



NOAA
FISHERIES



2024 BSAI Blackspotted/Rougheye Rockfish Assessment

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Alaska Fisheries Science Center

Overall summary

- Unusually large increase in 2011 year class (with high uncertainty), which affects the estimate of $B_{40\%}$, perceived stock depletion, and F_{abc}
- We recommend setting the 2011 year class to the next largest value for the purpose of stabilizing $B_{40\%}$ and obtaining the maximum ABC (i.e., same procedure as in 2022 assessment)
- The recommended ABC is not reduced from the maximum for several reasons: 1) The AI survey biomass for 2024 was a large increase from the 2022 estimate (continuing a trend since the 2018 survey); continued presence of small/medium sized fish in the survey and fishery composition data; and 3) the procedure we used in 2022 for a reduction from the max ABC would produce a similar value to the max ABC if applied in 2024.
- Several concerns noted in risk table.
- Spatially disproportionate harvesting has continued, and the SSC has noted that this is a concern.
- The MSSC, WAI/CAI subarea ABC, and the BSAI ABC have all been exceeded in recent years.

Outline

- 1) SSC – Plan Team comments
- 2) Catch information
- 3) Fishery and survey data
- 4) Model description and evaluation
- 5) Monitoring of catch
- 6) Risk table
- 7) Management recommendations

SSC and Plan Team comments

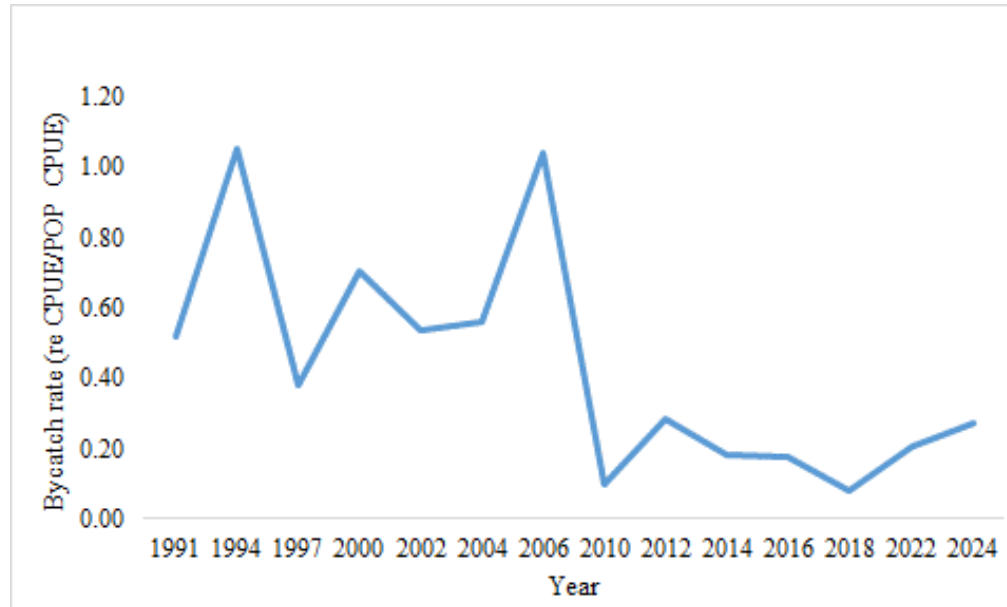
- (SSC, October 2022). *The SSC acknowledged the changes in the IPHC longline survey sampling design in 2020 but noted that the survey was highly correlated with the bottom trawl survey prior to 2020. Given the retrospective bias in the current model and its difficulty in assessing the scale of the stock, the SSC recommends the author explore use of the pre-2020 data in the assessment with emphasis on sampling in untrawlable habitats.*
- (BSAI Plan Team, November 2022). *The Team discussed the lack of larger fish in fishery composition data and recommended examining the NMFS and IPHC longline survey data to determine if larger fish may be in the population and not showing up in the fishery. The Team also recommended looking at the rate of blackspotted/rougeye to Pacific ocean perch in the survey tows over the time series.*

These comments were addressed in a report presented in September, 2024, to the Plan Team

SSC and Plan Team comments

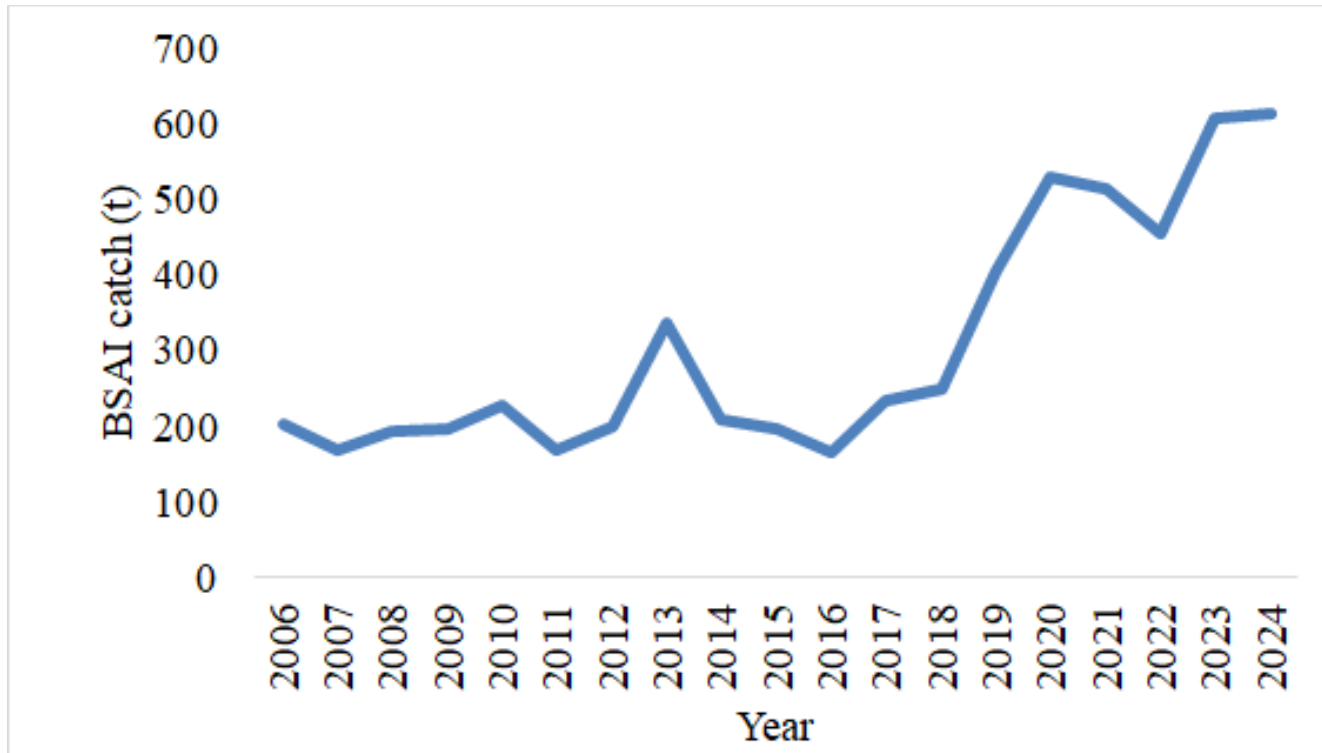
- (BSAI Plan Team, November 2022). *The Team also recommended looking at the rate of blackspotted/rougeye to Pacific ocean perch in the survey tows over the time series.*

The report in September looked at survey catch rates based on weight, and posed the question of whether the decline in CPUE was due to reductions in abundance or individual weight. The ratio of catch rates based on abundance is shown below:

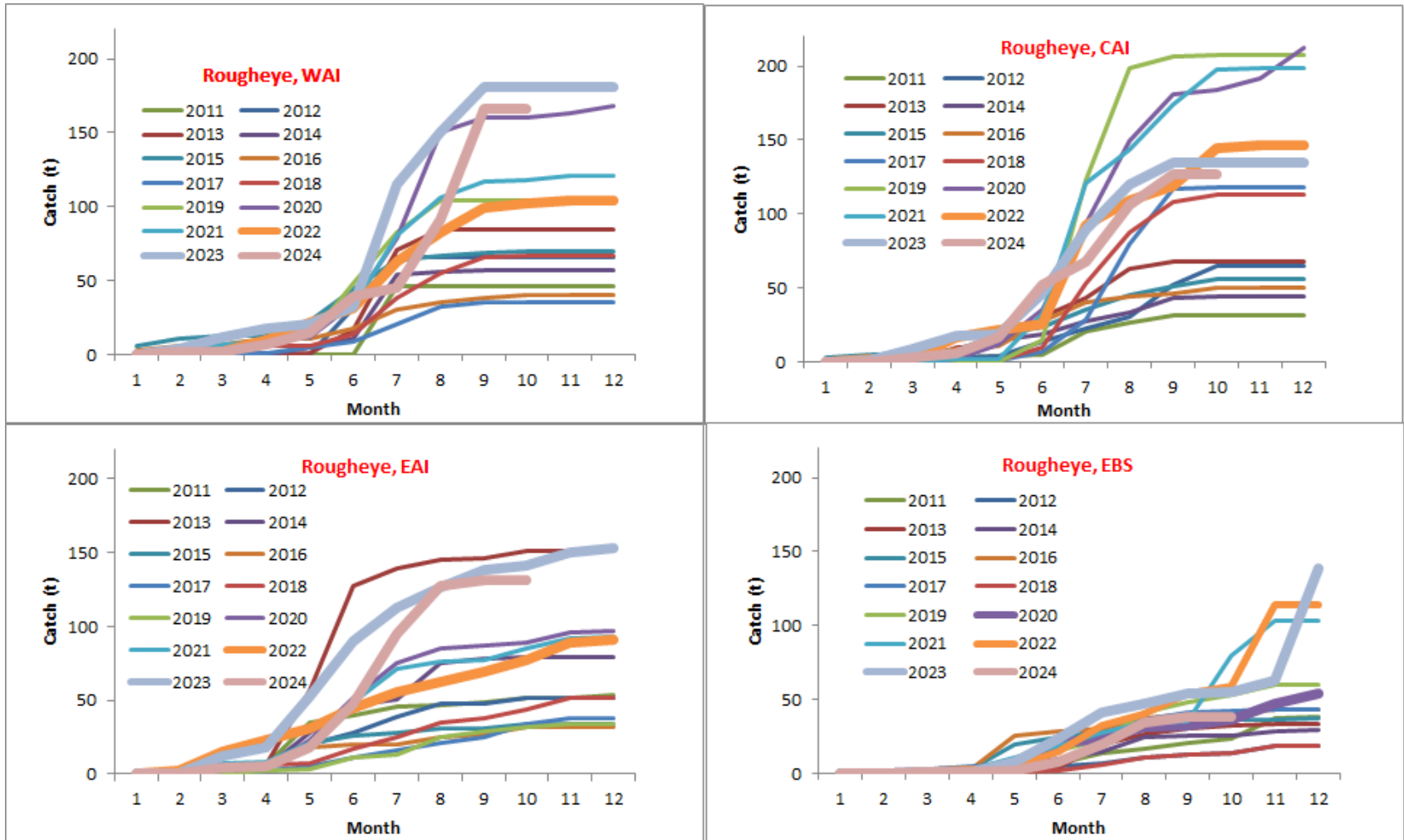


BSAI catch has increased since 2016

2024 catch is highest on record (through Nov 2)



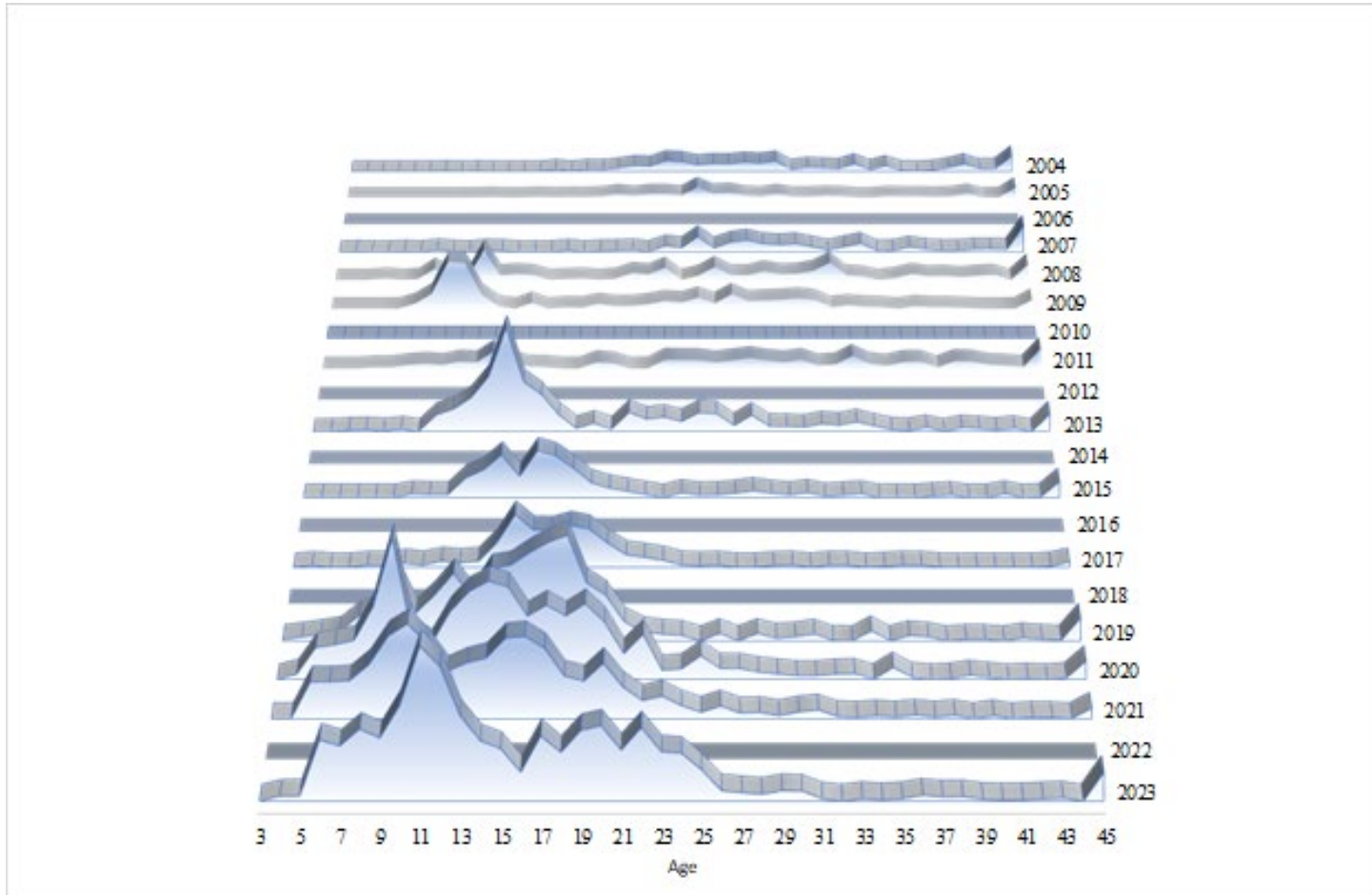
BSAI Blackspotted/Rougheye catch by month and area, 2011-2024



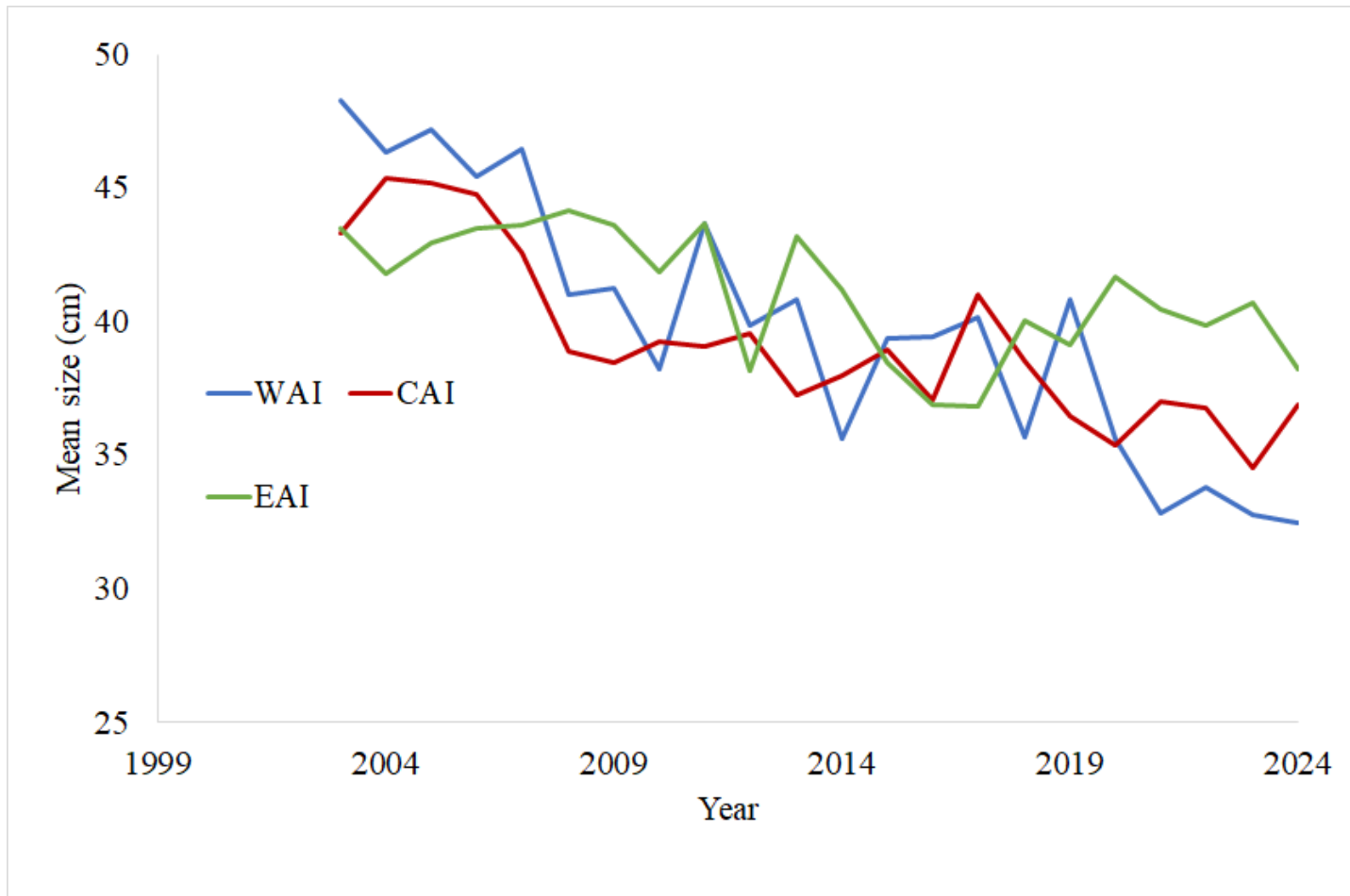
Data in assessment model

Component	Years
Fishery catch	1977- 2024
Fishery age composition	2004-2005, 2007-2009, 2011, 2013 , 2015, 2017, 2019-2021, 2023
Fishery size composition	1979, 1990, 1992-1993, 2003, 2010, 2012, 2014, 2016, 2018, 2022
AI Survey age composition	1991, 1994, 1997, 2000, 2002, 2004, 2006, 2010, 2012, 2014, 2016, 2018, 2022
AI Survey length composition	2024
AI Survey biomass estimates	1991, 1994, 1997, 2000, 2002, 2004, 2006, 2010, 2012, 2014, 2018, 2022, 2024

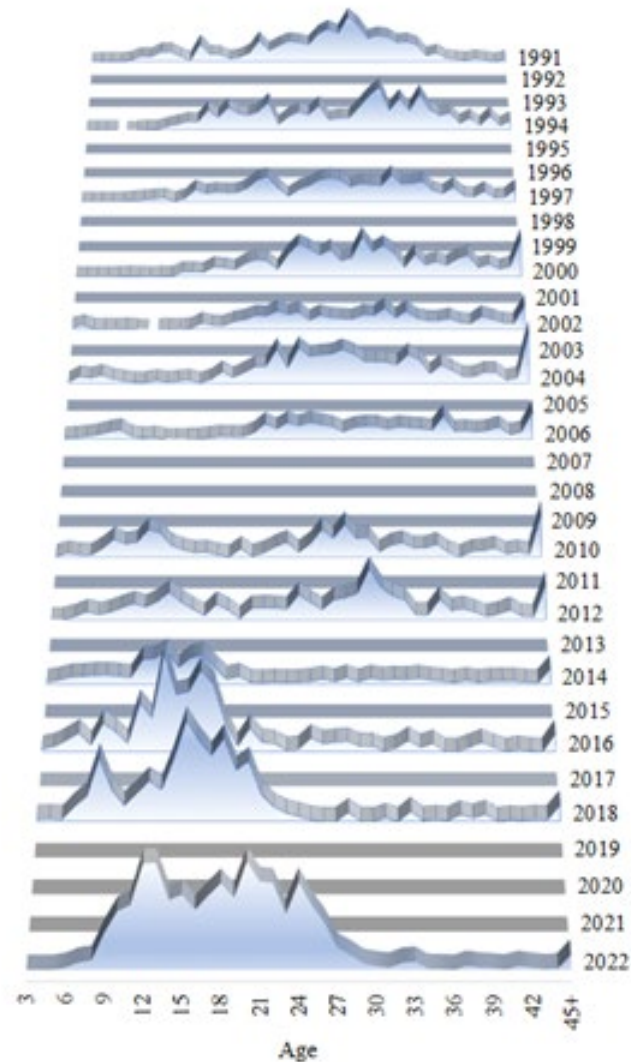
AI blackspotted/rougheye fishery age composition data



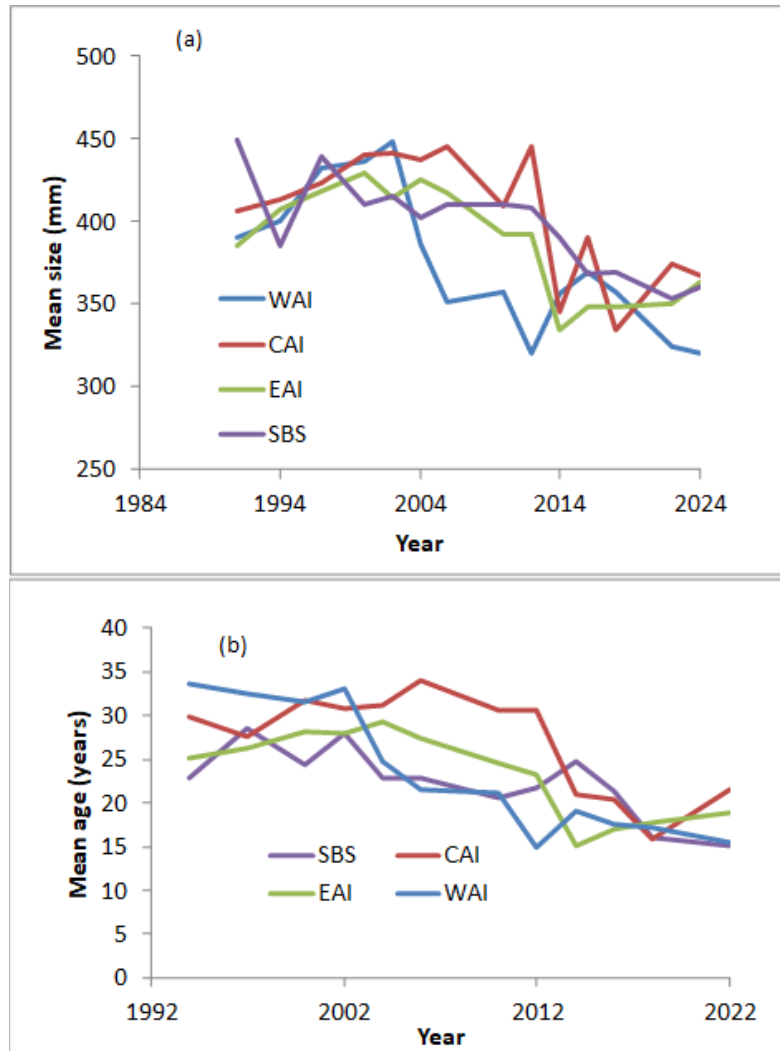
Decline in mean size caught in the fishery (but more stable last several years)



Absence of older fish in recent AI surveys

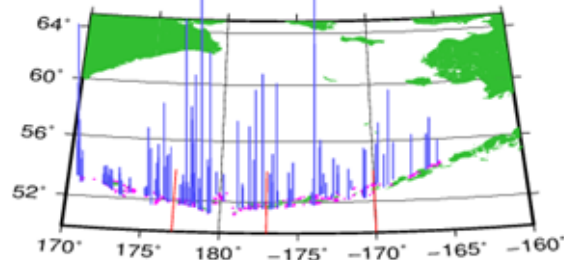


Reductions in fish size and age in AI survey

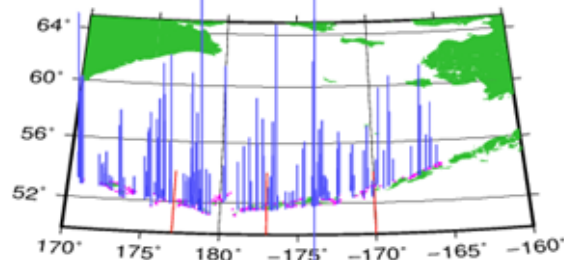


AI survey CPUE, 2018 – 2024 AI surveys

2018 AI Survey Blackspotted/Rougheye Rockfish CPUE (scaled sqrt wgt/km²)



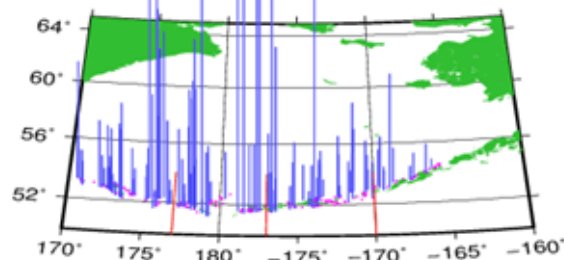
2022 AI Survey Blackspotted/Rougheye Rockfish CPUE (scaled sqrt wgt/km²)



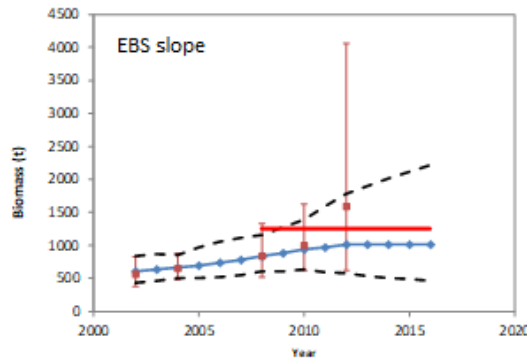
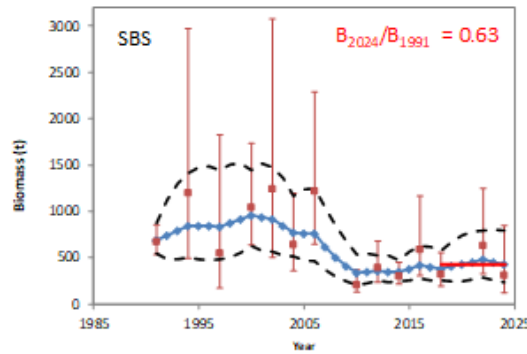
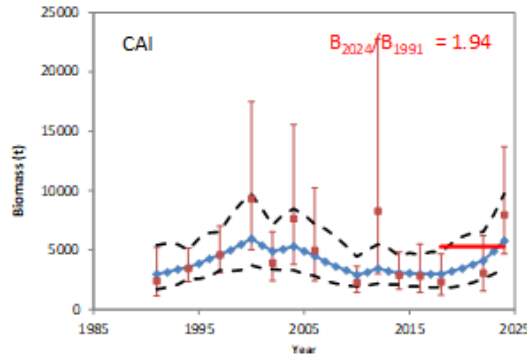
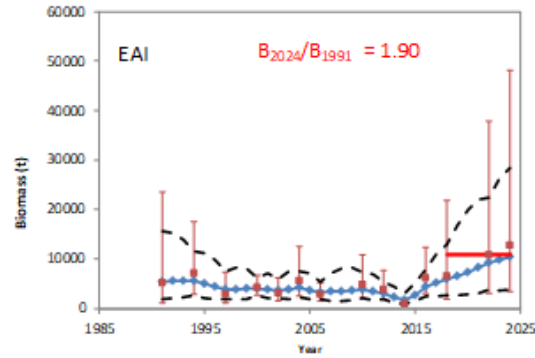
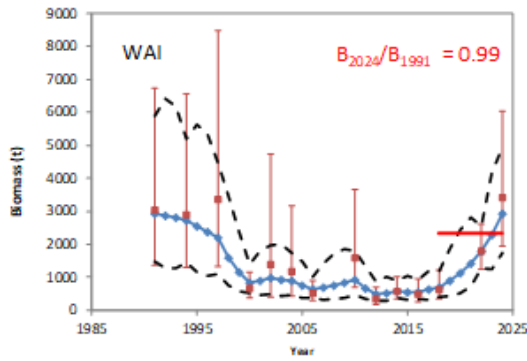
Survey biomass estimates and CVs

Year	Western	Central	Eastern	southern BS	Total AI survey
2018	632 (0.34)	2,438 (0.36)	6,535 (0.68)	328 (0.27)	9,843 (0.46)
2022	1,793 (0.19)	3,056 (0.37)	10,834 (0.71)	643 (0.35)	16,325 (0.48)
2024	3,417 (0.30)	7,972 (0.28)	12,698 (0.77)	323 (0.52)	24,410 (0.41)

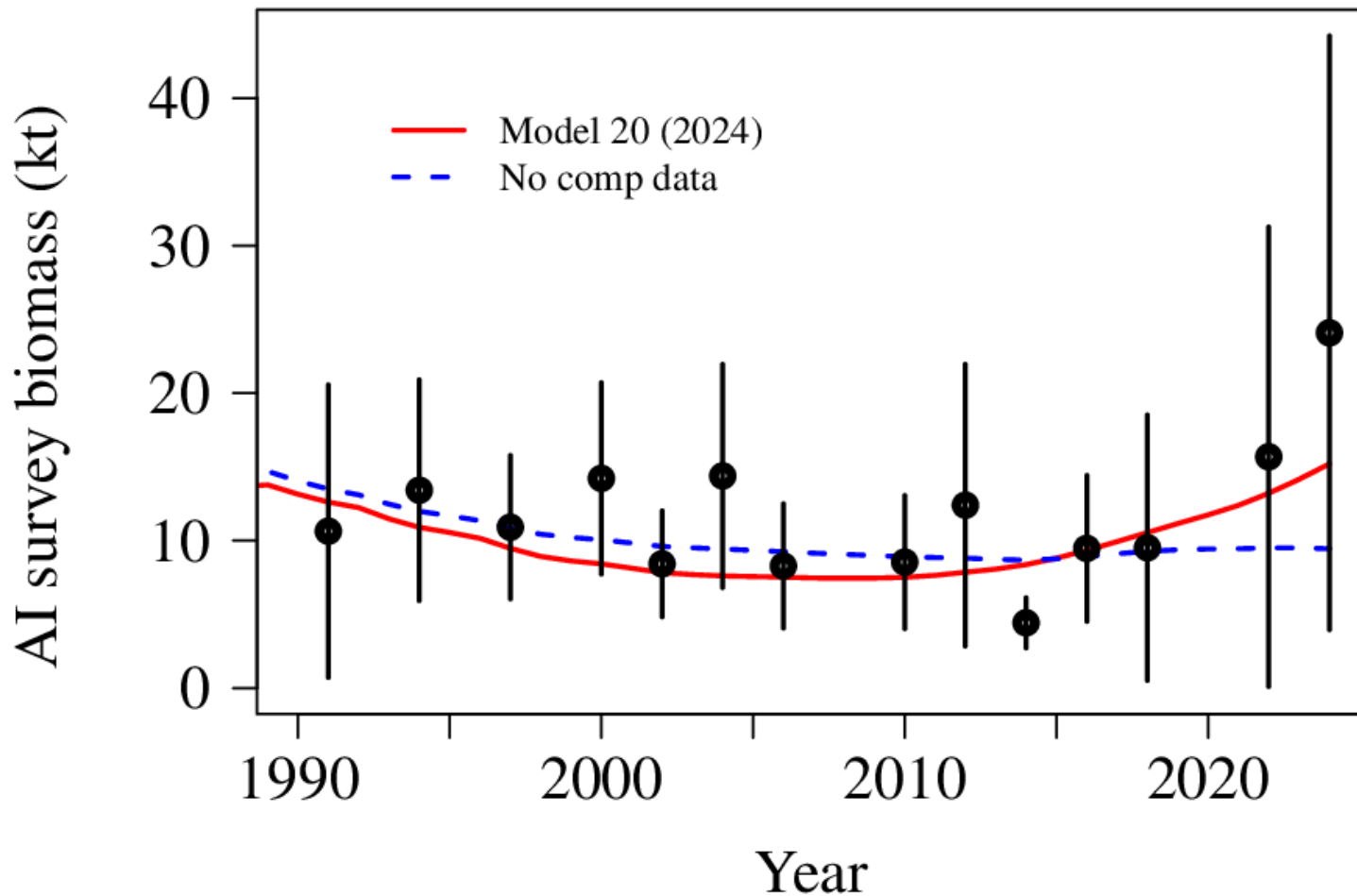
2024 AI Survey Blackspotted/Rougheye Rockfish CPUE (scaled sqrt wgt/km²)



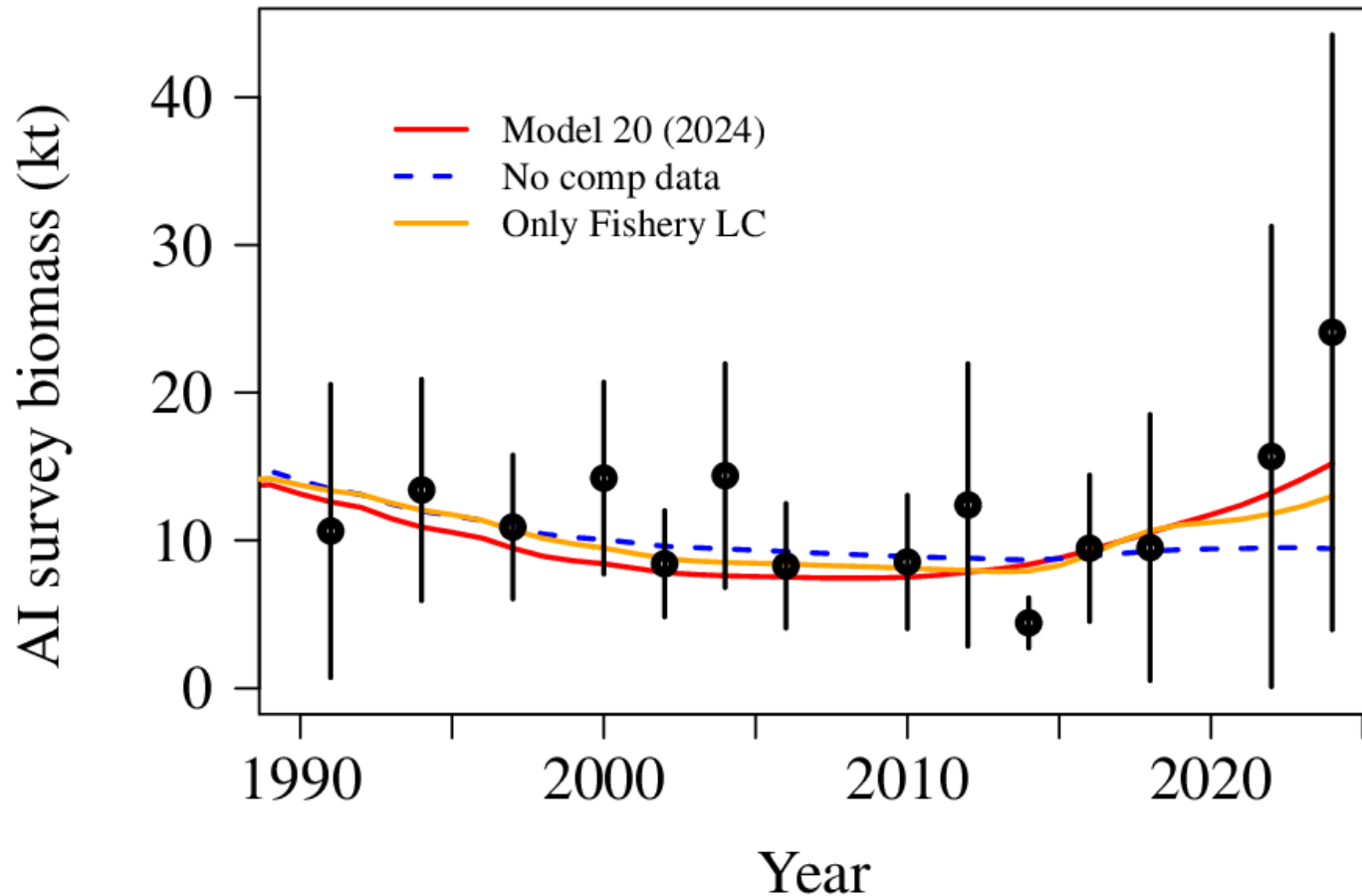
Smoothed survey biomass estimates



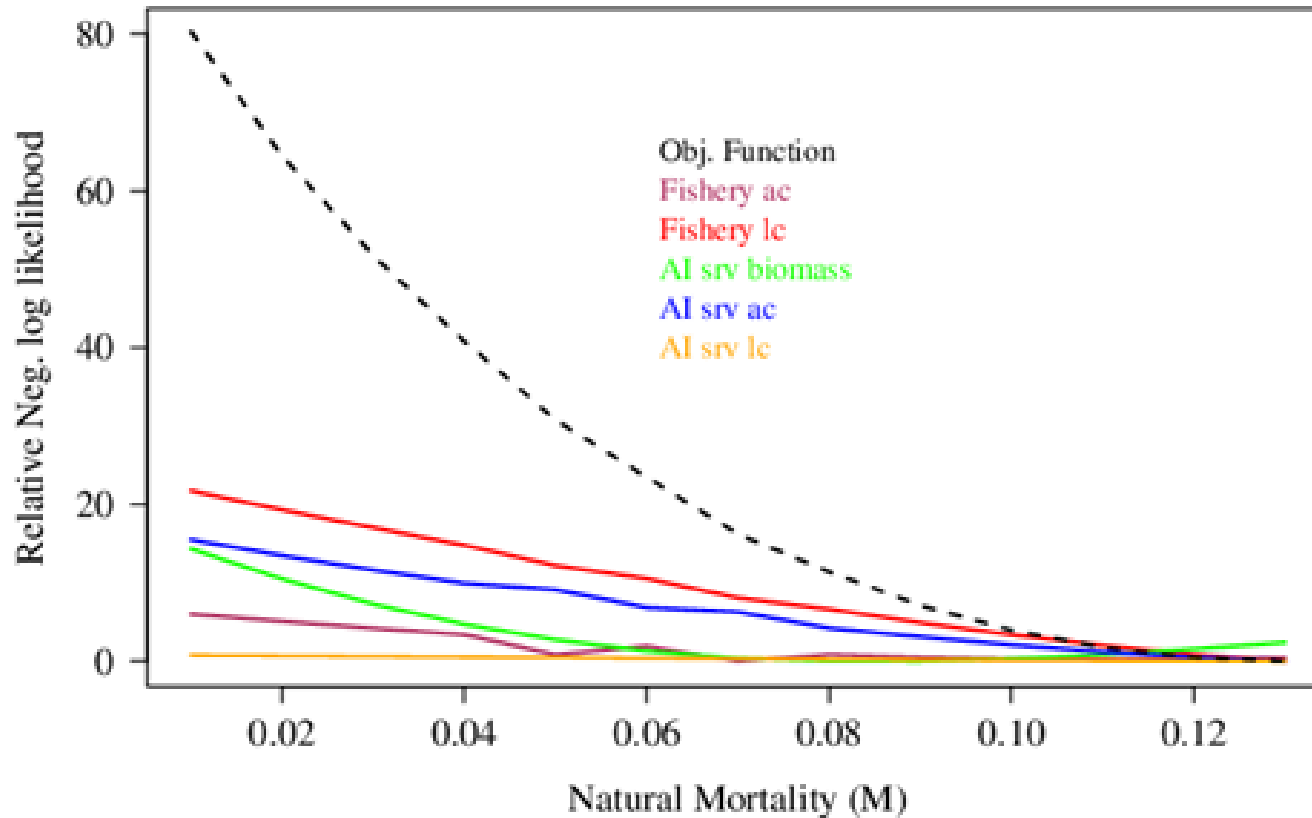
Sensitivity analyses – drop data sets



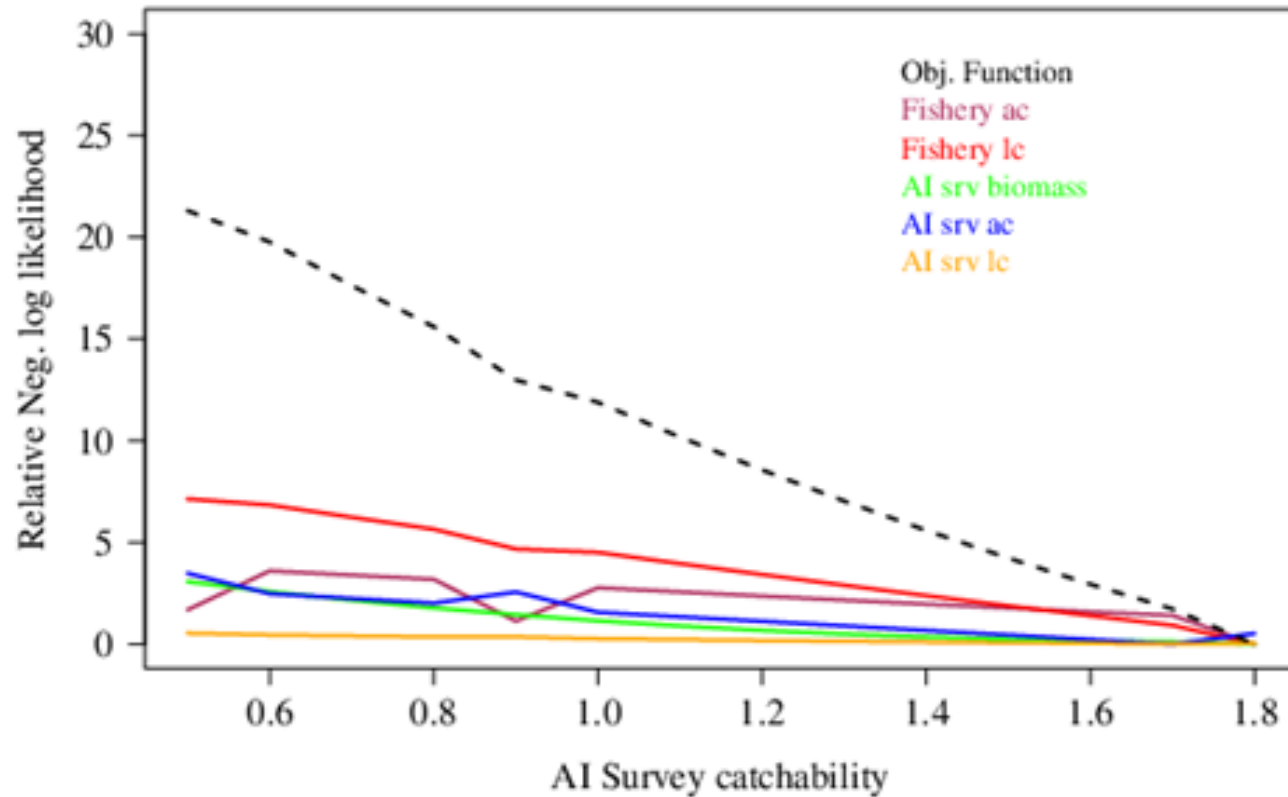
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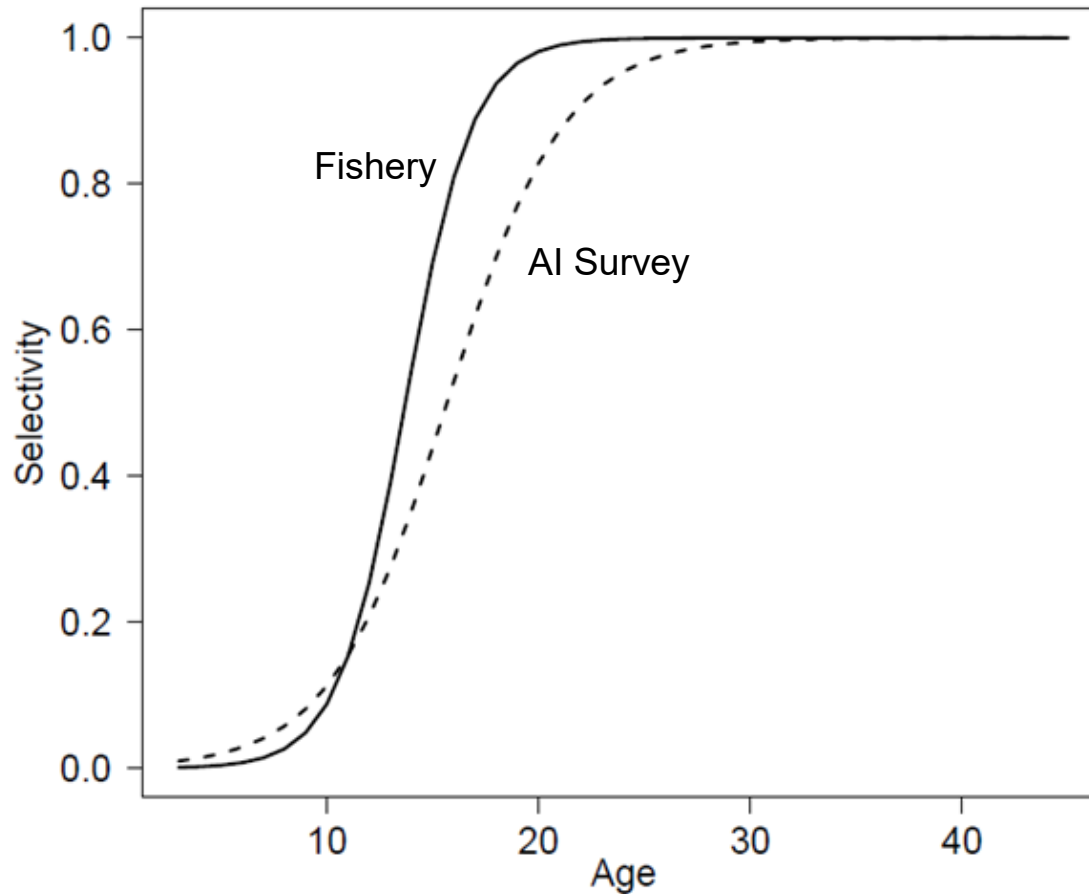
Likelihood profile – natural mortality



Likelihood profile – AI survey catchability

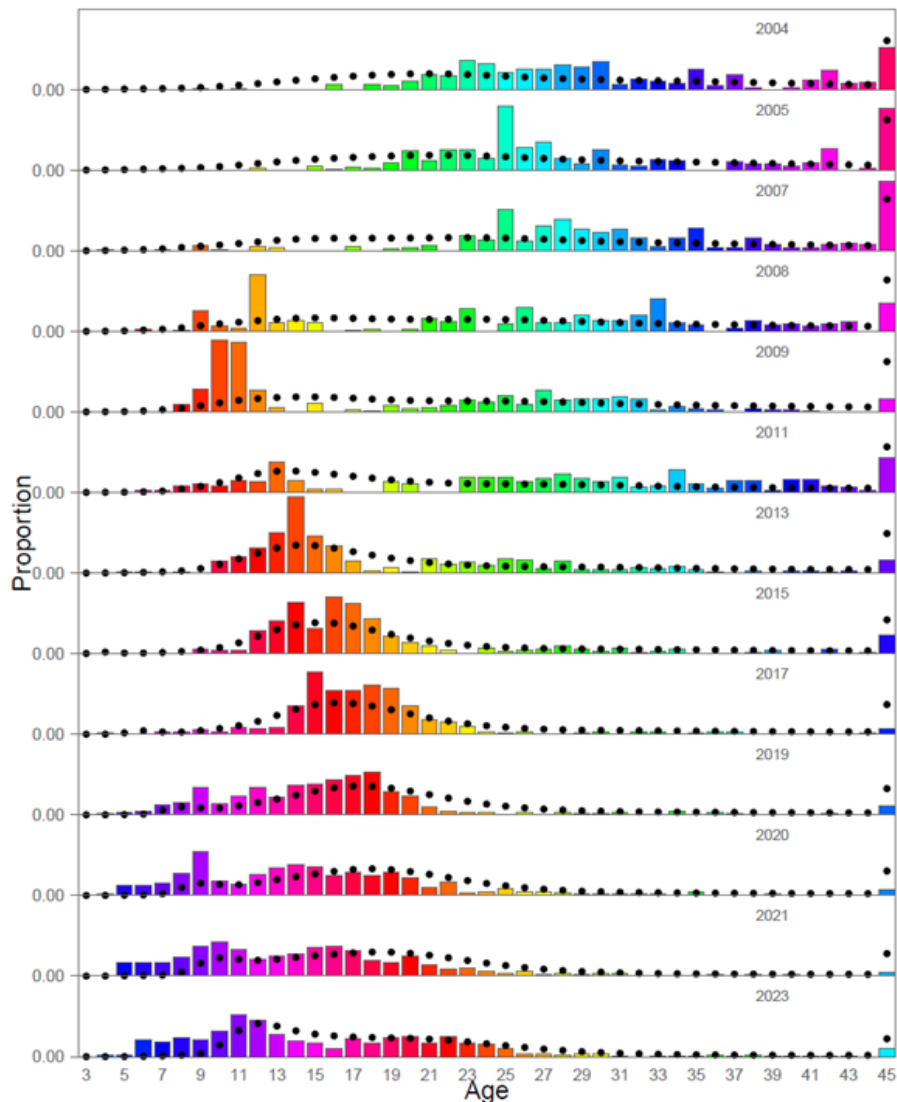


Selectivity Curves

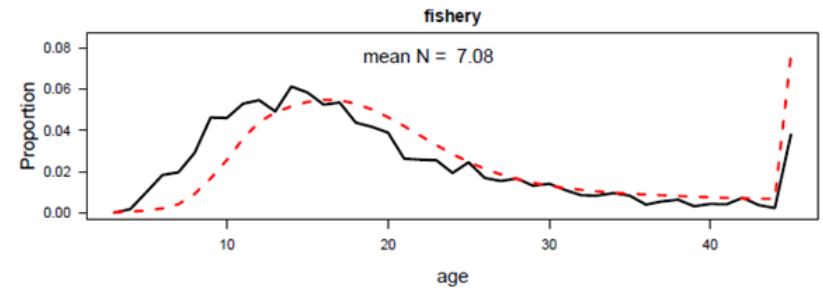


Fits to fishery age compositions

Fishery age composition data

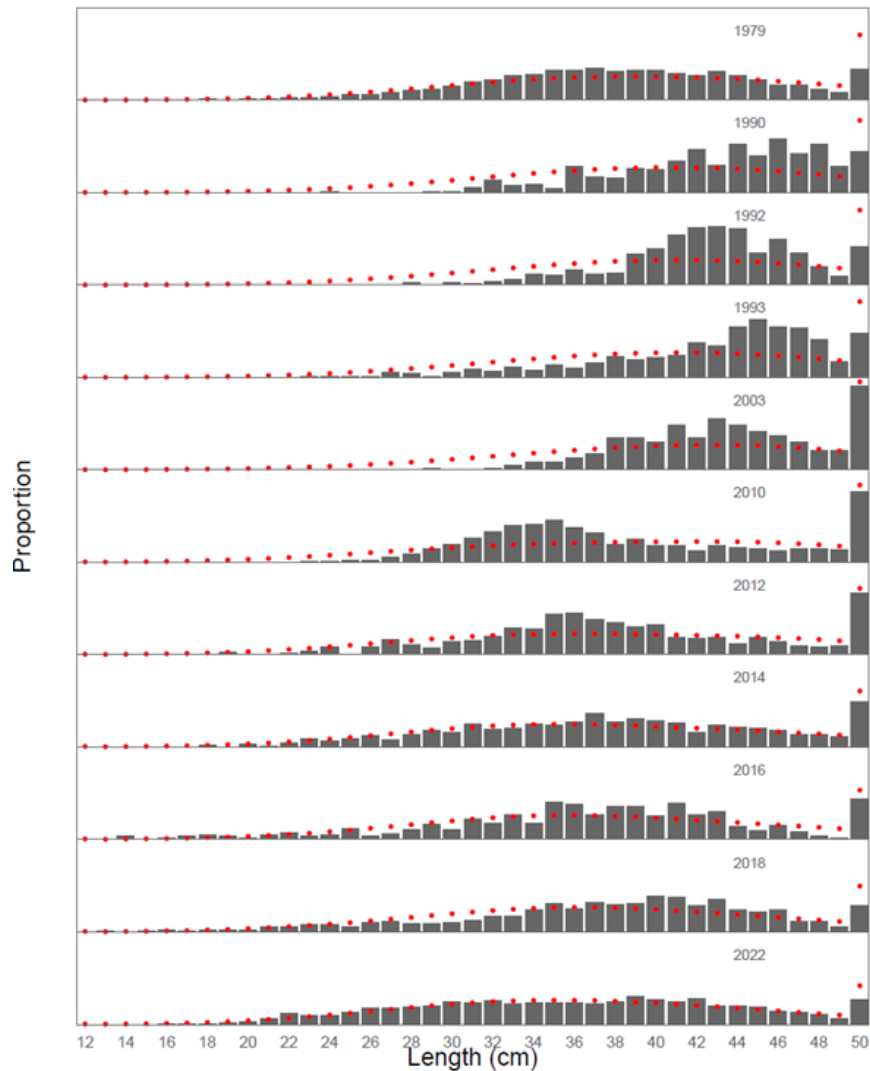


Aggregate fit

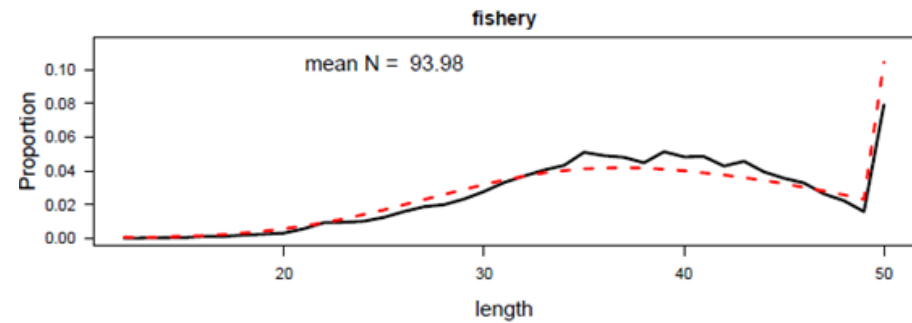


Fits to fishery length compositions

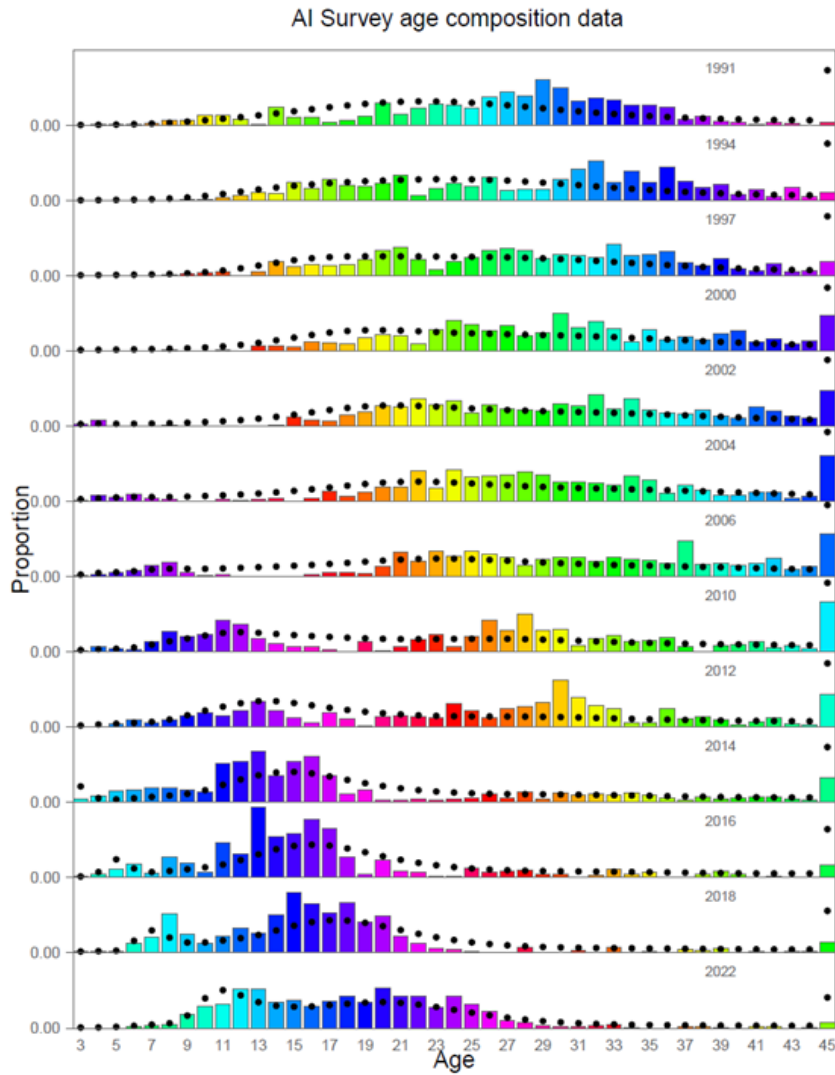
Fishery length composition data



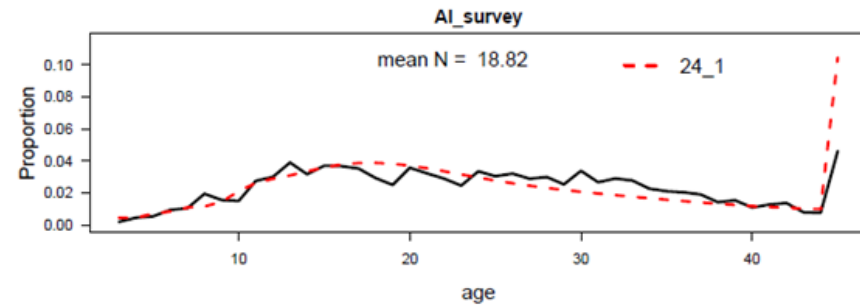
Aggregate fit



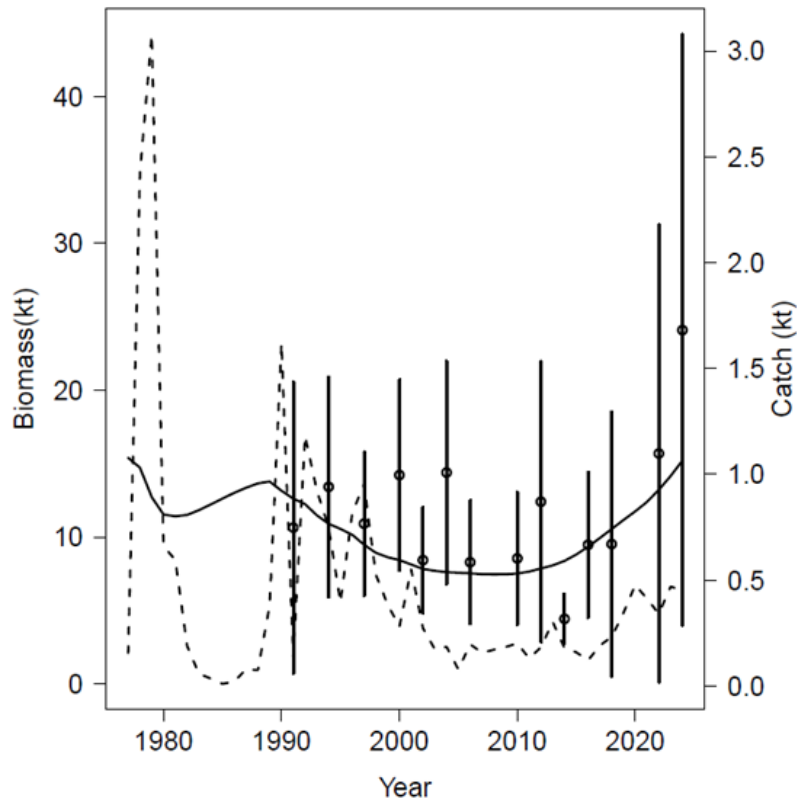
Fits to survey age compositions



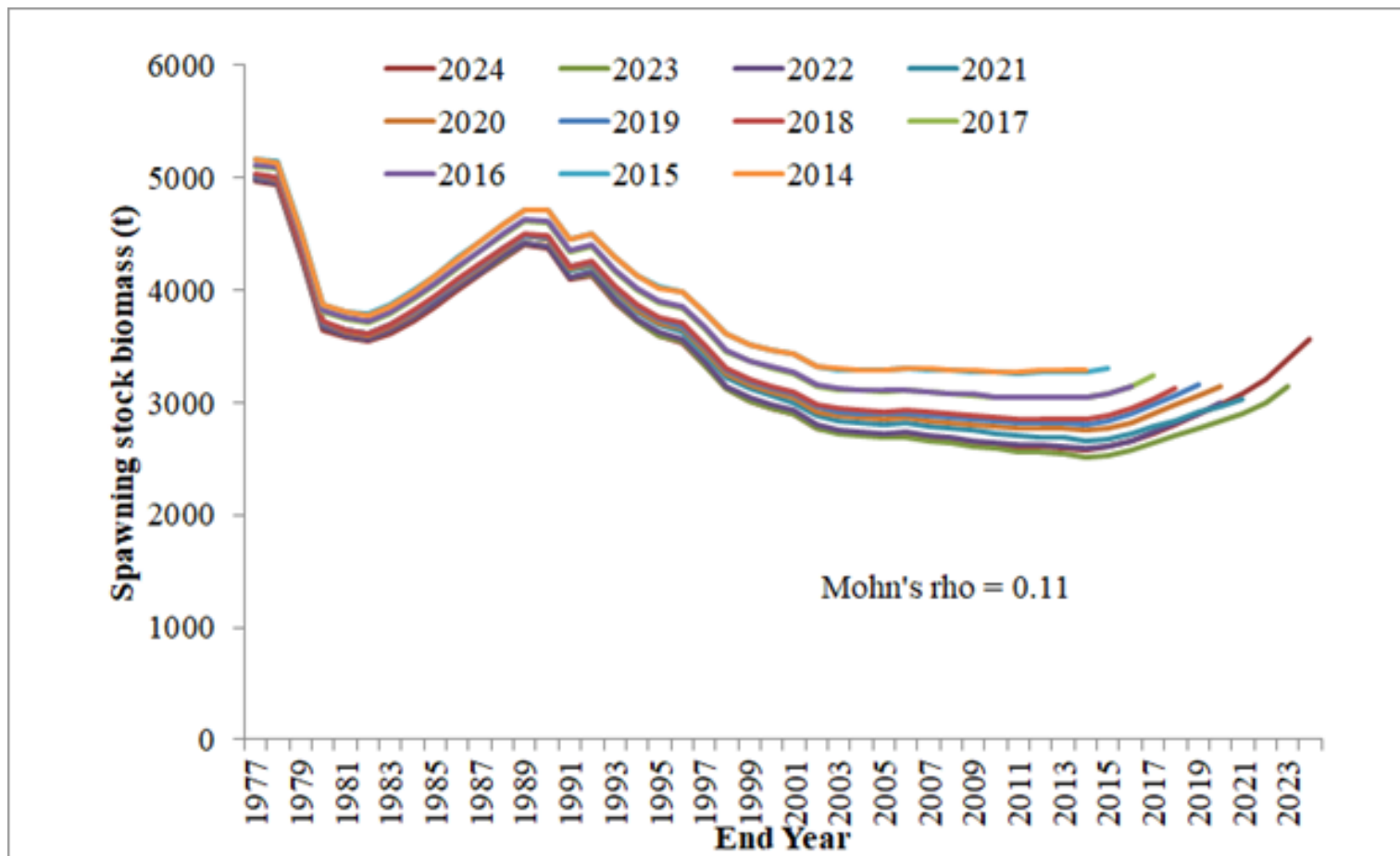
Aggregate fit



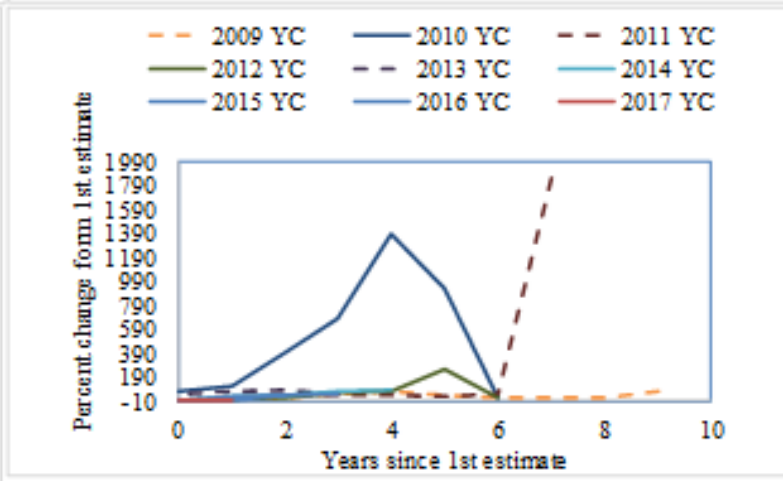
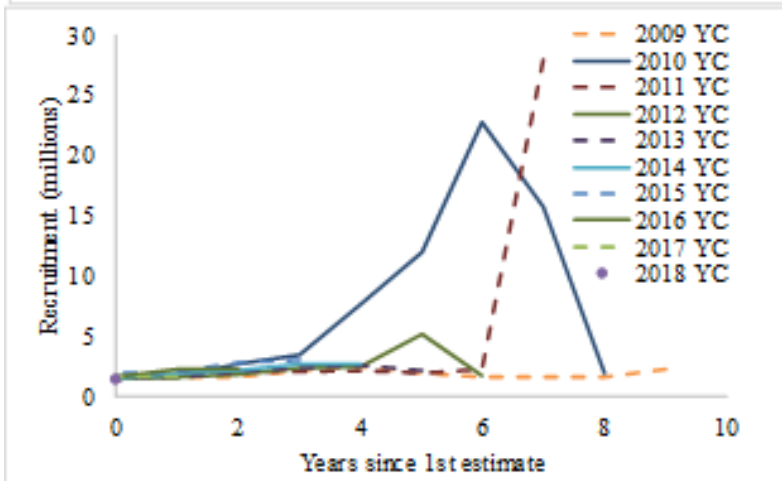
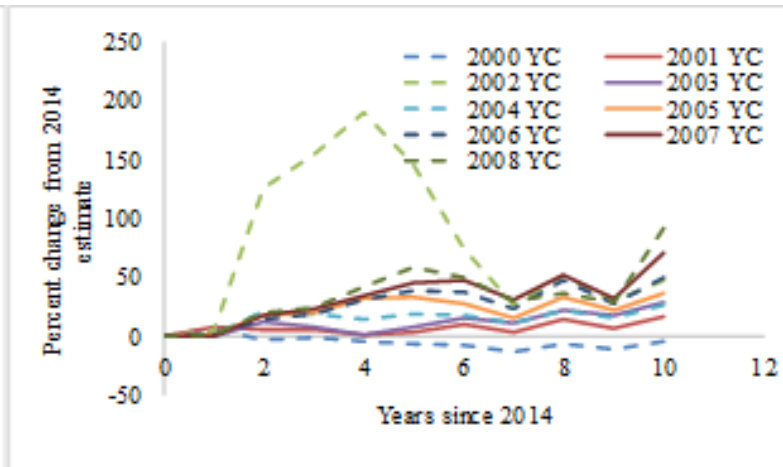
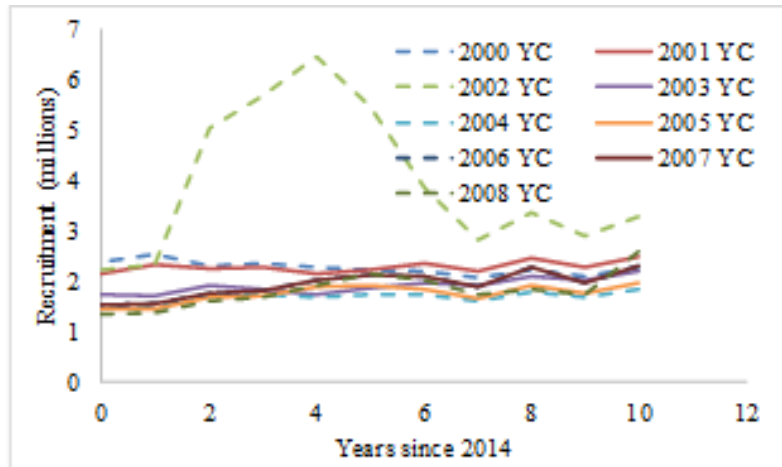
Fit to the AI survey biomass



Retrospective pattern in SSB

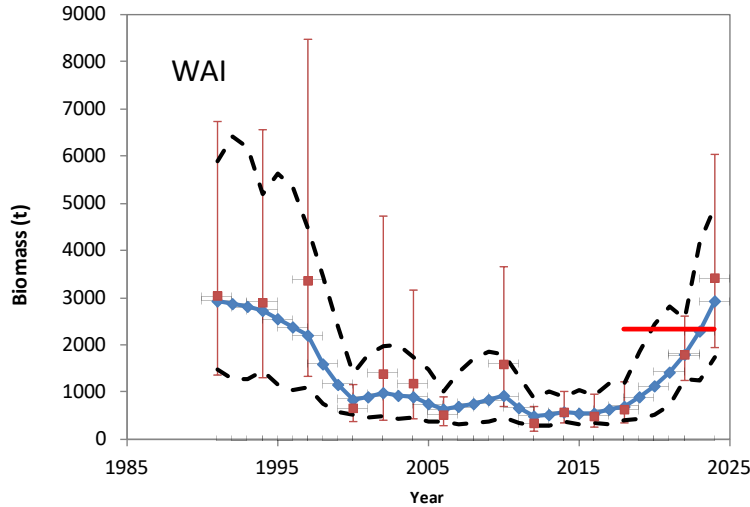


Retrospective pattern in estimated recruitments

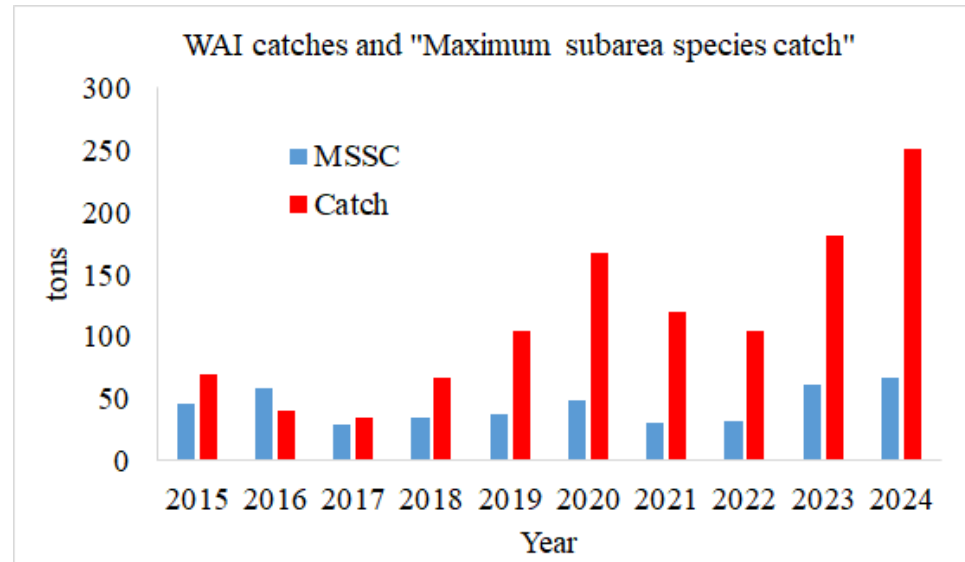


Monitoring of WAI catch relative to MSSC

Requested by SSC (Oct 2016, Dec 2016)



Year	MSSC	Catch	Catch/MSSC
2015	46	70	1.51
2016	58	40	0.69
2017	29	35	1.21
2018	35	67	1.91
2019	37	104	2.81
2020	48	168	3.50
2021	31	120	3.89
2022	32	104	3.25
2023	61	181	2.97
2024	67	251	3.75



MSSC evaluation, BSAI Plan Team

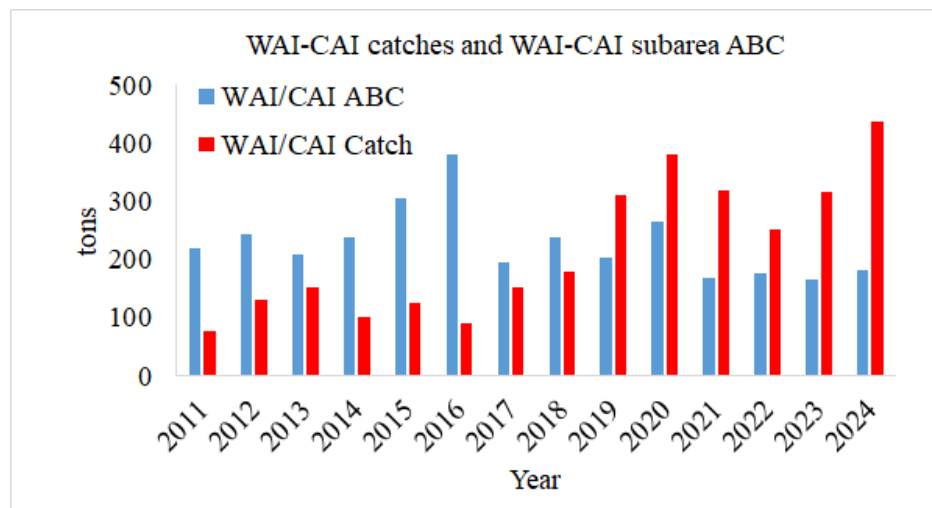
For blackspotted/rougheye rockfish the Team discussed the continued spatial management concerns with this stock and the lack of sufficient tools (MSSC) to address this.

BSAI Plan Team, November 2023

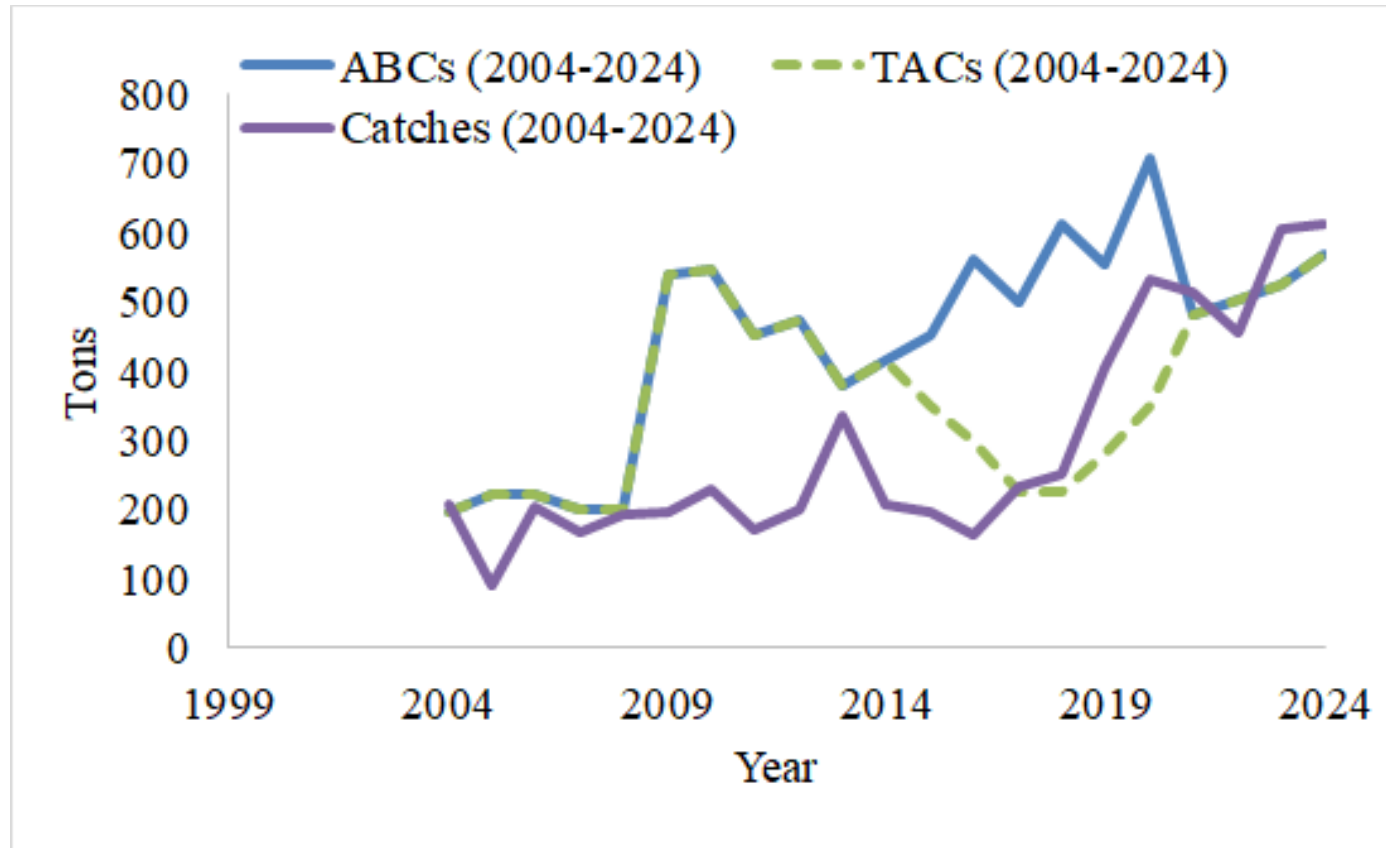
The recent catch has also frequently exceeded the WAI/CAI subarea ABC, and the BSAI stock-wide ABC.

Monitoring of WAI-CAI catch relative to WAI-CAI subarea ABC

Year	WAI/CAI ABC	WAI/CAI Catch	Catch/(WAI-CAI ABC)
2011	220	77	0.35
2012	244	130	0.53
2013	209	152	0.73
2014	239	101	0.42
2015	304	125	0.41
2016	382	89	0.23
2017	195	153	0.78
2018	239	180	0.75
2019	204	311	1.53
2020	264	380	1.44
2021	169	319	1.89
2022	177	250	1.41
2023	166	316	1.90
2024	181	438	2.42



BSAI Catch, TACs, and ABCs (back to 2004)



Risk table considerations

- Assessment considerations: “data-inputs: biased ages, **skipped surveys**, lack of fishery-independent trend data; model fits: **poor fits to fishery or survey data, inability to simultaneously fit multiple data inputs**; model performance: poor model convergence, multiple minima in the likelihood surface, parameters hitting bounds; estimation uncertainty: **poorly-estimated but influential year classes; retrospective bias in biomass estimates.**
- Level 2: Increased Concern. **Very poor fits to data; Substantially increased assessment uncertainty/ unresolved issues, such as residual patterns** and mortality for older fish; positive retrospective bias that is variable between assessments.

Risk table considerations

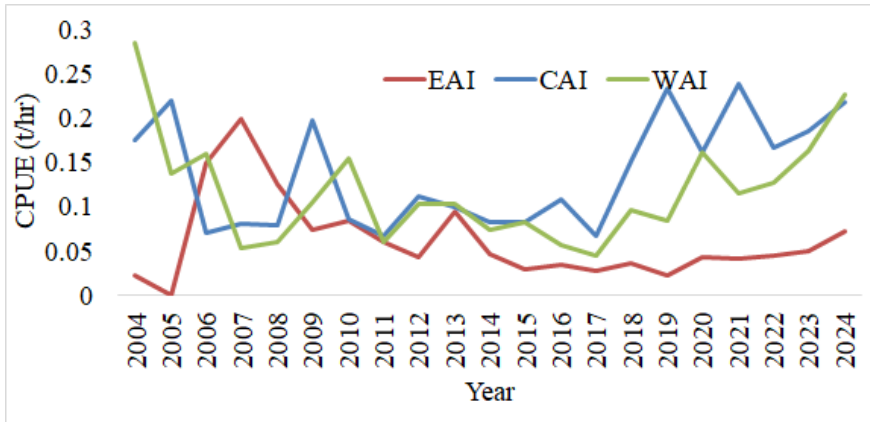
- Population dynamics considerations: “decreasing biomass trend, poor recent recruitment, inability of the stock to rebuild, abrupt increase or decrease in stock abundance.
- Level 2: Increased concerns. Stock trends are unusual; trends increasing or decreasing faster than has been seen recently, or patterns are atypical.

Also, existing spatial management measures are generally inconsistent with the relatively smaller spatial structure of Pacific rockfish

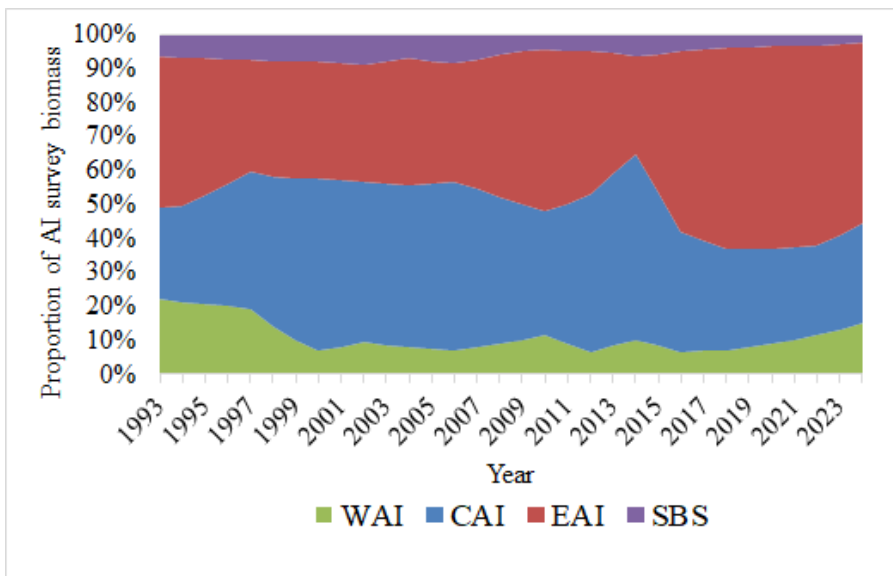
Risk table considerations

- Environmental/ecosystem considerations: *“adverse trends in environmental/ecosystem indicators, ecosystem model results, decreases in ecosystem productivity, decreases in prey abundance or availability, increases or increases in predator abundance or productivity.”*
- Level 1: Normal. *“We rank the environmental/ecosystem considerations as a 1 (Normal; No apparent environmental/ecosystem concerns) aside from the recent stretch of increased temperatures.”*

Fishery CPUE by subarea



Tons/hr, from tows targeting POP based on haul species composition. Source: North Pacific Groundfish Observer Program.

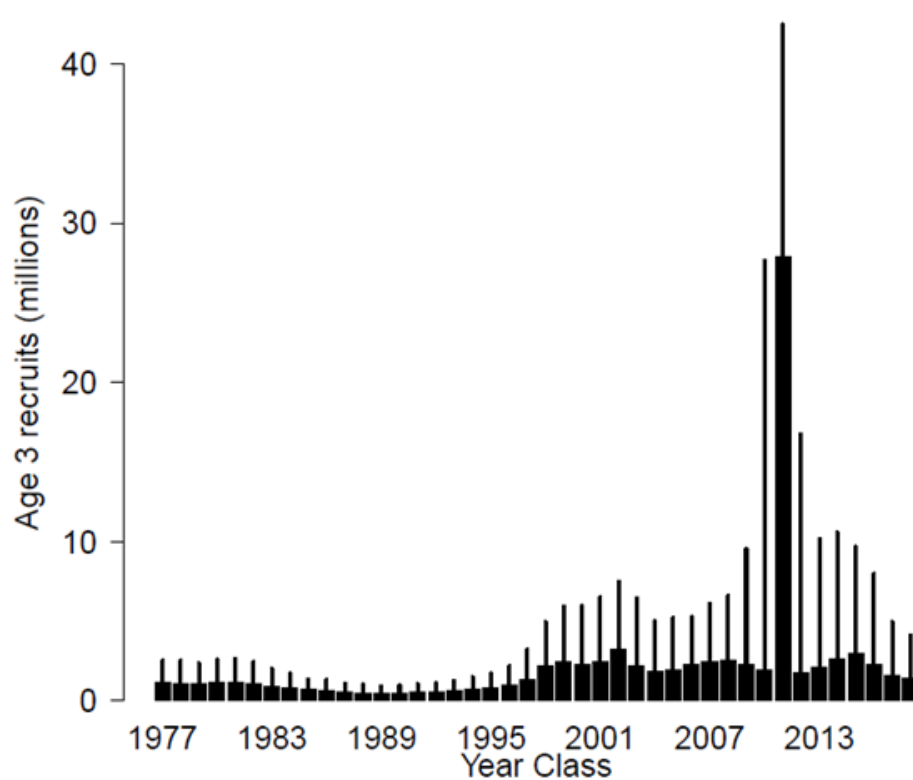


Fishery CPUEs are higher in the WAI than one would expect from the distribution of survey biomass

Risk table considerations

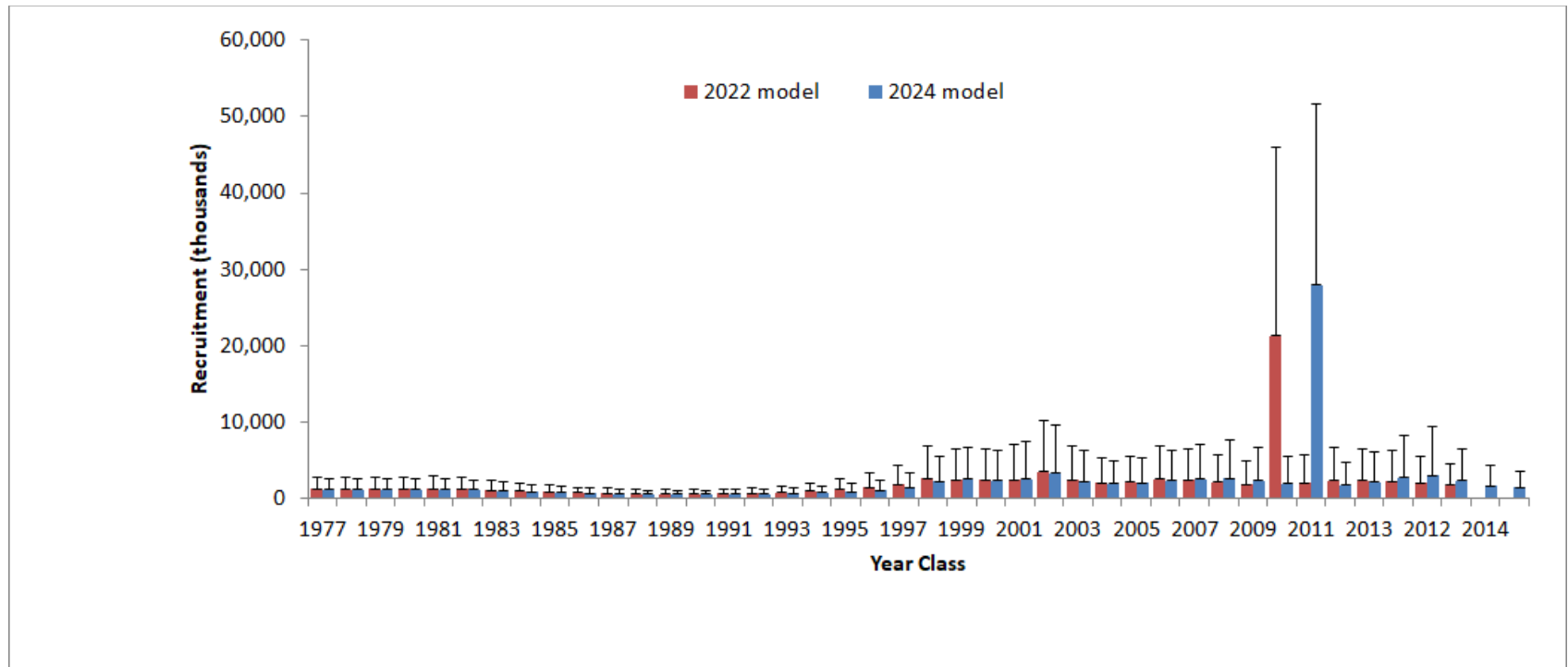
- Fishery performance considerations: “fishery CPUE is showing a contrasting pattern from the stock biomass trend, unusual spatial pattern of fishing, changes in the percent of TAC taken, changes in the duration of fishery openings.”
- Level 2: Increased concerns. Fishery CPUE in the WAI subarea are larger than would be expected based on the spatial distribution of survey biomass estimates. Also, the WAI catches have consistently exceeded the MSSC, and these overages have increased over time. The catches in the WAI/CAI subarea have also exceeded the subarea ABC from 2019 – 2024, and the BSAI ABC in 2021 and 2023-2024.

Estimation of recruitment



The 2011 year class is 27.96 million (CV of 0.58), which is > 8 times the next largest year class

Estimation of recruitment – comparison with 2022 model



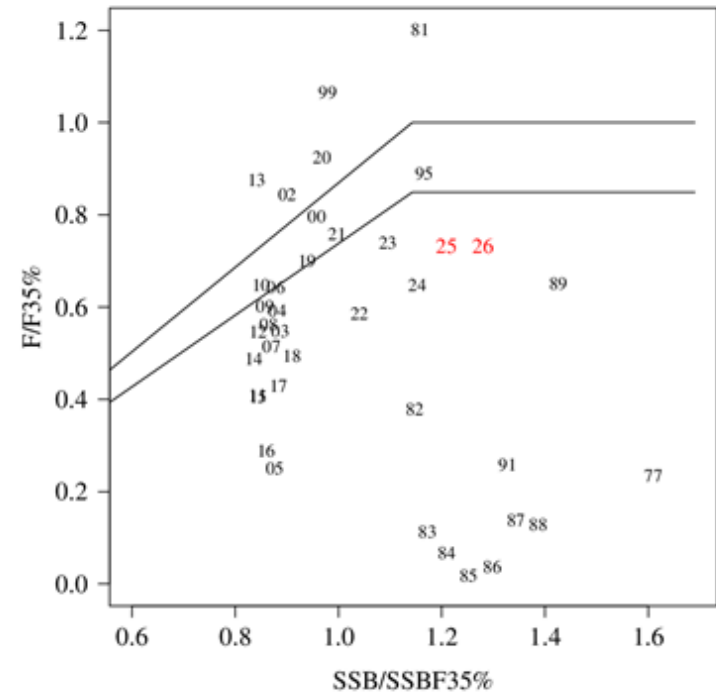
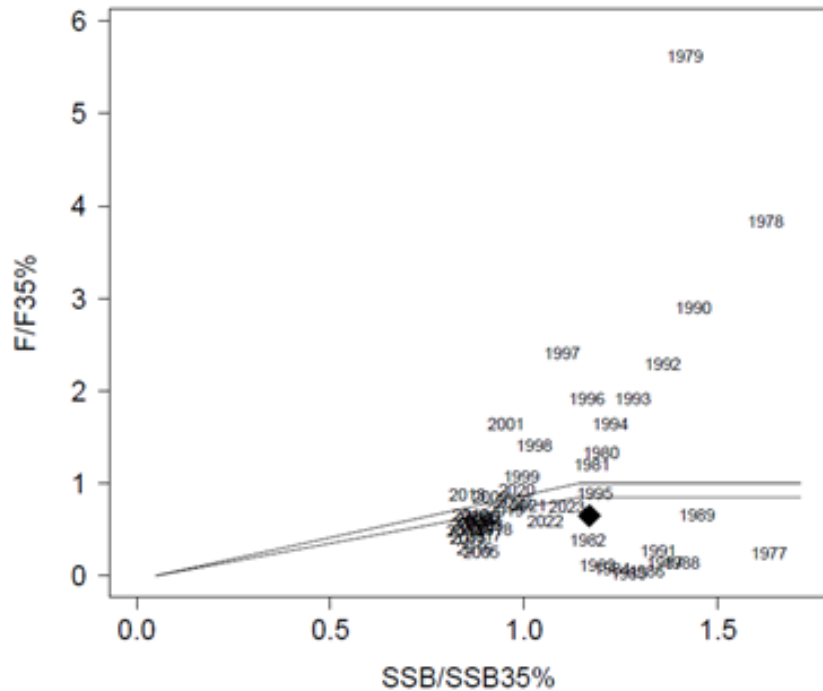
The effect of this year class on B40% and ABC

- If we apply our standard procedures, B40% increases sharply, and F_{abc} decreases sharply, despite little change in estimated SSB
- If we adjust the 2011 year class when computing mean recruitment to a more likely value, the B40% is stabilized
- We propose to set the value of the 2011 year class to the next largest (3.27 million, 2002 year class) for the purpose of stabilizing B40%. This procedure was also followed in the 2022 assessment

The effect of this year class on B40% and ABC

	2023 projection	2024 assessment	
	Adjusted 2010 YC used for $B_{40\%}$	Unadjusted 2011 YC used for $B_{40\%}$	Adjusted 2011 YC used for $B_{40\%}$
$B_{40\%}$	3,493		
$B_{40\%}$ (2024 assessment)		5,118	3,525
Percent change in $B_{40\%}$, 2022 to 2024		46.52%	0.92%
2024 SSB	3,630		
2025 SSB		3,732	3,729
2026 SSB		3,966	3,946
$B_{2024}/B_{40\%}$	1.04		
$B_{2025}/B_{40\%}$		0.73	1.06
$B_{2026}/B_{40\%}$		0.77	1.12
2024 Total Biomass	24,315		
2025 Total Biomass		28,356	28,314
2026 Total Biomass		29,004	28,814
2024 Fabc	0.034		
2025 Fabc		0.025	0.035
2026 Fabc		0.027	0.035
2024 maximum ABC	583		
2025 maximum ABC		468	652
(percent change 2024 to 2025)		-19.73%	11.84%
2026 maximum ABC		547	712
(percent change 2024 to 2025)		16.88%	9.20%

Phase plane (with adjusted 2011 year class)



Rationale for the no reduction from max ABC

- 1) Large 2024 AI survey biomass estimate (continuing a trend since the 2018 survey)
- 2) Continued presence of small/medium size/age fish in the fishery and survey composition data
- 3) The 2024 survey biomass estimate is consistent with recent composition data, which led to an improved retrospective pattern
- 4) The procedure we used in 2022 for a reduction from the max ABC, if applied in 2024, would produce a similar value to the max ABC.

Harvest spec table, AI subarea

Quantity	As estimated or <i>specified</i> last year for:		As estimated or <i>recommended</i> this year for:	
	2024	2025	2025*	2026*
<i>M</i> (natural mortality rate)	0.050	0.050	0.050	0.050
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass (t)	24,315	24,743	28,314	28,814
Female spawning biomass (t)				
Projected	3,630	3,821	3,729	3,946
<i>B</i> _{100%}	8,733	8,733	8,813	8,813
<i>B</i> _{40%}	3,493	3,493	3,525	3,525
<i>B</i> _{35%}	3,056	3,056	3,085	3,085
<i>F</i> _{OFL}	0.040	0.040	0.041	0.041
<i>maxF</i> _{ABC}	0.034	0.034	0.035	0.035
<i>F</i> _{ABC}	0.034	0.034	0.035	0.035
OFL (t)	684	736	766	830
maxABC (t)	583	627	652	712
ABC (t)	511	549	652	712
Status	As determined <i>last</i> year for:		As determined <i>this</i> year for:	
	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

Recommended 2025 AI ABCs and OFLs

AI ABC: 652 t (increase from 2024 ABC of 511 t)

AI OFL: 766 t (increase from 2024 OFL of 684 t)



EBS portion table

Quantity	As estimated or <i>recommended last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2024	2025	2025	2026
<i>M</i> (natural mortality rate)	0.050	0.050	0.050	0.050
Tier	5	5	5	5
Biomass (t)	1544	1544	1444	1444
<i>F_{OFL}</i>	0.050	0.050	0.050	0.050
<i>maxF_{ABC}</i>	0.037	0.037	0.037	0.037
<i>F_{ABC}</i>	0.037	0.037	0.037	0.037
OFL (t)	77	77	72	72
maxABC (t)	58	58	54	54
ABC (t)	58	58	54	54
Status	As determined <i>last year for</i>		As determined <i>this year for:</i>	
	2022	2023	2023	2024
Overfishing	No	No	No	n/a

Plan Team table

Area/subarea	Year	Total				
		Biomass (t) ¹	OFL	ABC	TAC	Catch ²
BSAI	2023	25,400	703	525	525	607
	2024	25,859	761	569	569	463
	2025	29,758	838	706	n/a	n/a
	2026	30,258	902	766	n/a	n/a
Western/Central Aleutian Islands	2023			166	166	316
	2024			181	181	293
	2025			298	n/a	n/a
	2026			325	n/a	n/a
Eastern AI/Eastern Bering Sea	2023			359	359	291
	2024			388	388	170
	2025			408	n/a	n/a
	2026			441	n/a	n/a

MSSC calculations

Spatial apportionment (from 2022 assessment)

	WAI	CAI	Area		
			EAI	SBS	EBS slope
Smoothed biomass	1,671	2,887	8,282	534	1,010
percentage (within AI subarea)	13.0%	22.5%	64.5%		

Spatial apportionment from (2024 assessment)

	WAI	CAI	Area		
			EAI	SBS	EBS slope
Smoothed biomass	2,913	5,788	10,366	433	1,011
percentage (within AI subarea)	15.3%	30.4%	54.4%		

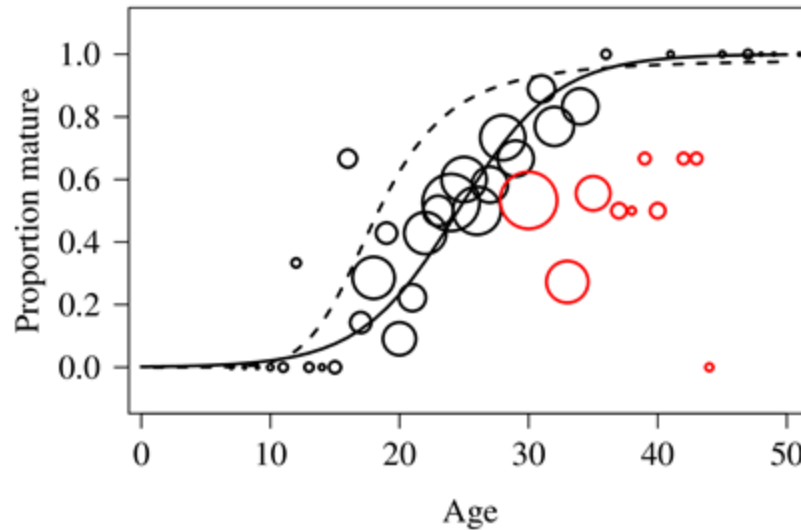
MSSCs (from 2024 assessment)

Year	Area				
	WAI	CAI	WAI/CAI		Total
	MSSC	MSSC	ABC	ABC	ABC
2025	100	198	298	408	706
2026	109	216	325	441	766

Conclusions

- Continued issue with estimating recent year classes that are incompletely observed.
- Large increase in 2024 survey biomass estimate, and improved retrospective pattern.
- Poor fits to the composition data and the survey biomass estimates are concerning. Research models and simulation experiments may be helpful (i.e., data processing, data weighting, variability in observed data from patchy populations).
- Catch overages at multiple spatial scales (MSSC, WAI/CAI, and BSAI) are also of concern.

Estimated maturity



Estimated age at 50% mature = 24.5 years

Estimate proportion mature at 12 years old = 0.035