

Chinook salmon mortality and impacts due to bycatch in the EBS pollock fishery



Components

PSC: Prohibited species catch. aka bycatch

- Observer program sampling at sea and in port, 100% covered

Age and growth data

- With length frequency makeup the Age composition data

Model to account for immature Chinook salmon in the bycatch

- “Adult equivalents” or AEQ

Genetics

- Also adjusted to year of capture

In-river estimates

- For age composition (and oceanic maturation rate needed for AEQ)
- For total run estimates (to estimate impacts)

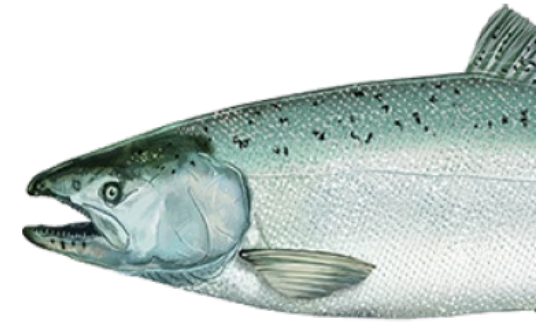
Uncertainty treatment

- In run-size, AEQ rates, and genetic reporting groups

Sensitivities

- Maturity change, and “what-if” PSC was set artificially at the limit



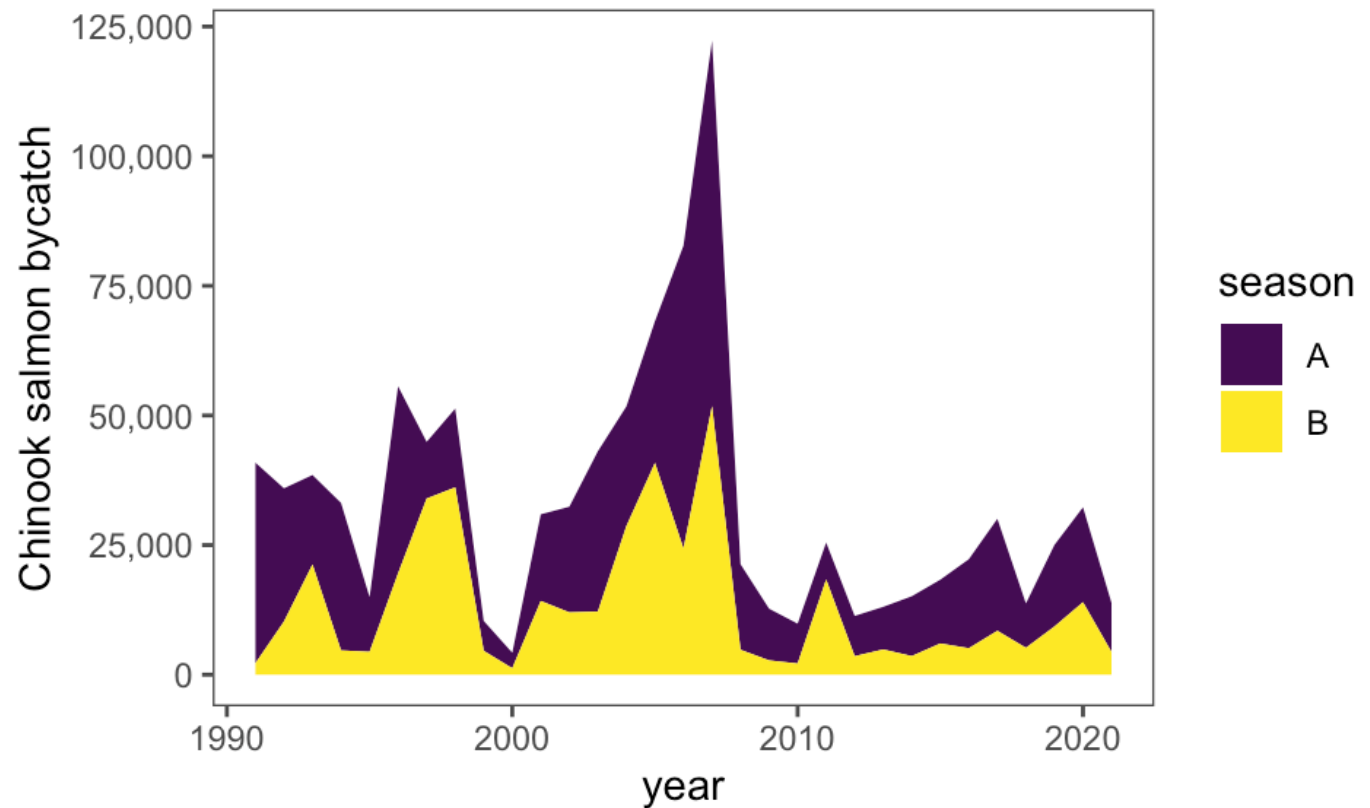


Steps

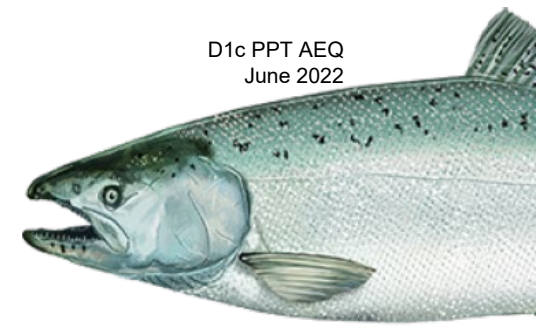
1. Stats on Chinook salmon bycatch
 - by region and season in the pollock fishery including
 - Length and sex composition of the bycatch
 - Ages
2. Compile age composition data
 - By strata (season)
3. Use length compositions to with age data to estimates for each year, and season using the age-length keys from step 2 to get the PSC catch-at-age (Tables 4 and 5).
4. Provide demographic characteristics of Chinook salmon for use in the AEQ model (these include the oceanic survival-at-age and maturity-at-age and were the same values as used in Ianelli and Stram 2015).
5. Update the season-specific genetics information (the “Stock composition” estimates were used from Iii et al. (2013, 2015, 2018), Guthrie et al. (2013, 2014, 2016) for the period 2011-2016 (Table 6; Fig. 4).
6. Run the AEQ model with these inputs (extending the estimates back to 1994-2021) and compile/summarize results.
7. Compare a subset (where data are available) of the AEQ results against corresponding run-strength estimates.

Chinook salmon bycatch

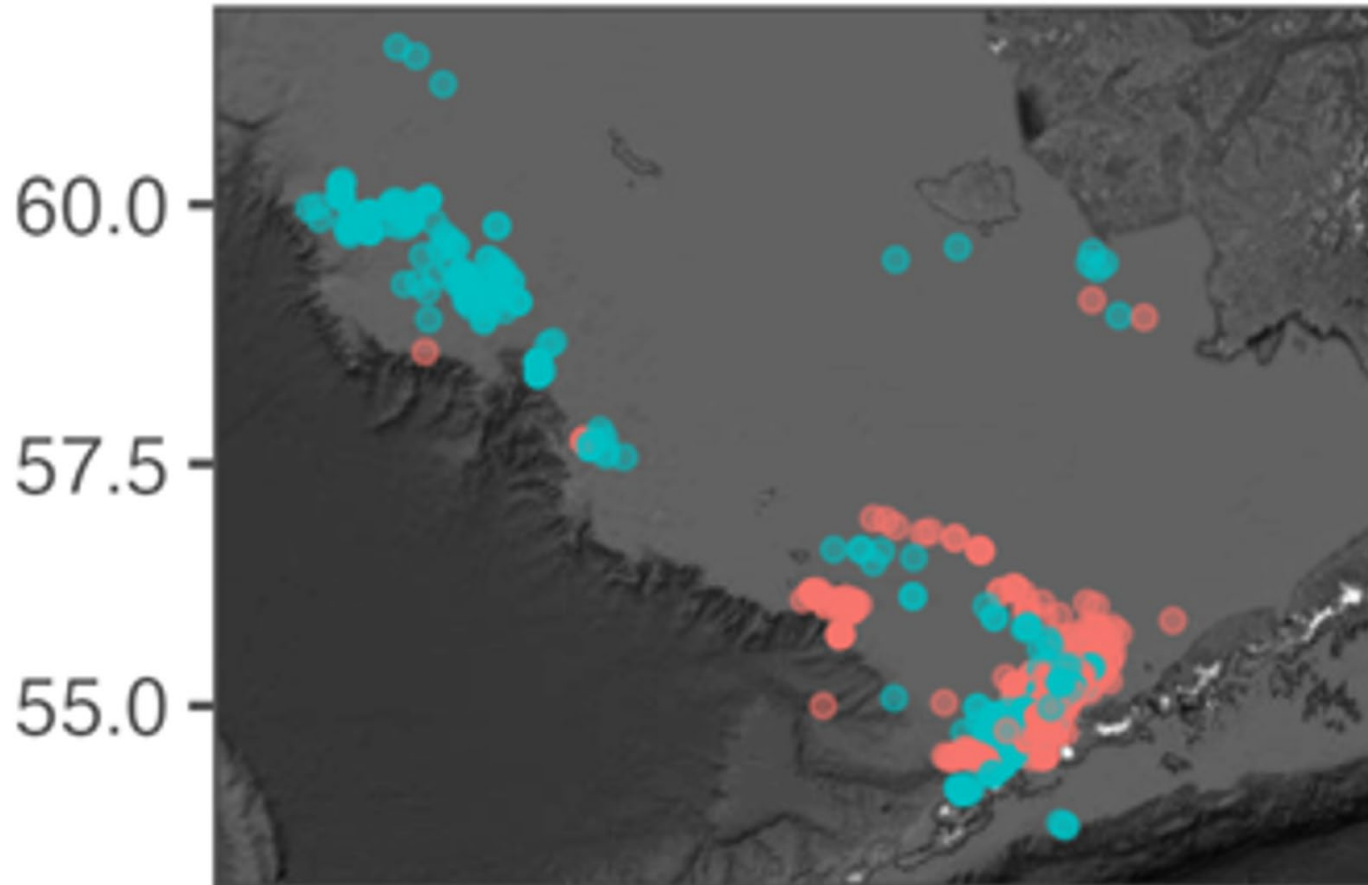
All stocks



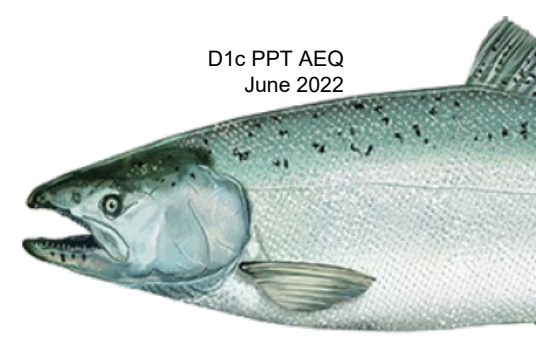
Chinook salmon age d



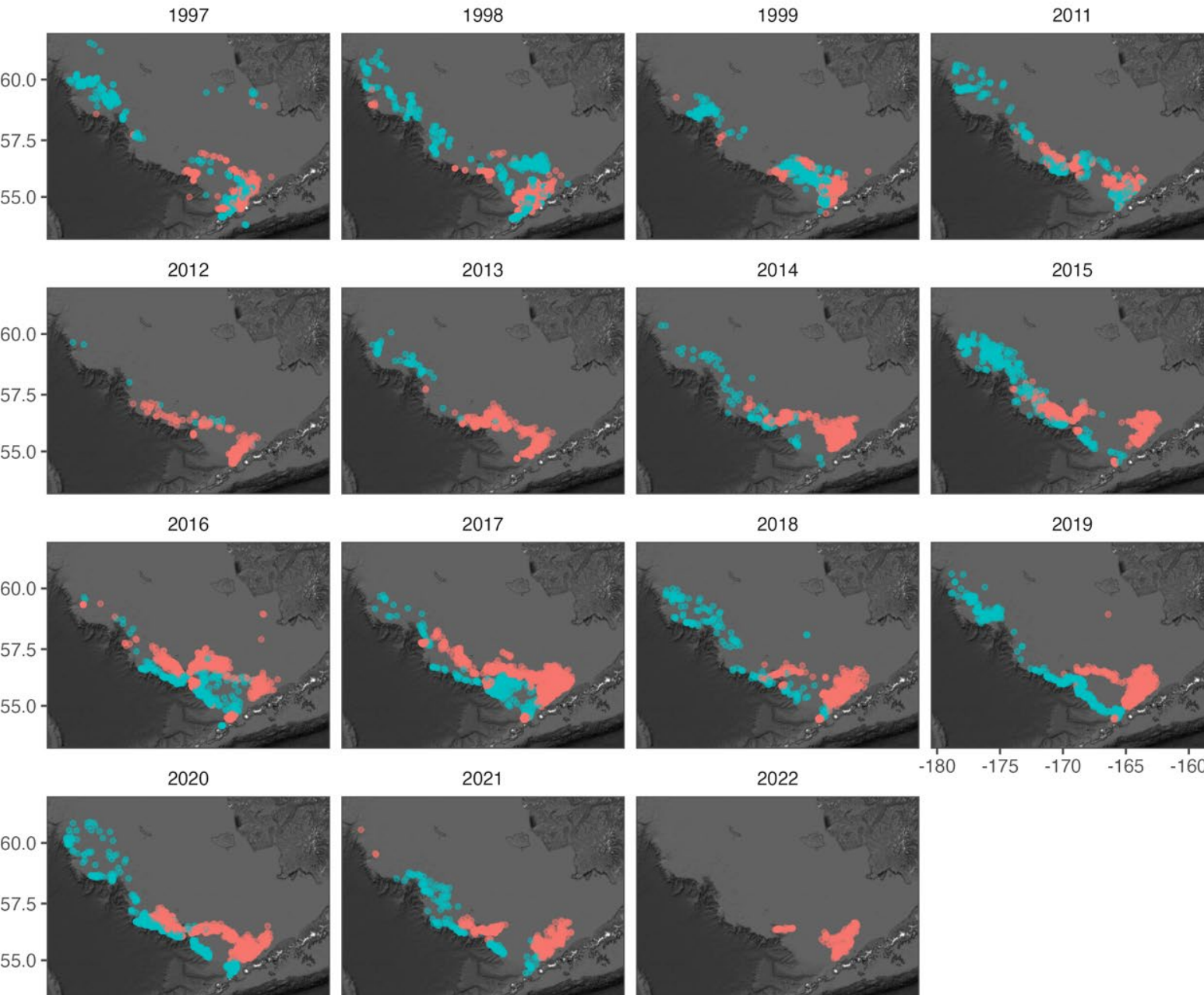
1997



Locales of sampling
for age data



Chinook salmon age data



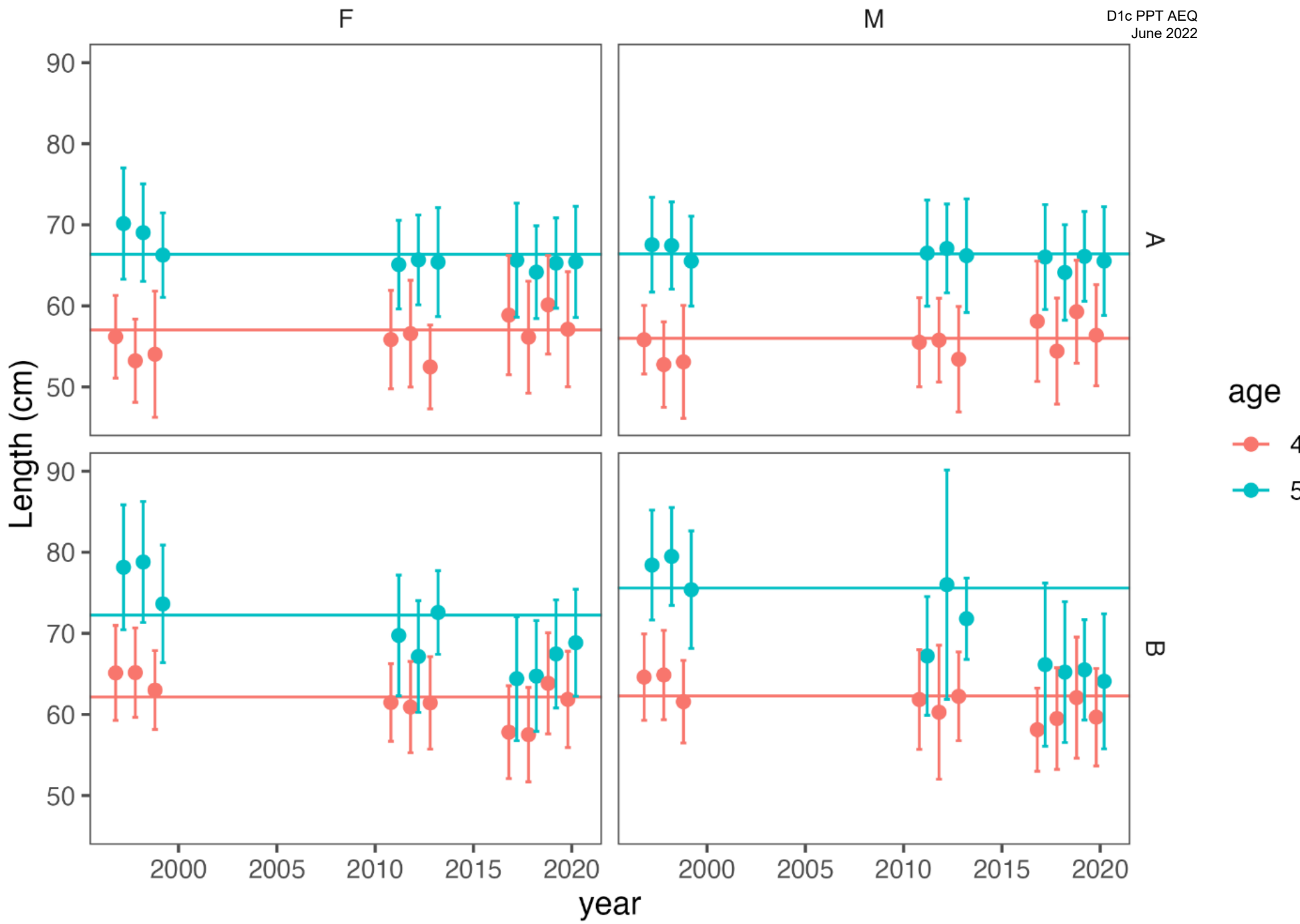
Locales of sampling
for age data

Season

- A
- B

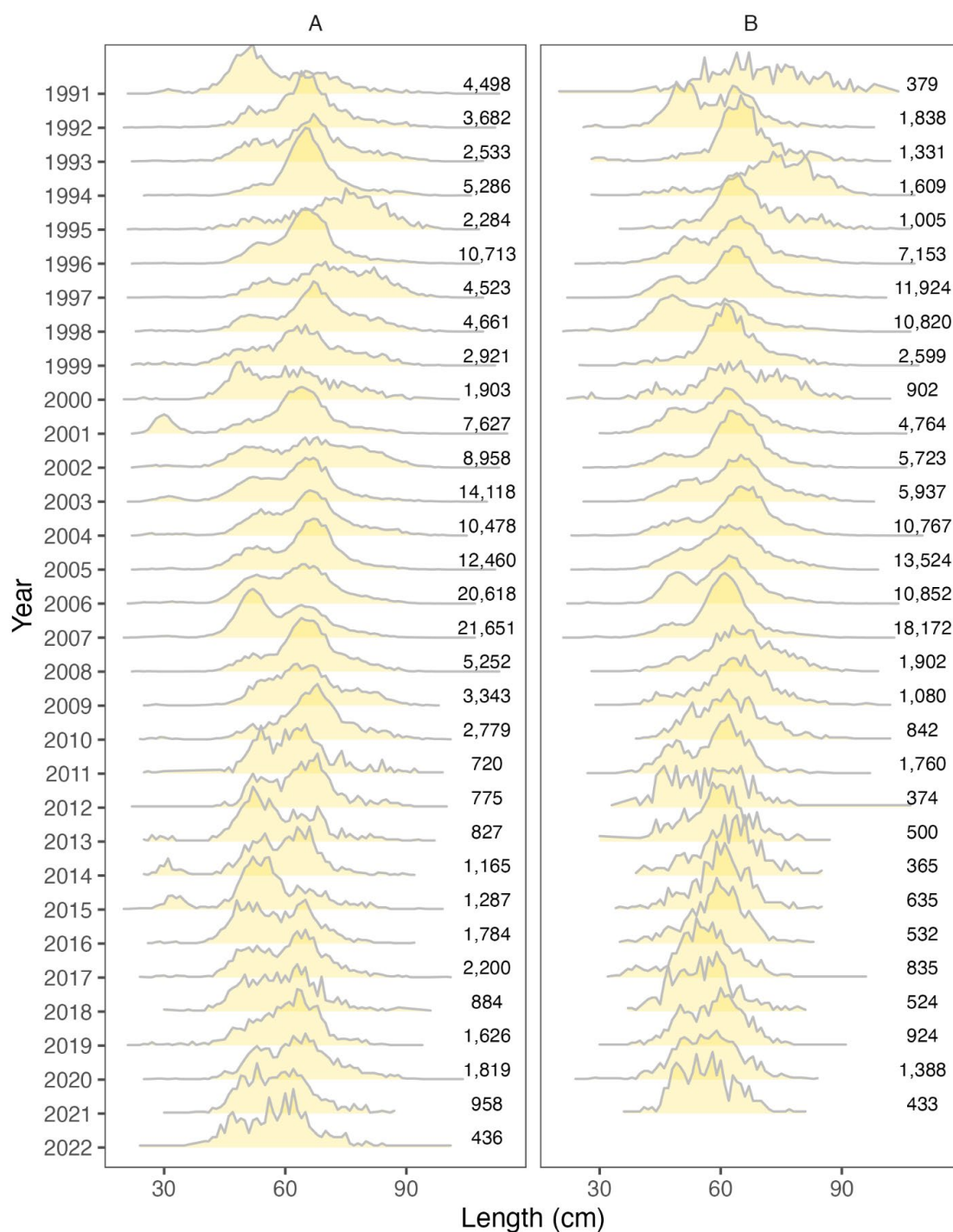
Fig. 5

- Main ages of bycatch
- Changes in size-at-age apparent
- Accounted for in age-comp. estimates

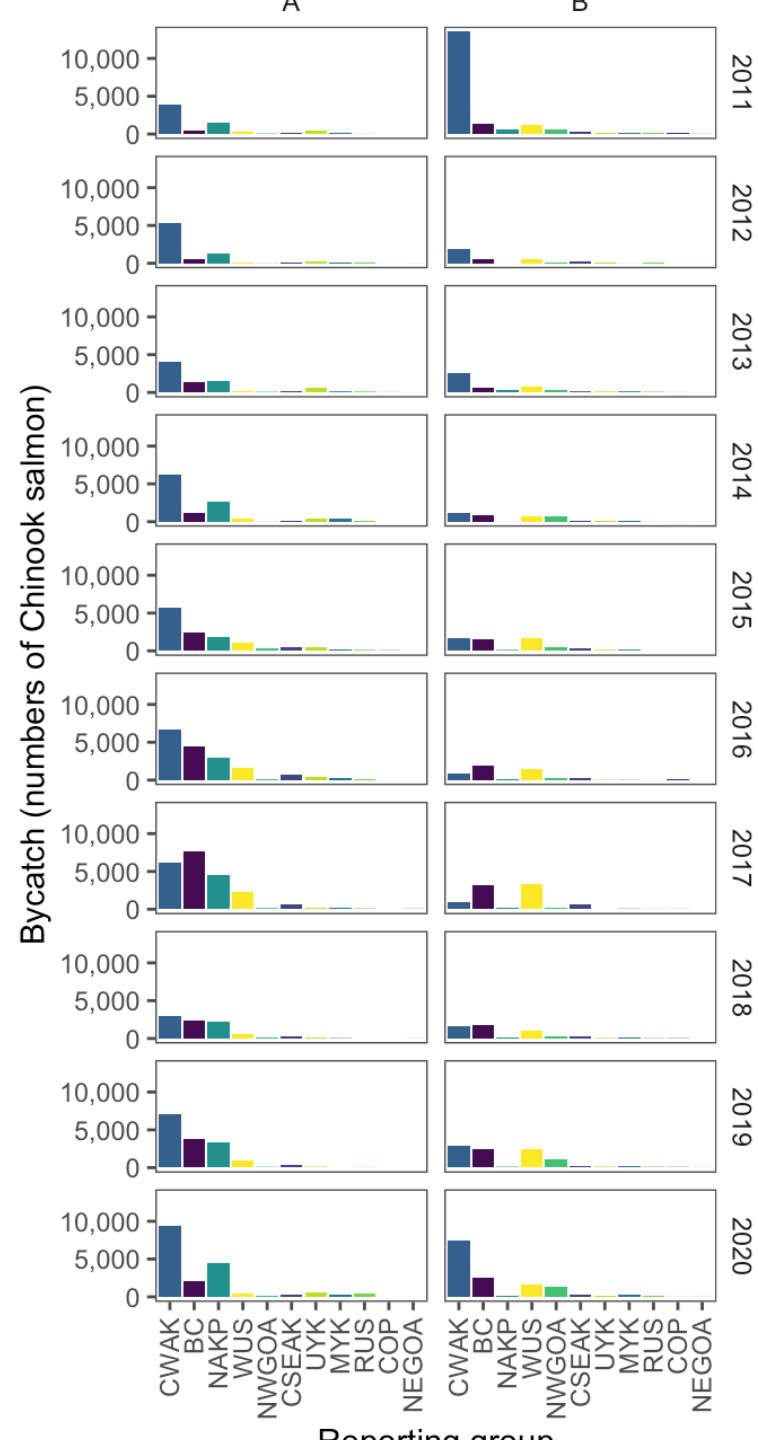


Length composition

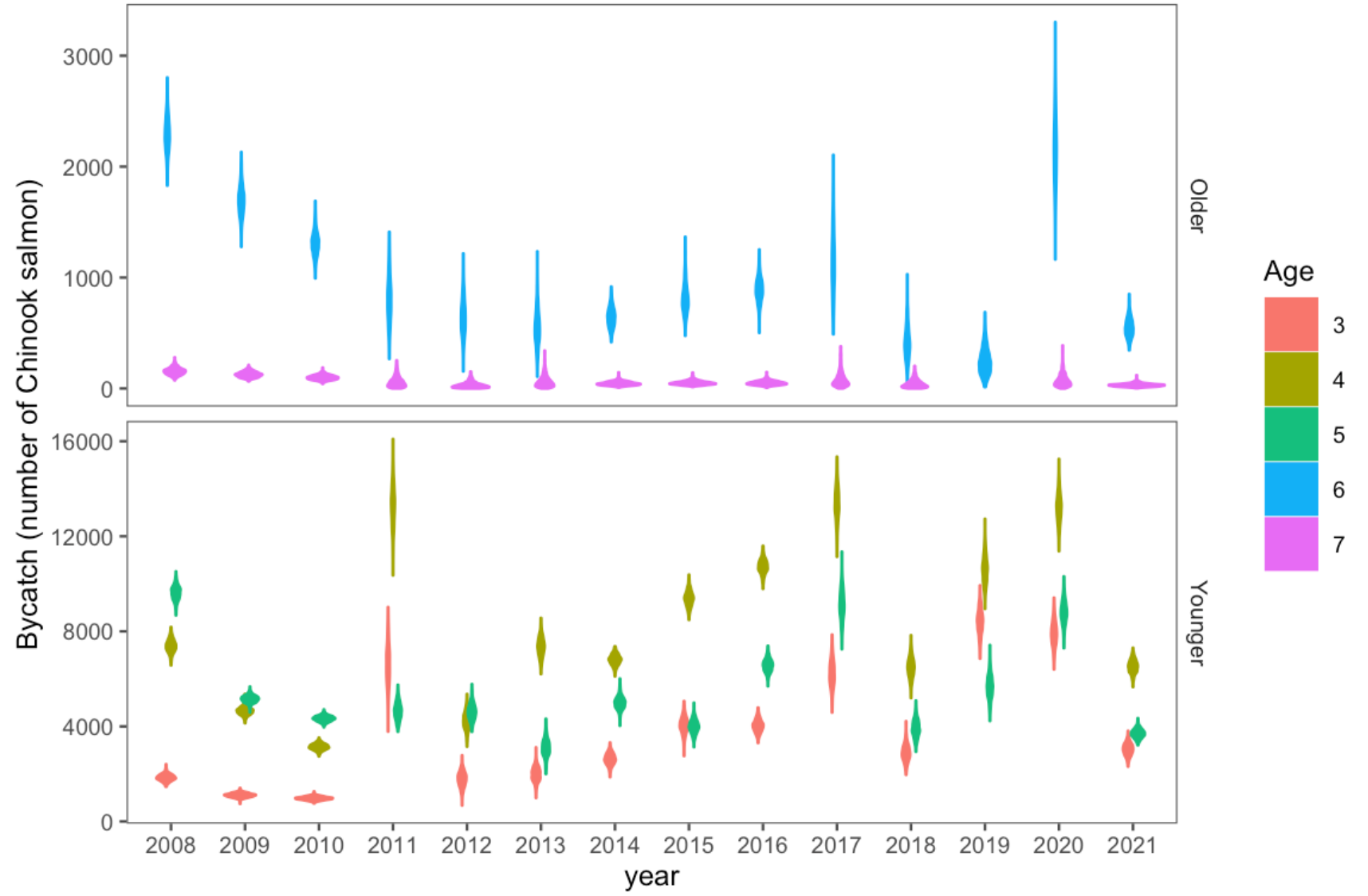
Samples of Chinook salmon
in bycatch



Genetic stock composition by season bycatch



Age composition estimates of bycatch



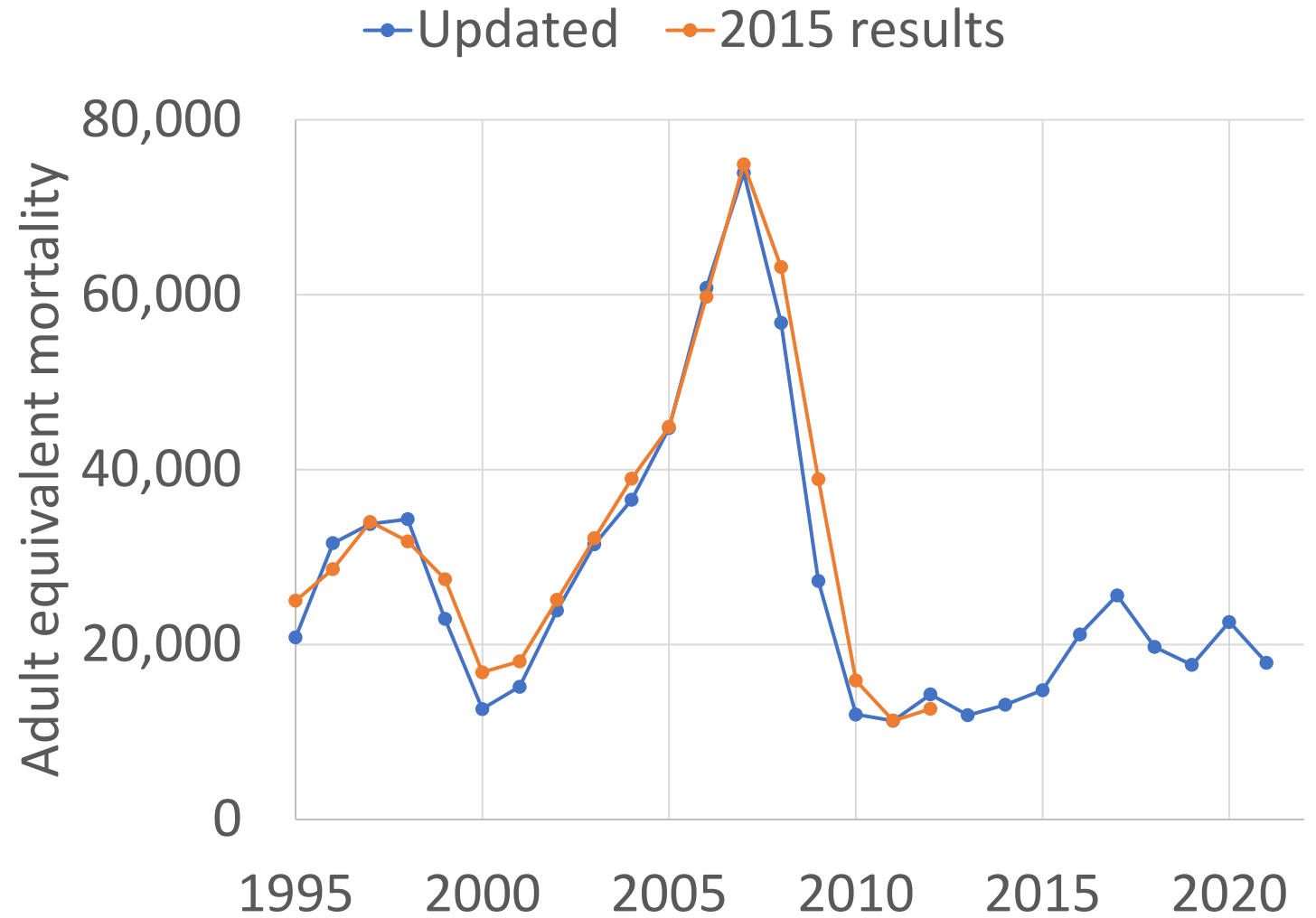
Age

	3	4	5	6	7	Mean run size	Weighting factor
Kuskokwim Bay	5.10%	35.10%	36.00%	23.10%	0.60%	40,709	0.077
Kuskokwim River	1.30%	30.00%	42.00%	26.00%	0.60%	124,100	0.2346
Lower Yukon	0.00%	31.70%	48.00%	20.00%	0.30%	57,554	0.1088
Middle Yukon	0.00%	18.20%	45.70%	35.30%	0.80%	46,245	0.0874
Norton Sound and Point Clarence	1.10%	23.30%	51.10%	22.30%	2.20%	9,417	0.0178
Nushagak	1.20%	37.60%	44.70%	16.30%	0.20%	178,144	0.3368
Upper Yukon	0.00%	8.60%	43.40%	45.40%	2.60%	72,836	0.1377
Weighted mean in-river age composition	1.10%	29.10%	43.80%	25.30%	0.70%		
Oceanic natural mortality	0.3	0.2	0.1	0.1	0		
Oceanic maturity (this study)	3%	23%	75%	97%	100%		
Council update from 2018	4%	18%	64%	100%	100%		
Original (Ianelli and Stram 2015)	0%	19%	50%	94%	100%		

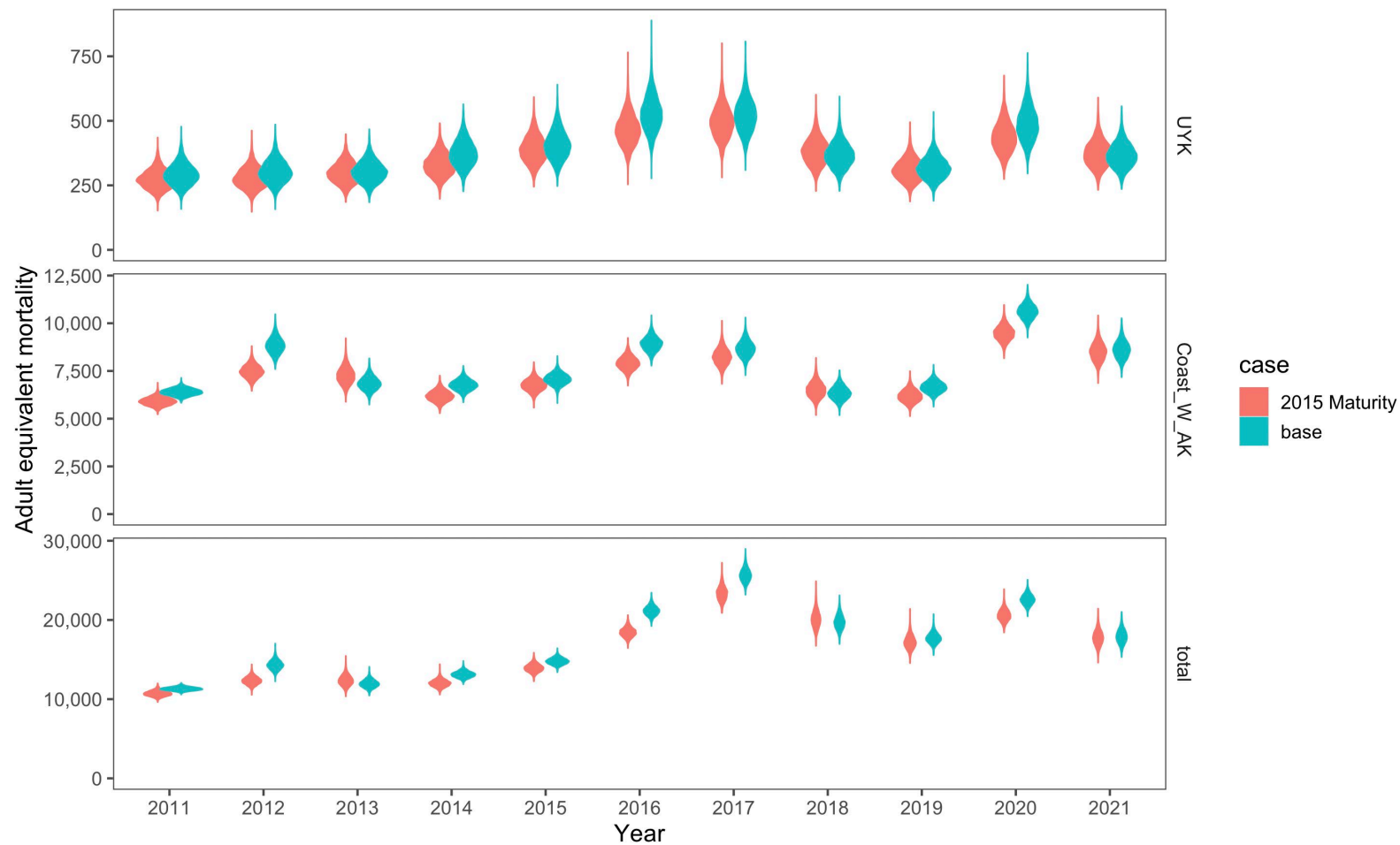
Maturity
(Table 8)

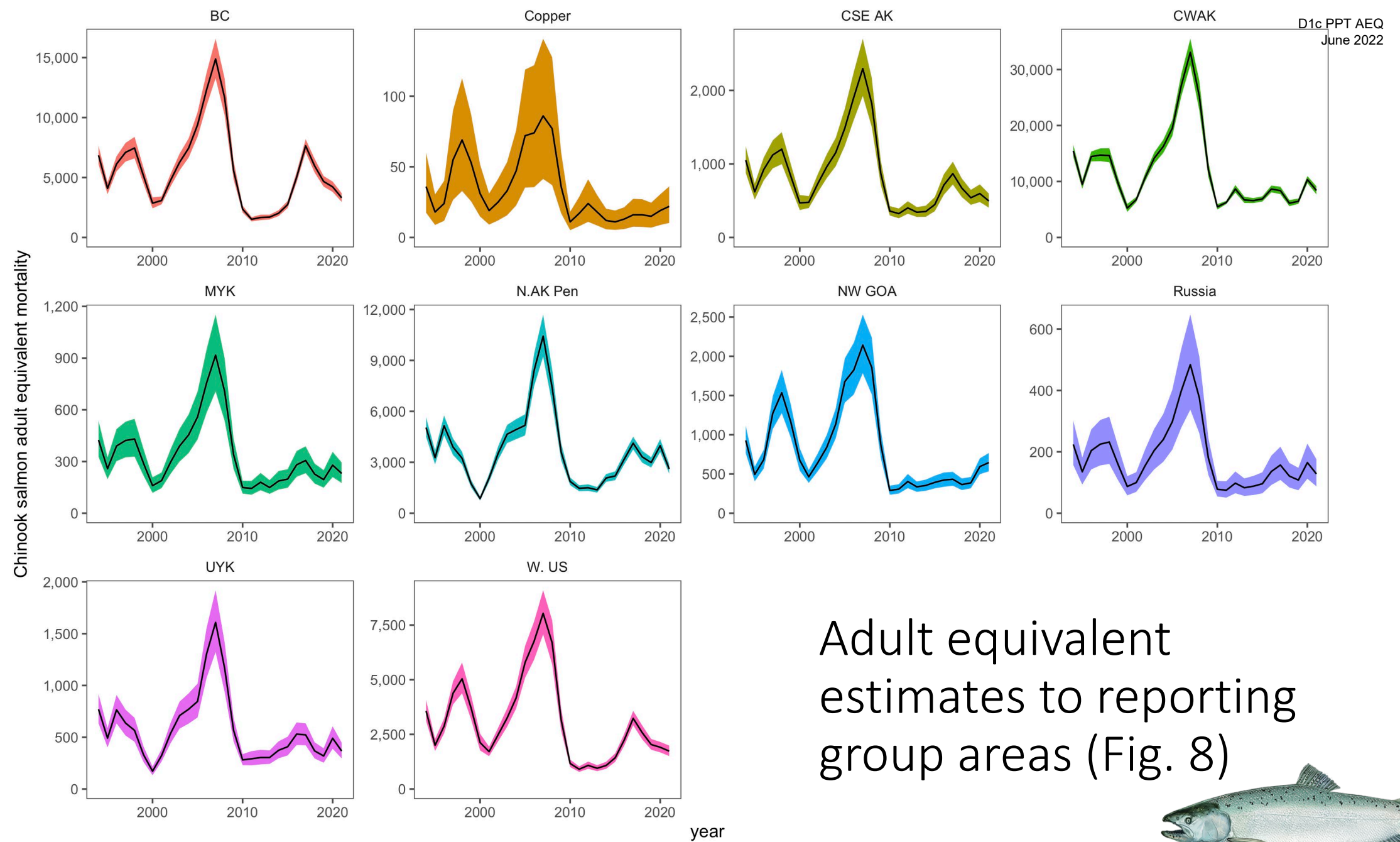


Sensitivity
to updated
information
(Fig 7)



Contrast w/
old and new
maturity
estimates
(Figure 9)

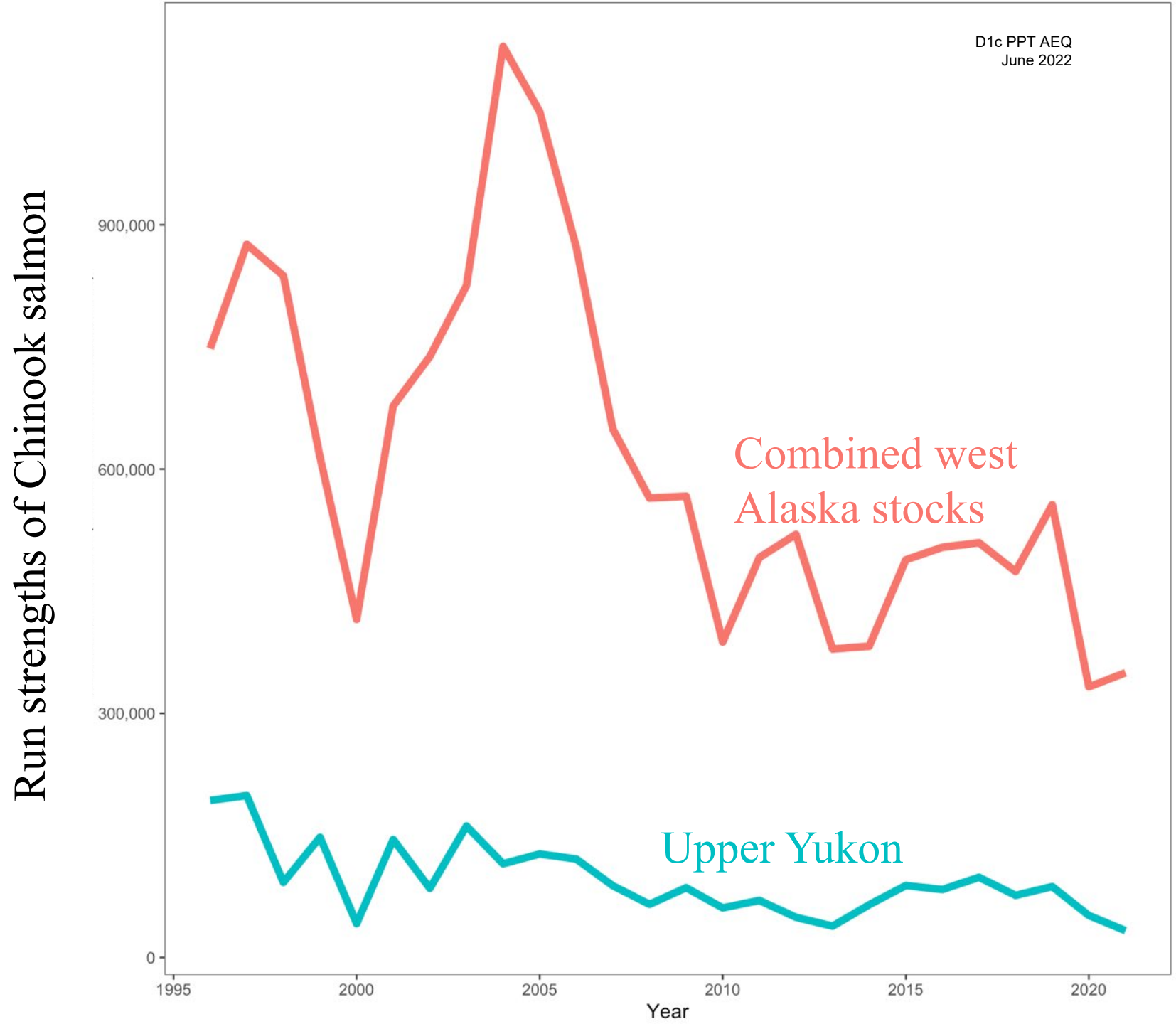




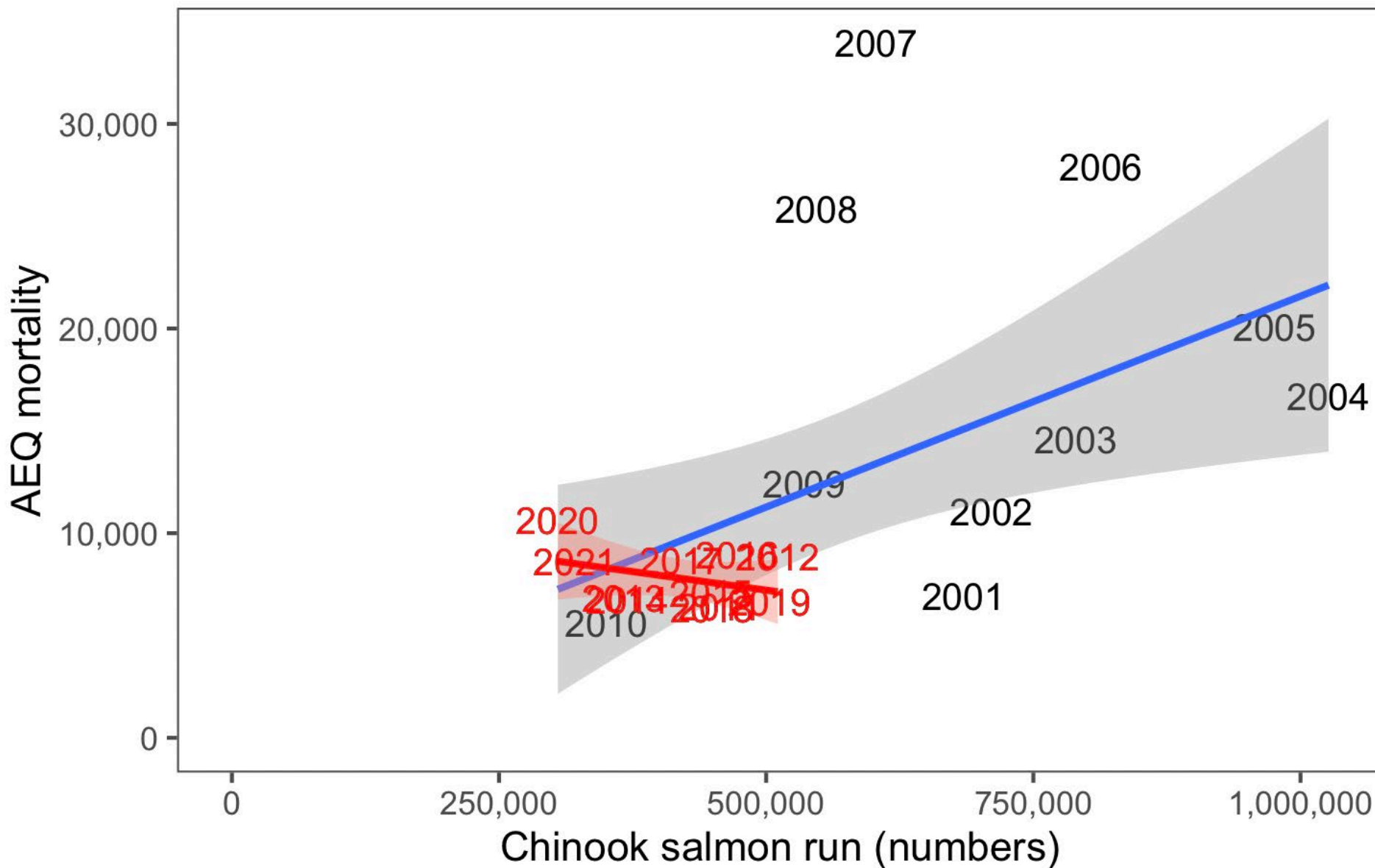
Adult equivalent estimates to reporting group areas (Fig. 8)



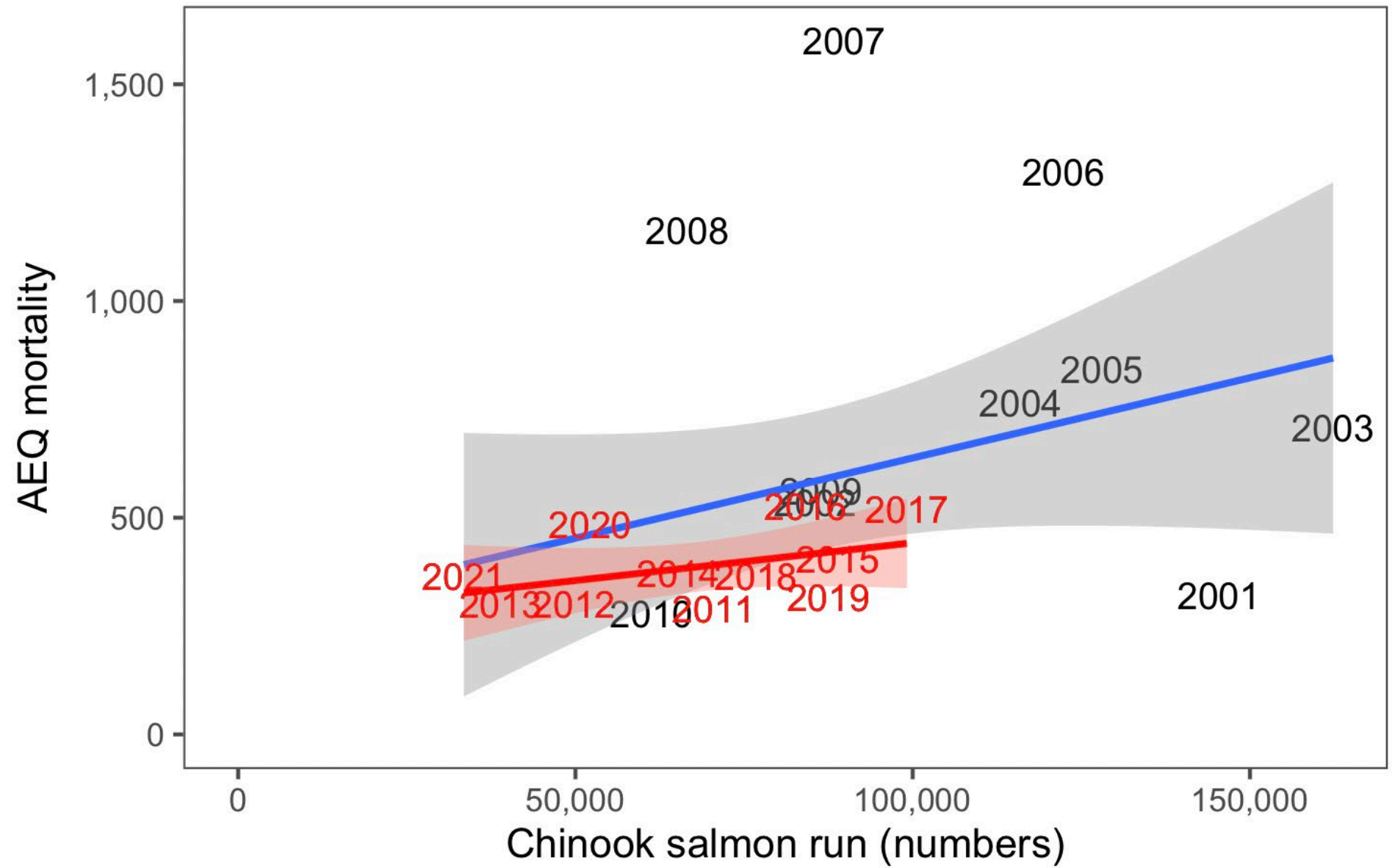
Run sizes



Combined west Alaska

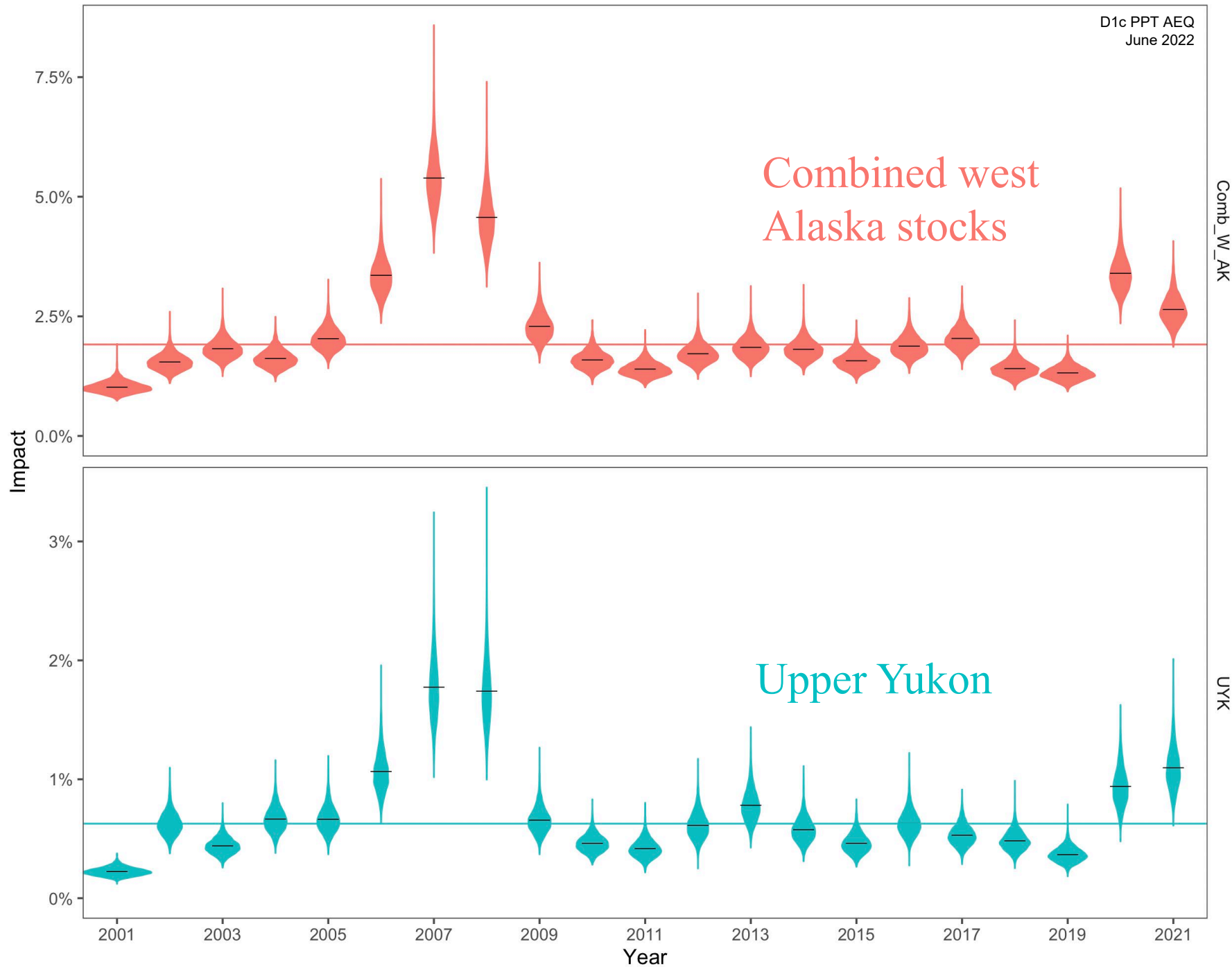


Upper Yukon



Impact estimates

$$\frac{\text{AEQ}}{\text{(run size + AEQ)}}$$



Impact rates

Response to Council request on "what-if" current limit had been caught...

Year	Combined W. Alaska		Upper Yukon	
	base	PSC=45k cap	base	PSC=45k cap
2011	1.40%	2.1%	0.42%	0.6%
2012	1.72%	4.0%	0.61%	1.6%
2013	1.85%	4.9%	0.78%	2.3%
2014	1.81%	4.8%	0.58%	1.6%
2015	1.57%	3.5%	0.46%	1.0%
2016	1.88%	3.1%	0.63%	1.1%
2017	2.04%	2.9%	0.53%	0.8%
2018	1.41%	2.5%	0.48%	0.9%
2019	1.32%	2.4%	0.37%	0.7%
2020	3.40%	5.0%	0.94%	1.4%
2021	2.64%	4.9%	1.10%	2.2%
Mean	1.91%	3.6%	0.63%	1.3%

Summary

- Impact rates which has averaged 1.9% since 2011 for the combined coastal western Alaska stocks
 - 0.6% for the Upper Yukon
- The rate for the western Alaska stocks increased in 2020 to an estimate of 3.4% but dropped in 2021 to 2.6%
 - 0.9% and 1.1% for the Upper Yukon
- The increase is due to lower returns overall with the biggest decrease for Combined western Alaska from the Nushagak River

Extra slides

Chinook salmon mean weight given length anomaly by season

