



BSAI Atka Mackerel

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BSAI Atka Mackerel

Model 16.0b



Changes in the Input Data

- Fishery catch data updated (2018, 2019=TAC)
- **2018** fishery and survey age composition data added
 - **2011 year class** ↓ 2% relative to last year's assessment
 - **2012 year class** ↑ 10% (above ave.)
 - **2013 year class** ↑ 12%
- The est. average selectivity for **2014-2018** used for projections
- Assume 85% of the BSAI-wide ABC to be taken under revised SSL RPAs; % applied to 2020 (and 2021) maxABC for projections

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Key Results

□ Tier 3b

- $B_{100\%}$, $B_{40\%}$, and $B_{35\%}$ are 3% higher
- 2020 spawning biomass (109,900 t) 3% higher, **below** $B_{40\%}$ ($B_{38\%}$), Tier 3b
- 2020 age 1+ biomass 3.5% higher than last year's projection for 2019, and \approx to last year's projection for 2020
- 2020 projections:

Yield at $F_{40\%adj} = 0.41 =$

2020 ABC = 70,100 t **2020 OFL = 81,200 t**

(2% higher than 2019 ABC)

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Model 16.0b (last year's accepted model)

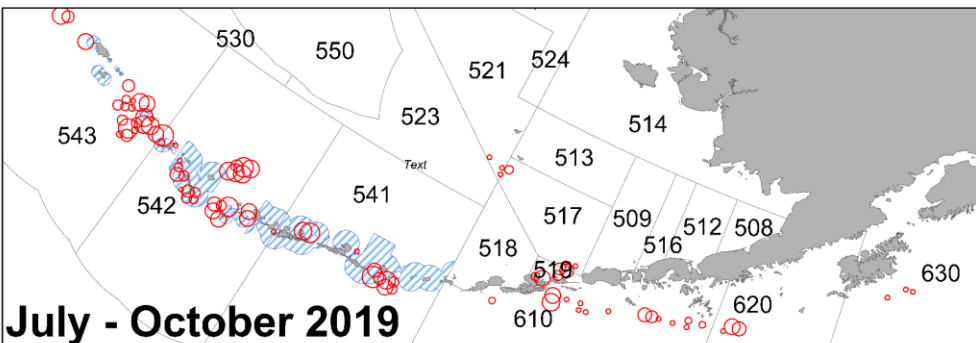
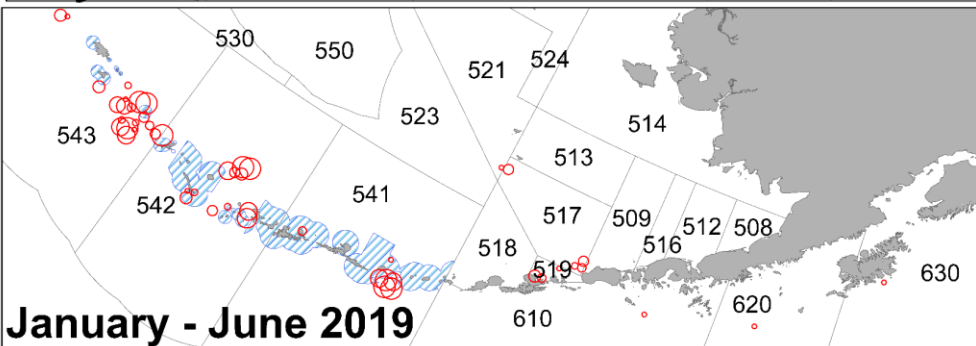
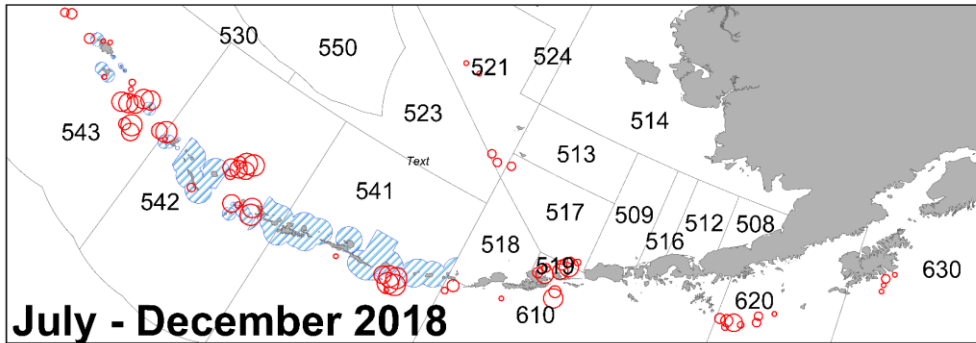
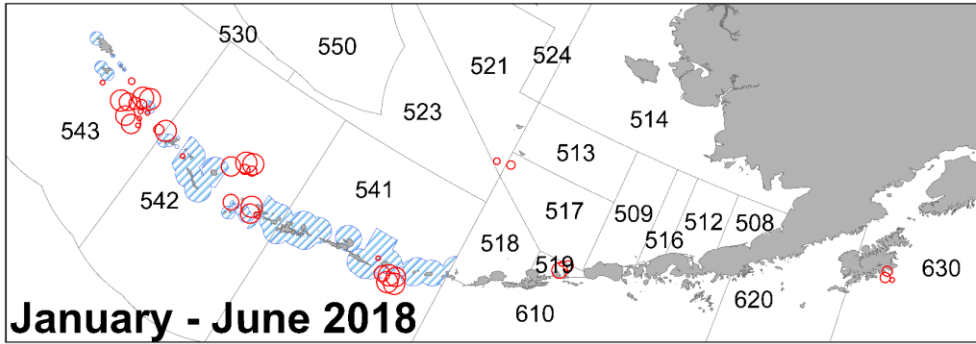
Preliminary investigation of a combined indices RE model approach

- Examined available NMFS observer data from the fishery
- Tow duration, observed catch, mean nominal CPUE, 2008-2019
- Hulson *et al.* 2019 combines available survey data and a secondary index in RE model
- Applied survey data and nominal fishery CPUE
- Evaluated varying the relative weights on the indices

(Sept, 2019 document in Appendix 17C)

“... The SSC recommends that the combined indices be brought forward for consideration in December.”

Presented in this assessment, not recommended for apportionment



Legend

Observed catch (Tons)

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 40
- 41 - 80
- 81 - 100
- 101 - 200
- 201 - 400
- 401 - 800
- > 800

Legend

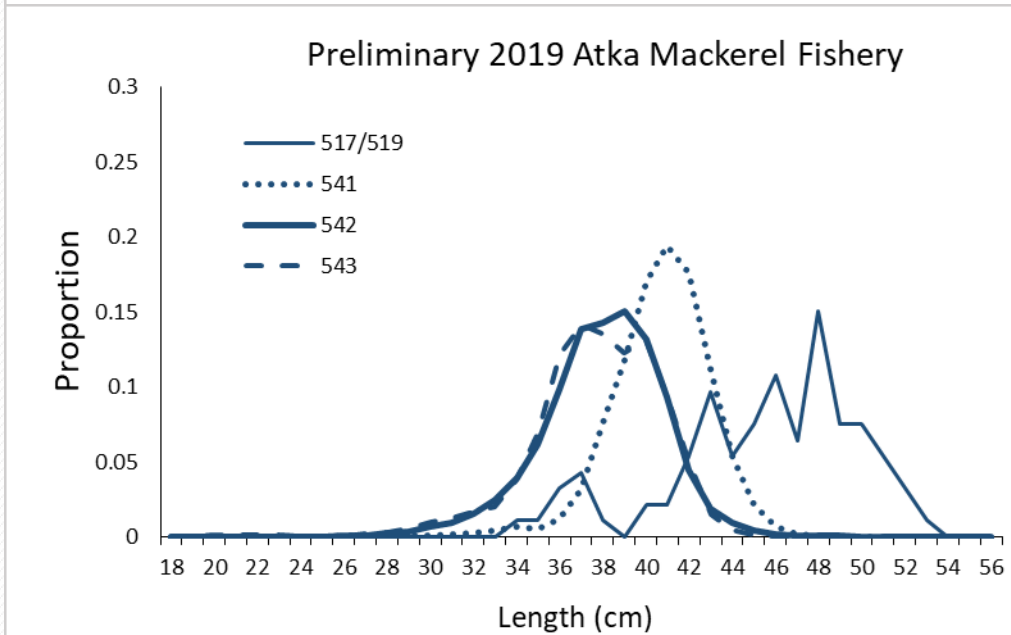
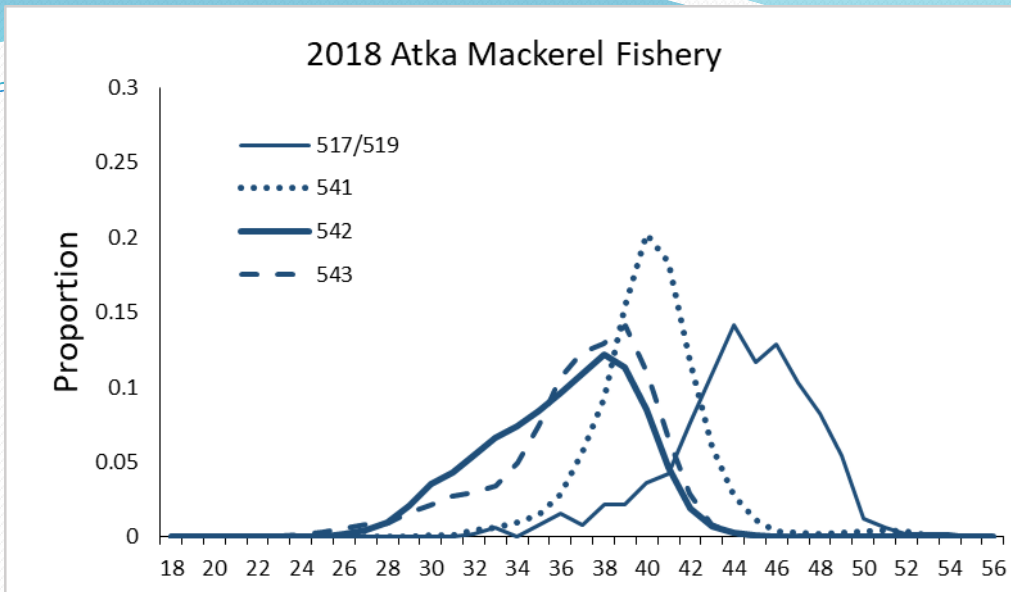
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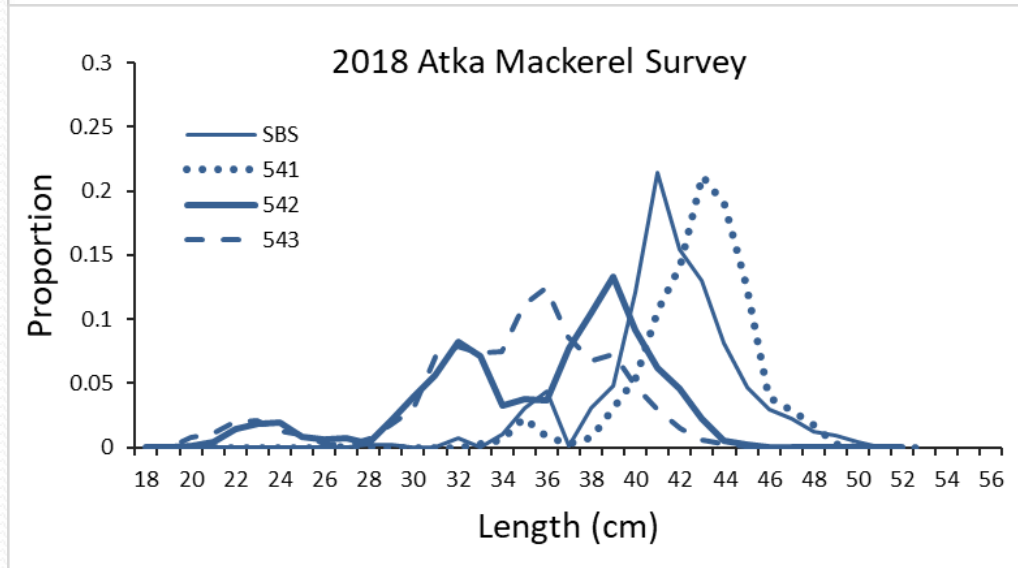
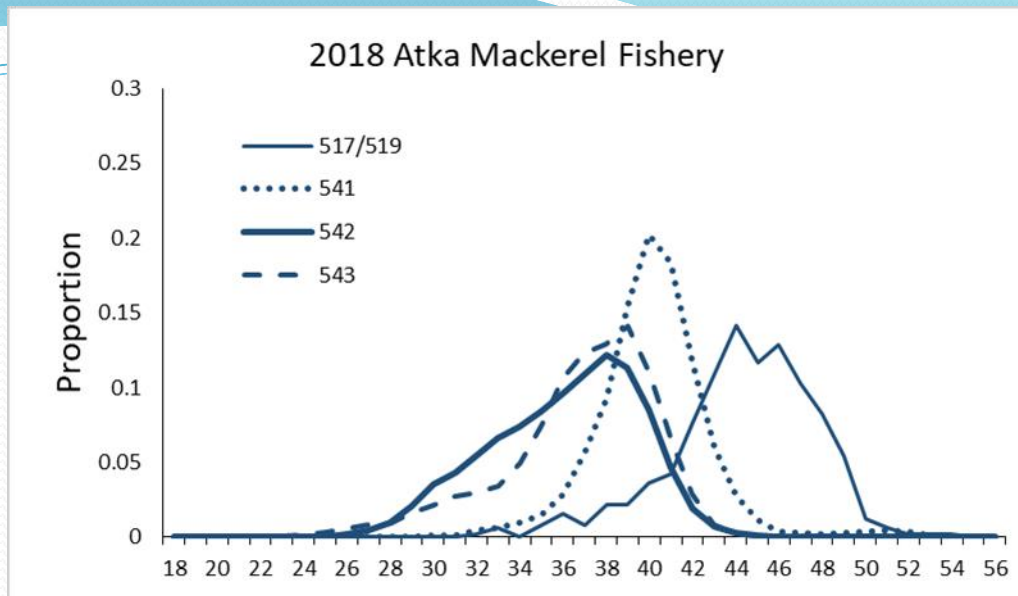


2018-2019

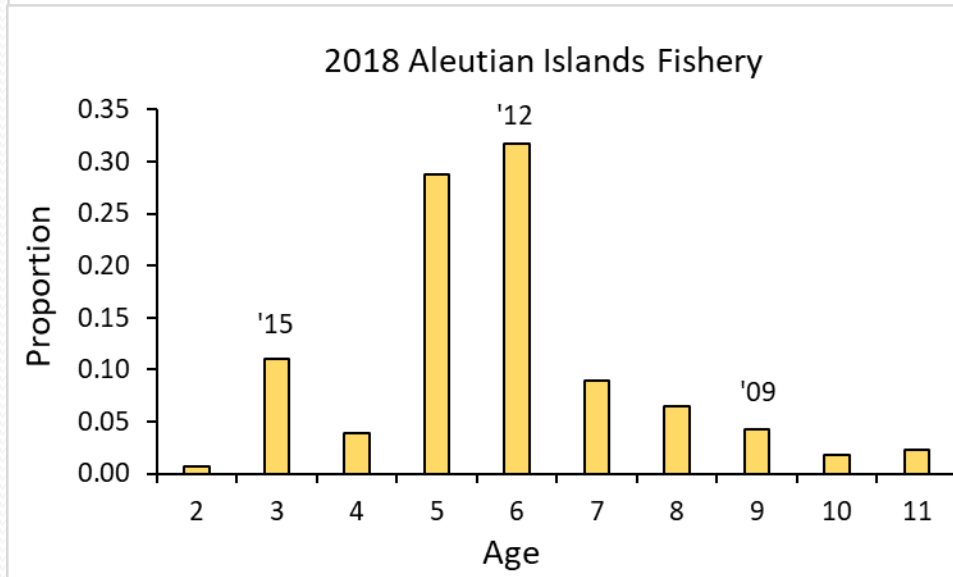
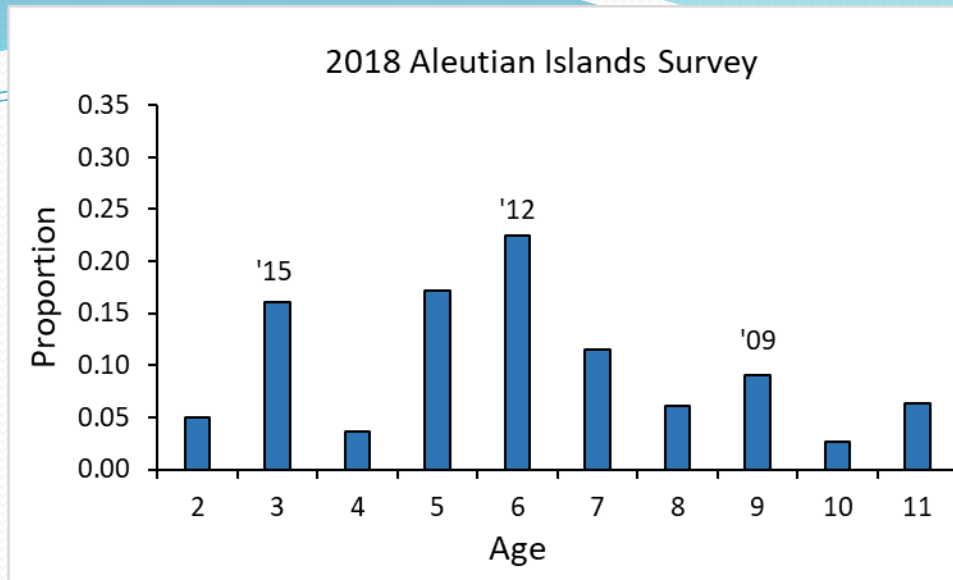
Atka mackerel fishery locations



Atka mackerel fishery length-frequency data by area fished

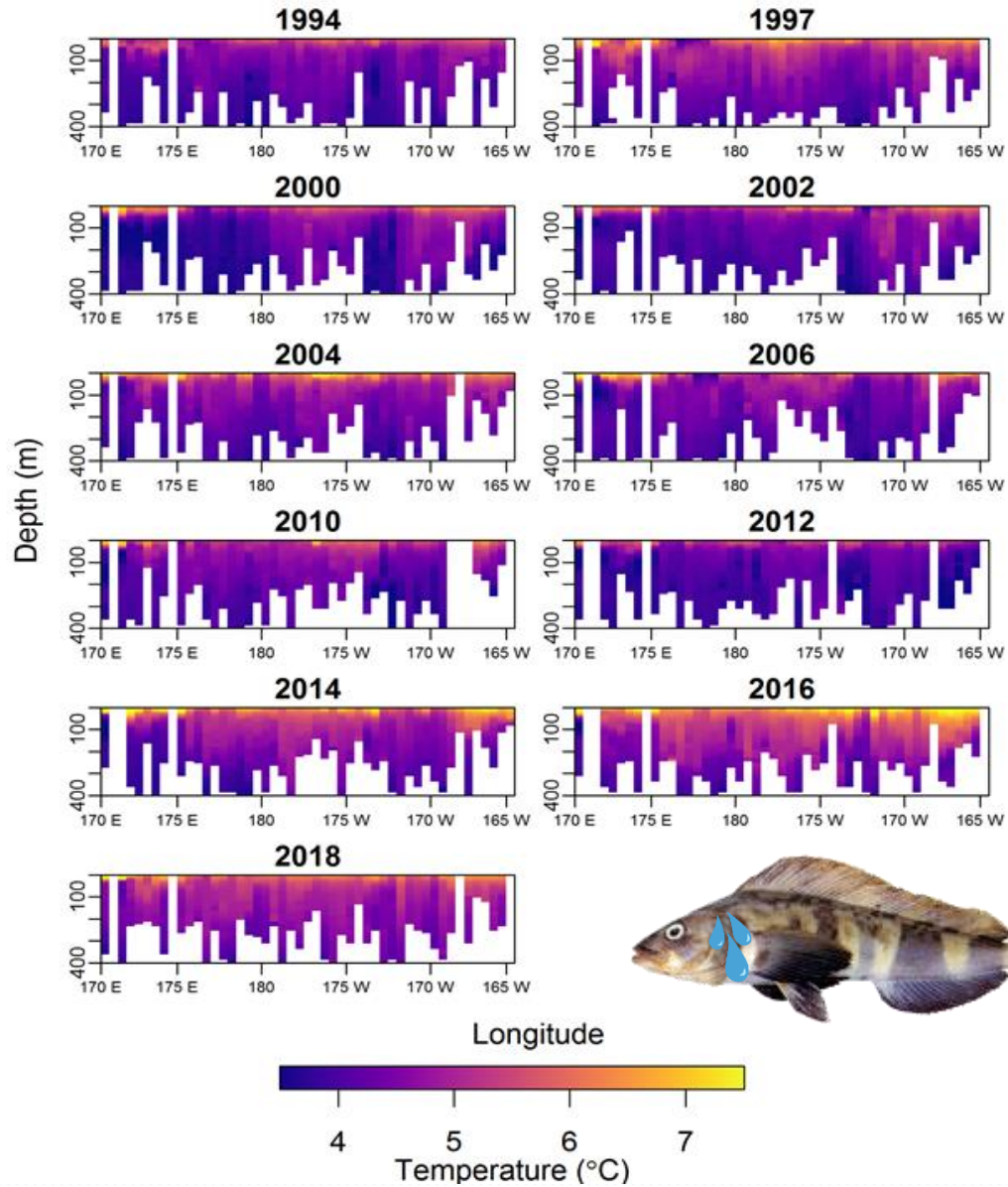


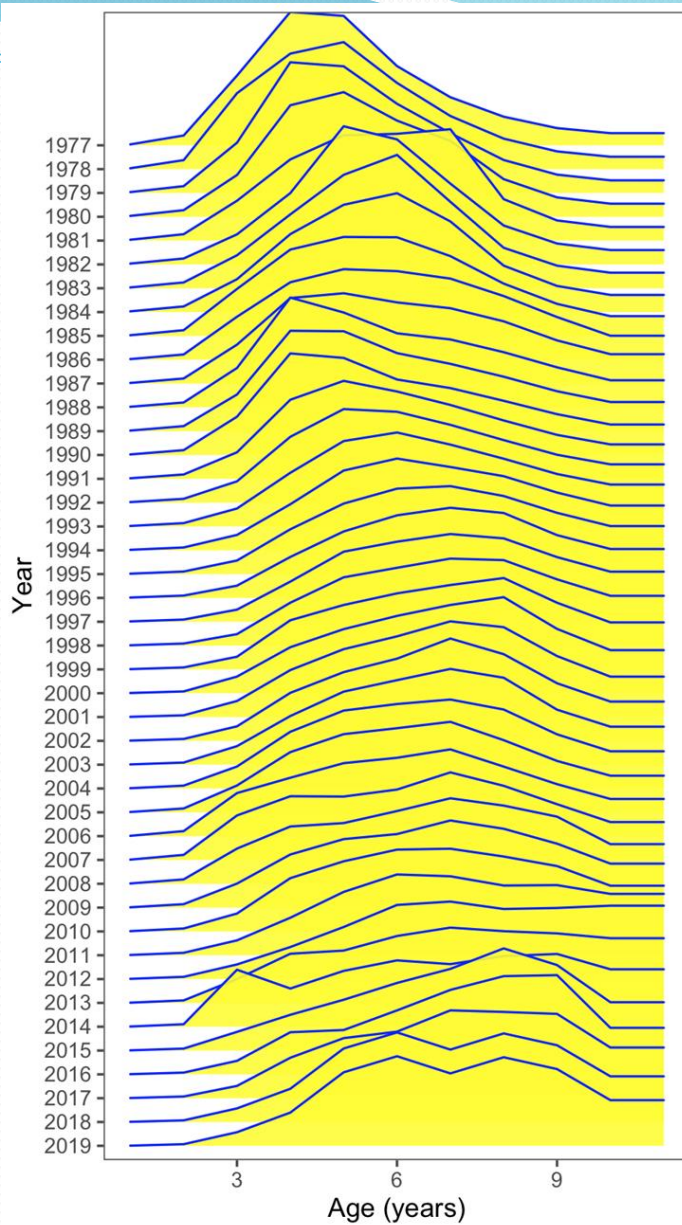
2018 Atka mackerel fishery and survey length frequency



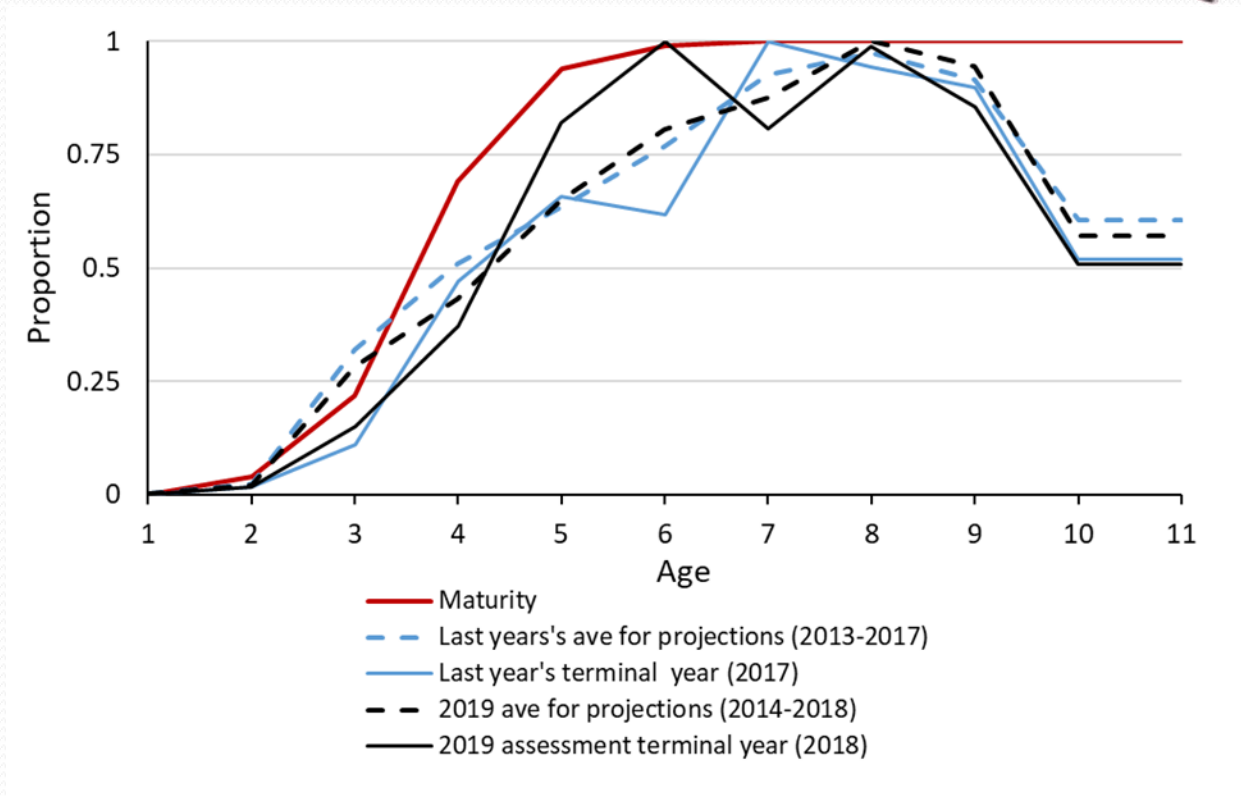
A total of 1,052 otoliths were aged from 2018 survey; mean age is 6 years

A total of 1,581 otoliths were aged from 2018 fishery; mean age is 5.8 years

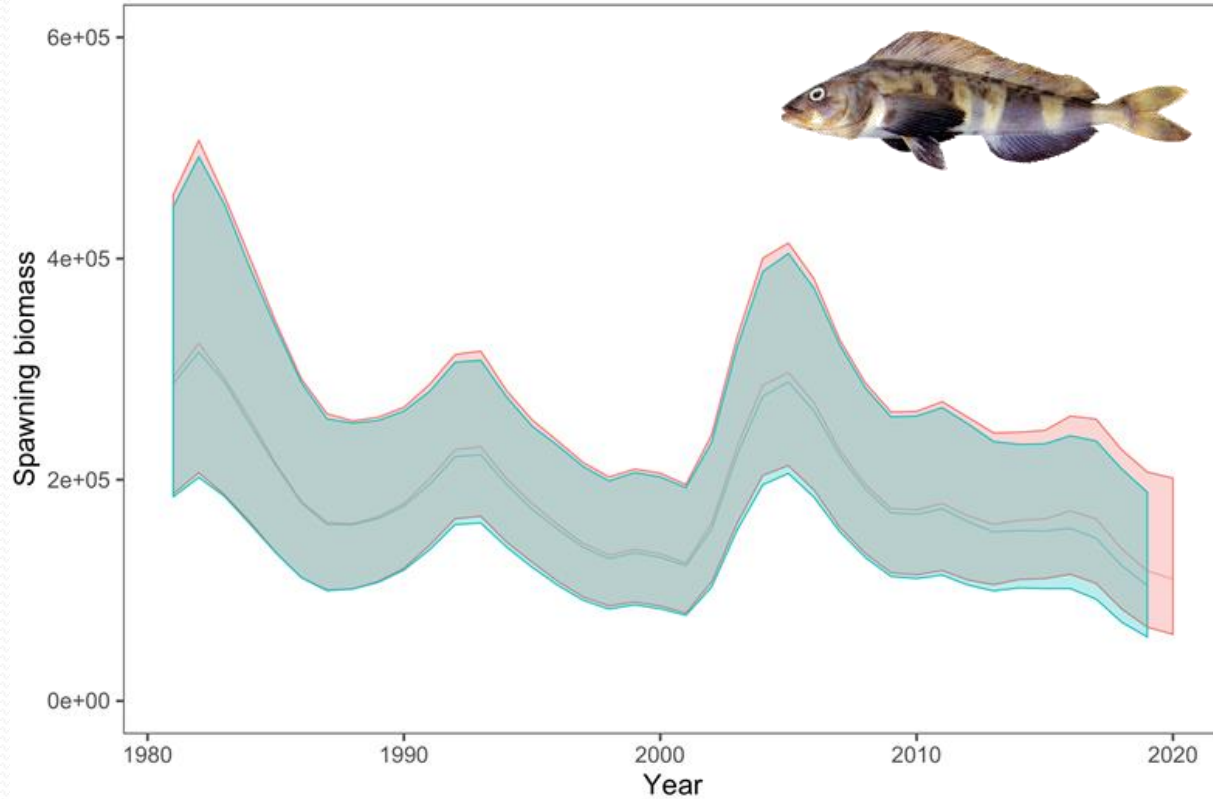




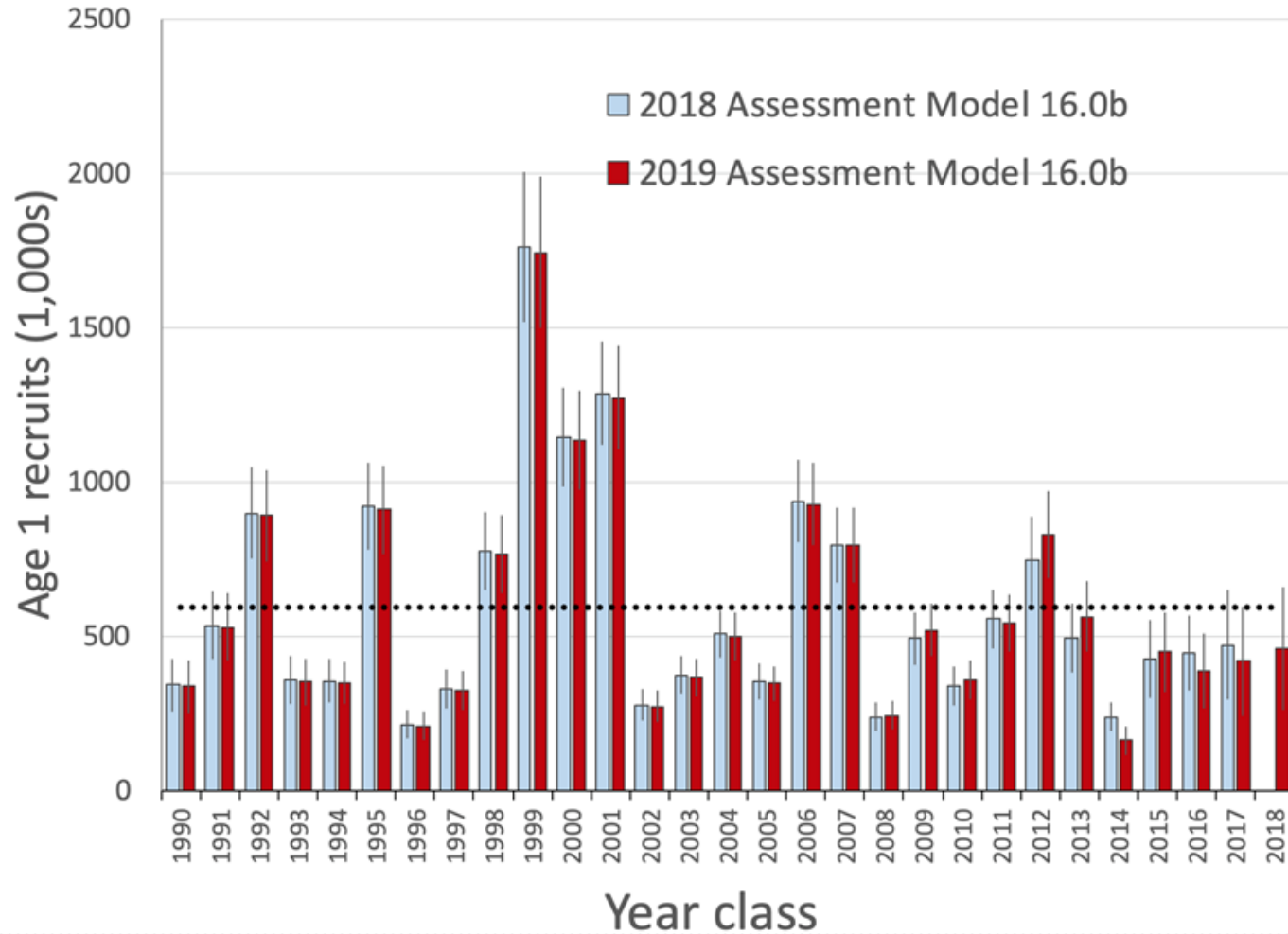
Fishery selectivity pattern from the BSAI Atka mackerel assessment Model 16.0b



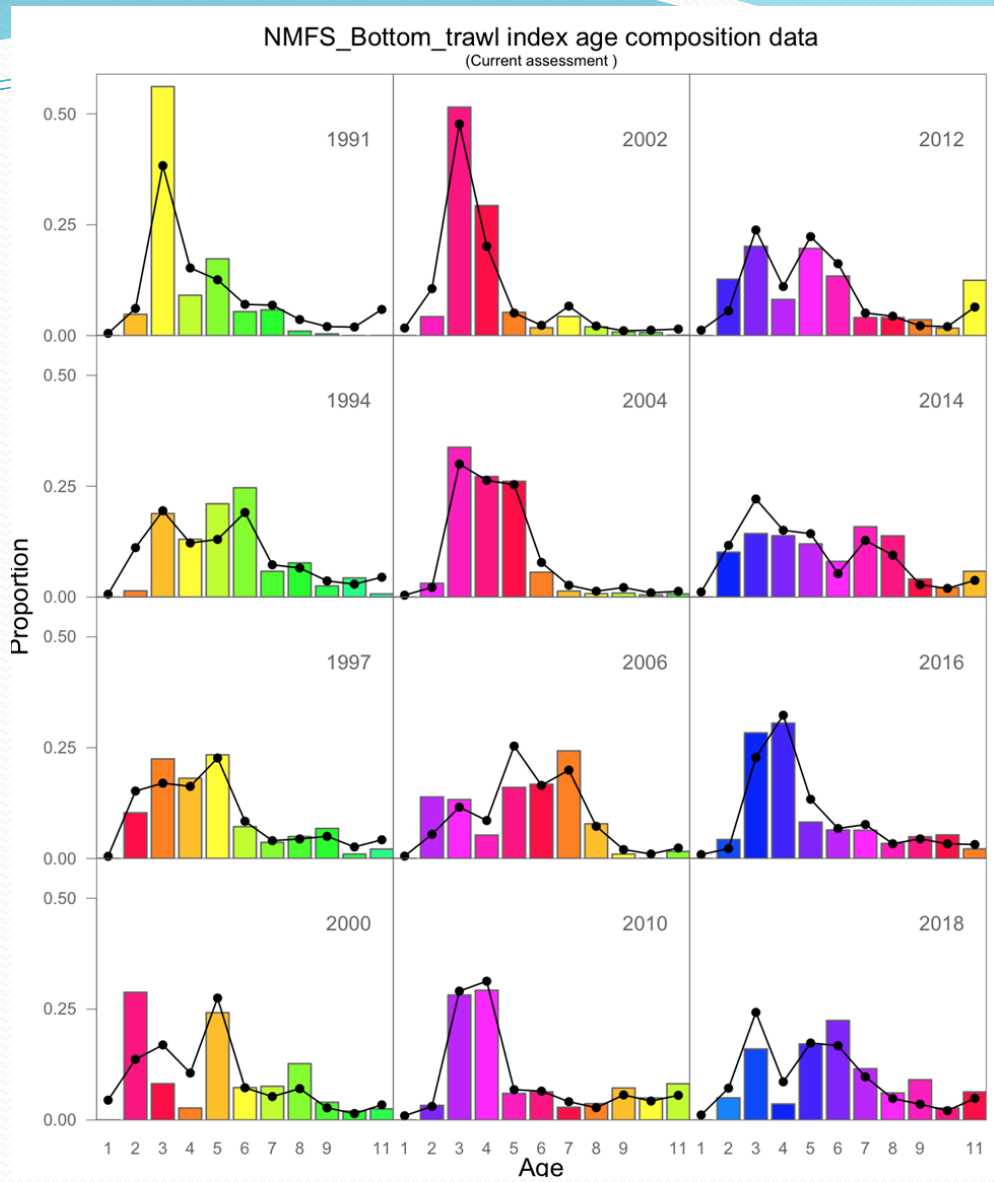
Estimated fishery selectivity patterns in the current assessment with a) last year's average for projections (2013-2017), b) the 2019 assessment average selectivity used for projections (2014-2018), c) last year's assessment terminal year (2017), and d) the 2019 assessment terminal year (2018) compared with the maturity-at-age estimates for BSAI Atka mackerel.



Time series of the current assessment (Model 16.0b) estimated AI Atka mackerel spawning biomass (t) with approximate 95% confidence bounds, compared to last year's Model 16.0b estimates (2018 assessment). Changes include 2018 fishery and survey age composition data in the current assessment.

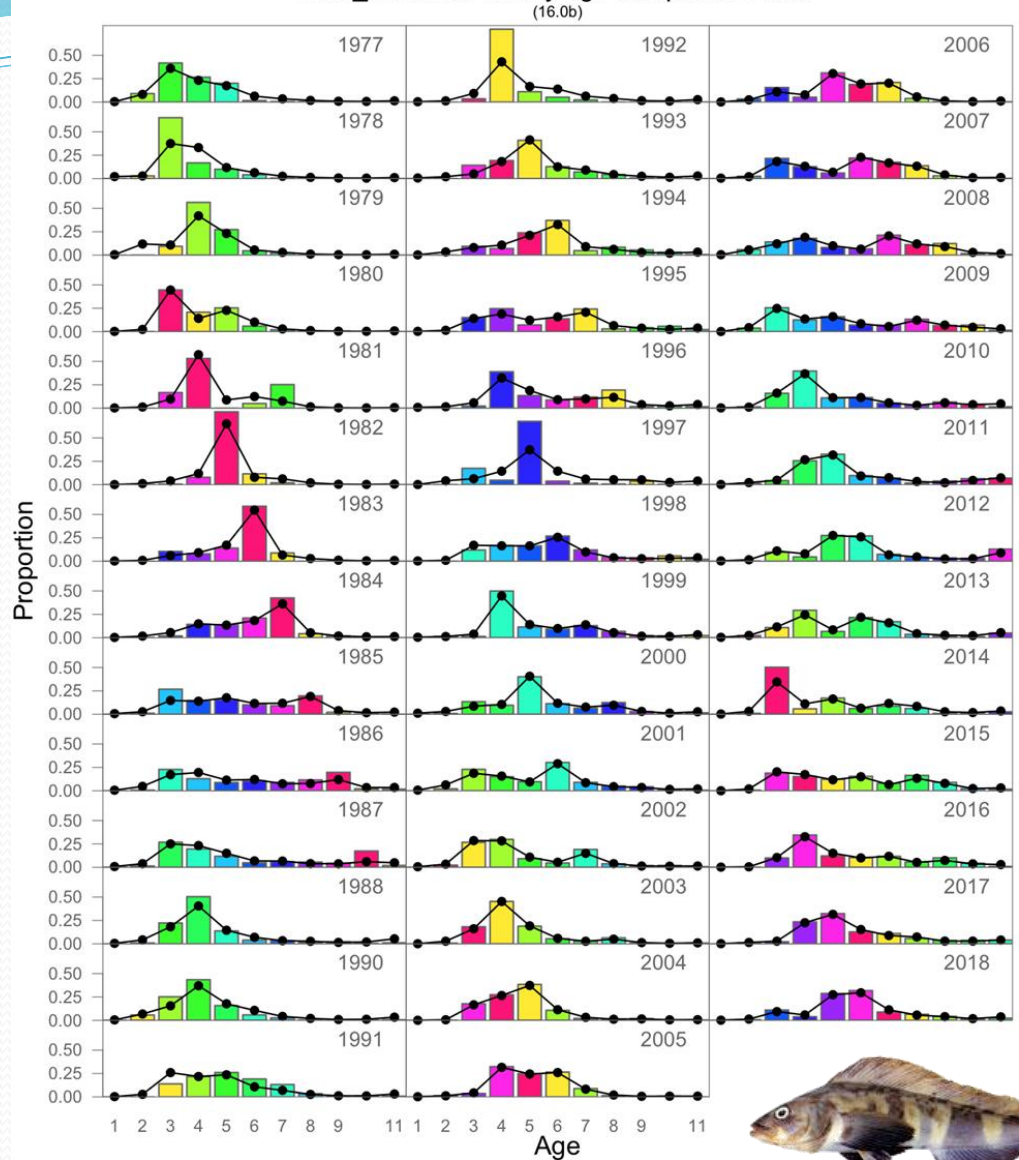


Age 1 recruitment from the current assessment (2019) with the dashed line indicating average recruitment (599 million) from the 1977-2017 year classes, and age 1 recruitment as estimated from the 2018 assessment

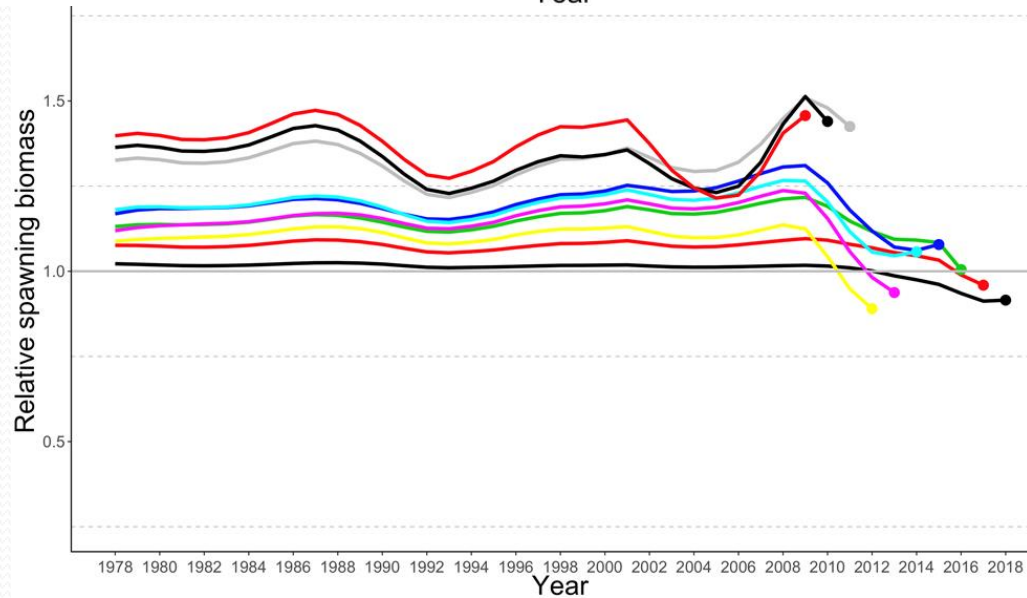
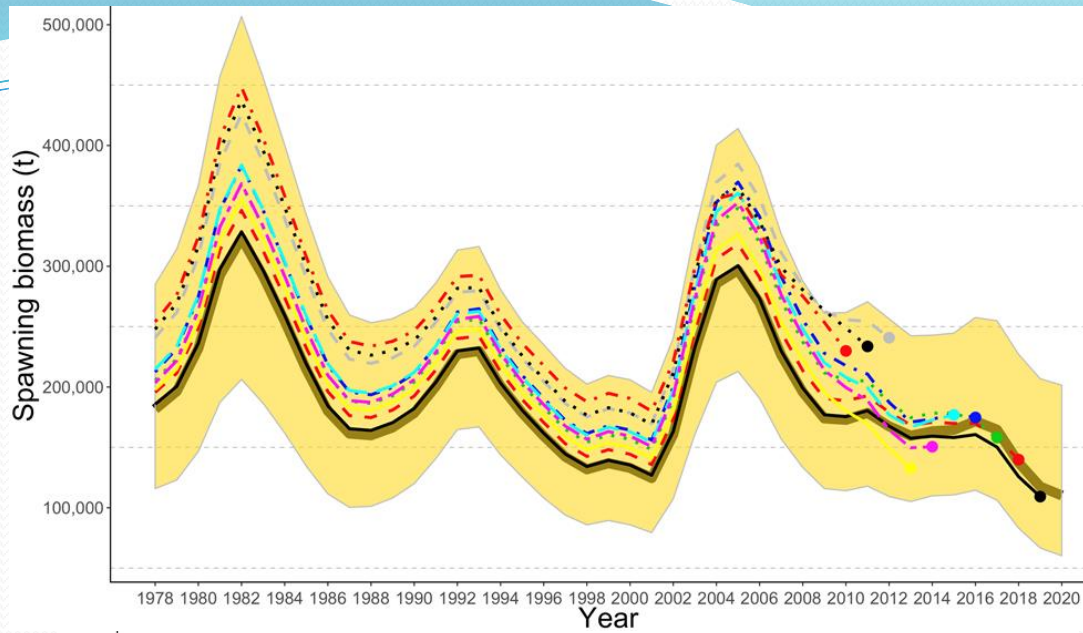


Observed and predicted **survey** proportions-at-age for BSAI Atka mackerel. Lines with “●” symbol are the model predictions and columns are the observed proportions at age

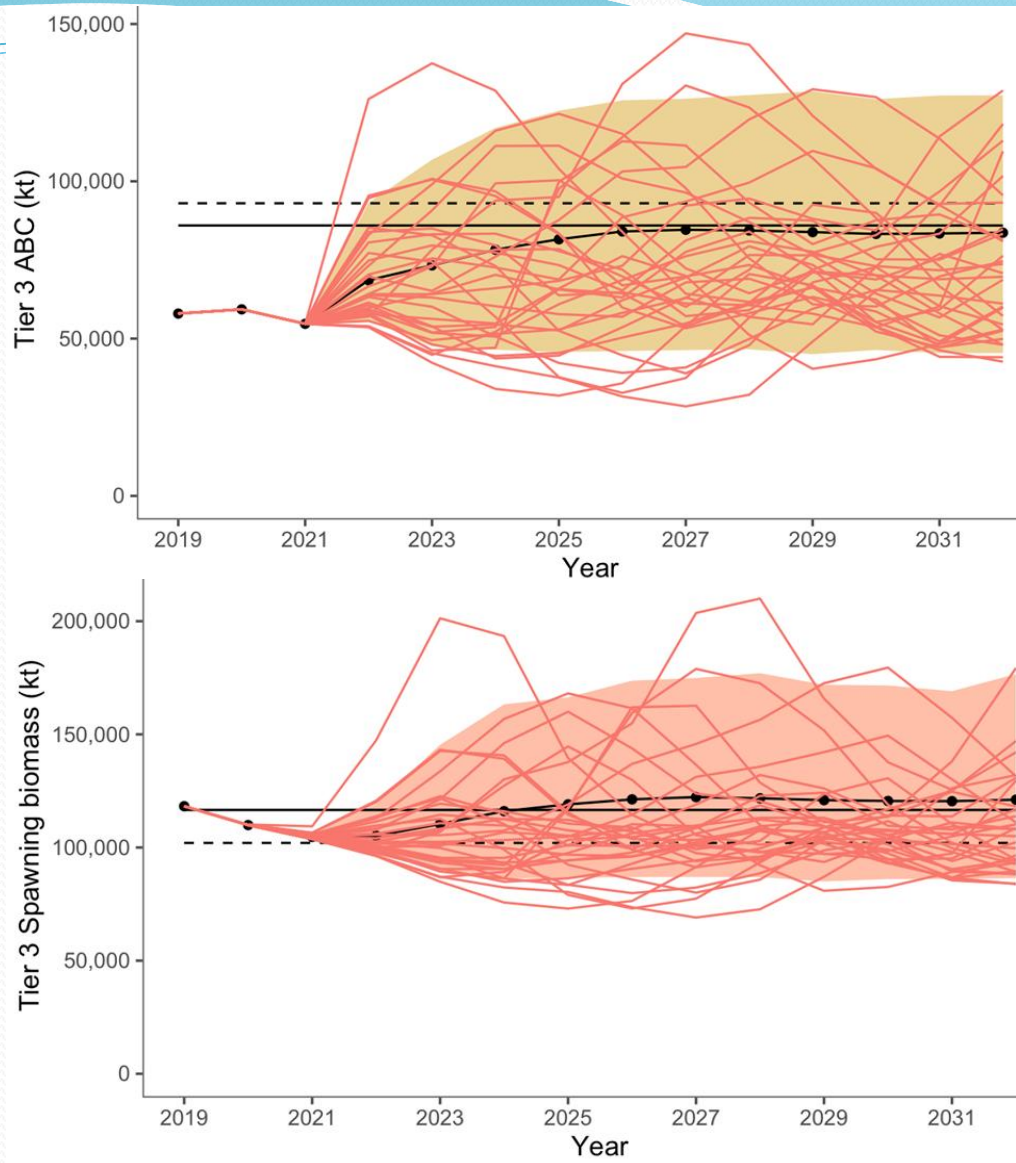
Atka_mackerel fishery age composition data



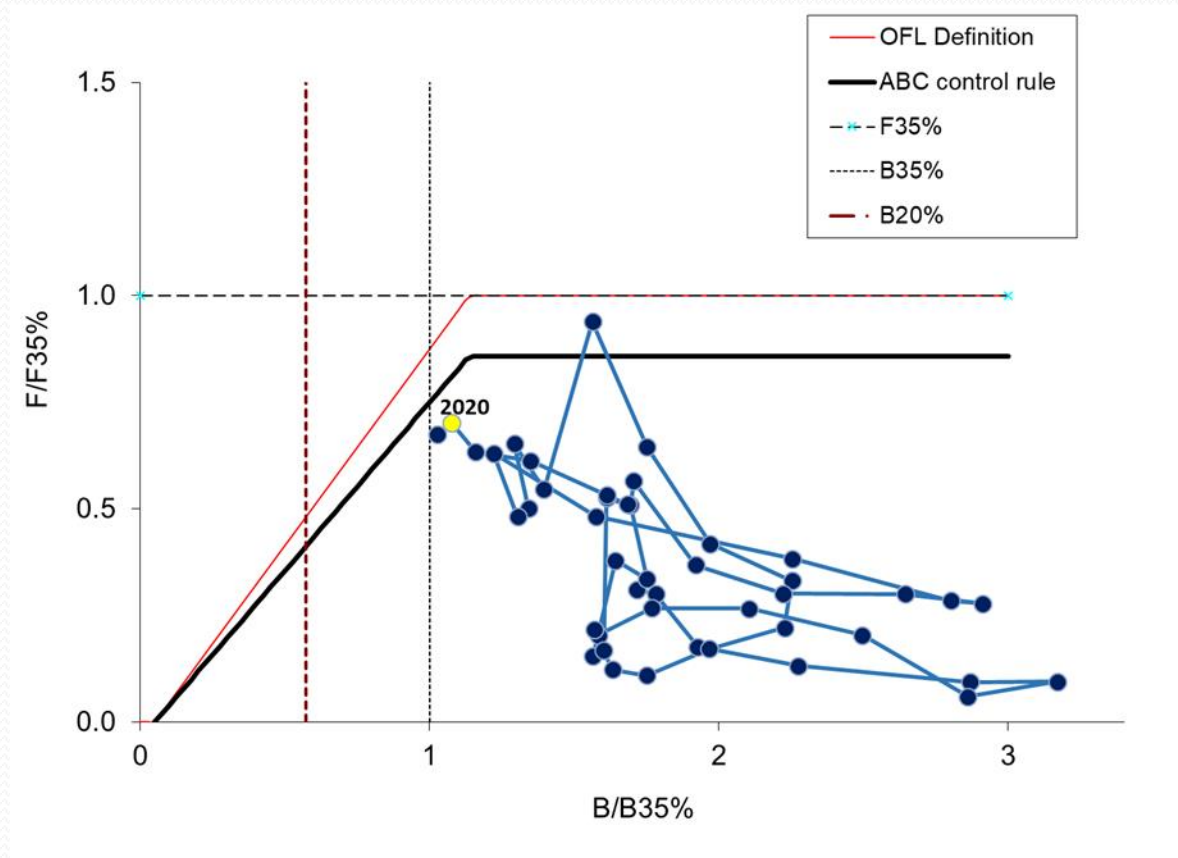
Observed and predicted Atka mackerel **fishery** proportions-at-age for BSAI Atka mackerel. Lines with “•” symbol are the model predictions and columns are the observed proportions at age (with colors corresponding to cohorts)



Retrospective plots showing the spawning biomass over time (top) and the relative difference (bottom) over 10 different “peels”



Projected Atka mackerel catch (assuming TAC taken in 2019 and reduced 2020 and 2021 catches; top) and spawning biomass (bottom) in thousands of metric tons under maximum permissible harvest control rule specifications after 2021



BSAI Atka mackerel spawning biomass relative to $B_{35\%}$ and fishing mortality relative to F_{OFL} (1977-2021)

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Overfishing Level and Maximum Permissible ABC

Catch assumptions:

- Total 2019 year end catch set = to TAC (57,951 t) for ABC/OFL specification purposes
- For 2020 & 2021 assume that 85% of the BSAI-wide ABC would be taken
 - Due to revised SSL RPAs
 - Affects ABC and OFL values



Selectivity assumption for projections:

- Estimated ave. selectivity for 2014-2018

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Quantity	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year</i> for:	
	2019	2020	2020*	2021*
Tier	3b	3b	3b	3b
Projected total (age 1+) biomass (t)	498,320	514,400	515,890	534,220
Projected Female spawning biomass	106,800	102,700	109,900	104,700
$B_{40\%}$	113,510	113,510	116,600	116,600
$B_{35\%}$	99,320	99,320	102,020	99,320
F_{OFL}	0.53	0.53	0.48	0.46
$maxF_{ABC}$	0.44	0.44	0.41	0.39
F_{ABC}	0.44	0.44	0.41	0.39
OFL (t)	79,200	73,400	81,200	74,800
maxABC (t)	68,500	63,400	70,100	64,400
ABC (t)	68,500	63,400	70,100	64,400

*Projections are based on estimated total catch of 59,300 t and 57,500 t in place of maximum permissible ABC for 2020 and 2021, respectively.

BSAI Atka Mackerel Apportionment

2018 Random Effects Model	
541 ¹	50%
542	10%
543	40%

¹Includes eastern Aleutian Islands and southern Bering Sea areas.

Apportionment percentages by Aleutian Islands management areas with different weightings of fishery CPUE data:

CPUE weight	Eastern	Central	Western
0.0	49.6%	9.3%	41.1%
0.5	43.8%	17.0%	39.2%
1.0	40.8%	20.4%	38.7%
2.0	38.0%	22.8%	39.2%
100	32.7%	26.2%	41.1%



BSAI Atka Mackerel Apportionment

4-Survey Weighted Median

	Survey Year				2020 & 2021 Apportionment	2020 ABC	2021 ABC
	2012	2014	2016	2018			
541+SBS	12%	42%	35%	38%	0.33	23,133	21,252
542	39%	28%	30%	7%	0.25	17,525	16,100
543	48%	30%	35%	55%	0.42	29,442	27,048
Weights	8	12	18	27	1.00	70,100	64,400
Total ABC						70,100	64,400

4-Survey Weighted Average (Recommended)

	Survey Year				2020 & 2021 Apportionment	2020 ABC	2021 ABC
	2012	2014	2016	2018			
541+SBS	12%	42%	35%	38%	0.35	24,535	22,540
542	39%	28%	30%	7%	0.21	14,721	13,524
543	48%	30%	35%	55%	0.44	30,844	28,336
Weights	8	12	18	27	1.00	70,100	64,400
Total ABC						70,100	64,400

Should the ABC be reduced below the maximum permissible ABC?

<i>Assessment-related considerations</i>	<i>Population dynamics considerations</i>	<i>Environmental/ecosystem considerations</i>	<i>Fishery Performance considerations</i>	<i>Overall score (highest of the individual scores)</i>
Level 1: Typical to moderately increased concerns	Level 1: Stock trends are typical for the stock; recent recruitment is within normal range.	Level 1: No apparent environmental/ecosystem concerns	Level 1: No apparent fishery/resource-use performance and/or behavior concerns	Level 1: Normal

The overall score of level 1 suggests that setting the ABC below the maximum permissible is not warranted