1
  - One 26 year old individual
- A_1 = 0, age-0 animals are encountered
- A_2 = 15, based on the mean age at which L_{inf} is reached



Tribuzio et al. 2025
Figure 1

TIER 3 - Proposed Model (Selectivity)

	Model 14.2d1		Model 25.3	
Parameter	Estimate	StdDev	Estimate	StdDev
Size DblN peak LGL(1)	91.2005	3.5087	89.8842	1.1888
Size DblN top logit LGL(1)	-1.0755	0.8097	—	—
Size DblN ascend se LGL(1)	6.9891	0.1525	6.8280	0.0722
Size DblN descend se LGL(1)	0.7595	7.2549	—	—
Size DblN start logit LGL(1)	-4.9987	0.0430	—	—
Size DblN end logit LGL(1)	1.3526	1.0948	-1.6182	0.5991
Size DblN peak TWL(2)	54.9263	3.9702	85.6907	1.4648
Size DblN top logit TWL(2)	1.7284	24.7343	—	—
Size DblN ascend se TWL(2)	6.1042	0.3213	7.6478	0.0955
Size DblN descend se TWL(2)	4.4888	98.3485	—	—
Size DblN start logit TWL(2)	-4.9972	0.0923	—	—
Size DblN end logit TWL(2)	5.9245	57.8677	-1.2223	0.5084
Size DblN peak SURV(3)	58.9480	1.7816	88.0519	2.8829
Size DblN top logit SURV(3)	0.5811	0.3141	—	—
Size DblN ascend se SURV(3)	6.3381	0.1304	7.8645	0.1037
Size DblN descend se SURV(3)	-0.0245	13.6910	—	—
Size DblN start logit SURV(3)	-4.9996	0.0151	—	—
Size DblN end logit SURV(3)	1.4899	0.8961	—	—

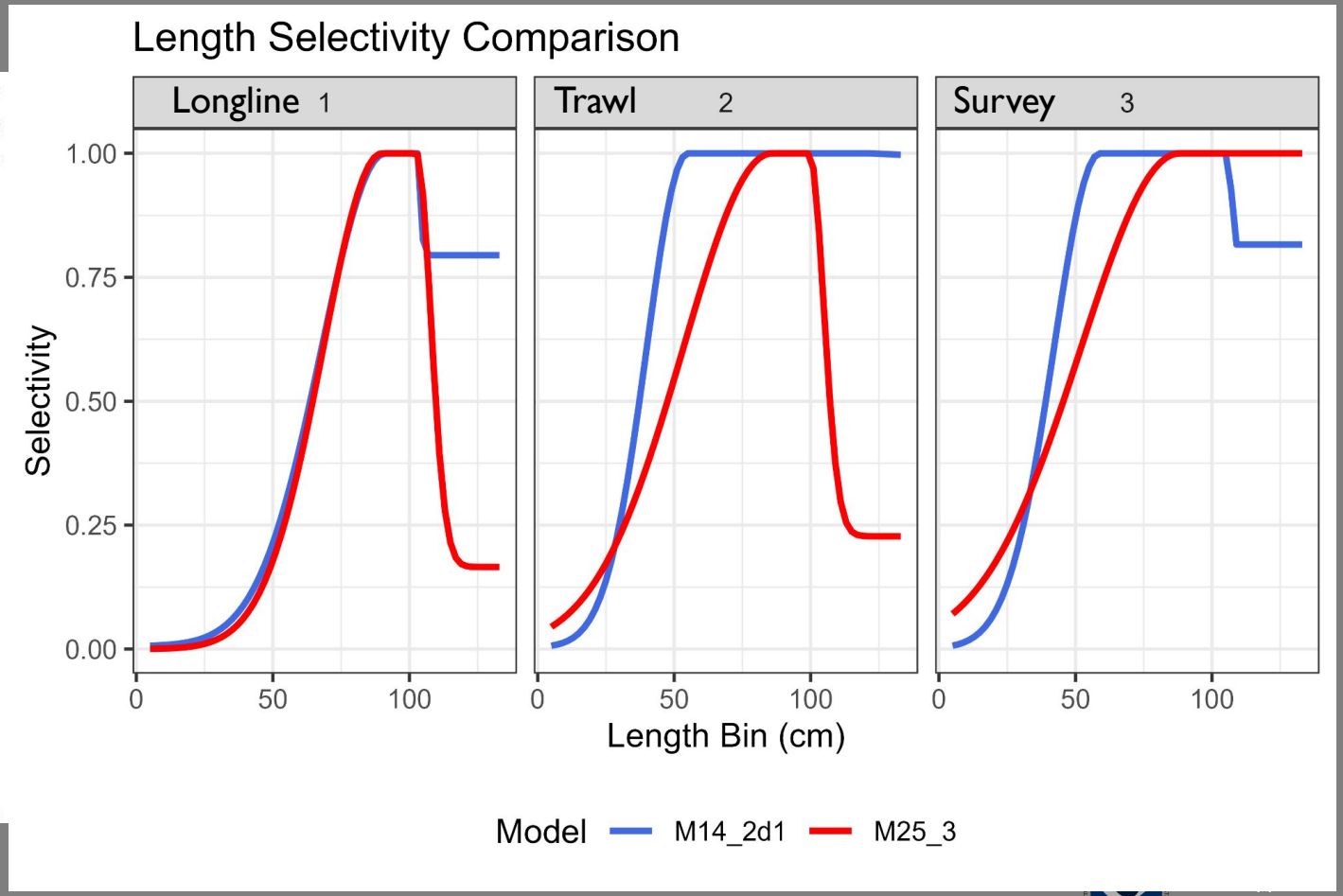


Table 18.8 and Figure 18.6

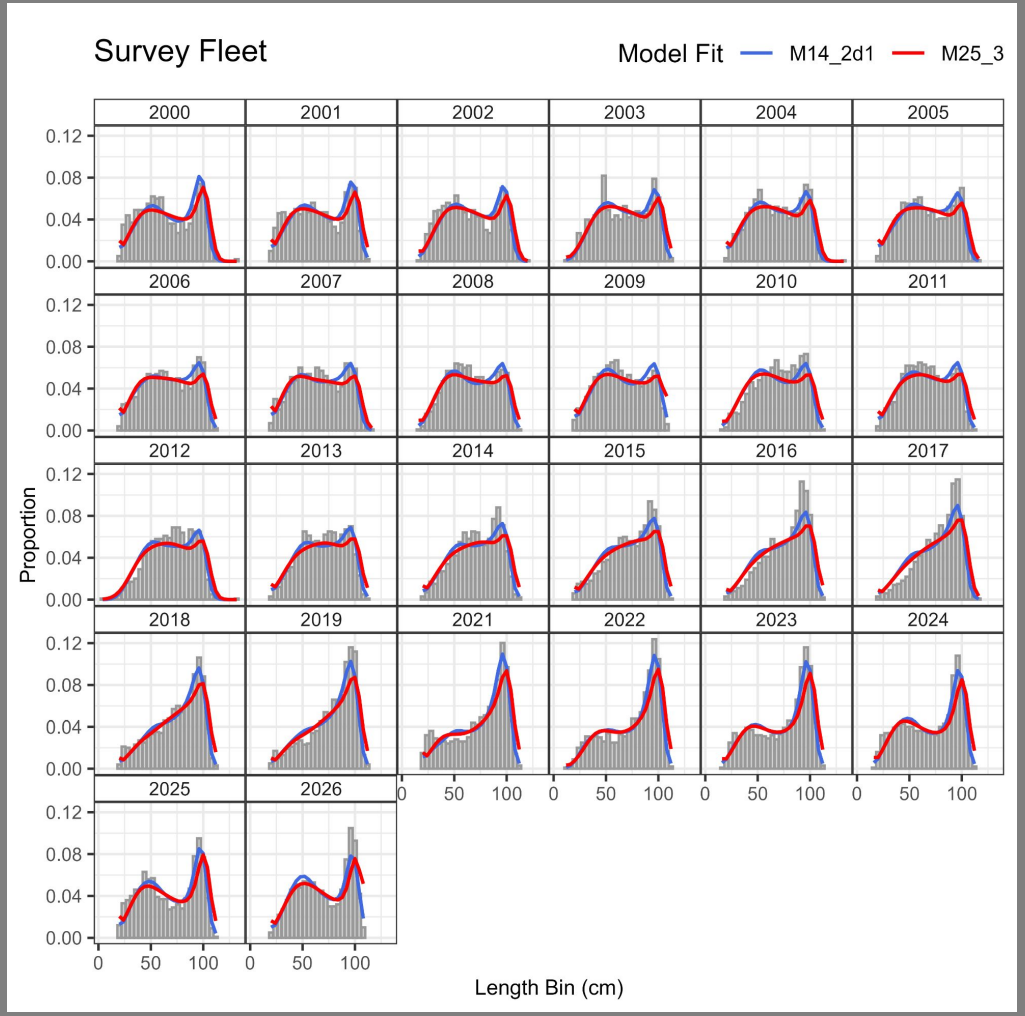
Tier 3 - Model Evaluation

Model Metric / Diagnostic	Model 14.2d1	Model 25.3
Active Parameters	102	86
Total Negative Log-Likelihood	356.287	575.707
Survey Index Likelihood	-21.993	95.419
Length Comp Likelihood	199.277	365.578
Recruitment Deviations Likelihood	6.172	24.236
ln(R0) Estimate	10.019	10.007
Survey Index RMSE	0.139	0.144
Survey Index SDNR	2.108	2.132
B100% (Female Spawning Biomass, t)	149,184	155,861
F35%	0.093	0.100

Table 18.9

Tier 3 - Model Evaluations

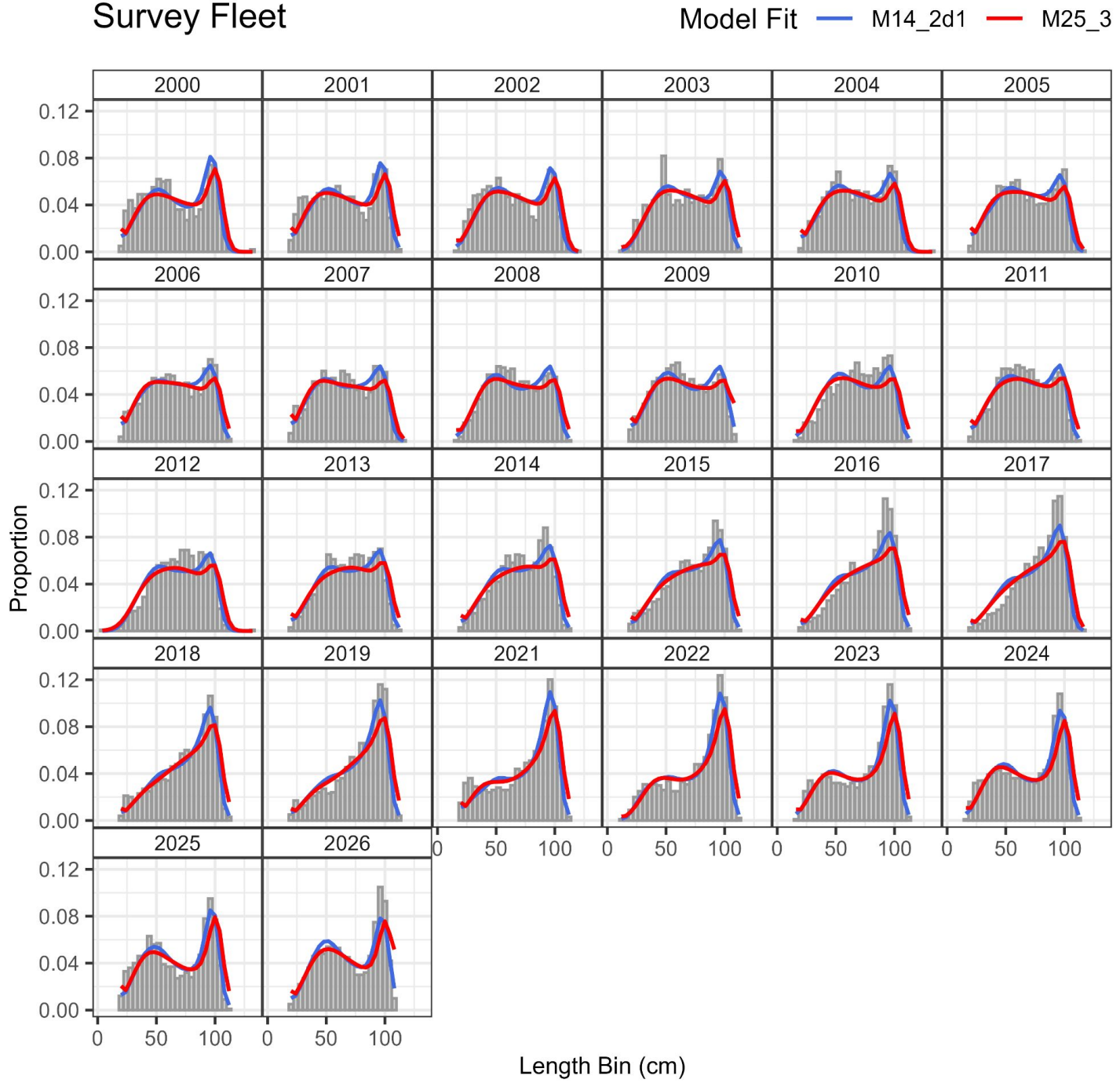
Fits to length composition data





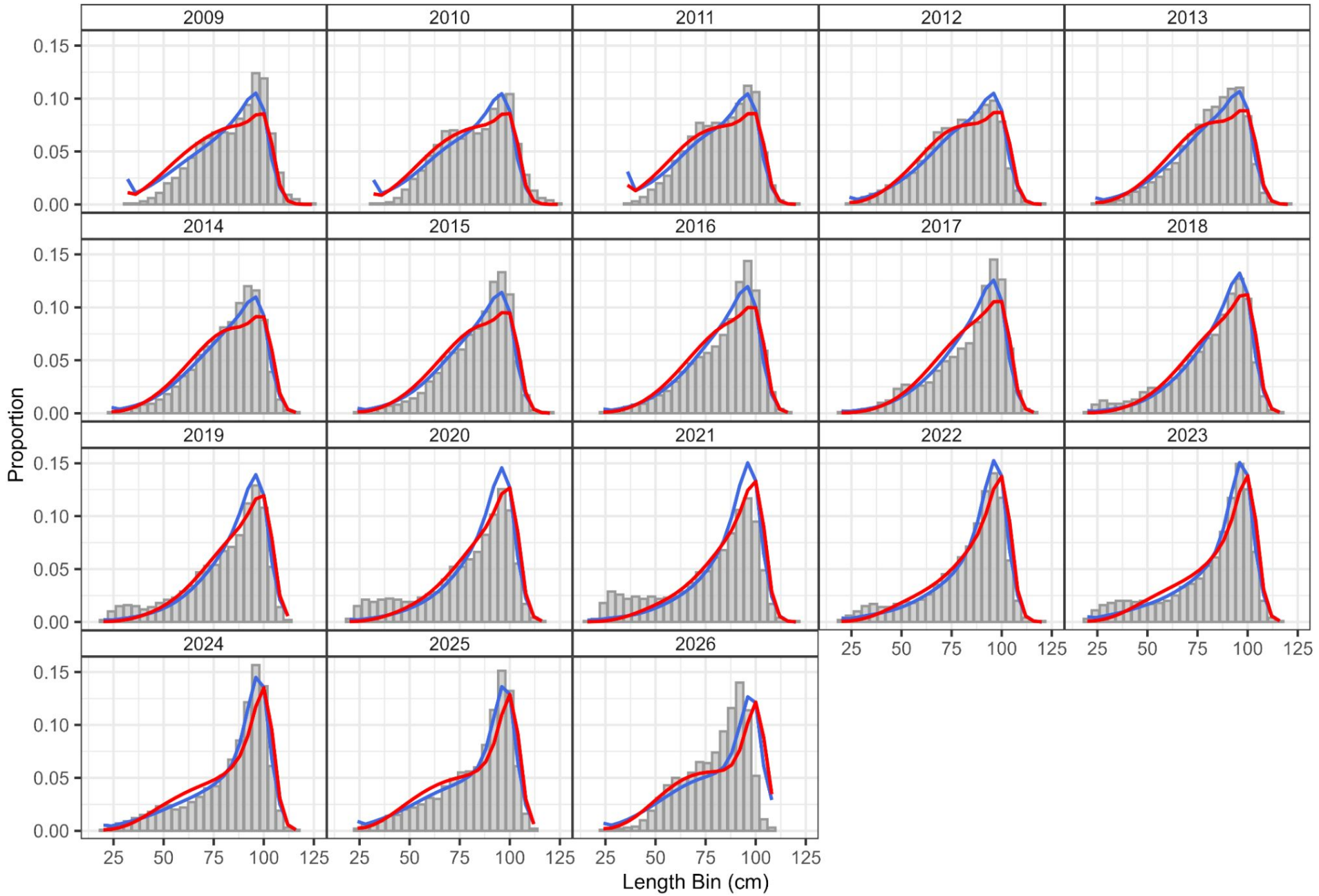


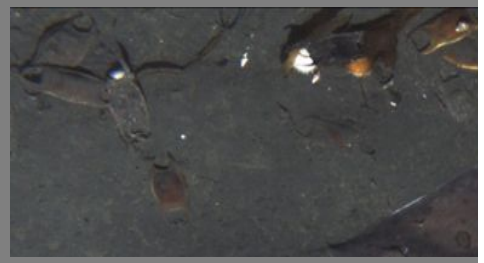
Survey Fleet



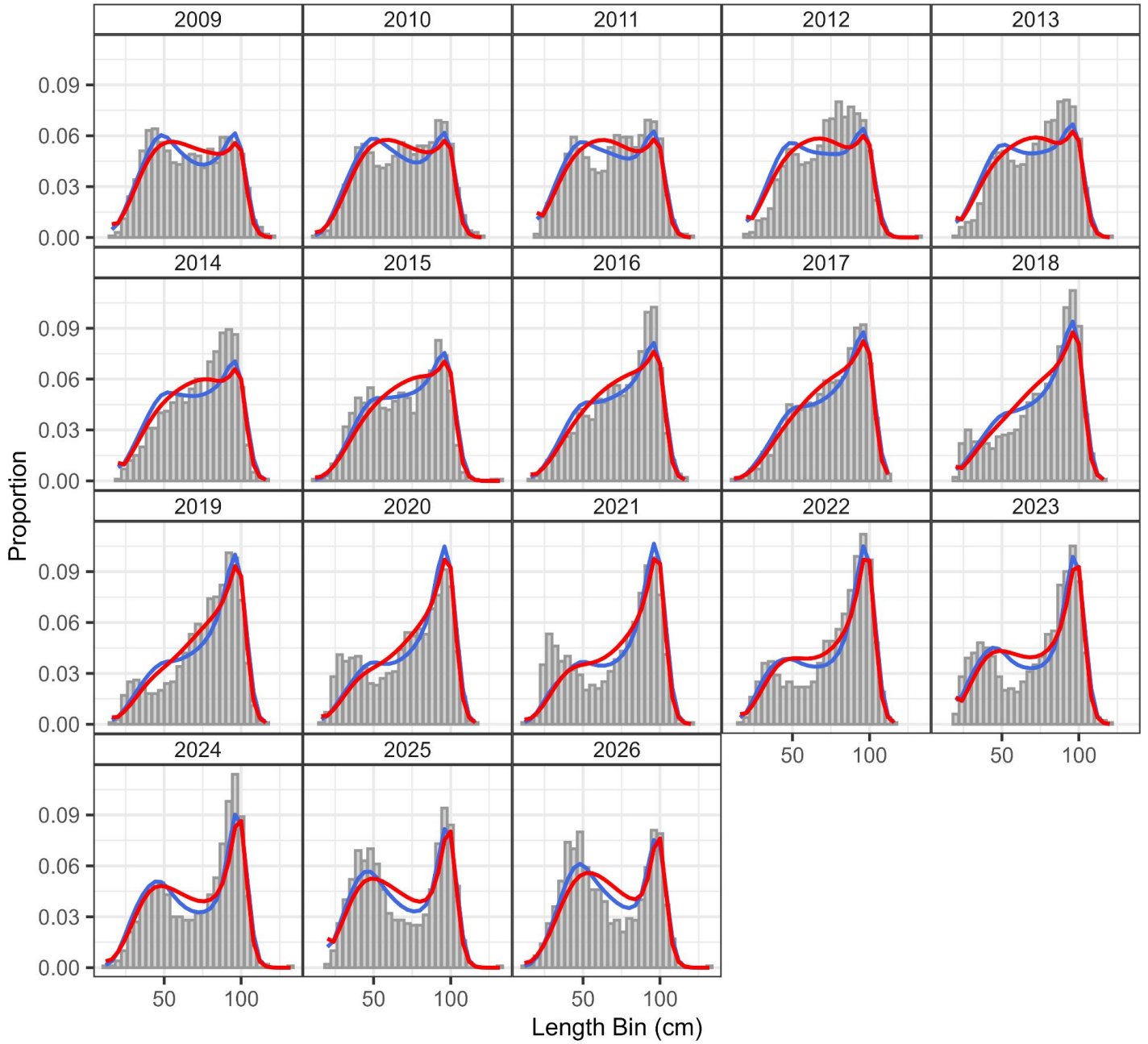





Longline Fleet
Model Fit
M14_2d1
M25_3
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
Proportion
0.15
0.10
0.05
0.00
25
50
75
100
125
Length Bin (cm)

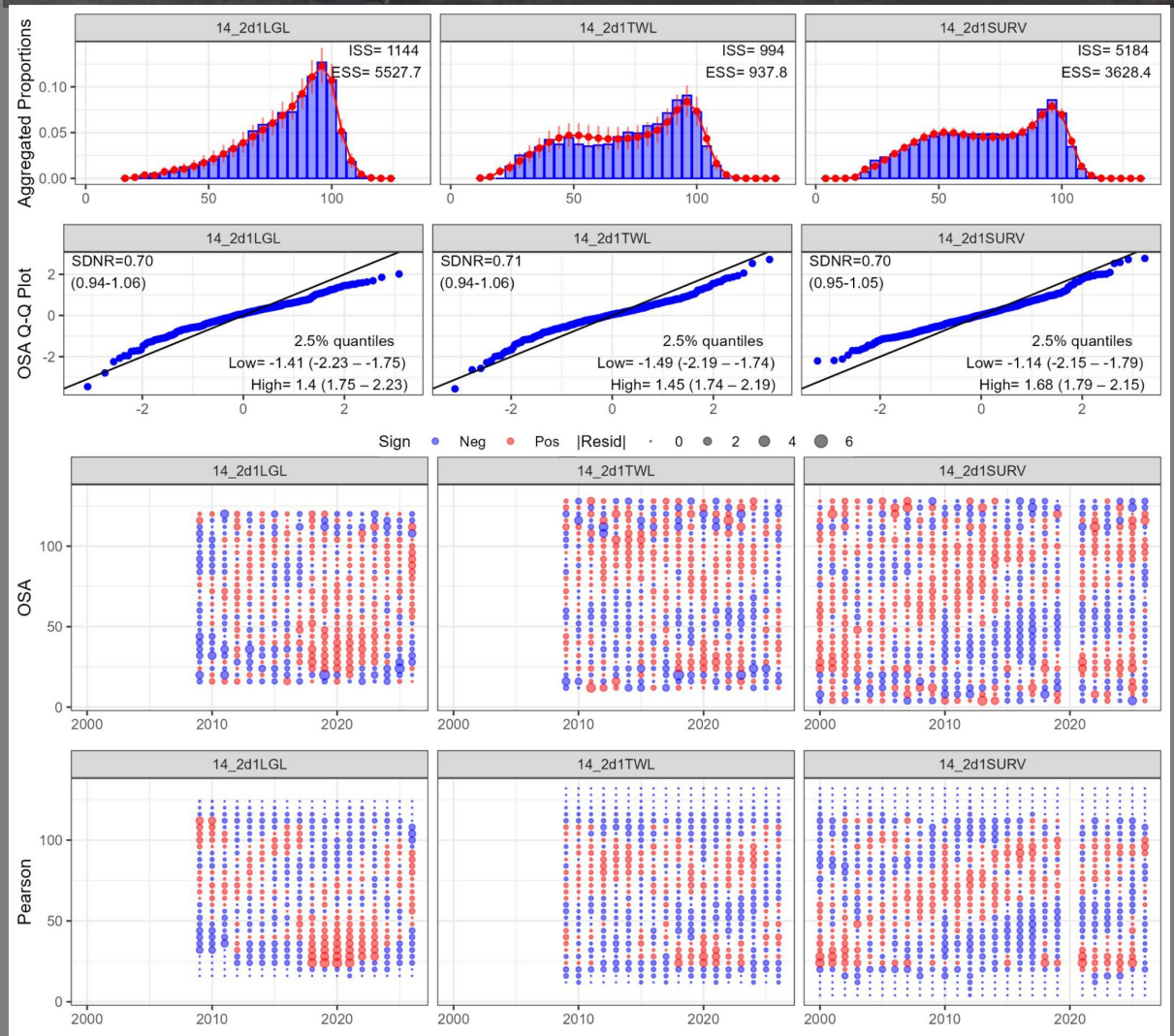


Trawl Fleet


Model Fit
M14_2d1
M25_3
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
Proportion
0.00
0.03
0.06
0.09
50
100
Length Bin (cm)



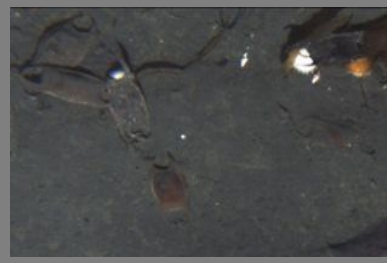
Tier 3 - Model Evaluations



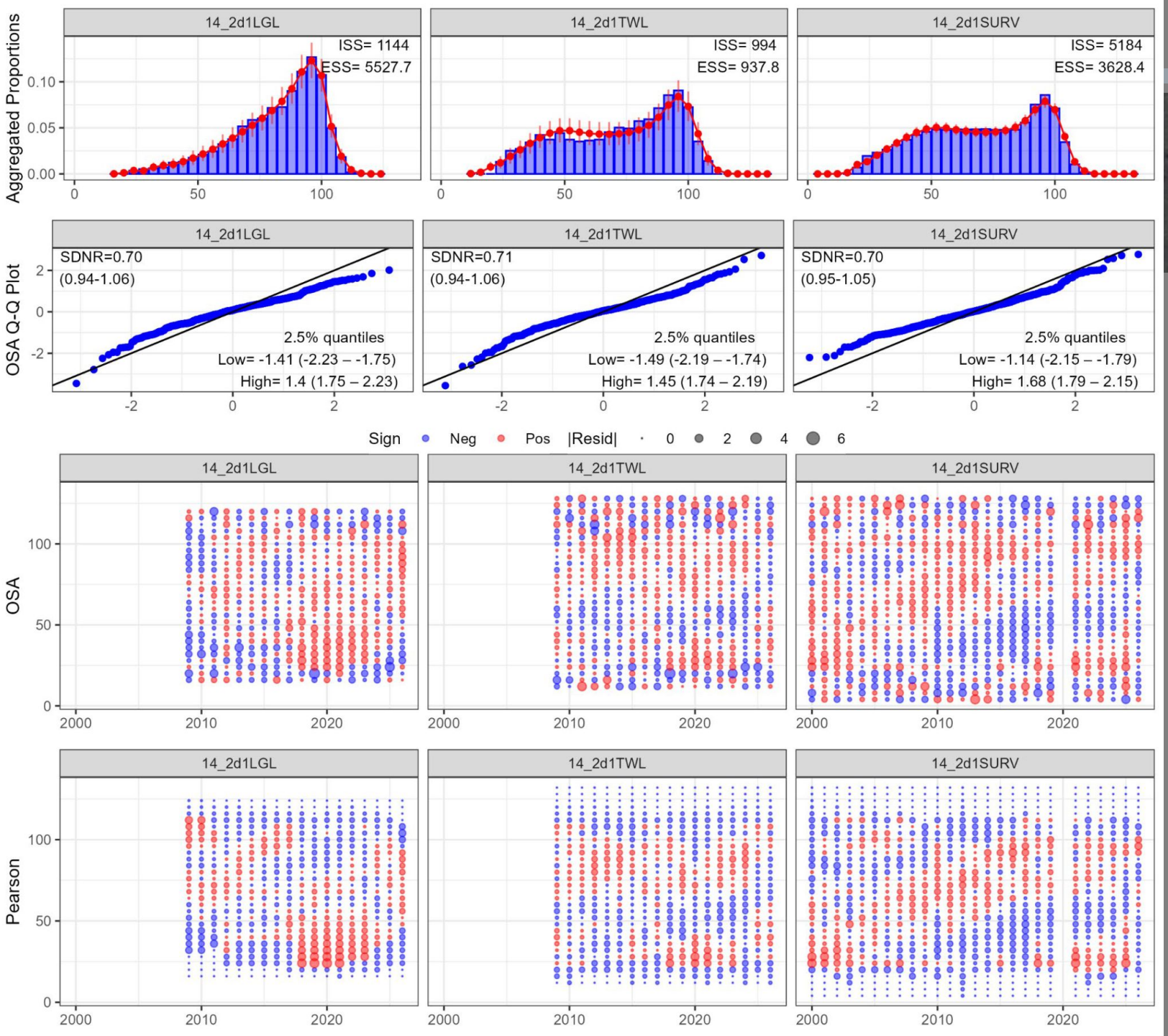
Residuals

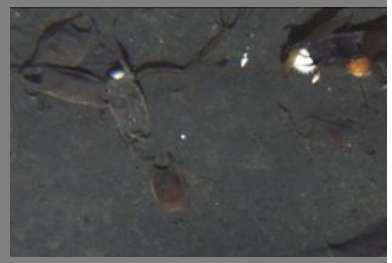
One-step Ahead

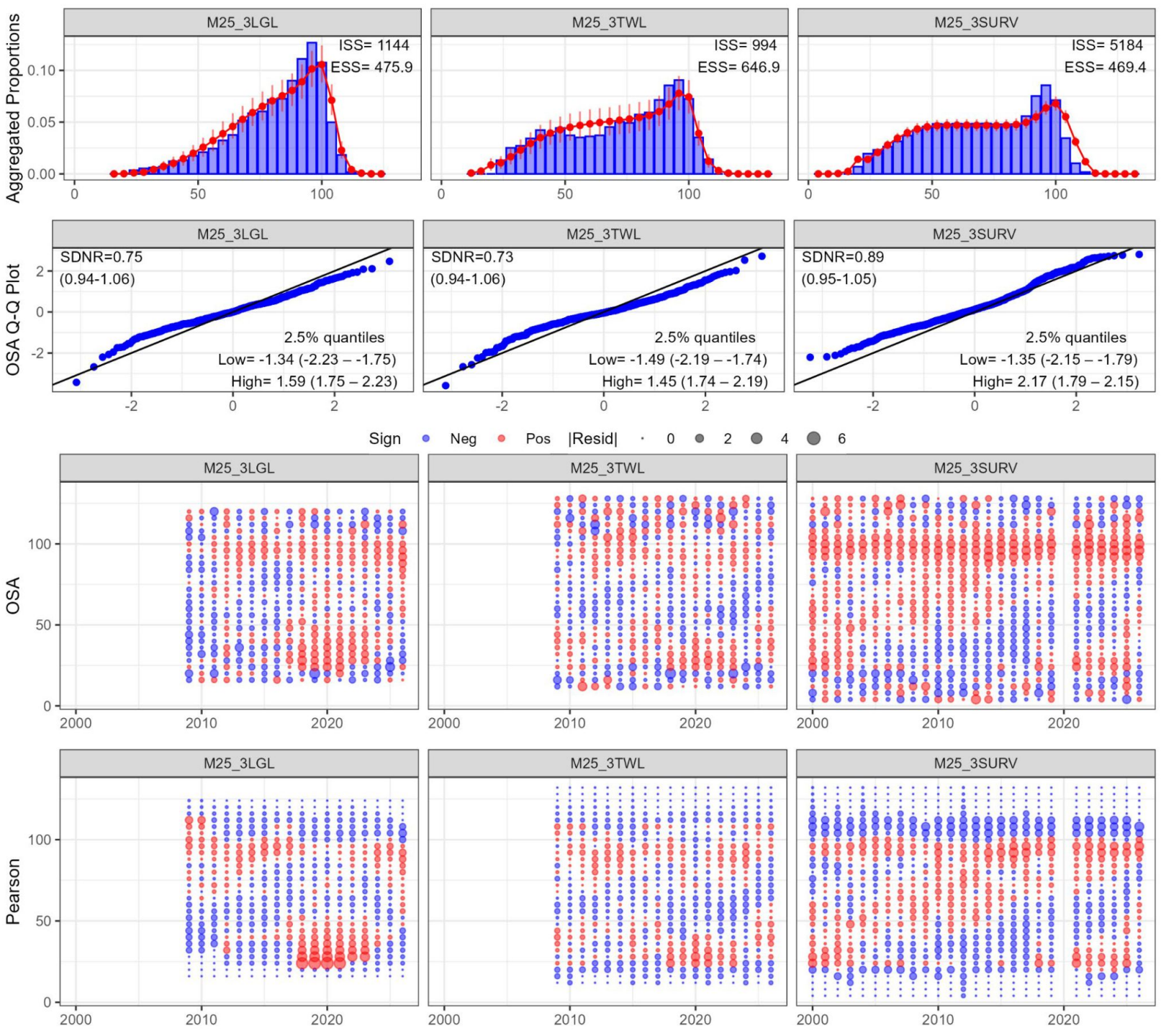
Pearsons






14_2d1LGL
ISS= 1144
ESS= 5527.7
14_2d1TWL
ISS= 994
ESS= 937.8
14_2d1SURV
ISS= 5184
ESS= 3628.4
Aggregated Proportions
OSA Q-Q Plot
SDNR=0.70
(0.94-1.06)
2.5% quantiles
Low= -1.41 (-2.23 – -1.75)
High= 1.4 (1.75 – 2.23)
SDNR=0.71
(0.94-1.06)
Low= -1.49 (-2.19 – -1.74)
High= 1.45 (1.74 – 2.19)
SDNR=0.70
(0.95-1.05)
Low= -1.14 (-2.15 – -1.79)
High= 1.68 (1.79 – 2.15)
Sign Neg Pos |Resid| 0 2 4 6
OSA
Pearson




M25_3LGL
M25_3TWL
M25_3SURV
Aggregated Proportions
ISS= 1144
ESS= 475.9
ISS= 994
ESS= 646.9
ISS= 5184
ESS= 469.4
OSA Q-Q Plot
SDNR=0.75
(0.94-1.06)
2.5% quantiles
Low= -1.34 (-2.23 – -1.75)
High= 1.59 (1.75 – 2.23)
SDNR=0.73
(0.94-1.06)
Low= -1.49 (-2.19 – -1.74)
High= 1.45 (1.74 – 2.19)
SDNR=0.89
(0.95-1.05)
Low= -1.35 (-2.15 – -1.79)
High= 2.17 (1.79 – 2.15)
Sign Neg Pos |Resid| 0 2 4 6
OSA
Pearson



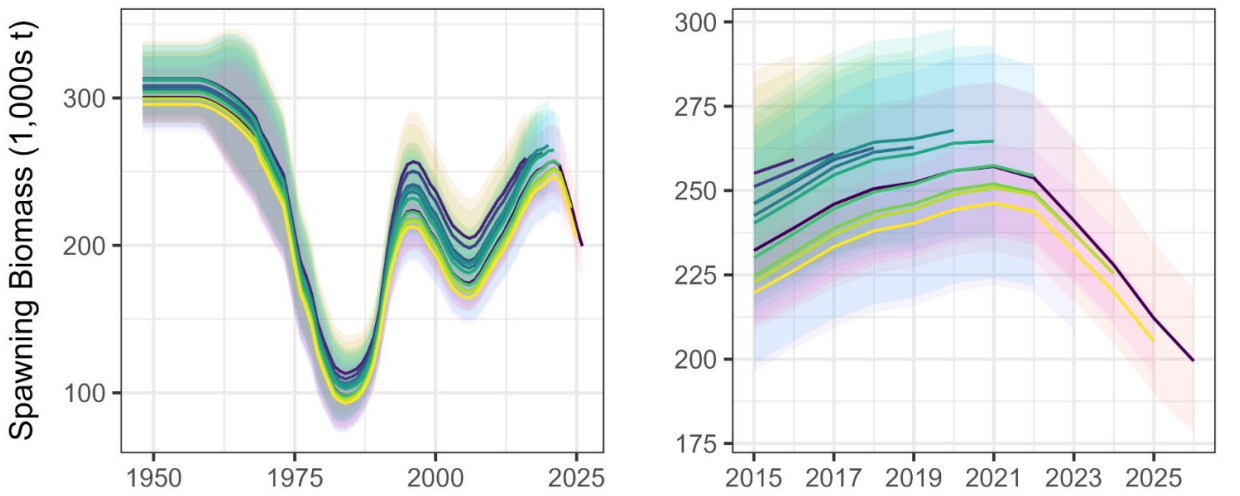
Tier 3 - Model Evaluations

Model 14.2d1 Retrospective

Mohn's rho (ϱ) = 0.256

Biomass increasing with recent years of data

Figure 18.12

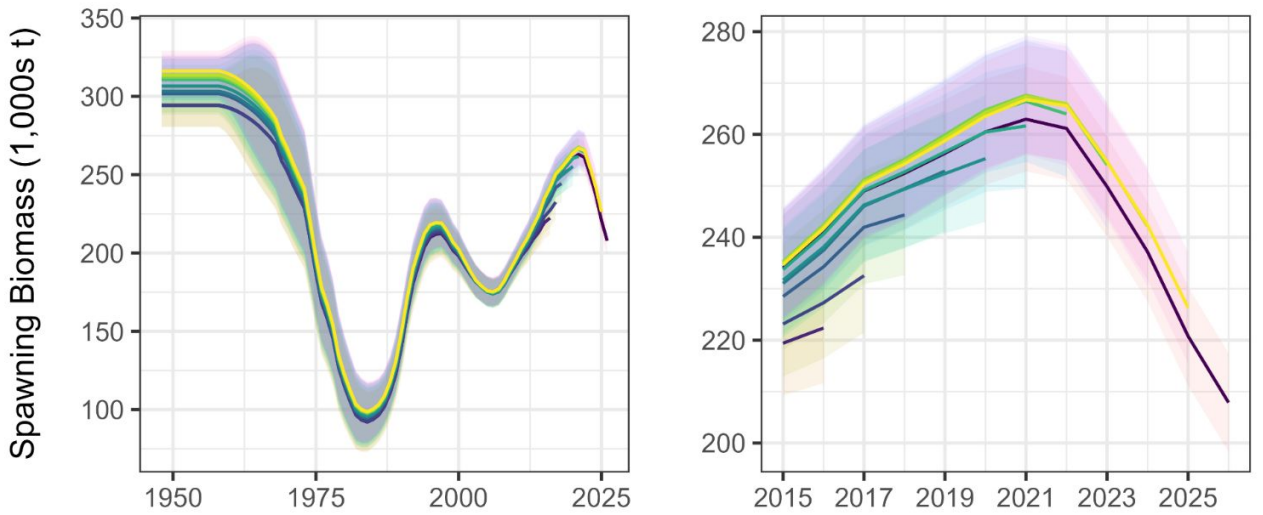


Model 25.3 Retrospective

Mohn's rho (ϱ) = -0.140

Biomass slightly decreasing with recent years of data

Figure 18.13



Tier 3 - Model Evaluations

Between Model Retrospective

Compares management accepted model results over time

Trends relatively similar

Overall biomass decreases with each accepted management model

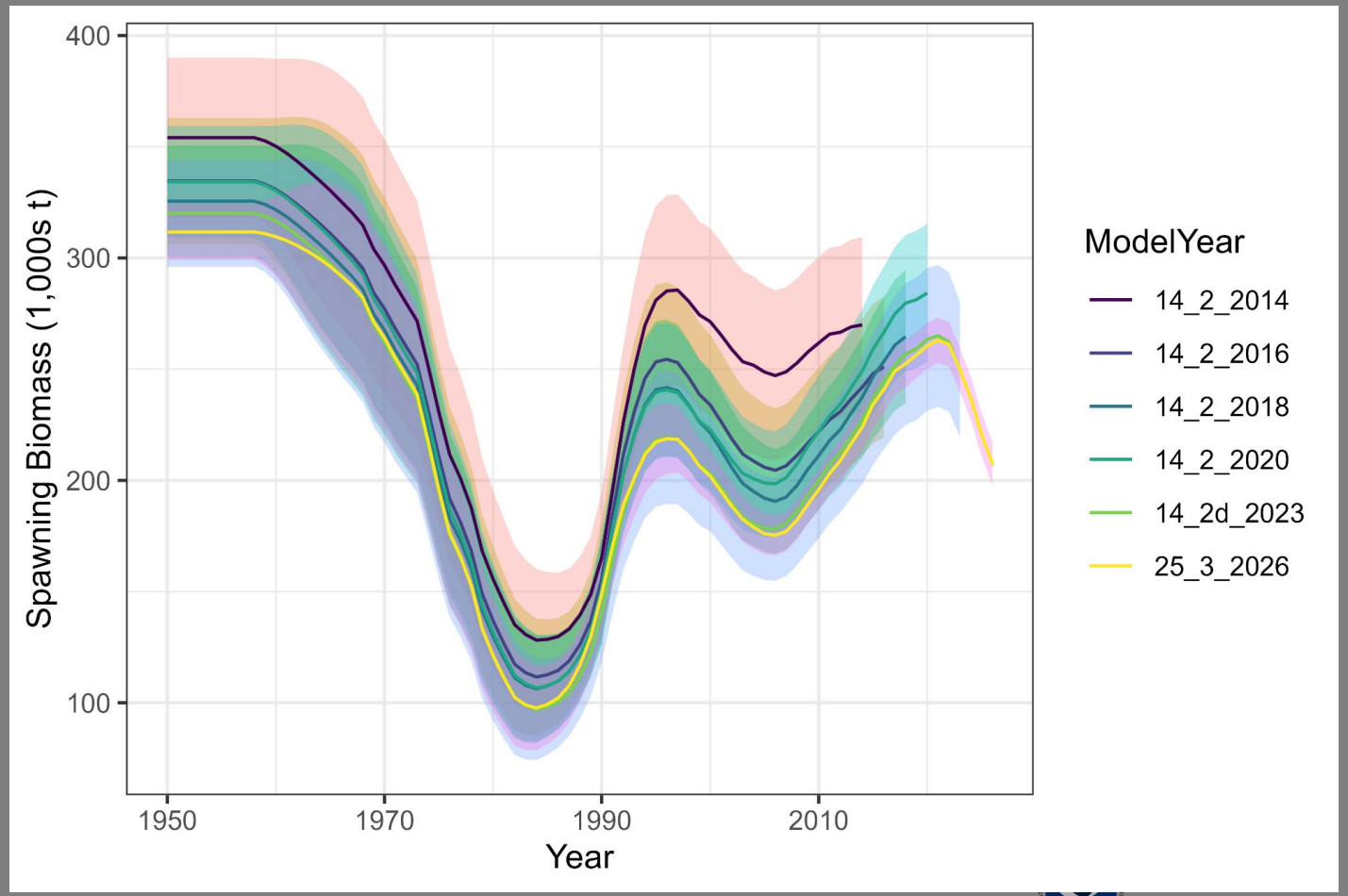


Figure 18.14

Tier 3 - Model Evaluations

Likelihood Profiles

Catchability (*q*)
- Suggests $q < 1$
- Highly influenced by length data
- Conflict between age/length data

Natural Mortality (*M*)
- Suggests $M > 0.13$
- Highly influenced by length data
- No data conflicts

Log Initial Recruitment (ln(R0))
- Agrees with model estimate
- Highly influenced by length data
- No data conflicts

Figure 18.15

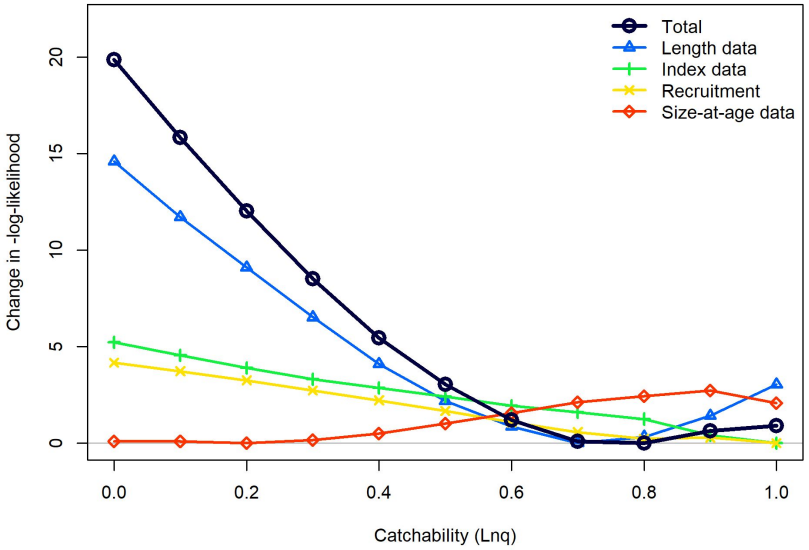


Figure 18.16

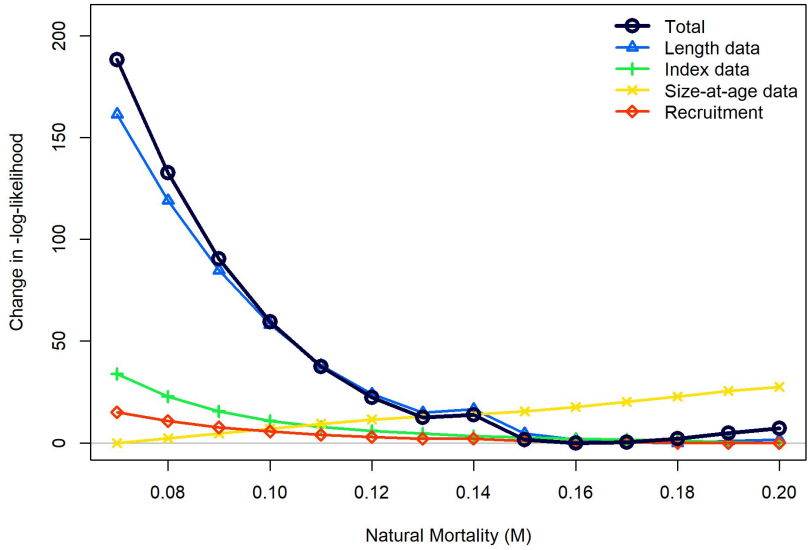
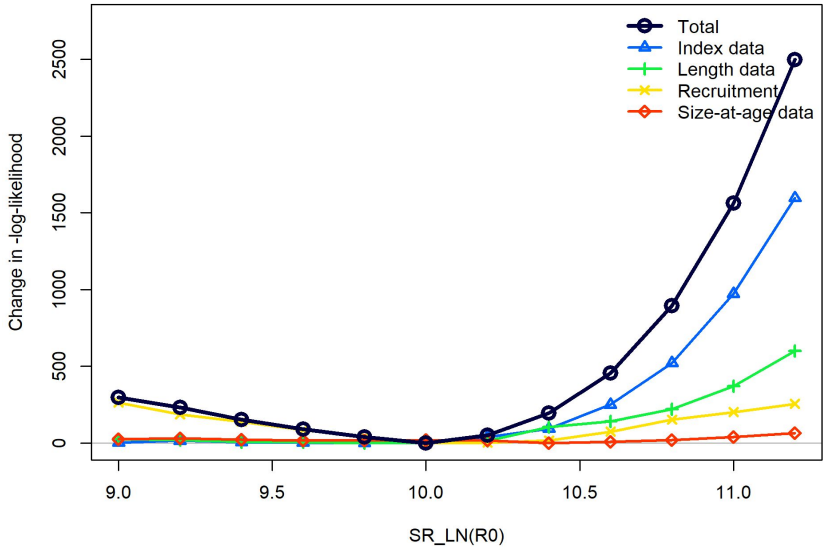


Figure 18.17



Tier 3 - Model Evaluations (Bonus Material)

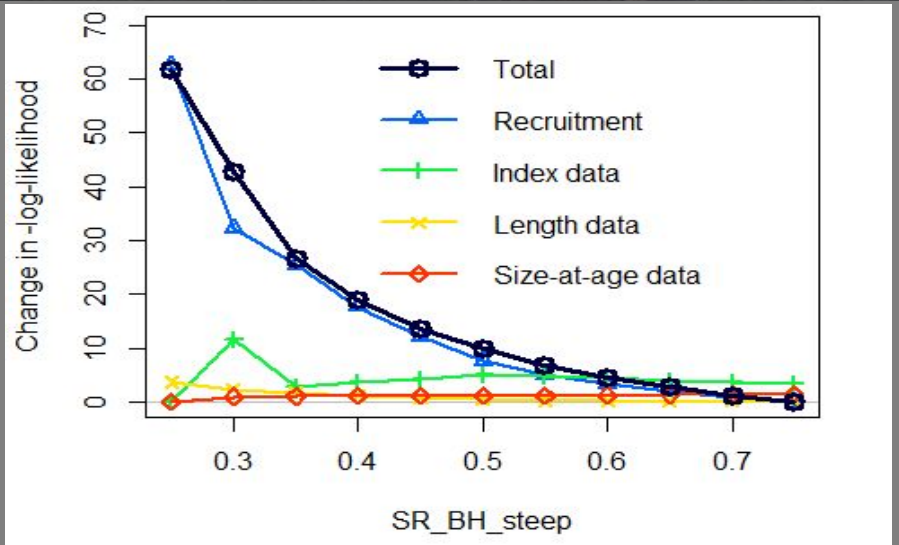
Likelihood Profiles

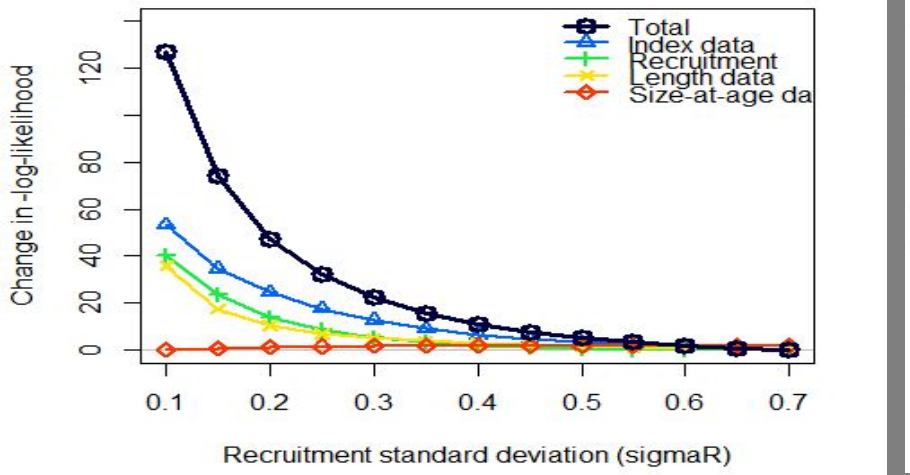
Steepness (h)

- Currently fixed at 1
- Assumes high productivity
- Unrealistic for elasmobranchs

Recruitment Deviations (sigmaR)

- Currently fixed at 0.4





For comparison:

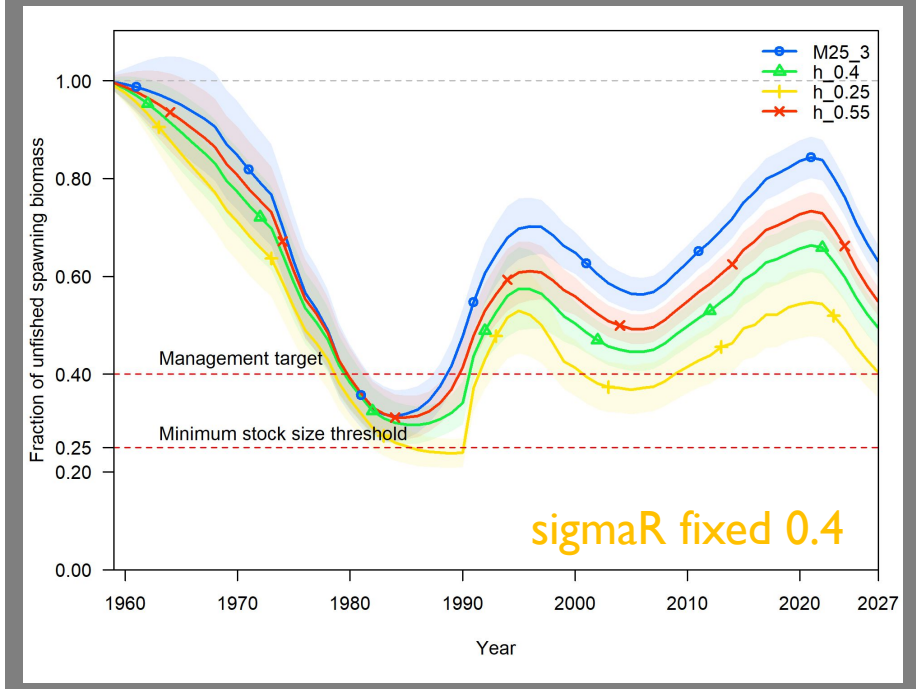
[Longnose skate - US West Coast]

[Big skate - US West Coast]

- h = 0.4 (fixed)

[Ormseth et al. 2007] h = 0.44 (estimated)

[Ormseth et al. 2008] h = 1 (fixed)



Tier 3 - Model Evaluation

Table 18.10

Quantity	As estimated in 2024	Model 14.2d1		Model 25.3		
	2026	2027	2028	2027	2028	% Change (2026 to M25.3 2027)
$B_{100\%}$	178,425	149,184	149,184	155,861	155,861	-13%
$B_{40\%}$	71,370	59,674	59,674	62,344	62,344	-13%
$B_{35\%}$	62,449	52,214	52,214	54,552	54,552	-13%
Female Spawning Biomass (t)	91,145	91,852	85,167	98,154	92,882	8%
Relative Spawning Biomass	0.679	0.619	0.574	0.630	0.584	-7%
$F_{40\%}$	0.080	0.079	0.080	0.085	0.085	6%
$F_{35\%}$	0.093	0.093	0.091	0.100	0.100	8%
ABC (t)	25,975	24,615	25,067	23,366	23,367	-10%
OFL (t)	30,140	28,585	28,611	27,074	26,633	-10%

Tier 3 - Model Selection

Model 14.2d1

Parameters within pre-specified bounds: **NO**

Maximum gradients < 1e-4: **NO**

Positive-definite Hessian: **YES**

Model 25.3

Parameters within pre-specified bounds: **YES**

Maximum gradients < 1e-4: **YES**

Positive-definite Hessian: **YES**

Likelihood profiles suggest future avenues of development

Tier 3 - Time Series Results M25.3

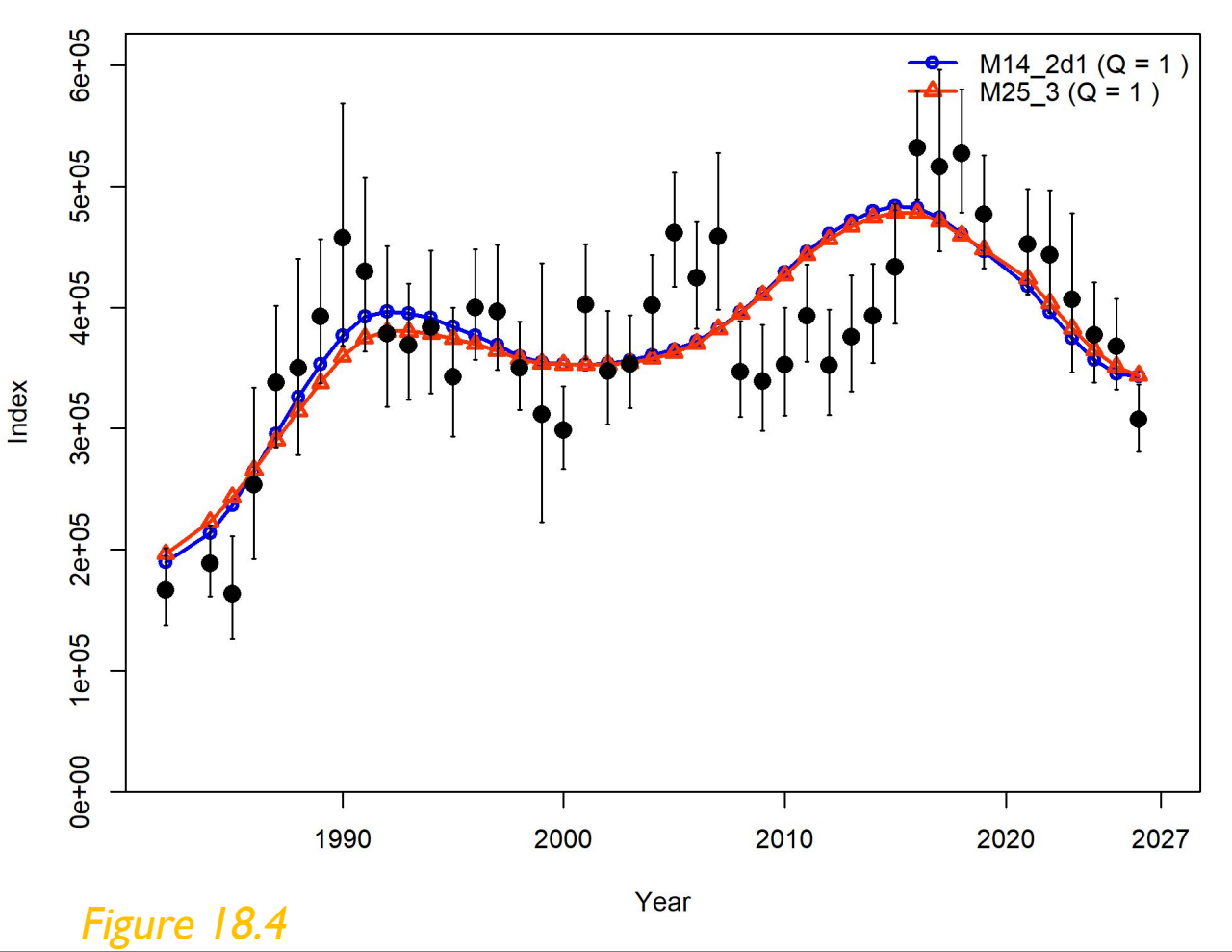


Figure 18.4

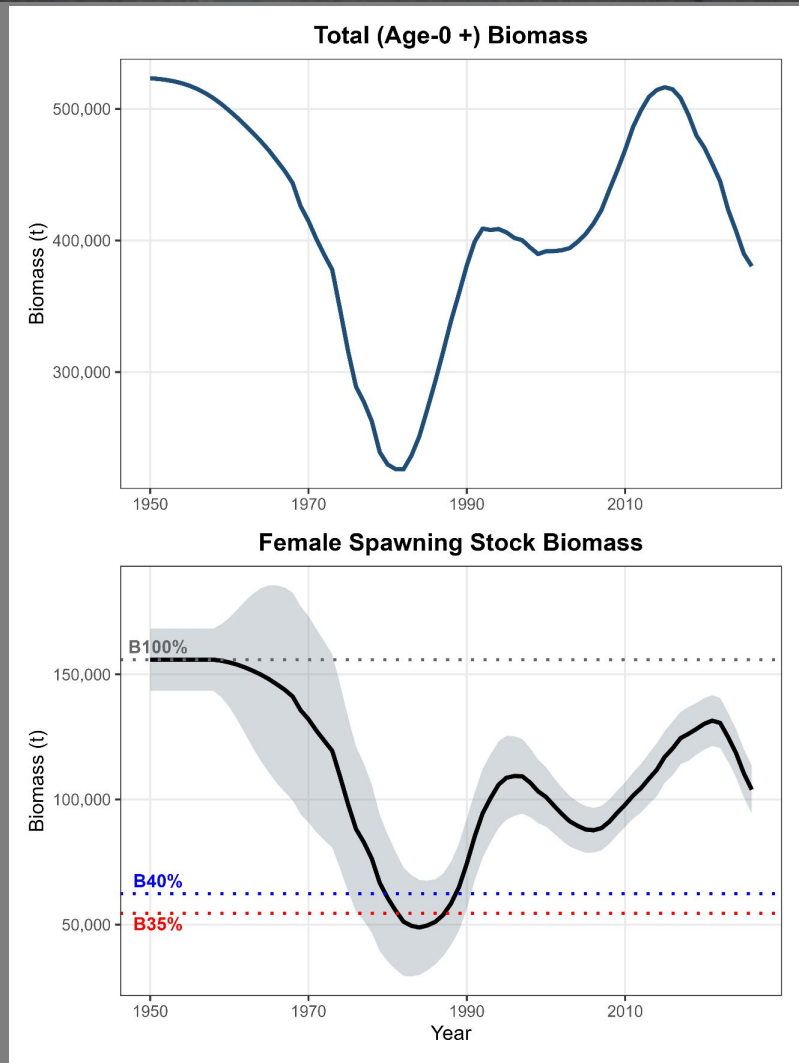


Figure 18.19

Tier 3 - Time Series Results M25.3

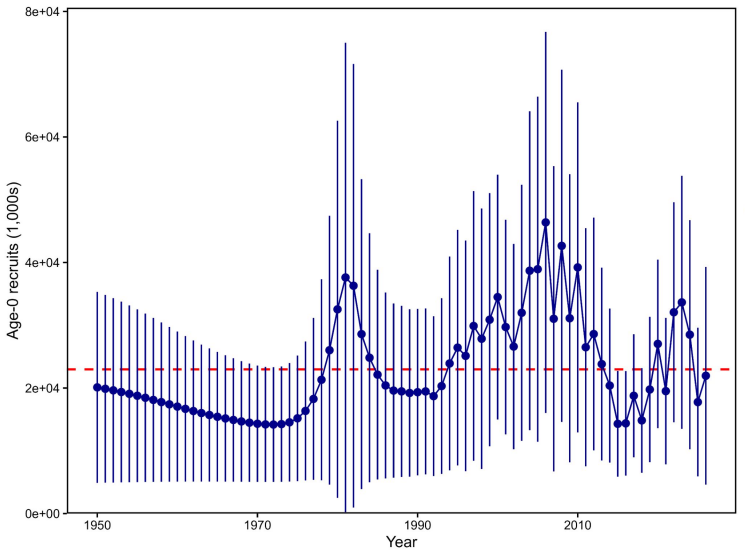


Figure 18.20

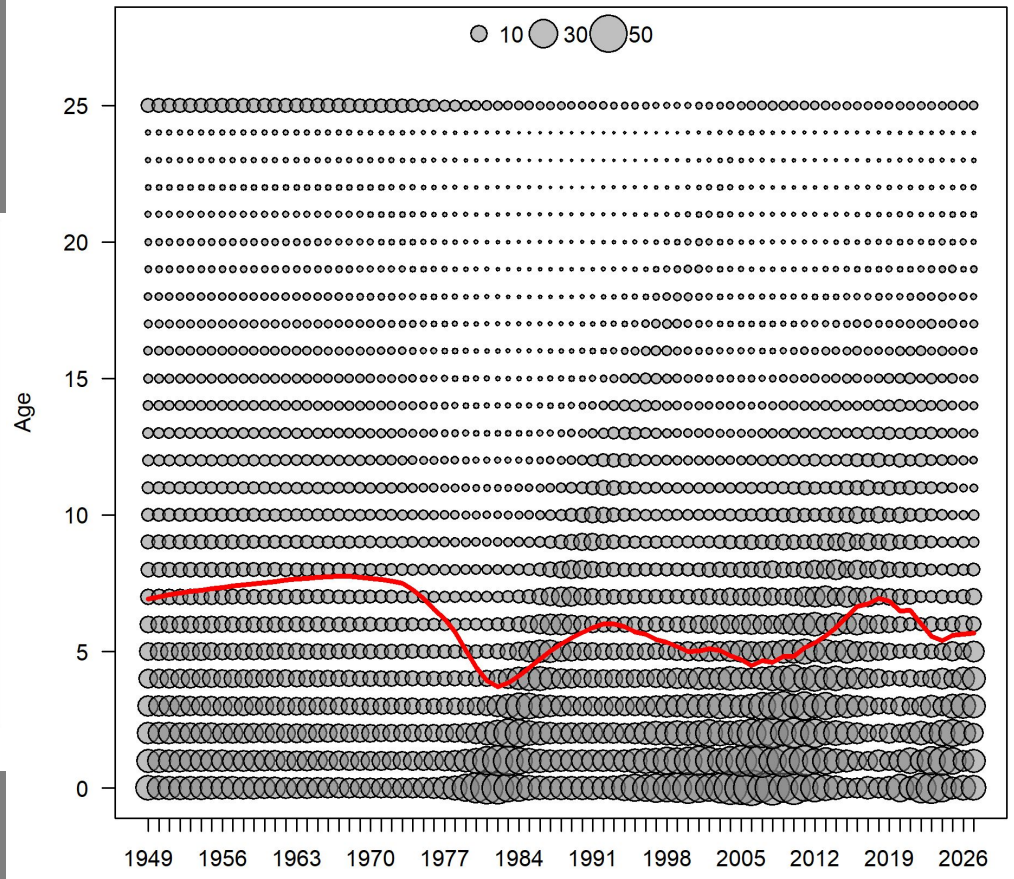


Figure 18.22

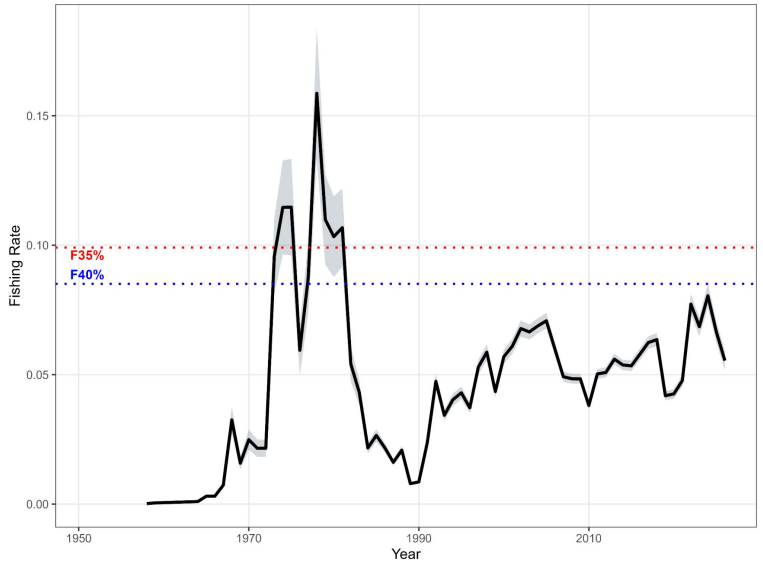


Figure 18.21

Questions on Tier 3 Alaska Skates Model

Up next: Status Determination and Harvest Recommendations

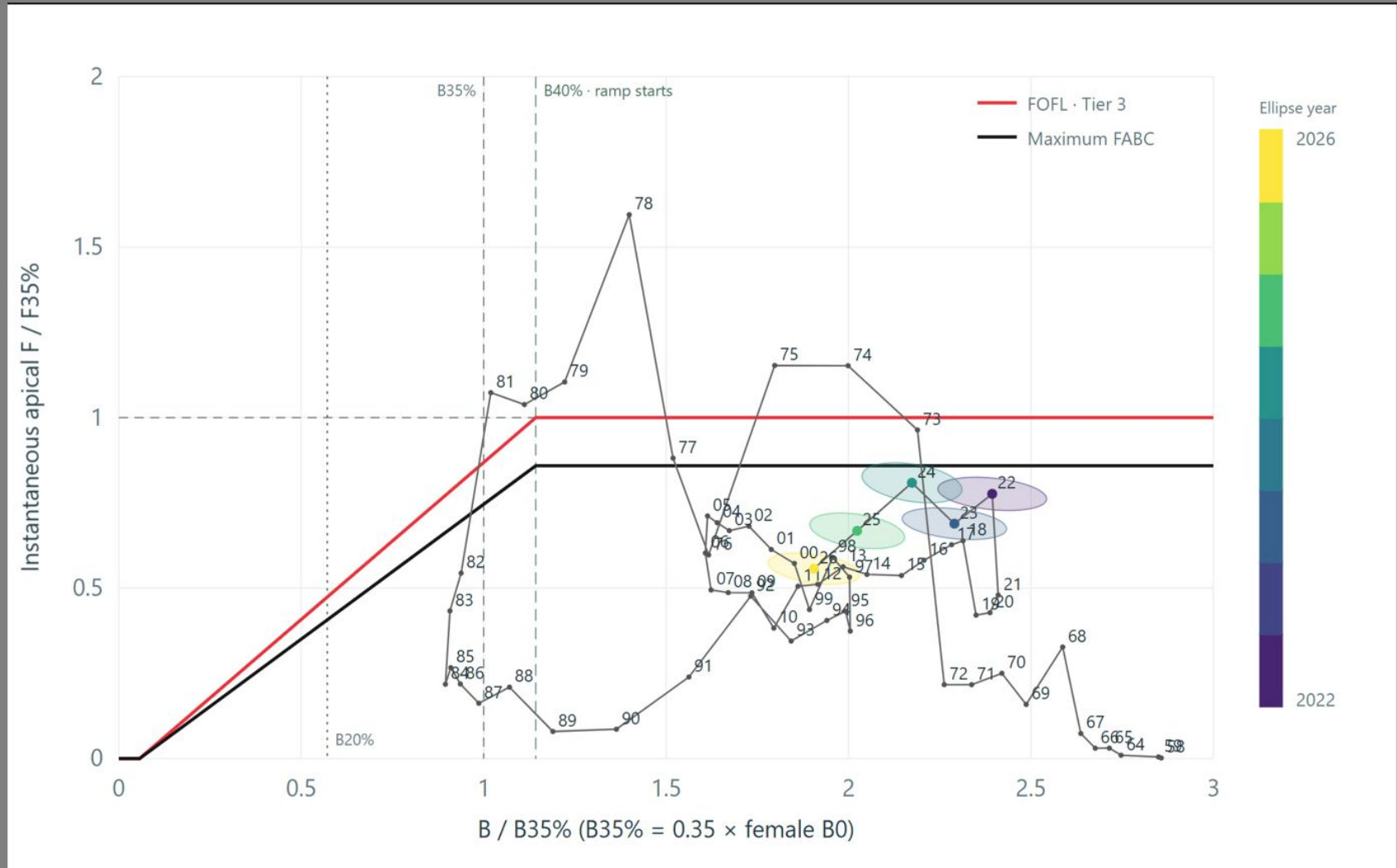






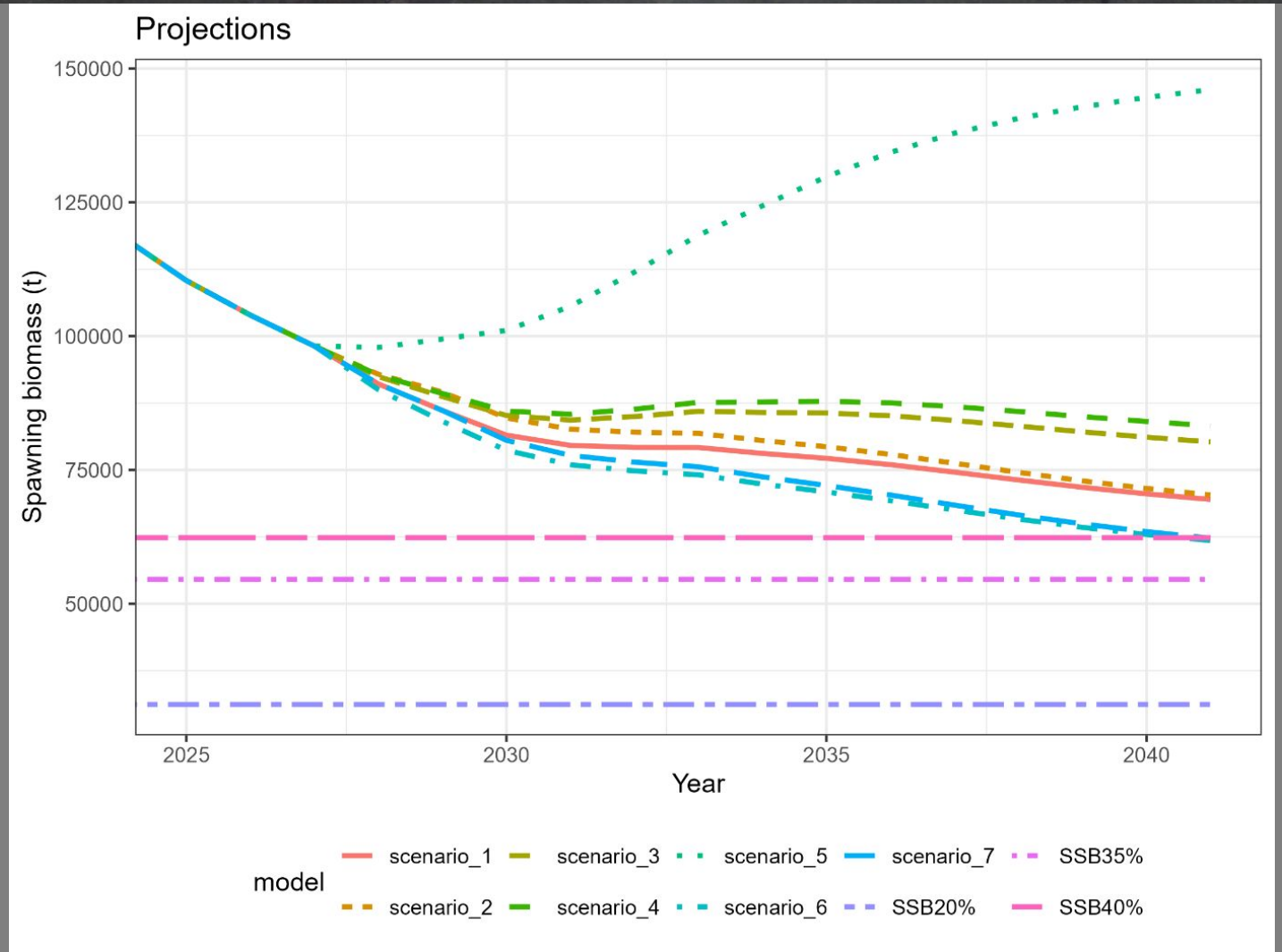
Tier 3 - Status Determination

- 2027 $B/B_{40\%}$ = 1.57
  - **Sub Tier 3a**
- *2025 Catch < OFL_{2025}*
  - **Overfishing not occurring**



Tier 3 - Status Determination

- 2027 $B/B_{40\%}$ = 1.57
  - **Sub Tier 3a**
- *2025 Catch < OFL_{2025}*
  - **Overfishing not occurring**
- $B_{2027} > B_{35\%}$
  - **Not Overfished**
- $B_{2041} > B_{35\%}$
  - **Not Approaching Overfished**



Tier 3 - Risk Table

Risk Tables

Assessment	Population dynamics	Enviro/ ecosystem	Fishery Performance
Level 2: Increased concern	Level 1: Normal	Level 1: Normal	Level 1: Normal

Assessment

- Survey catchability assumptions need to be examined
  - cold pool (availability)

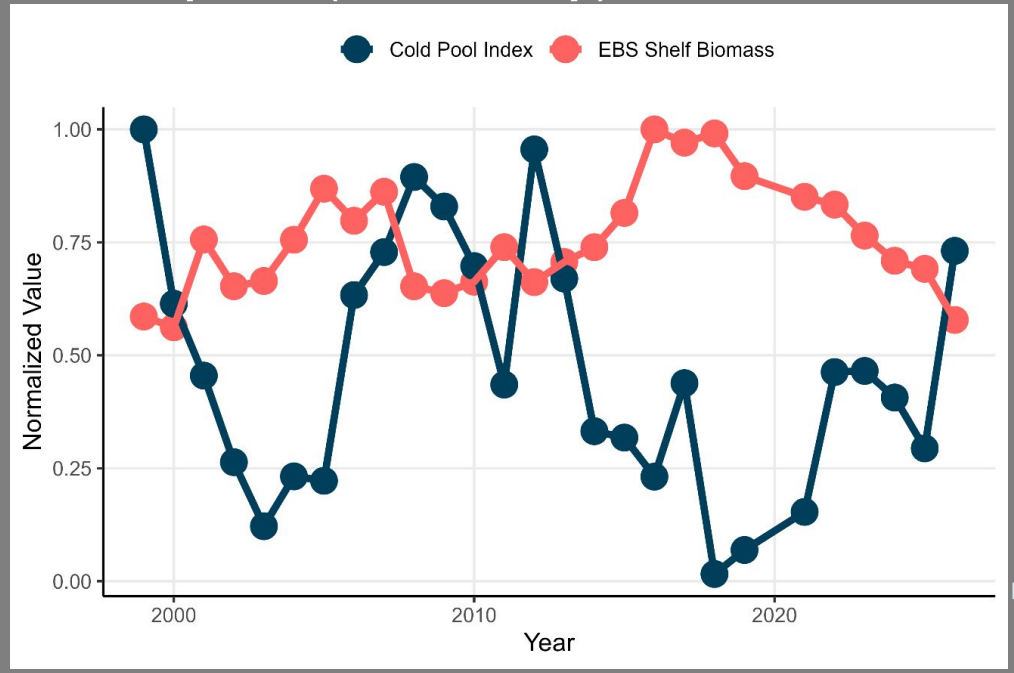


Figure 18.27

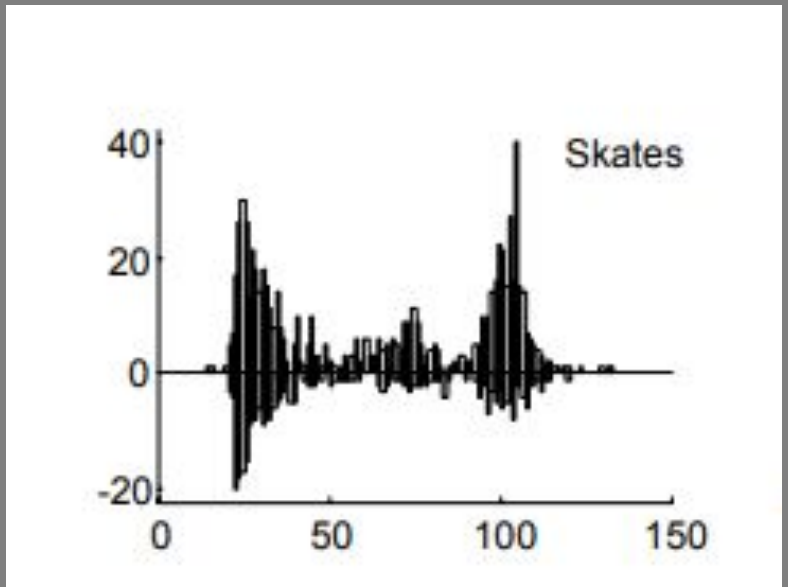
Tier 3 - Risk Table

Risk Tables

Assessment	Population dynamics	Enviro/ ecosystem	Fishery Performance
Level 2: Increased concern	Level 1: Normal	Level 1: Normal	Level 1: Normal

Assessment

- Survey catchability assumptions need to be examined
  - cold pool (availability)
  - gear susceptibility

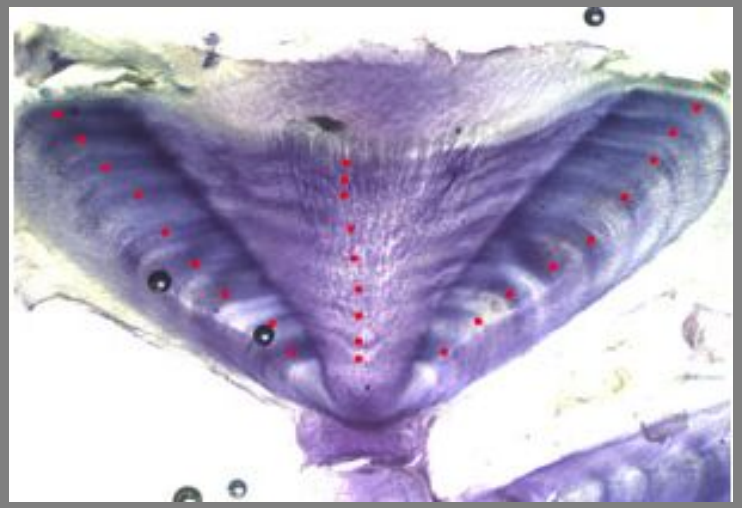


Snipped from Kotwicki and Weinberg 2005. Bars above the horizontal axis are caught skates, those below are escaped skates.

Tier 3 - Risk Table

Risk Tables

Assessment	Population dynamics	Enviro/ ecosystem	Fishery Performance
Level 2: Increased concern	Level 1: Normal	Level 1: Normal	Level 1: Normal



Assessment

- Survey catchability assumptions need to be examined
  - cold pool (availability)
  - gear susceptibility
- Reliance on outdated and limited age data
  - Difficult to age species
  - Only one experienced reader
  - Low priority
- *Steepness (not in document)*

Tier 3 - Risk Table

Risk Tables

Assessment	**Population dynamics**	Enviro/ ecosystem	Fishery Performance
Level 2: Increased concern	**Level 1: Normal**	Level 1: Normal	Level 1: Normal

Population Dynamics

- Continued declining trend
- Cohort developing that is just beginning to reach maturity
- *Steepness sensitivity suggests less resilience (not in the document)*
- Unknowns:
  - hatching success
  - movement

Tier 3 - Risk Table

Risk Tables

Assessment	Population dynamics	**Enviro/ ecosystem**	**Fishery Performance**
Level 2: Increased concern	Level 1: Normal	**Level 1: Normal**	**Level 1: Normal**

Ecosystem/Fishery

- Data-limited
- No apparent ecosystem concerns beyond those already discussed (Appendix 18.D)
- Bycatch species

No reduction from max ABC recommended at this time

Tier 3 - Harvest Recommendations

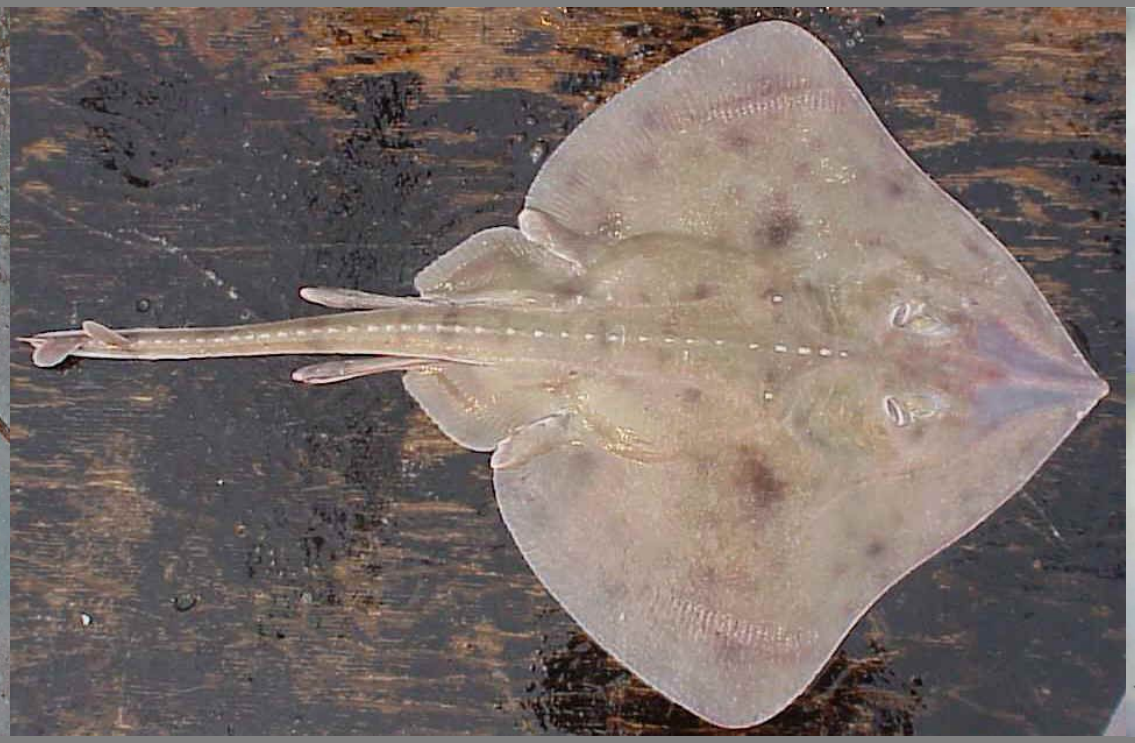
Alaska skate harvest recommendations (Model 25.3)				
	As estimated or specified *last* assessment for:		As estimated or recommended *this* year for:	
Quantity	2025	2026	2027*	2028*
M (natural mortality rate)	0.13	0.13	0.13	0.13
Tier	3a	3a	3a	3a
Projected total (age 0+) biomass (t)	436,238	425,822	376,985	368,228
Projected Female spawning biomass (t)	98,443	91,145	98,154	92,882
$B_{100\%}$	178,425	178,425	155,861	155,861
$B_{40\%}$	71,370	71,370	62,344	62,344
$B_{35\%}$	62,449	62,449	54,552	54,552
F_{OFL}	0.093	0.093	0.100	0.100
$maxF_{ABC}$	0.08	0.08	0.085	0.085
F_{ABC}	0.08	0.08	0.085	0.085
OFL (t)	30,941	30,140	27,074	26,633
maxABC (t)	26,665	25,975	23,366	23,367
ABC (t)	26,665	25,975	23,366	23,367
	As determined *last* assessment for:		As determined *this* year for:	
Status	2022	2023	2025	2026
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

Questions on Tier 3 Alaska Skates

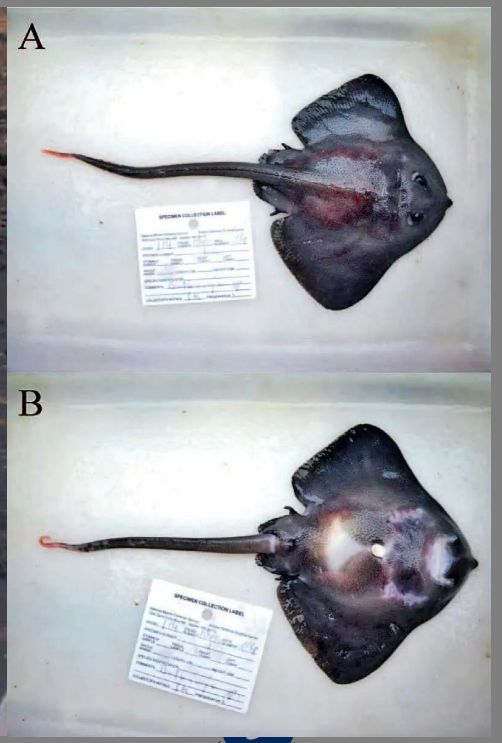
Up next: Tier 5 Other Skates



Leopard Skate



Aleutian Skate



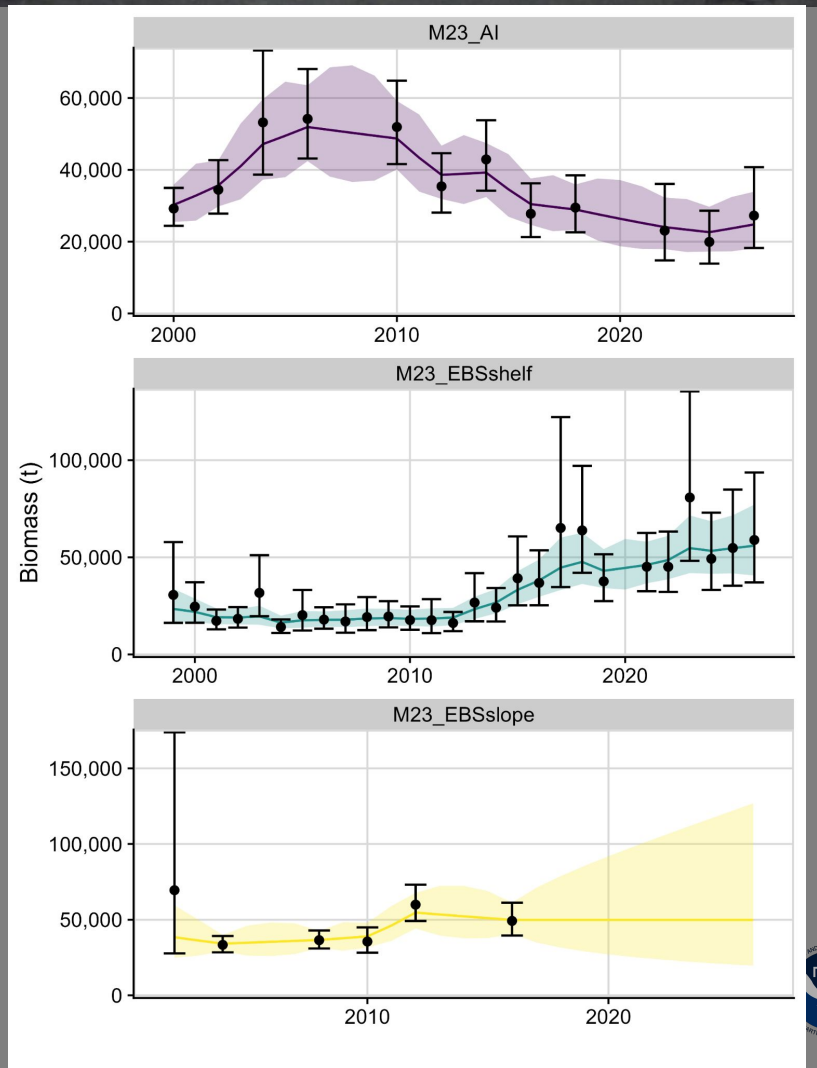
Pacific White Skate

TIER 5 – OTHER SKATES

Model 23.0

Figure 18.24

- Everything but Alaska skates in the EBS shelf survey
- No model changes
- Updated survey data since 2023
- Using *rema* framework
- Each area modelled separately, summed for total Tier 5 biomass
- All species combined, same $M = 0.1$

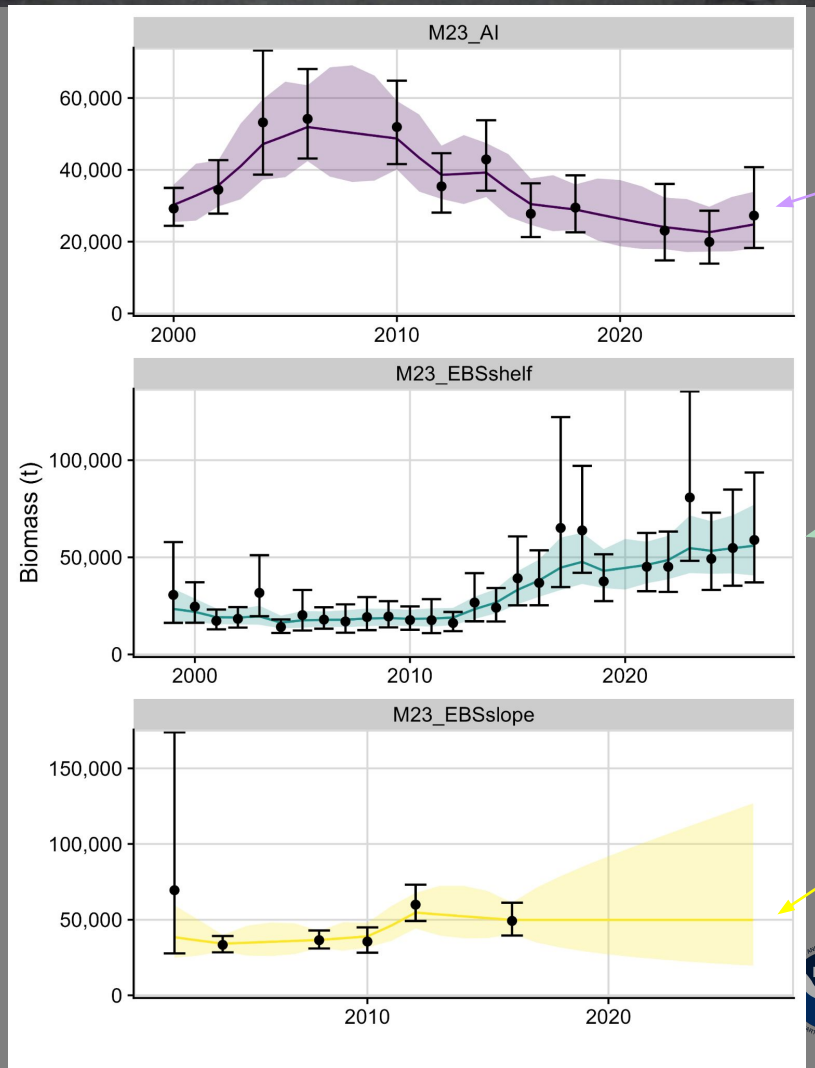


TIER 5 – OTHER SKATES

Figure 18.24

Model 23.0

- AI survey combined biomass remains low, but slight increase in 2026
- EBS Shelf survey continues long term increase
  - Mostly due to influx of big skates
  - 2026 had a big increase in Aleutian skates
- No news is…..no news for the EBS slope survey



Increase in leopard and whiteblotched

Lots of Aleutians

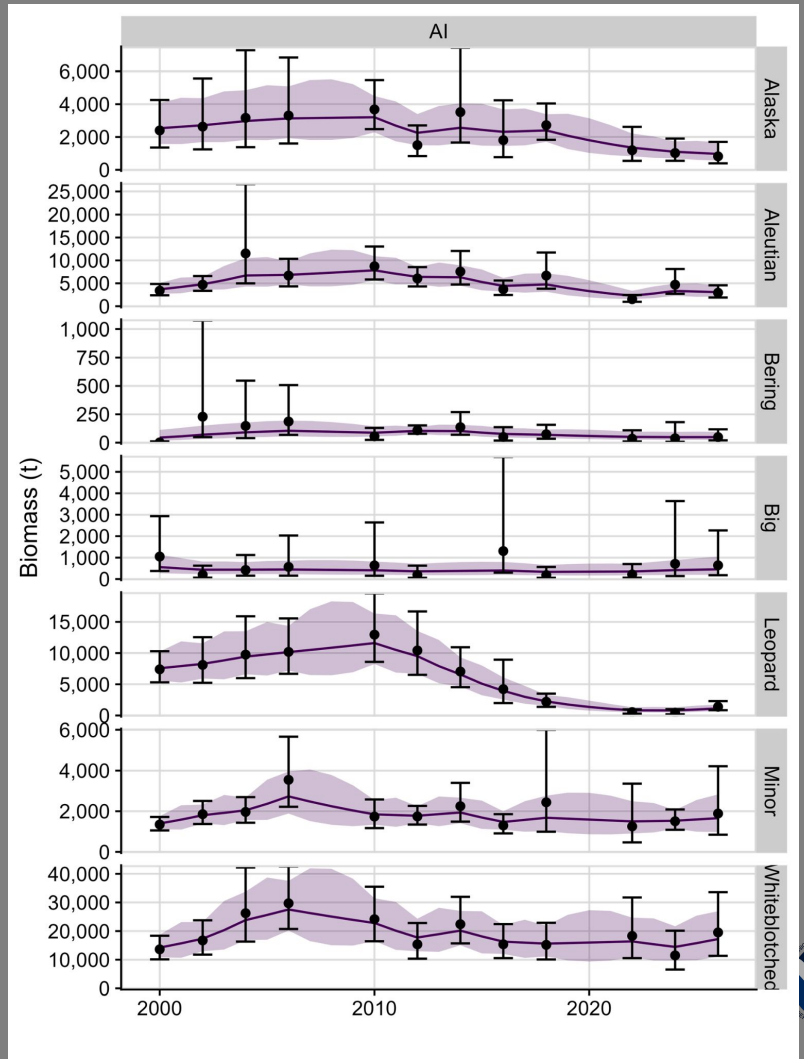
Highest diversity region

TIER 5 – OTHER SKATES (APPENDIX 18.B)

Figure 18.B1

Aleutian Islands Survey

Dominant	Minor
Alaska	Butterfly
Aleutian	Commander
Bering	Longnose
Big	Mud
Leopard	Roughtail
Whiteblotched	Whitebrow
	Skate Unid

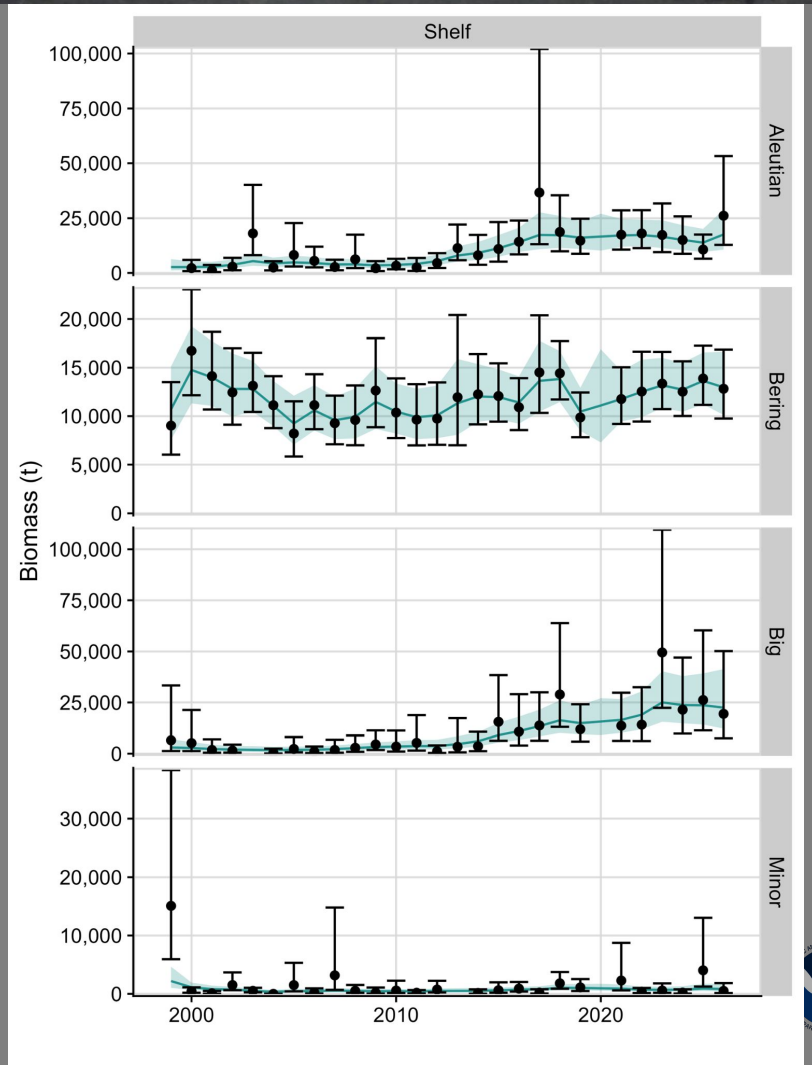


TIER 5 – OTHER SKATES (APPENDIX 18.B)

Figure 18.B2

EBS Shelf Survey

Dominant	Minor
Aleutian	Longnose
Bering	Mud
Big	Okhotsk
	Whiteblotched

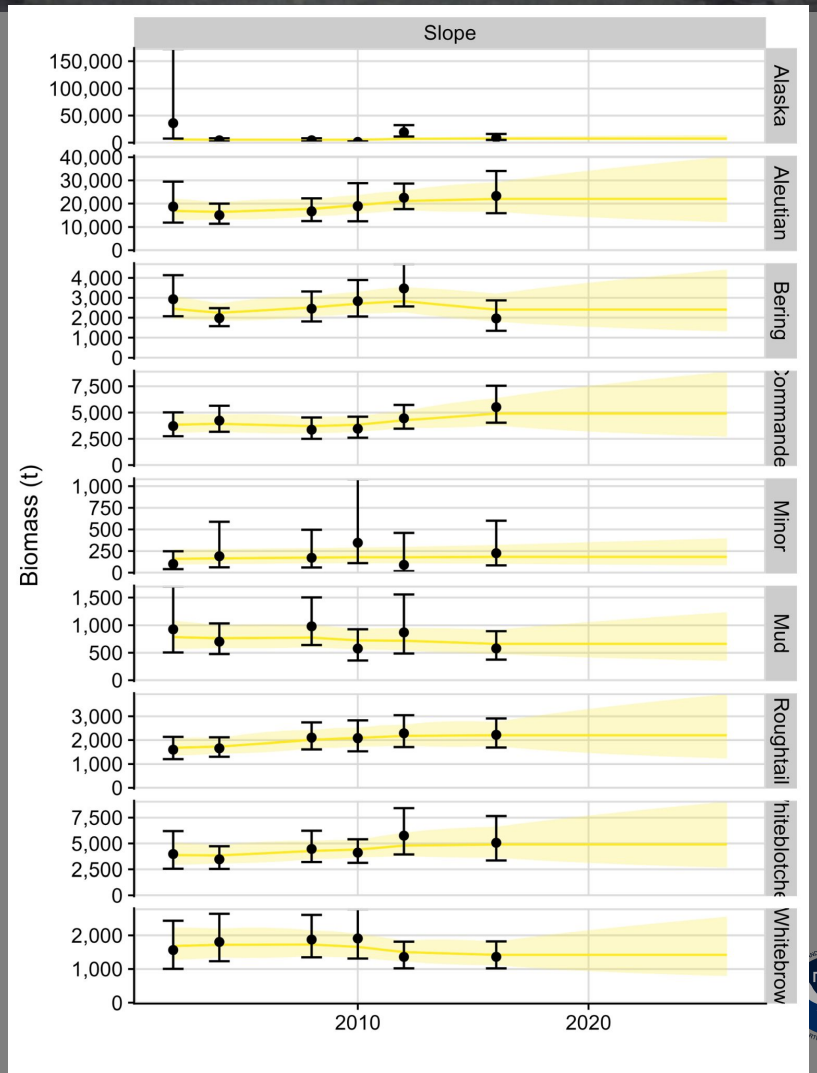


TIER 5 – OTHER SKATES (APPENDIX 18.B)

Figure 18.B3

EBS Slope Survey

Dominant	Minor
Alaska	Deepsea
Aleutian	Longnose
Bering	Okhotsk
Commander	Skate Unid
Mud	
Roughtail	
Whiteblotched	
Whitebrow	



Tier 5 - Other Skates

Risk Tables

Assessment	Population dynamics	Enviro/ ecosystem	Fishery Performance
Level 2: Increased concern	Level 2: Increased concern	Level 1: Normal	Level 1: Normal

Assessment

- All Other Skates lumped together
  - Assumes same M
  - Potential for Tier 4 species
- Masked species specific declines

Tier 5 - Other Skates

Risk Tables

Assessment	**Population dynamics**	Enviro/ ecosystem	Fishery Performance
Level 2: Increased concern	**Level 2: Increased concern**	Level 1: Normal	Level 1: Normal

Population Dynamics

- Continued low biomass of three AI species
  - Endemic leopard skate 74% below long term mean
  - Alaska, Aleutian skates
- Lack of slope survey
  - Highest diversity of species
  - Endemic species

Tier 5 - Other Skates

Risk Tables

Assessment	Population dynamics	**Enviro/ ecosystem**	**Fishery Performance**
Level 2: Increased concern	Level 2: Increased concern	**Level 1: Normal**	**Level 1: Normal**

Ecosystem/Fishery

- Data-limited
- No apparent ecosystem concerns beyond those already discussed (Appendix 18.D)
- Bycatch species

No reduction from max ABC recommended at this time

Tier 5 - Other Skates

- *2025 Catch < OFL_{2025}*
  - **Overfishing not occurring**

Other Skate harvest recommendations (Model 23.0)				
	As estimated or specified *last* assessment for:		As estimated or recommended *this* year for:	
Quantity	2025	2026	2027	2028
M (natural mortality rate)	0.10	0.10	0.10	0.10
Tier	5	5	5	5
Biomass (t)	131,446	131,446	130,627	130,627
F_{OFL}	0.10	0.10	0.10	0.10
$maxF_{ABC}$	0.075	0.075	0.075	0.075
F_{ABC}	0.075	0.075	0.075	0.075
OFL (t)	13,145	13,145	13,063	13,063
maxABC (t)	9,858	9,858	9,797	9,797
ABC (t)	9,858	9,858	9,797	9,797
	As determined *last* assessment for:		As determined *this* year for:	
Status	2022	2023	2025	2026
Overfishing	No	n/a	No	n/a

Questions on Tier 5 Other Skates

Up next: Aggregate Recommendations







BSAI Skate Stock Complex

Assessment-related Considerations	Population Dynamics Considerations	Environmental / Ecosystem Considerations	Fishery Performance Considerations
Level 2 for Alaska skates Level 2 for Other Skates	Level 1 for Alaska skates Level 2 for Other Skates	Level 1: no increased concerns	Level 1: no increased concerns

Risk Table Summary:

- Despite elevated risks, no recommended reduction from maxABC
- Tier 3 Alaska skate are well above biomass reference points, potential incoming cohort, there is no directed fishing
- A reduction in maxABC for Other Skates would be ineffective
  - no BRDs
  - no species specific ABCs

BSAI Skate Stock Complex

Aggregate BSAI Skate Harvest Recommendations				
	As estimated or specified *last* assessment for:		As estimated or recommended *this* year for:	
Quantity	2025	2026	2027	2028
OFL (t)	44,086	43,825	40,137	39,696
maxABC (t)	36,523	35,833	33,163	33,164
ABC (t)	36,523	35,833	33,163	33,164

Data Gaps and Research Priorities

- **Limited age data**
  - 1,255 aged vertebrae
  - No new ages since 2015
  - > 500 vertebrae collected since 2025
  - No capacity to age them
  - Low priority stock

Data Gaps and Research Priorities

- Limited age data
- **Natural Mortality**
  - Relevant to all BSAI skate species
  - Has not been re-evaluated since 2008
  - Updated methods
  - New information
  - Ongoing project for all Alaska elasmobranchs

Data Gaps and Research Priorities

- Limited age data
- Natural Mortality
- **Lack of EBS slope survey**

- EBS slope is the most species rich regions for BSAI skates
- Span full depth range of the slope
- Impossible to track trends for those species

Data Gaps and Research Priorities

- Limited age data
- Natural Mortality
- Lack of EBS slope survey
- **Survey Catchability**
  - Skates are able to avoid the trawl survey gear
  - Size dependent gear avoidance
  - Skates may be less available to survey in cold years
  - Tied in with selectivity, steepness and sigmaR

Data Gaps and Research Priorities

- Limited age data
- Natural Mortality
- Lack of EBS slope survey
- Survey Catchability
- **Species Identification**

- Leopard skate is not identified by at-sea observers, nor estimated by CAS
- May be lumped in with Alaska skate catch or unidentified skate catch
- 2027 fishery special project to collect genetics, along with life history samples

Data Gaps and Research Priorities

- Limited age data
- Natural Mortality
- Lack of EBS slope survey
- Survey Catchability
- Species Identification
- **Life History**
  - Many species have updated life history studies which are not incorporated into the assessment
  - Leopard skate may have different life history from Alaska skate
  - Alaska skate weight-at-length needs to be updated

Questions, comments or feedback

Contact: cindy.tribuzio@noaa.gov

With contributions from:

- Ivonne Ortiz and Ebett Siddon (AFSC) for the Ecosystem Considerations sections.
- Jerry Hoff and Duane Stevenson (AFSC) for survey and skate expertise.

