Pacific ocean perch

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- Outline:
  - SSC/PT comments
  - Overview slide
  - Pop’n trends/catch
  - Recommended changes
  - Recommended model results
  - Other analyses/things of interest
  - Future work

Pacific ocean perch

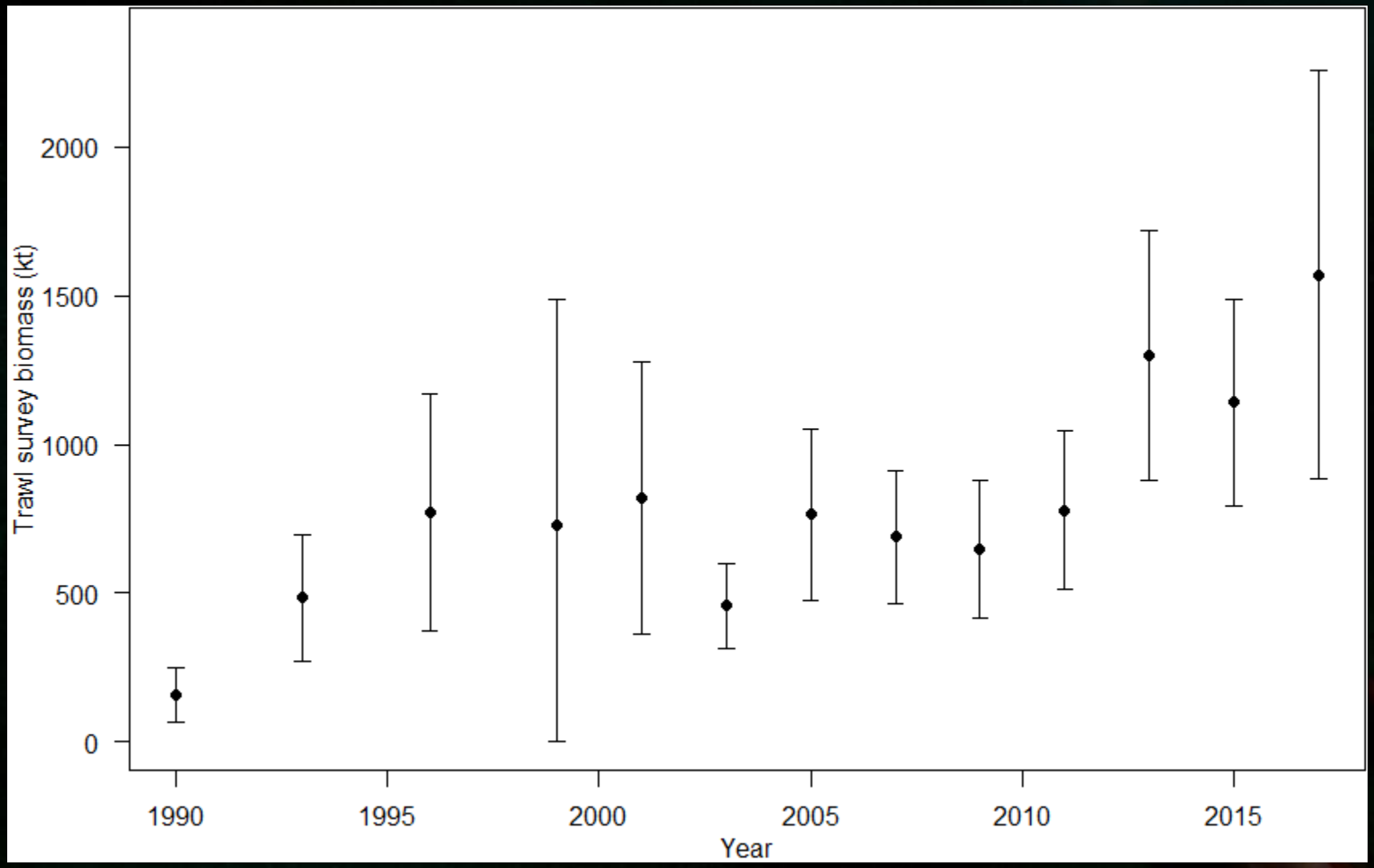
- SSC/Team comments:
  - ✗ VAST/GLMM survey biomass index
  - ✗ Data weighting
  - ✗ Explicit ecosystem and stock assessment status
  - ✓ Model numbering
  - ✓ Length bins/plus group
  - ✓ Investigate removal of 84/87 trawl survey data
  - ✓ WYAK harvest rates
  - ✓ Relating fishery selectivity to depth fished (investigated, not used)
  - ✓ Common process error in RE (investigated, not used)

Pacific ocean perch

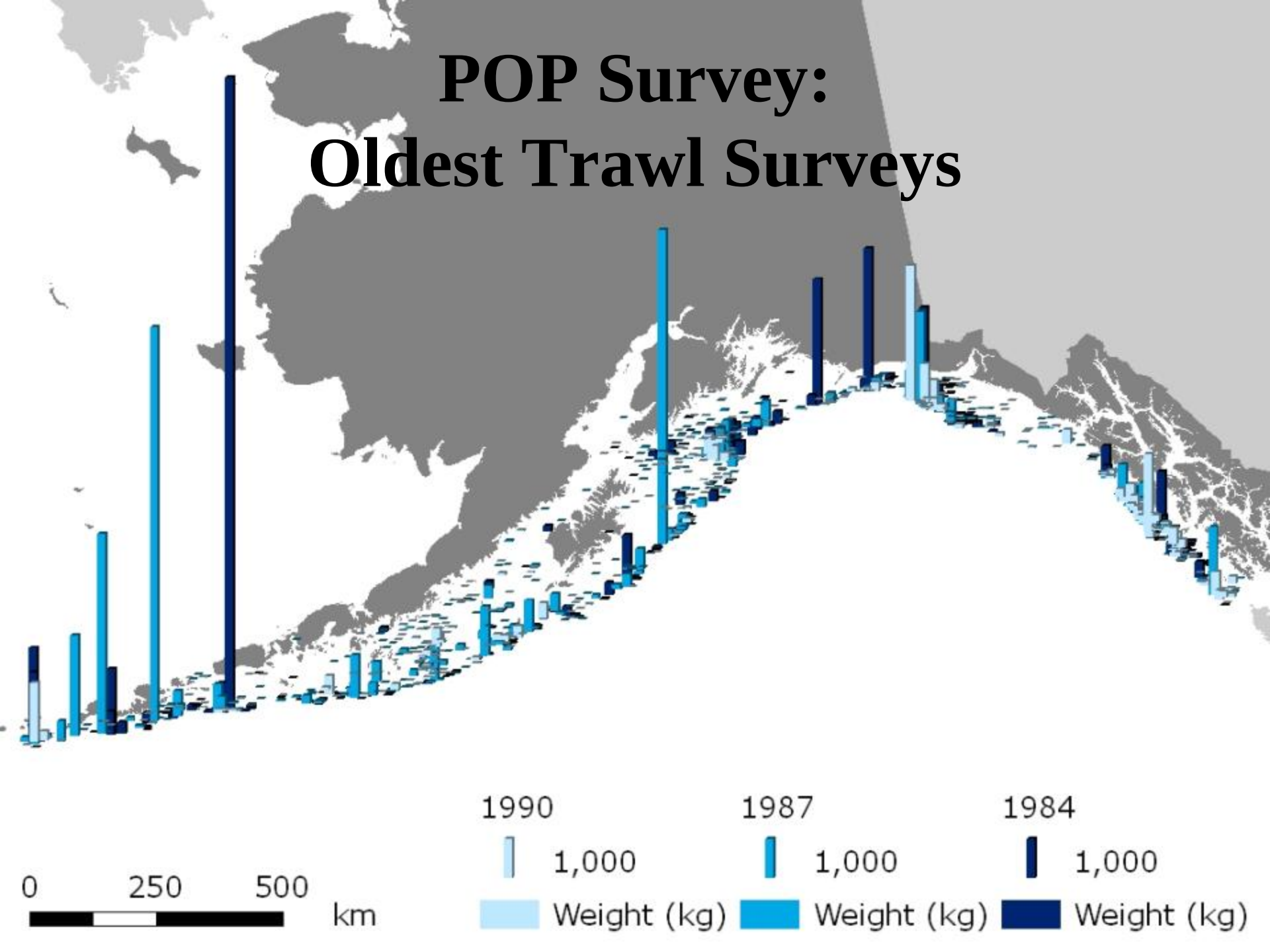
Tier 3a, update 2015 assessment model

- Changes in input data:
  - 2017 survey biomass estimates, 2015 survey age compositions, 2014 & 2016 fishery age compositions, and final catch for 2015 and 2016 and preliminary catch for 2017-2019
  - The fishery length composition data changed to 1 cm length bins and a plus length group of 45 cm
  - The 1984 and 1987 bottom trawl survey biomass and age composition removed from the time series
- Data trends
  - 2017 survey biomass largest of time series (CV=22%), 3rd year of trawl survey biomass >1 million t
- Model changes:
  - Bottom trawl survey biomass fit using a log-normal likelihood
  - Additional fishery selectivity time period added (2007 – present) to coincide with the Central GOA rockfish program and the availability of older fish to the fishery

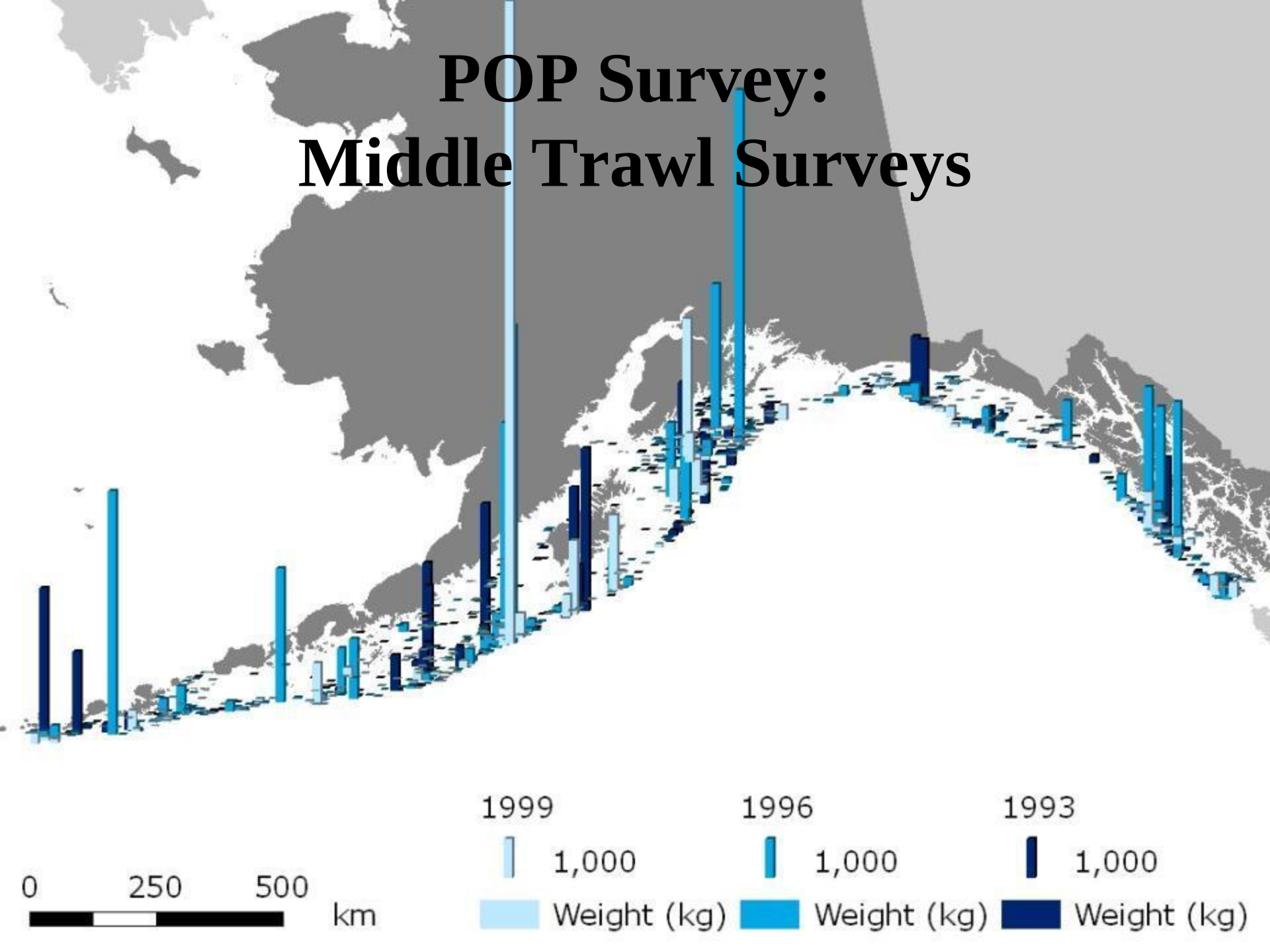
POP – Survey Biomass

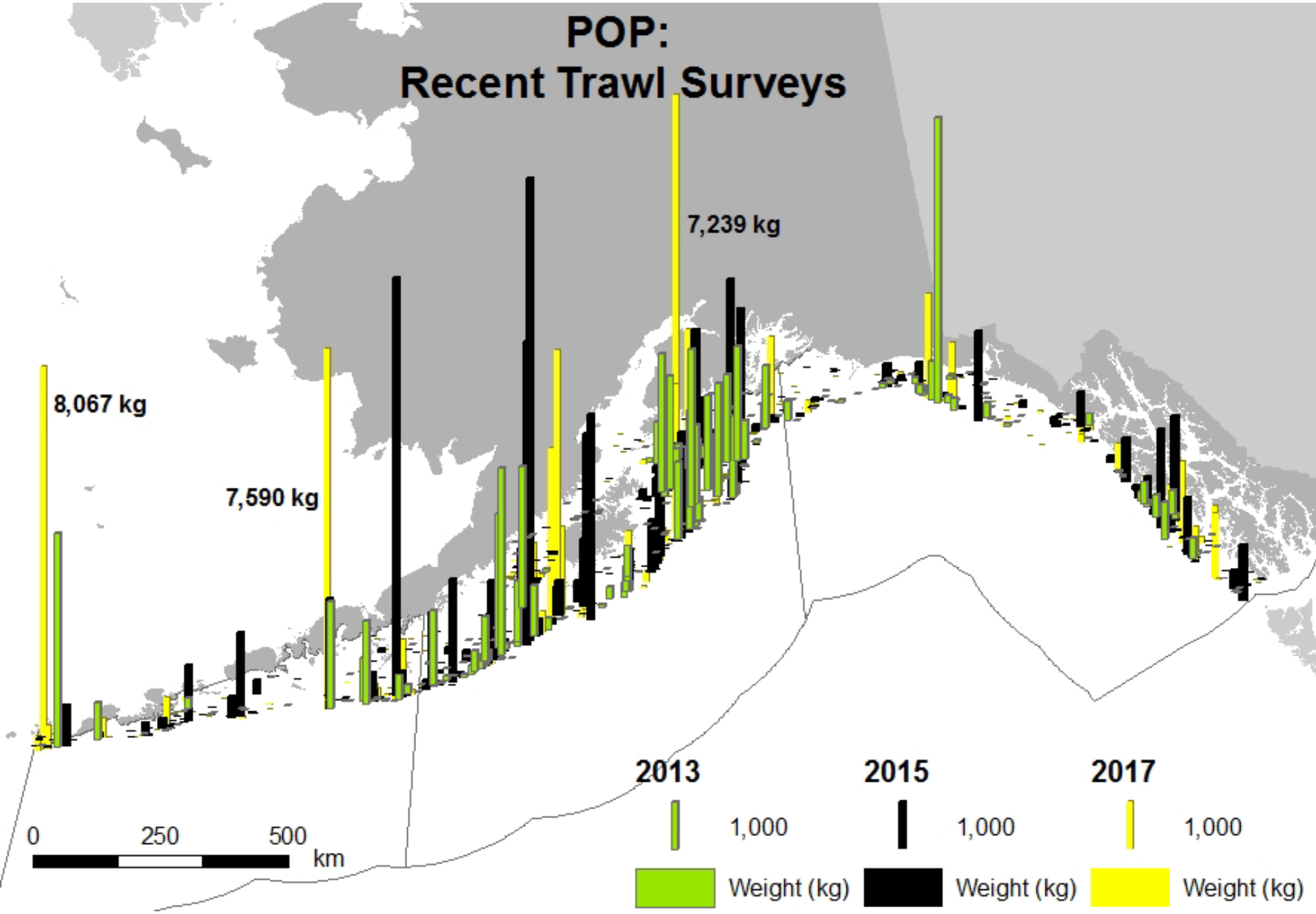


POP Survey:
Oldest Trawl Surveys

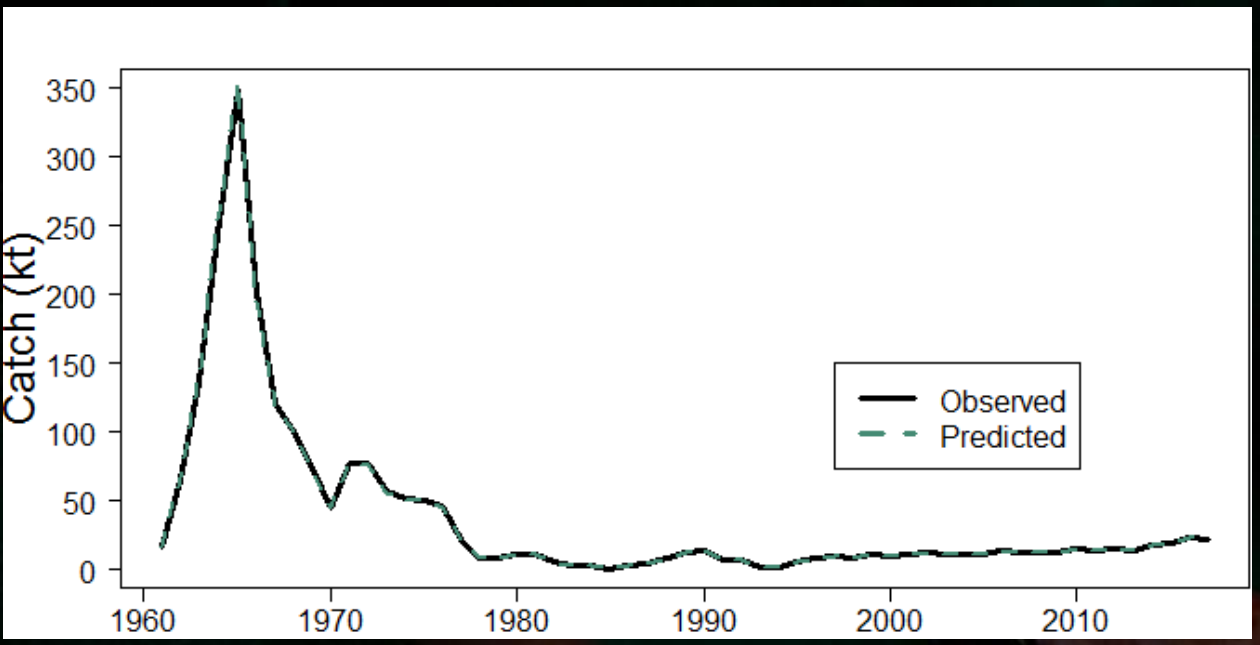


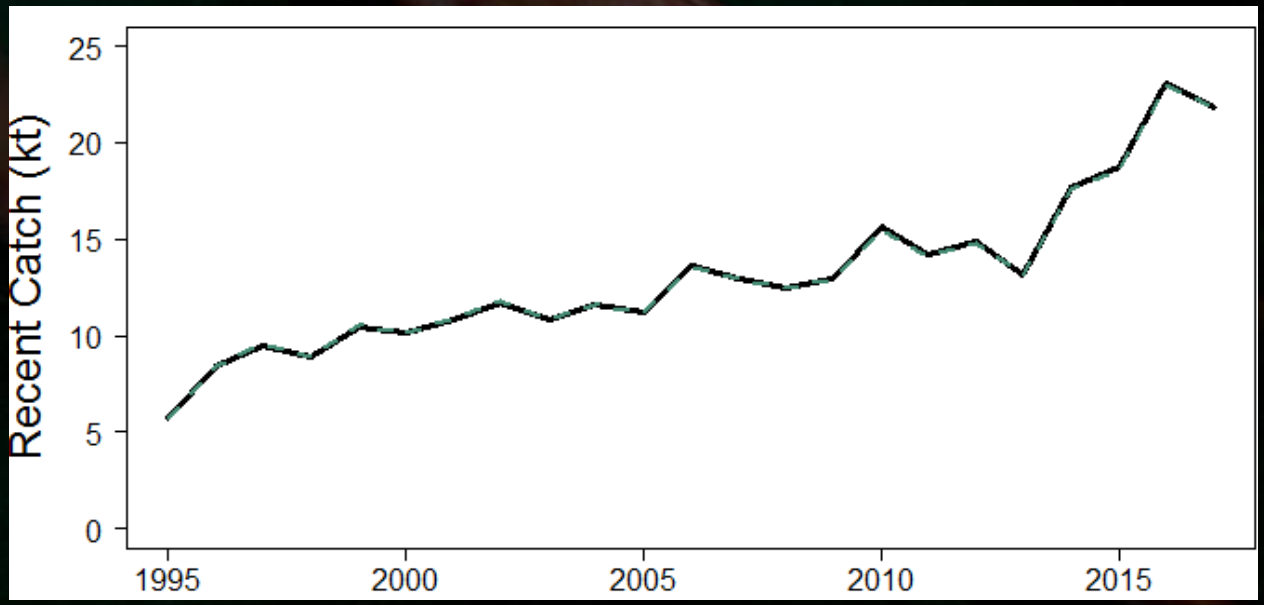
POP Survey:
Middle Trawl Surveys




POP:
Recent Trawl Surveys
7,239 kg
8,067 kg
7,590 kg
0
250
500
km
2013
1,000
Weight (kg)
2015
1,000
Weight (kg)
2017
1,000
Weight (kg)

POP – Catch

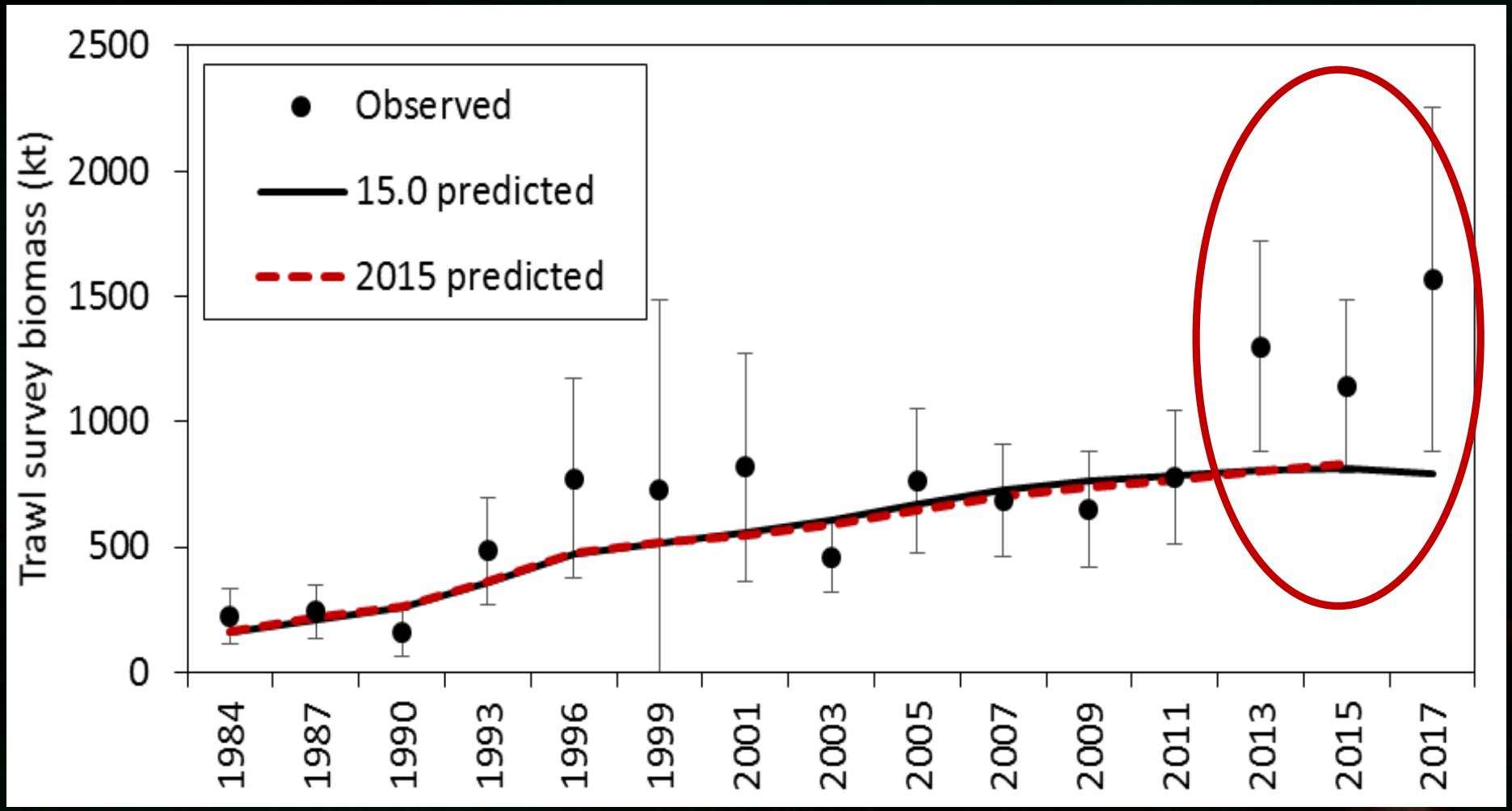

Catch (kt)
350
300
250
200
150
100
50
0
1960
1970
1980
1990
2000
2010
Observed
Predicted


Recent Catch (kt)
25
20
15
10
5
0
1995
2000
2005
2010
2015

POP – Model Evaluation

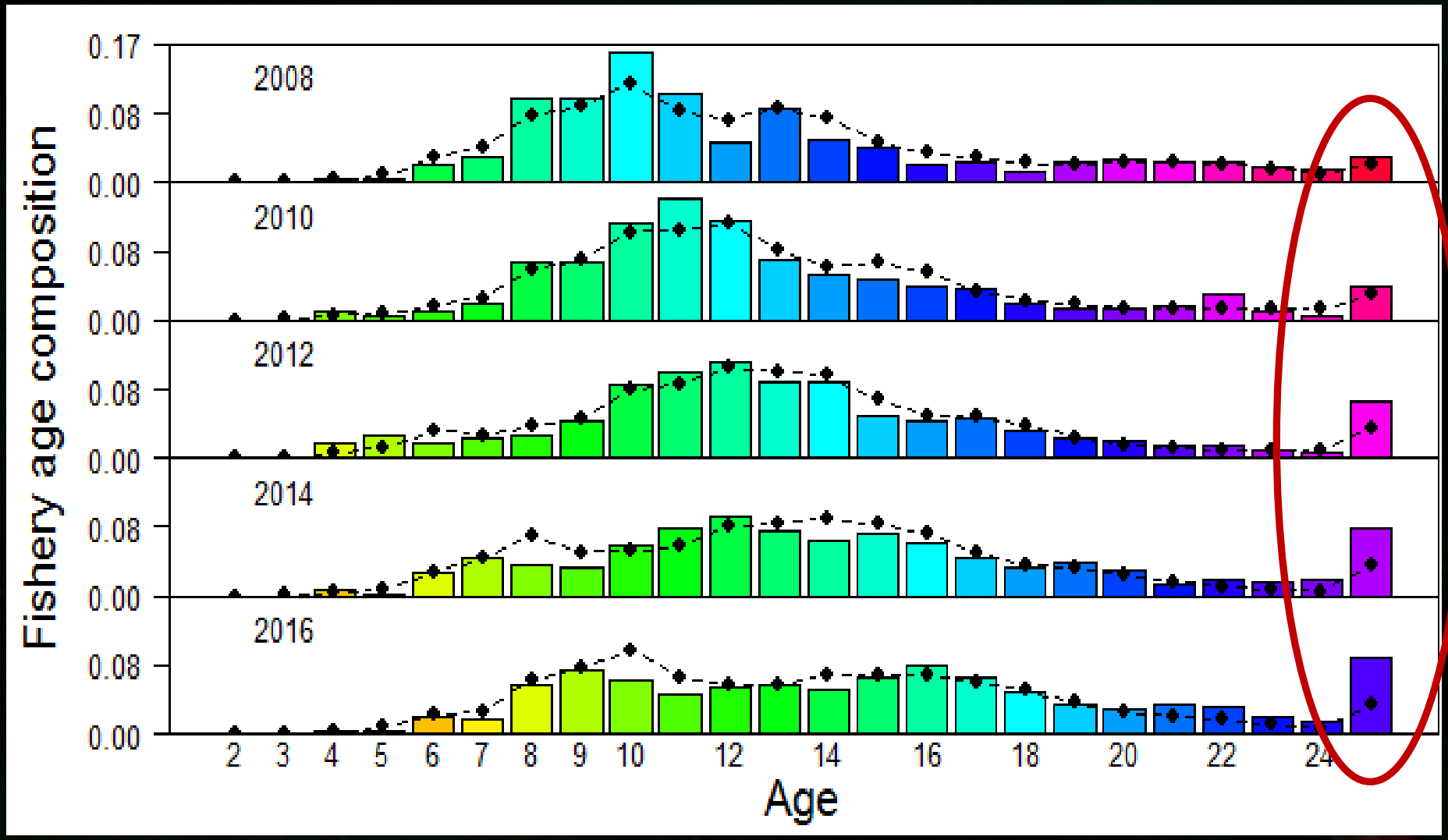
Model Evaluation:

- Issue #1: fit to trawl survey biomass



Model Evaluation:

- Issue #2: fit to recent fishery plus age group



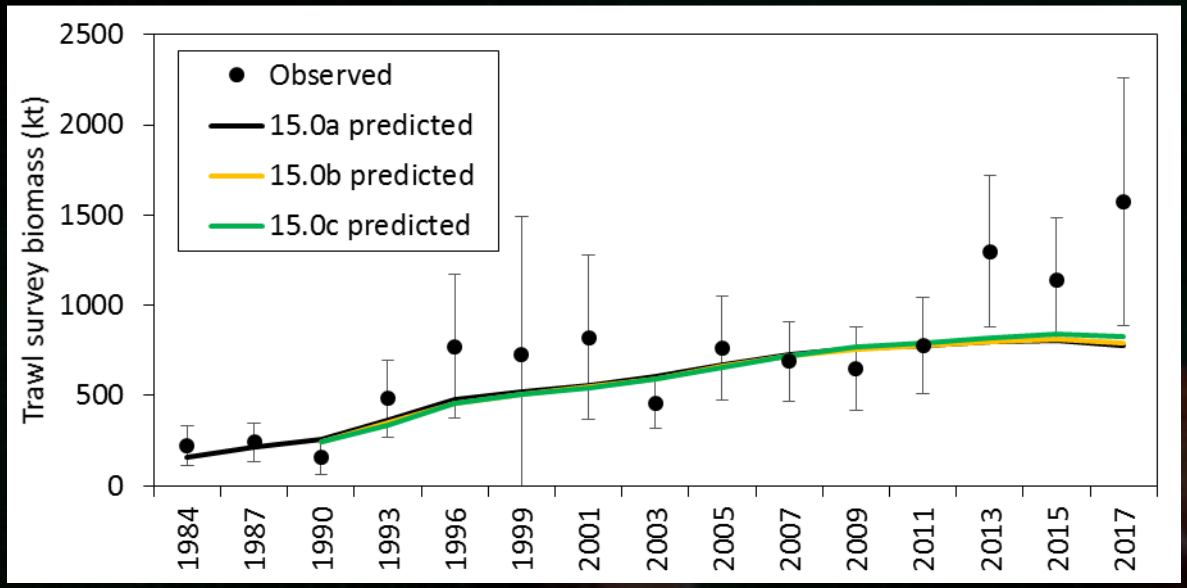
Model Evaluation:

- Model cases for this year:

Model case	Description
15.0	2015 model with data updated through 2017 (Model case M3 in 2015)
15.0a	15.0 with 1 cm length bins and a plus length group of 45 cm
15.0b	15.0a with 1984 and 1987 bottom trawl survey biomass removed
15.0c	15.0a with 1984 and 1987 bottom trawl survey biomass and age composition removed
15.0d	15.0c with log-normal distribution used to fit the bottom trawl survey biomass
17.0	15.0d with dome-shaped fishery selectivity estimated for all years
17.1	15.0d with additional dome-shaped selectivity time block starting in 2007 to coincide with the Central GOA rockfish program

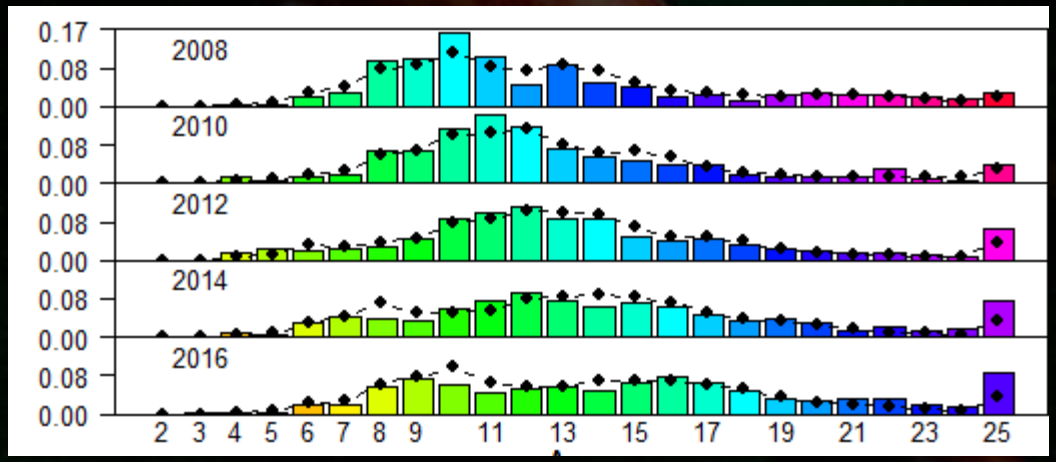
Model Evaluation:

- 15.0a-c (length bins/plus length & 84/87 trawl survey)



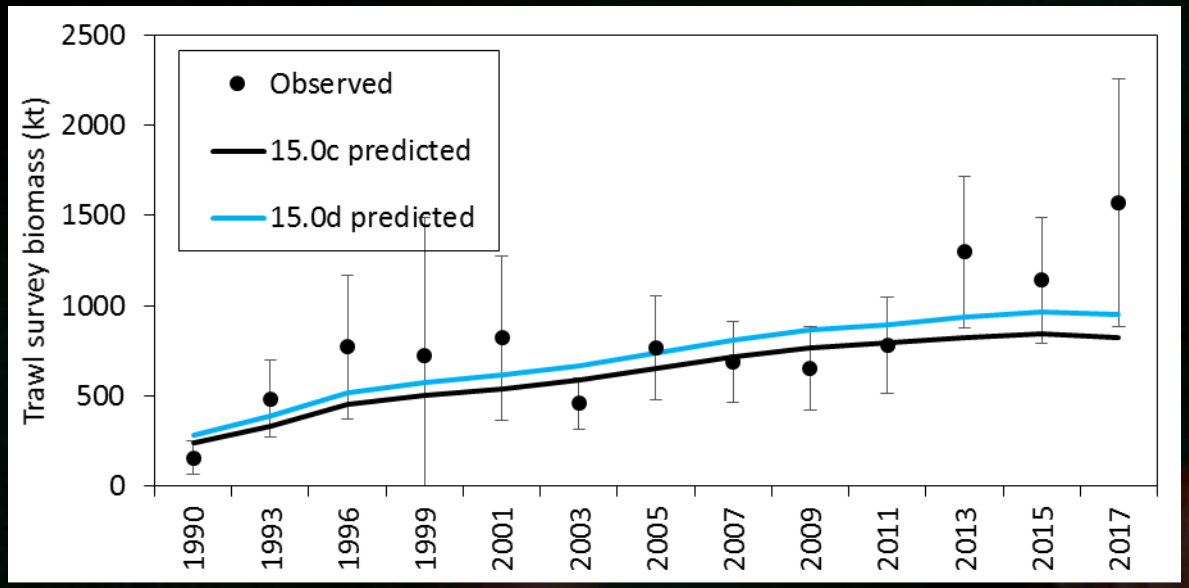
Issues not resolved: #1 best with 15.0c, #2 unchanged

Recommend: change length bins/plus group, remove both biomass and age comps in 84/87



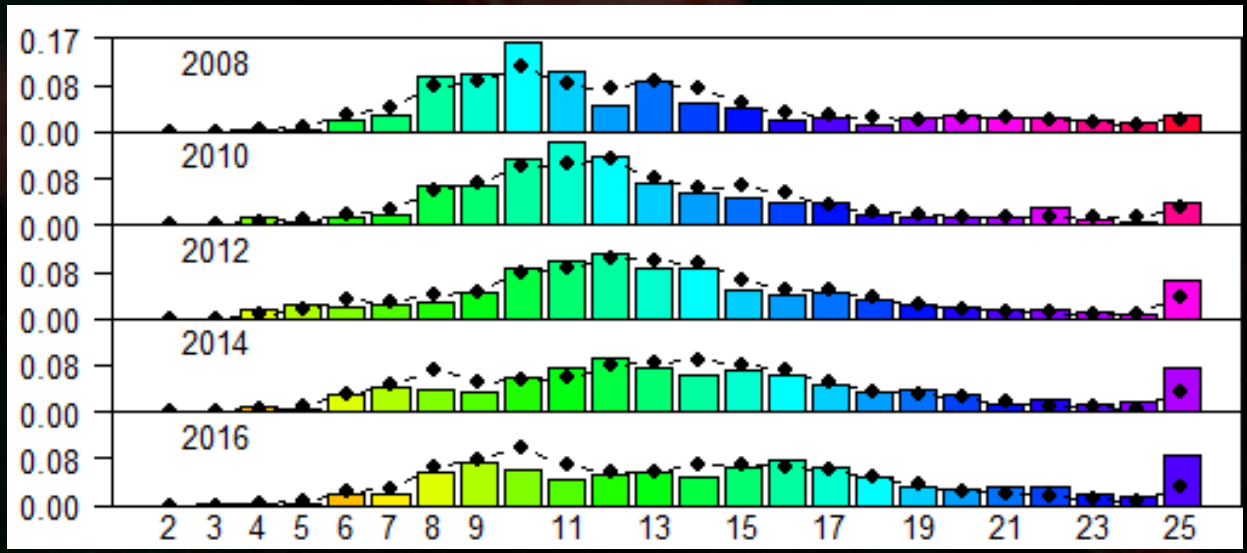
Model Evaluation:

- 15.0d (log-Normal bottom trawl survey)



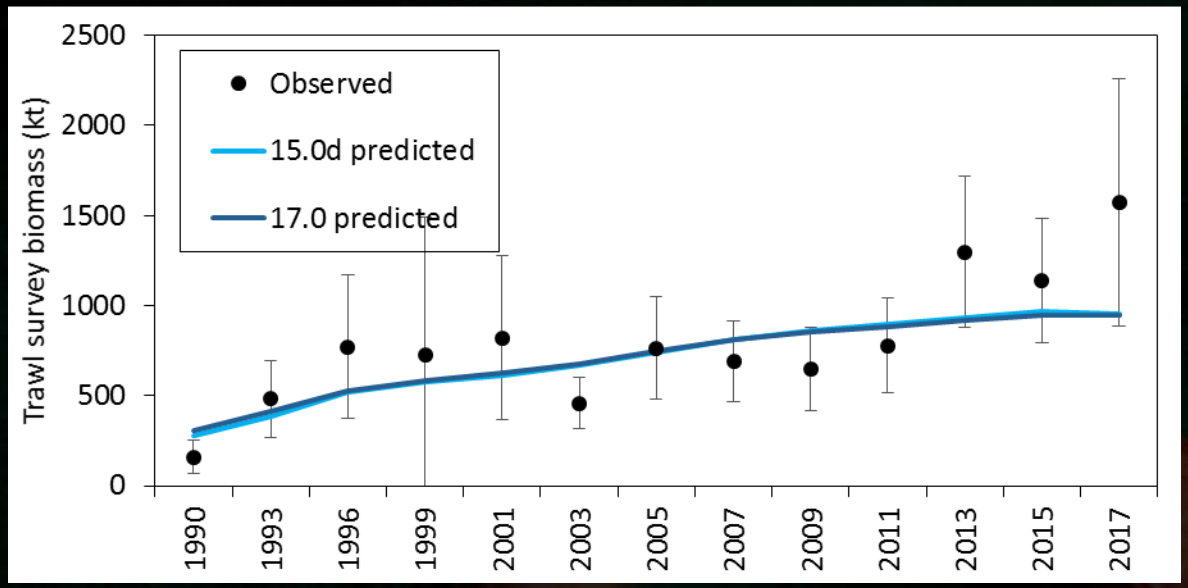
Again, issues not completely resolved: #1 much better than 15.0c, #2 unchanged

Recommend: Fit survey biomass with log-normal

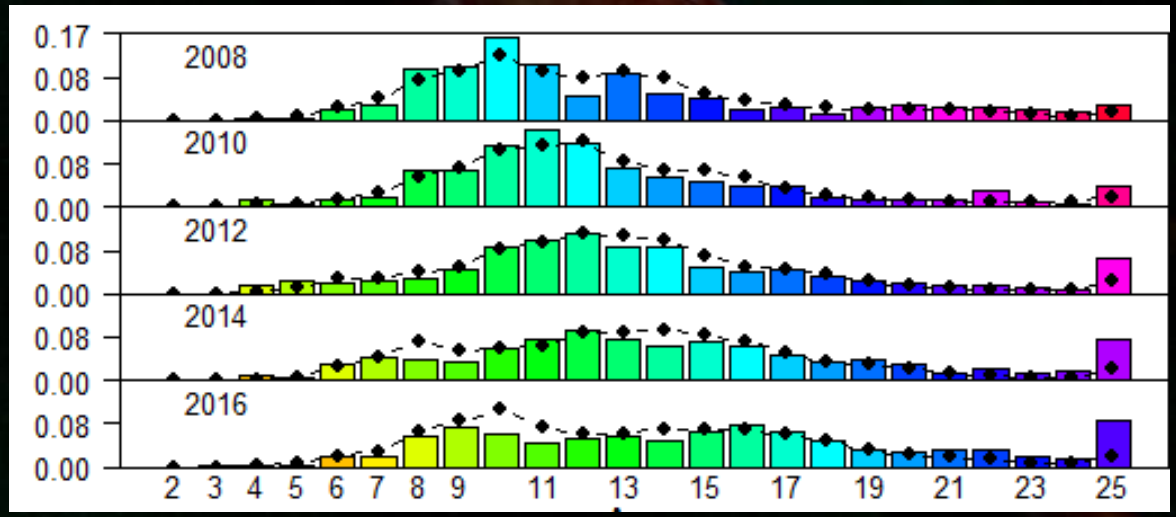


Model Evaluation:

- 17.0 (dome-shaped selectivity for all years)

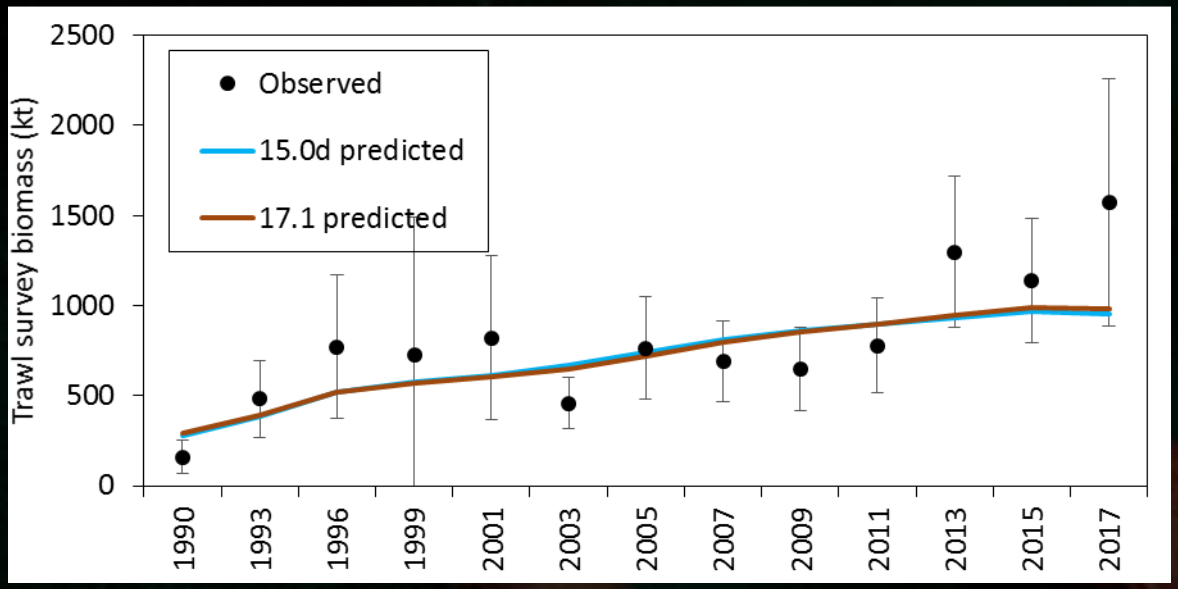


Issues: basically same as 15.0d, 15.0d slightly better for #1, no change to #2



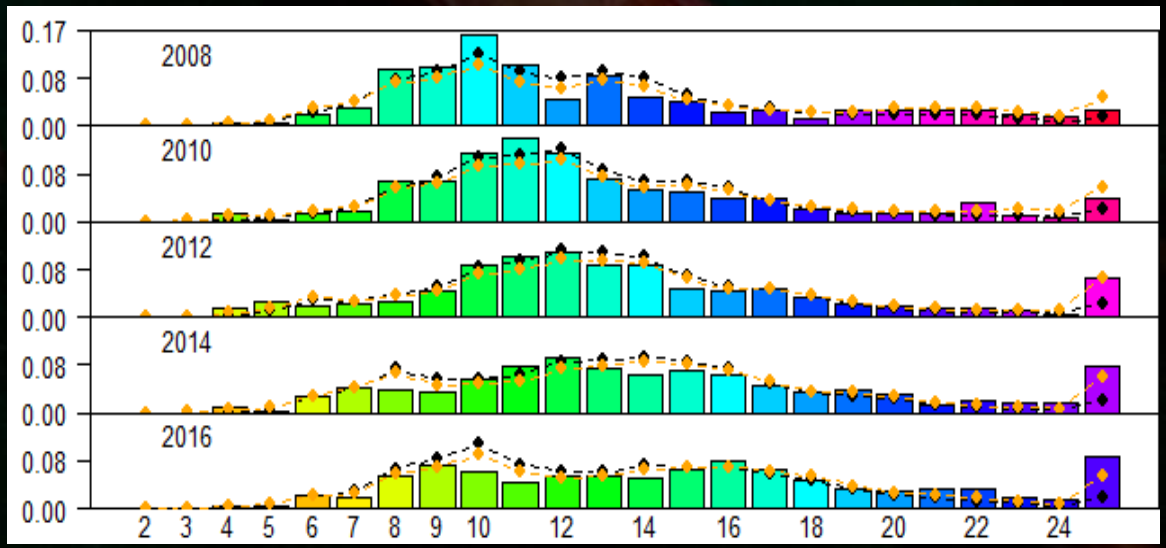
Model Evaluation:

- 17.1 (add fishery selectivity time period in 2007)



Issues: Slightly improved for #1, greatly improved for #2

Recommend: add time period after 2007

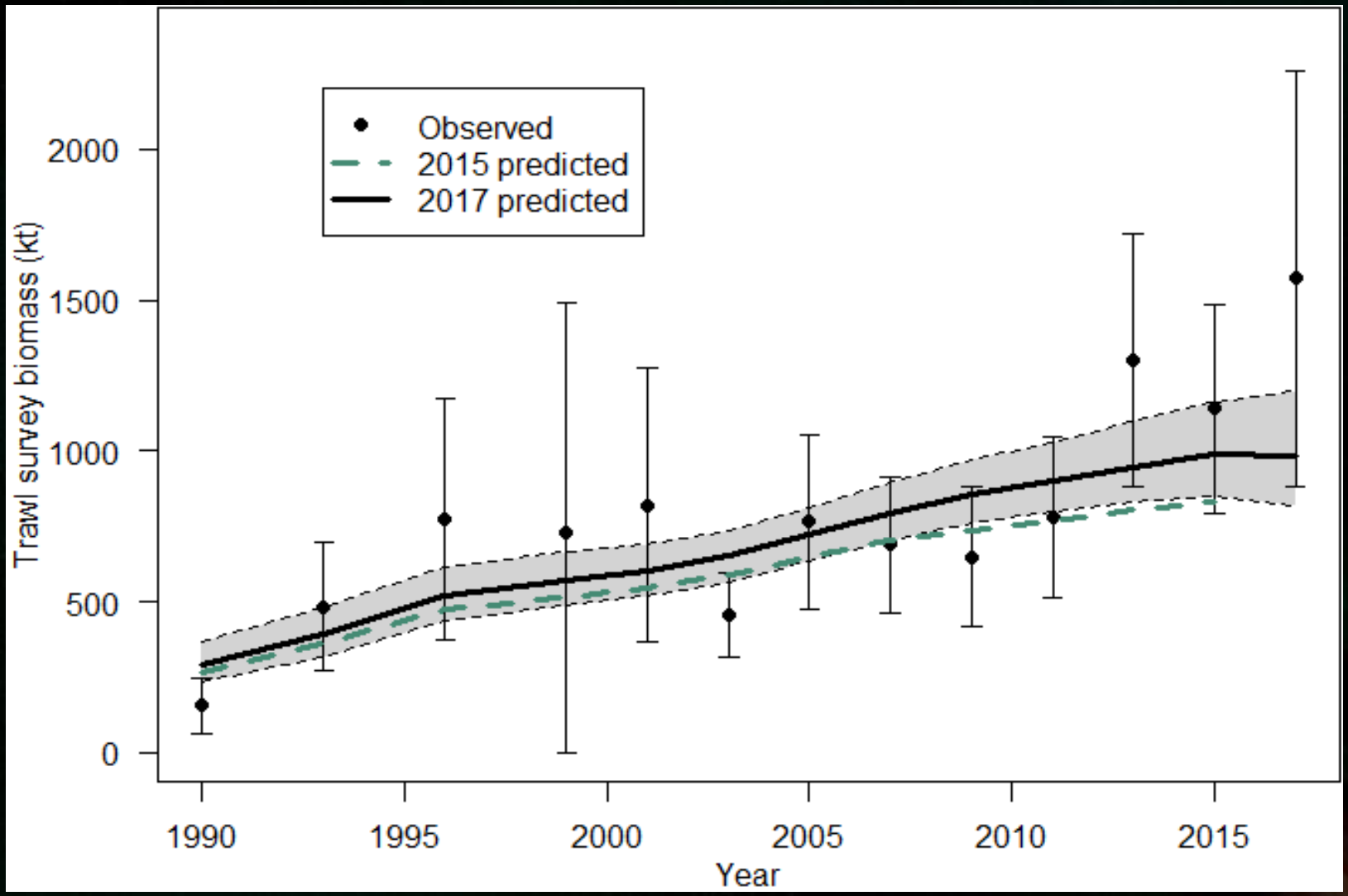


Model Evaluation:

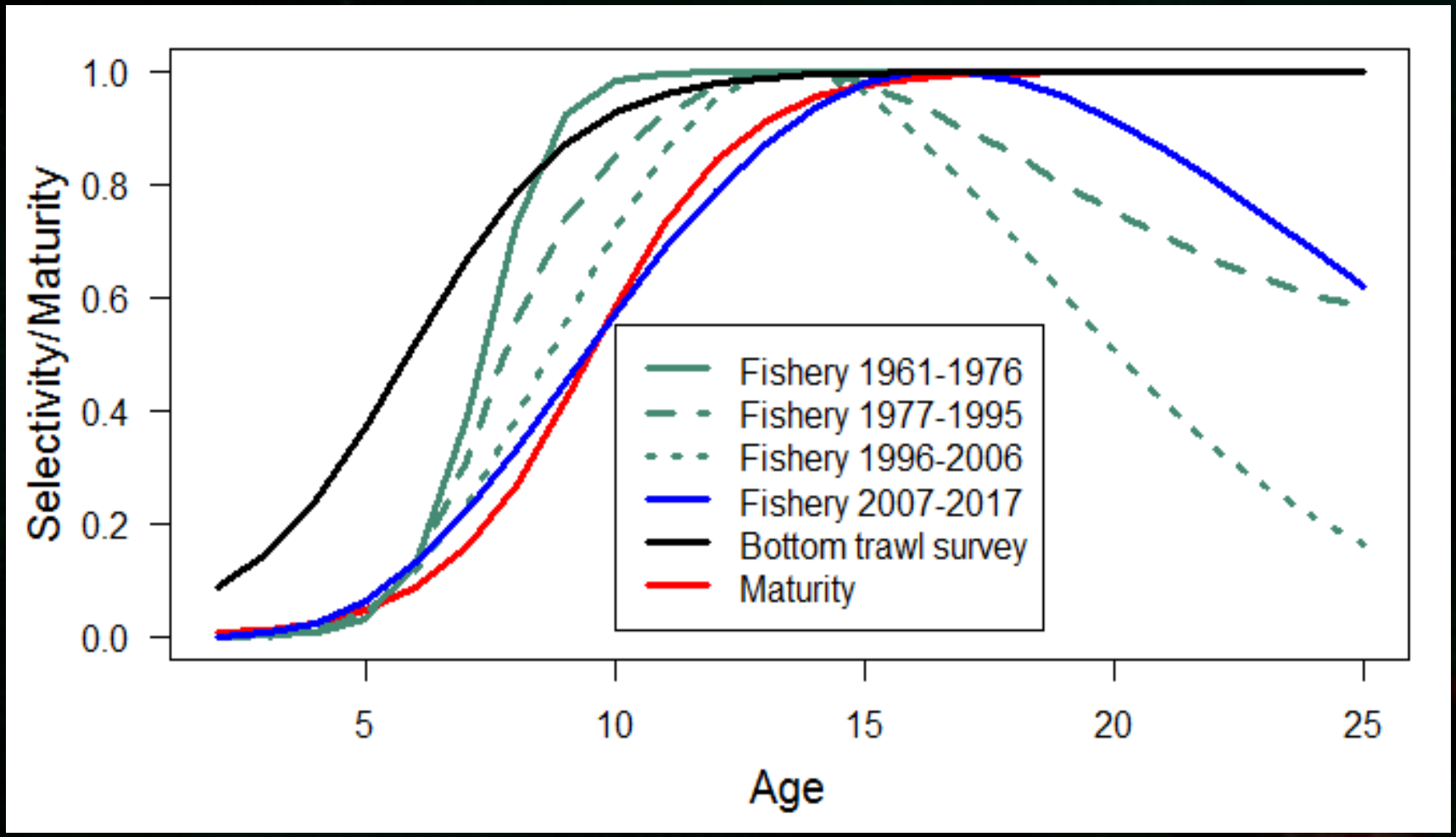
Likelihoods	2015	15.0	15.0a	15.0b	15.0c	15.0d	17.0	17.1
Catch	0.14	0.15	0.17	0.16	0.17	0.18	0.16	0.18
Survey Biomass	12.21	15.34	15.51	14.07	13.31	14.09	14.82	13.23
Fishery Ages	18.24	23.20	23.17	23.30	23.57	23.93	28.20	19.28
Survey Ages	32.03	33.69	33.55	33.37	18.74	18.72	18.93	19.55
Fishery Sizes	55.34	55.98	66.16	66.27	65.24	65.34	66.11	65.51
Data-Likelihood	221.48	231.88	242.08	240.68	224.55	225.78	231.73	**221.27**
Penalties/Priors								
Recruitment Devs	21.56	20.71	22.21	23.02	17.26	16.77	7.93	15.92
F Regularity	4.63	4.93	4.82	4.93	5.01	5.06	8.03	5.08
Sigma r prior	5.48	5.76	5.49	5.36	6.39	6.48	8.26	6.64
q prior	1.12	0.92	1.02	0.89	1.07	1.46	0.35	1.39
M prior	2.02	1.81	2.28	2.14	2.99	3.25	3.46	3.73
Objective Fun Total	256.29	266.01	277.92	277.01	257.27	258.79	259.76	**254.04**
Parameter Ests.								
Active parameters	152	156	156	156	156	156	154	158
Mohn's rho	-0.17	-0.21	-0.22	-0.21	-0.18	-0.22	0.20	-0.22
q	1.95	1.84	1.89	1.81	1.92	2.14	1.46	2.11
M	0.061	0.060	0.062	0.062	0.064	0.065	0.065	0.066
Sigma r	0.88	0.86	0.88	0.88	0.83	0.83	0.75	0.82
Mean Recruitment (mill)	52.74	53.72	52.22	52.34	57.02	58.57	82.36	60.84
$F_{40\%}$	0.102	0.095	0.096	0.096	0.097	0.098	0.109	0.094
Total Biomass	457,768	452,284	432,626	458,584	468,887	487,310	695,769	511,857

POP – Recommended Model Results

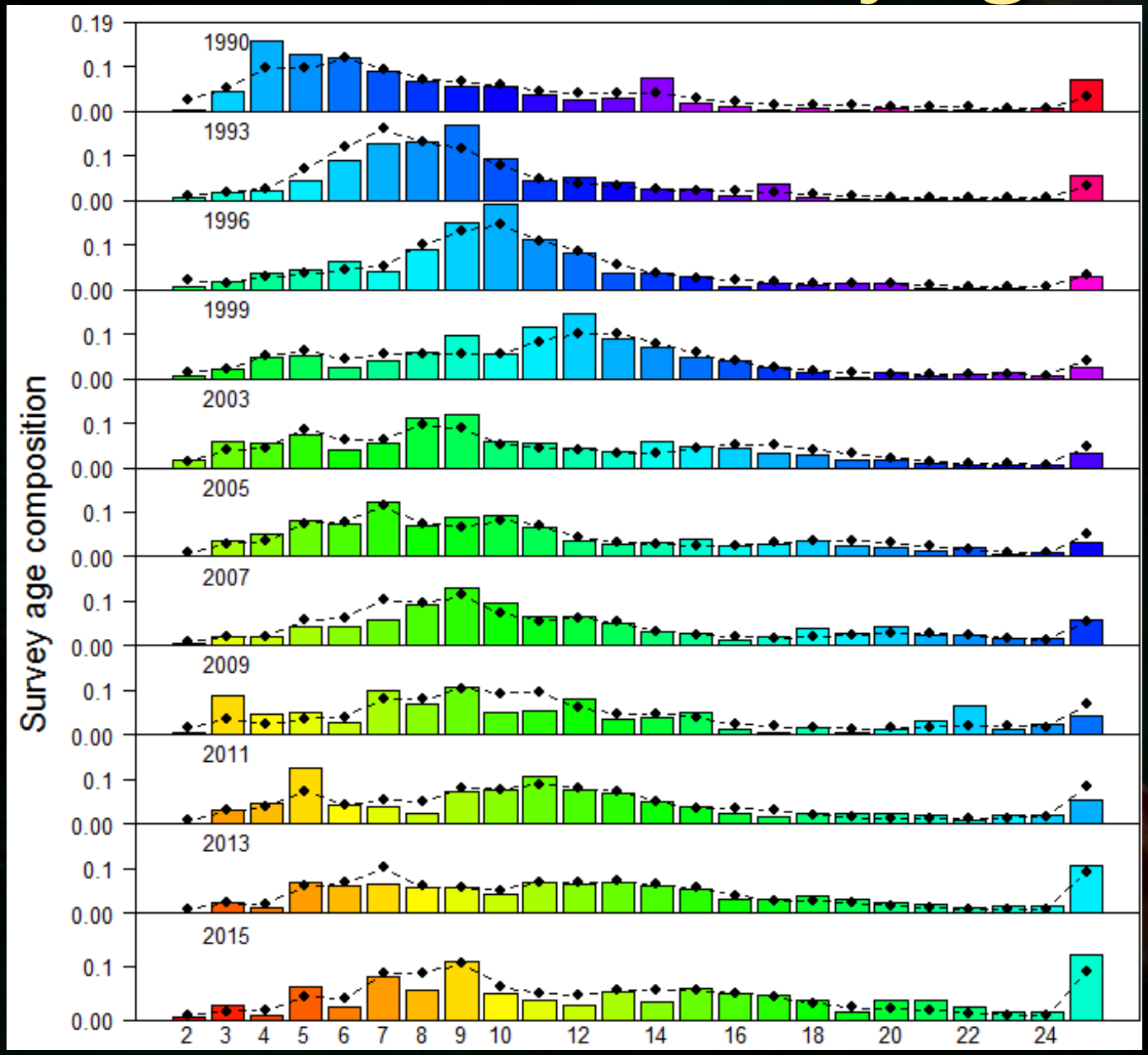
POP – Survey Biomass



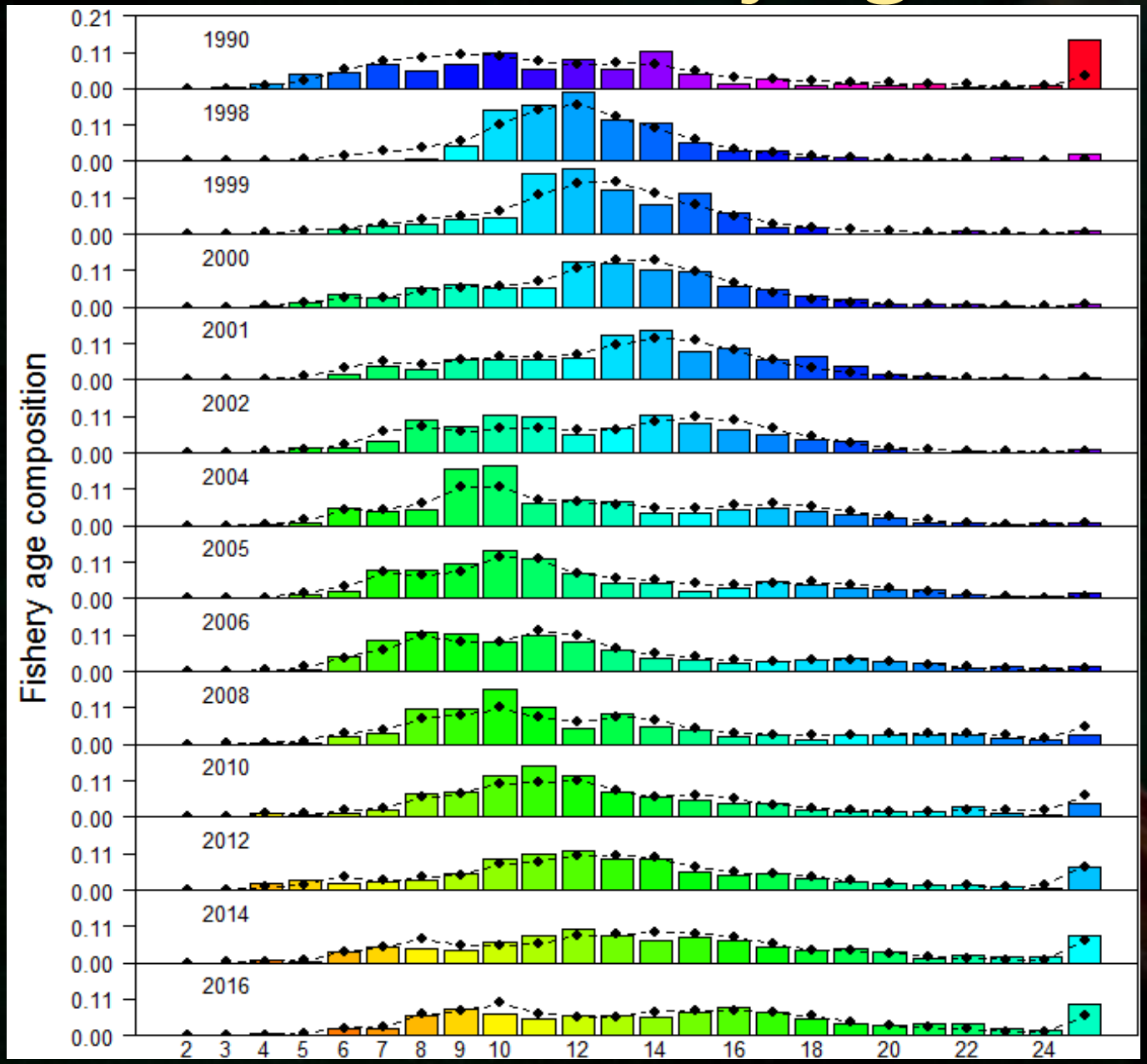
POP – Selectivity



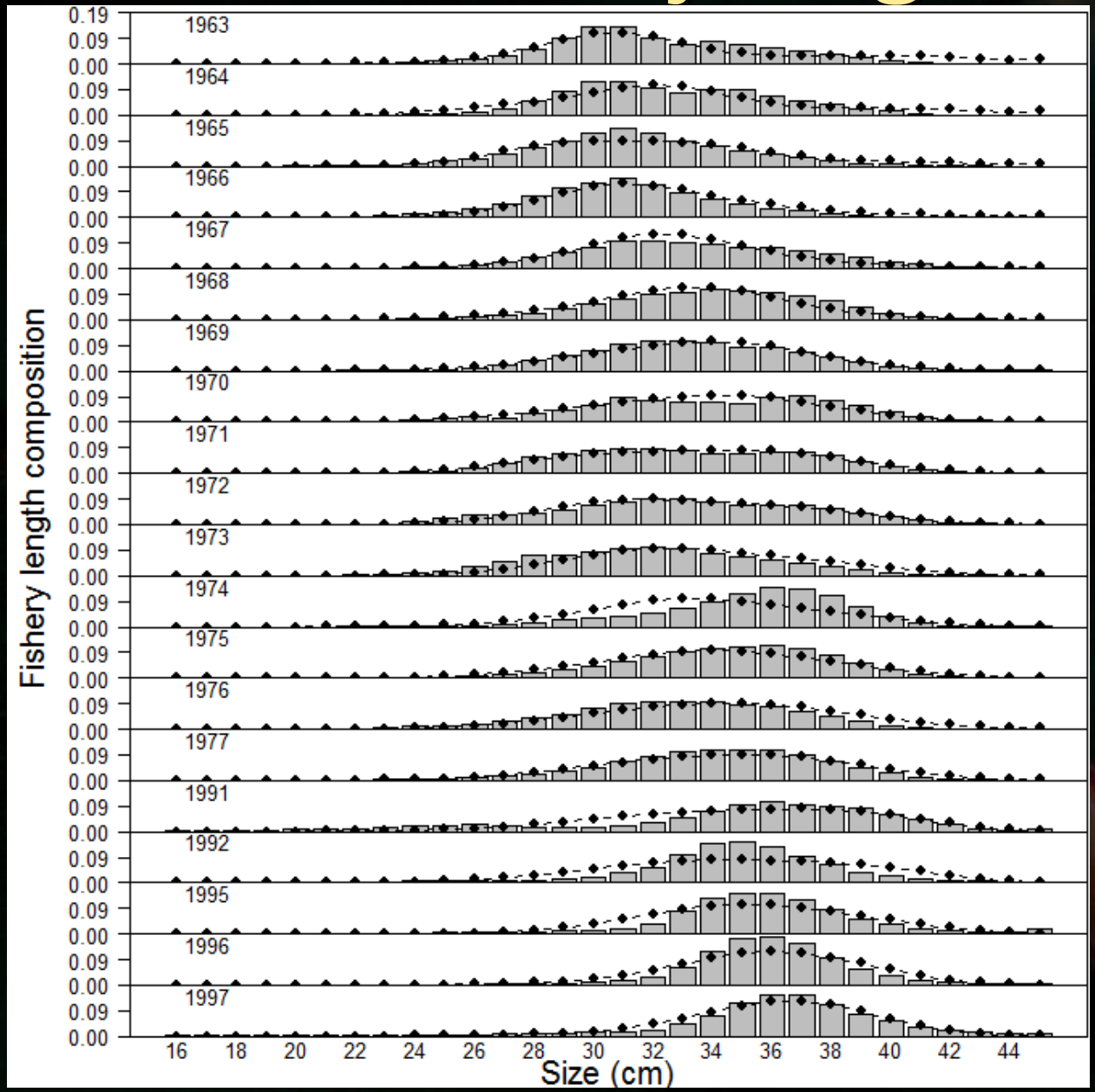
POP – Trawl survey age



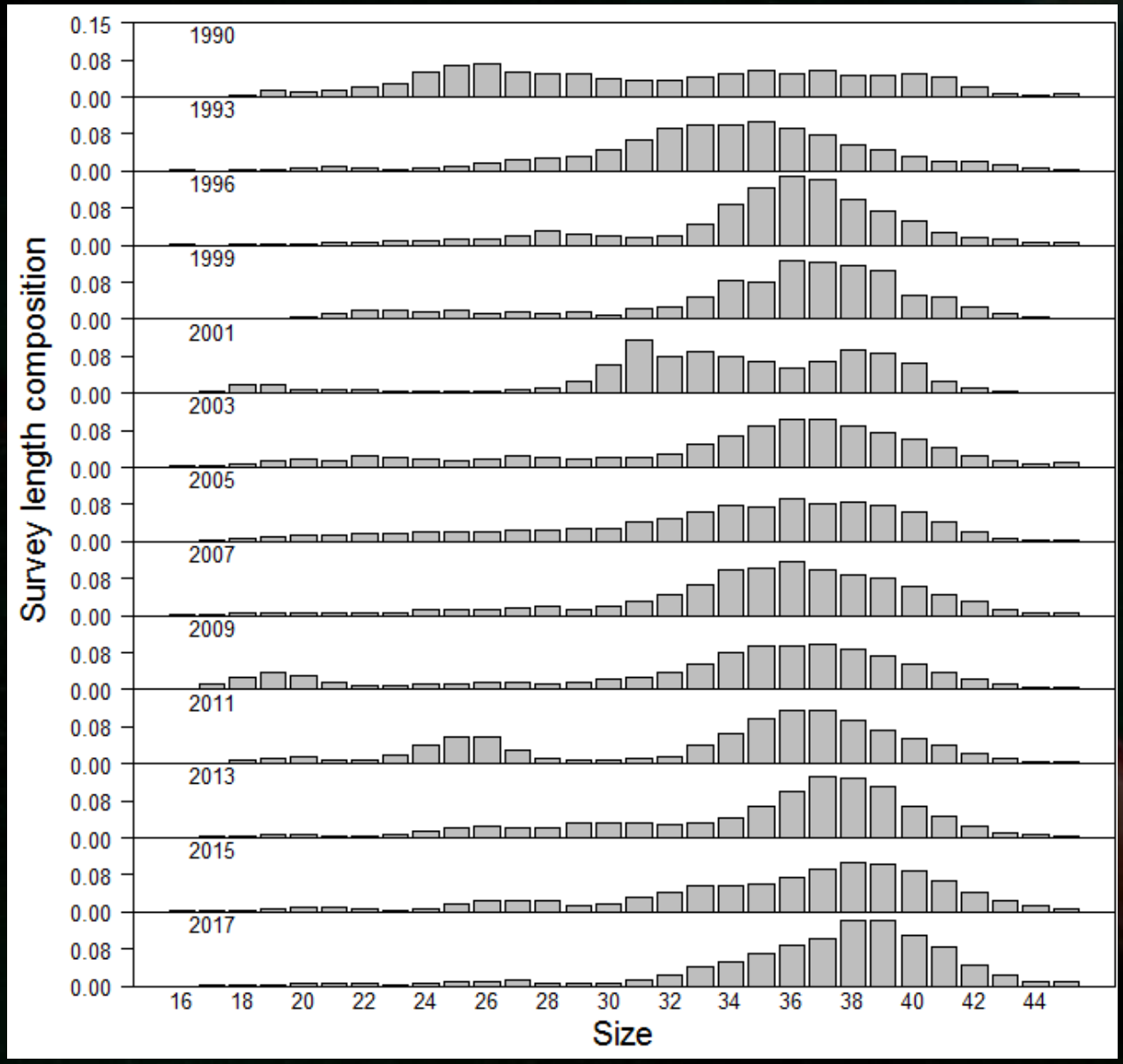
POP – Fishery age



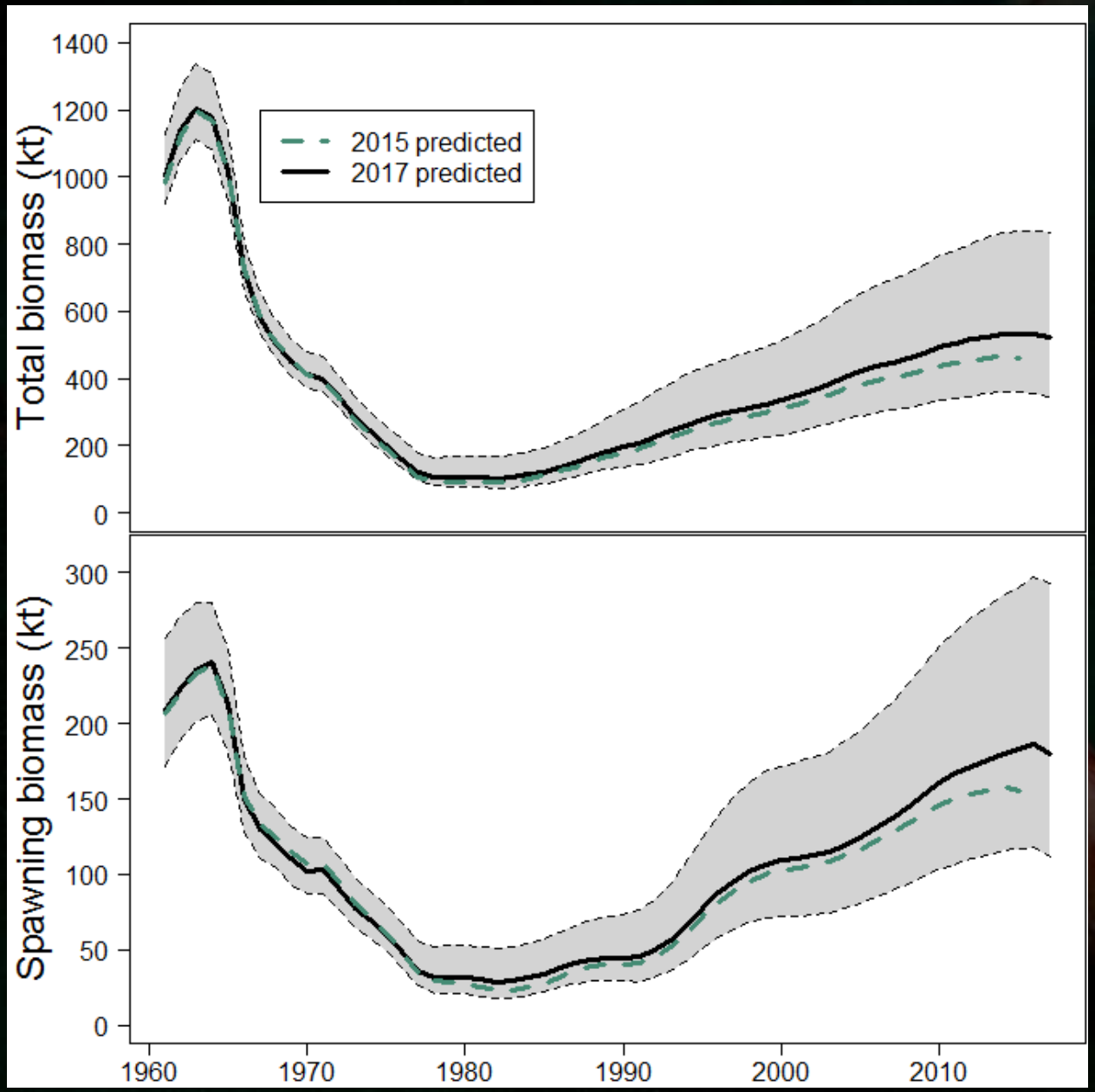
POP – Fishery length



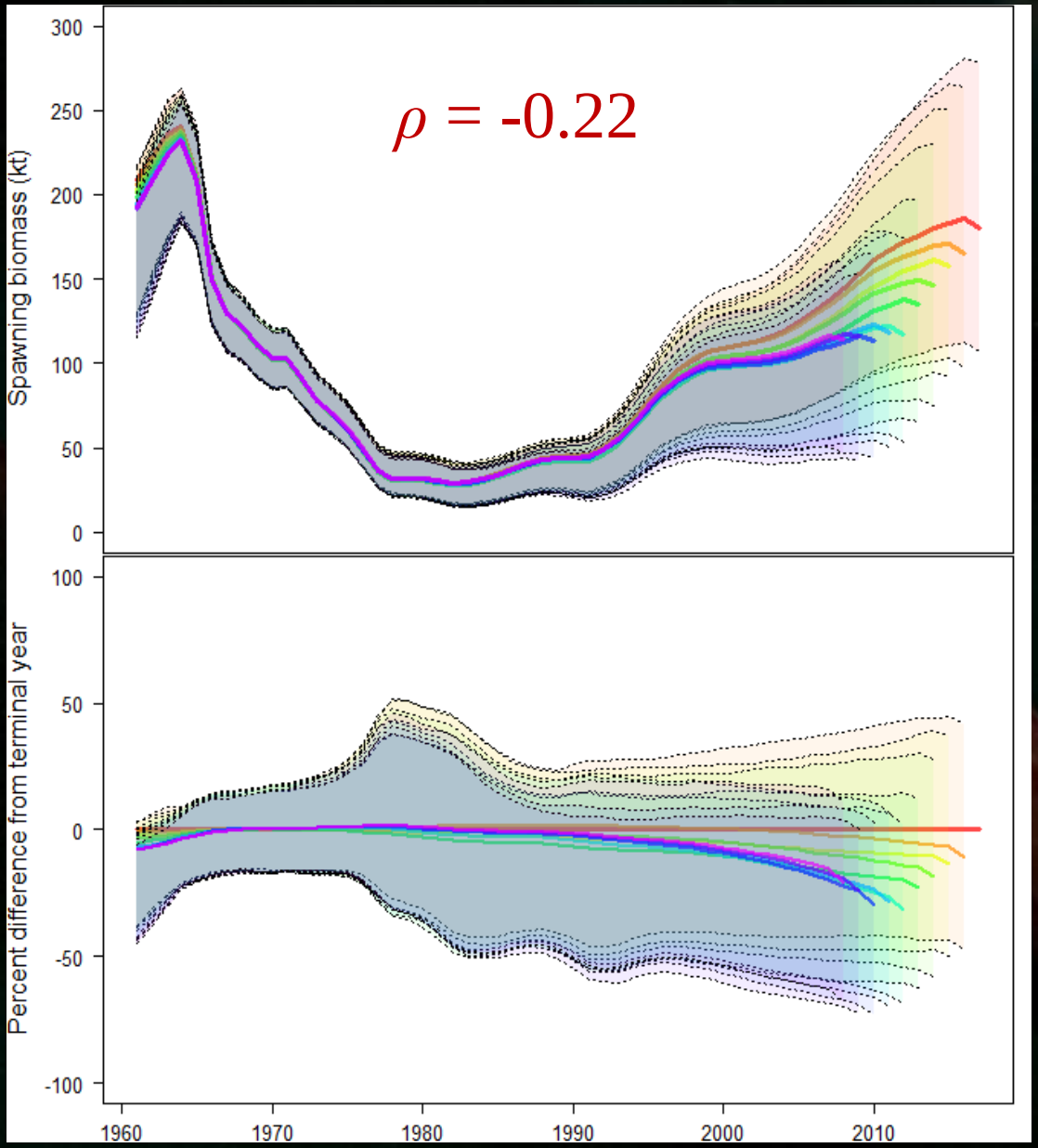
POP – Survey length



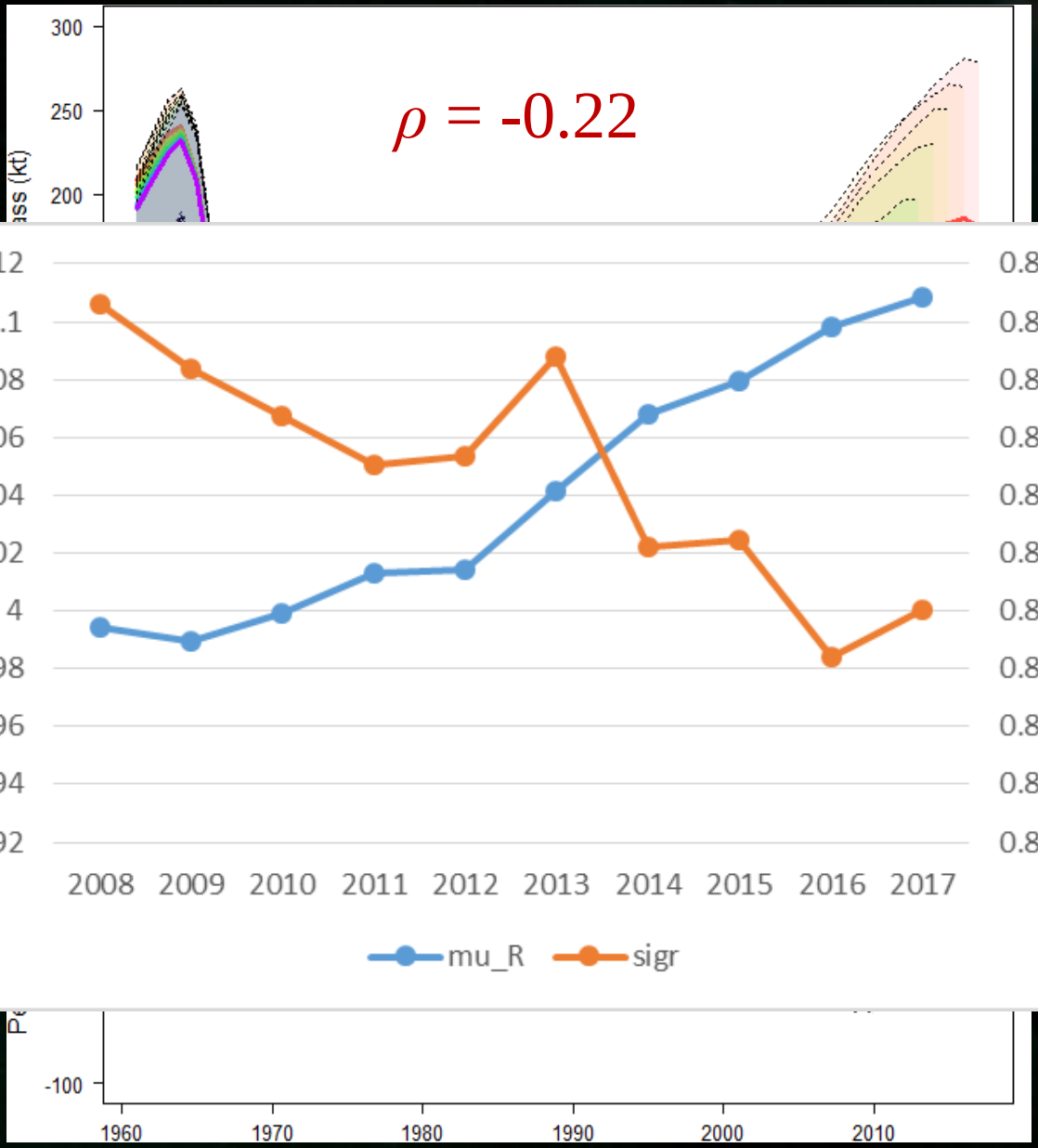
POP – Total/Spawning Biomass



POP – Retro Spawning Biomass

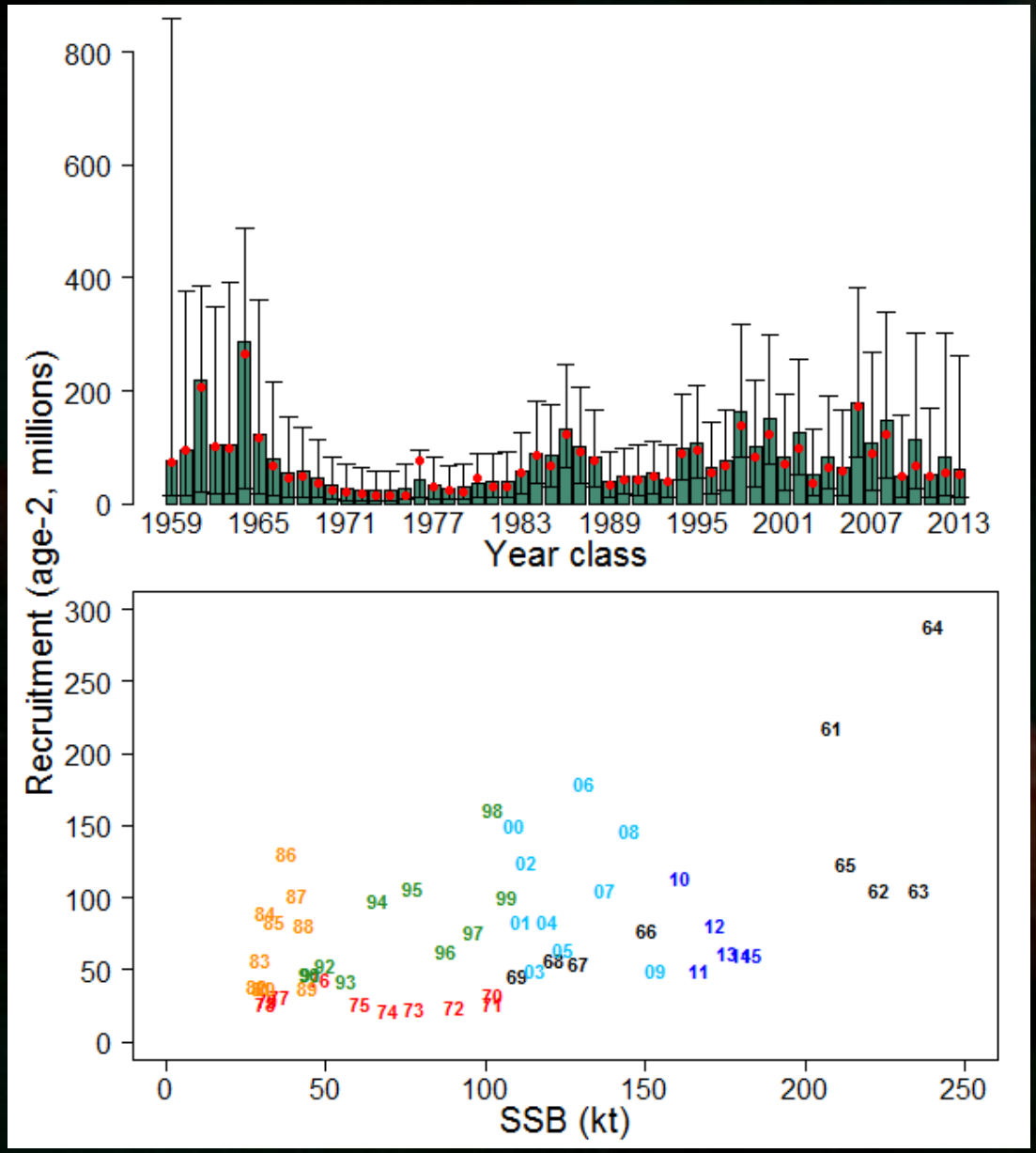


POP – Retro Spawning Biomass

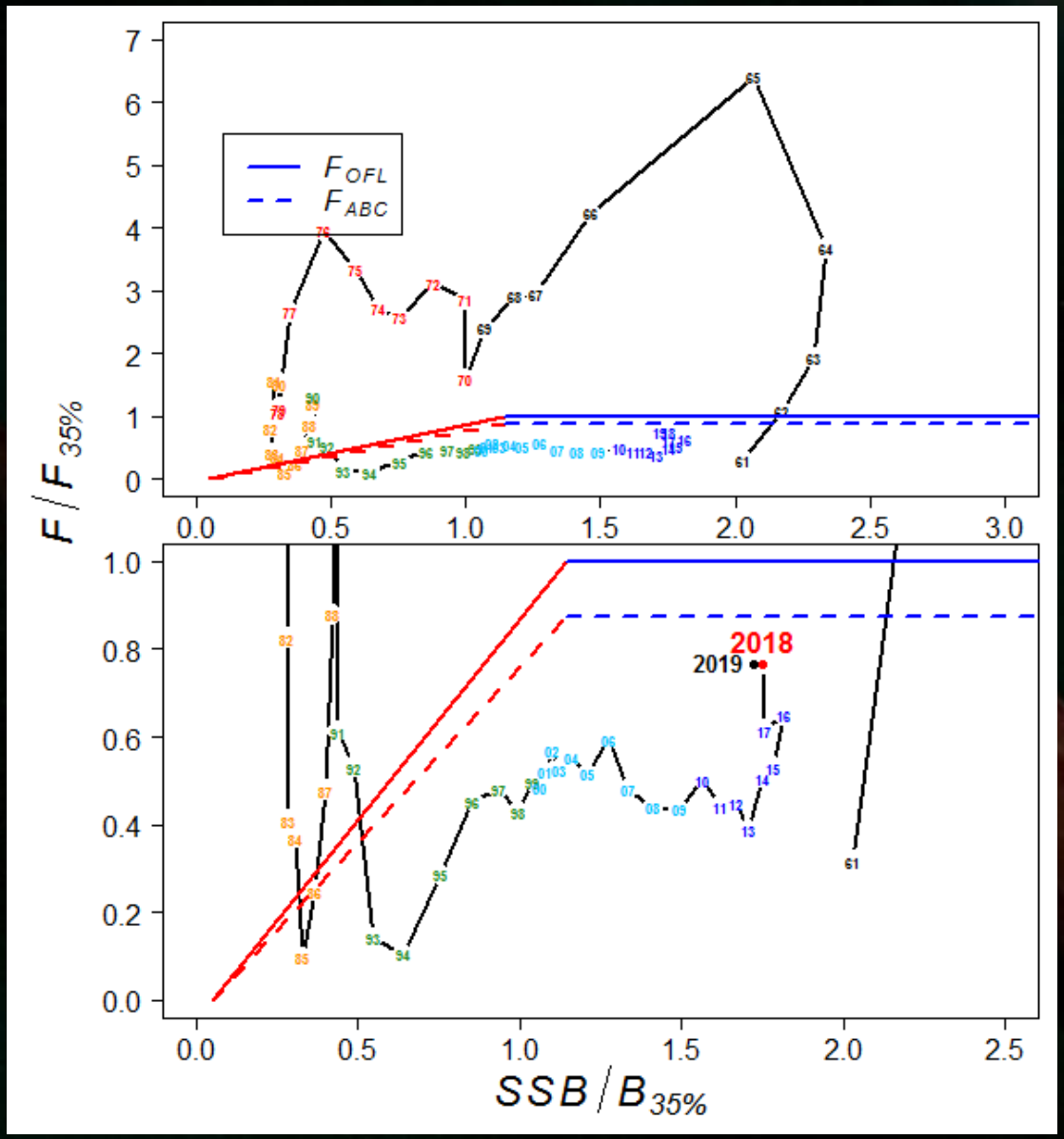


ρ = -0.22

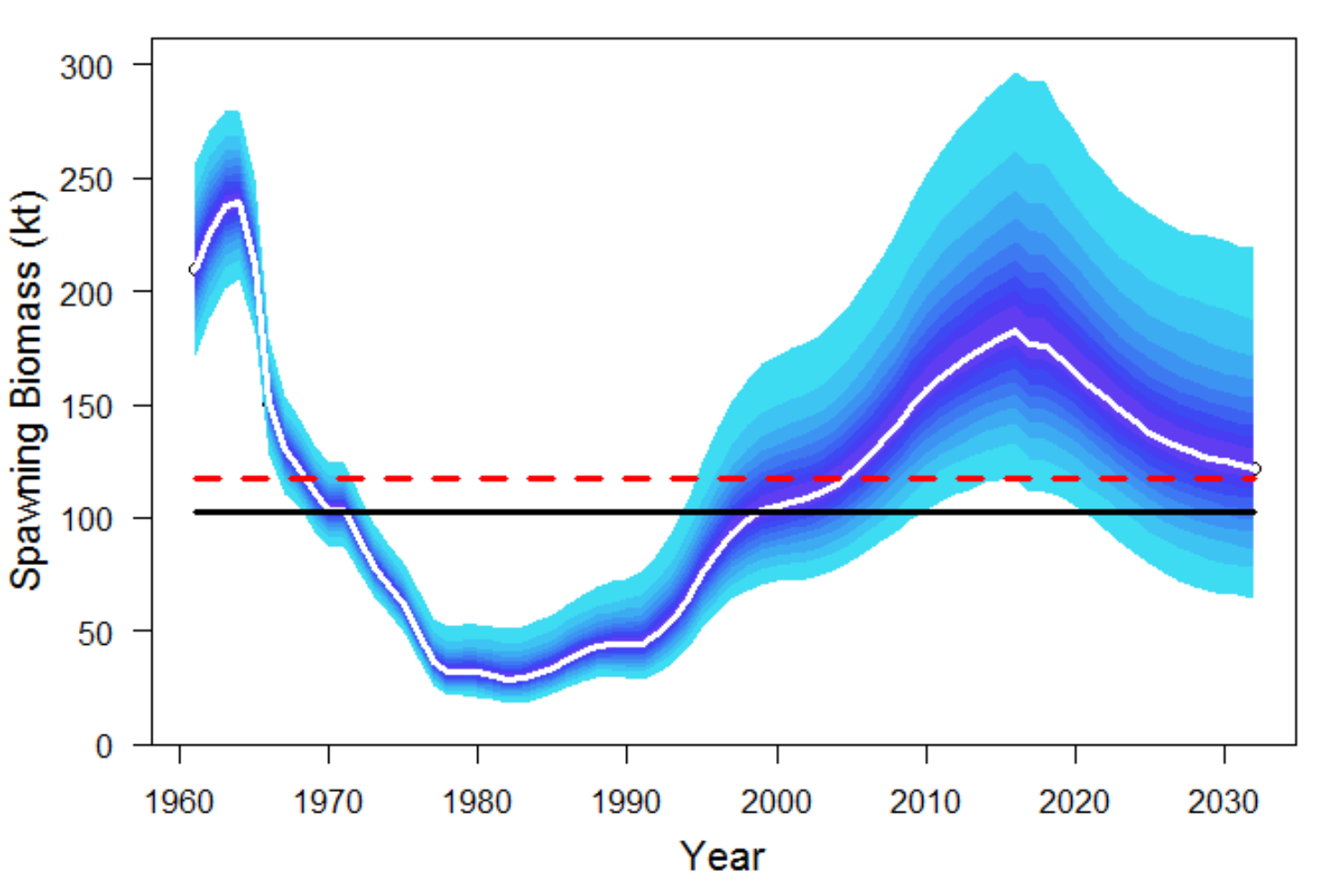
POP – Recruitment



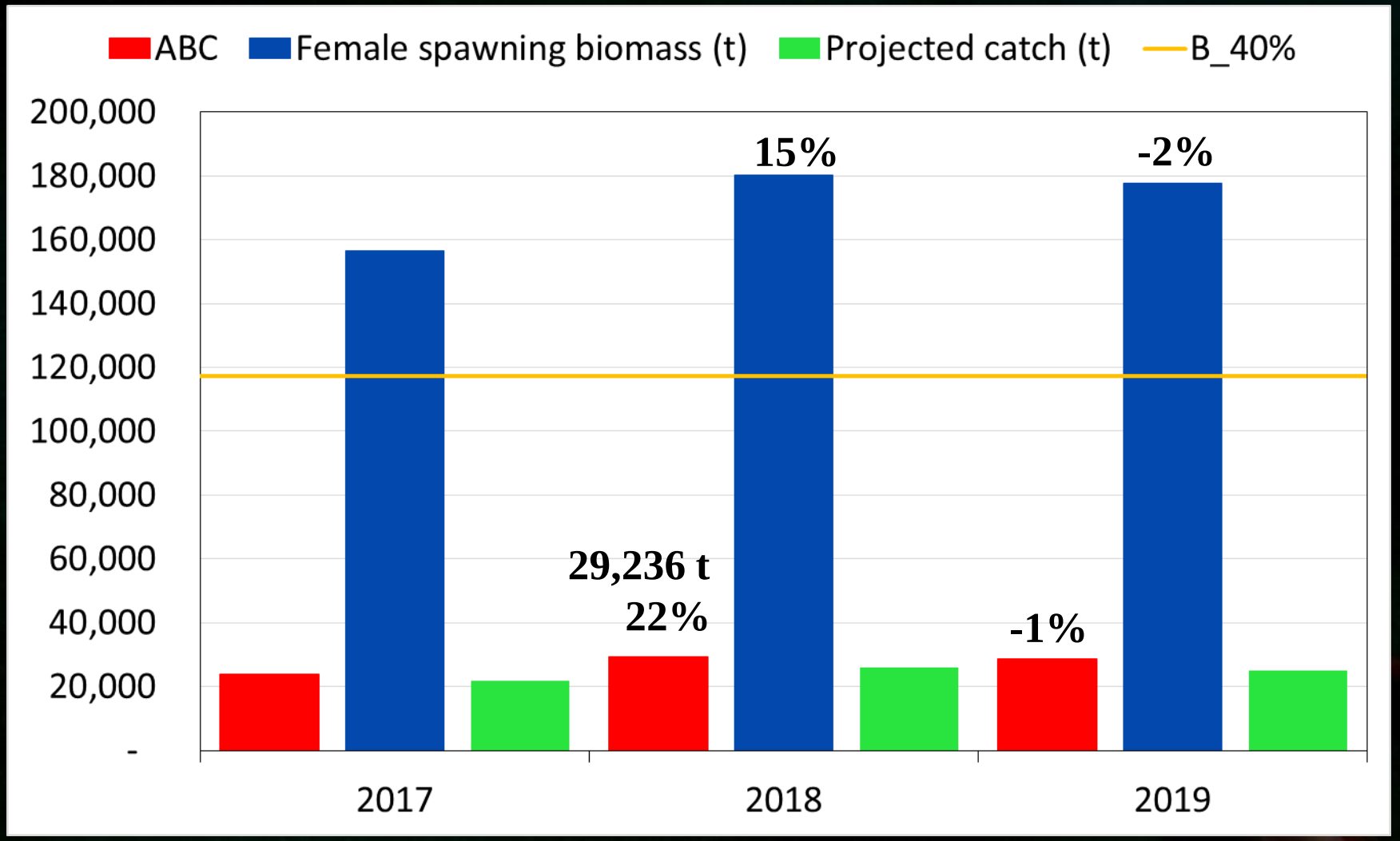
POP – Phase-plane



POP – Projection



Pacific ocean perch

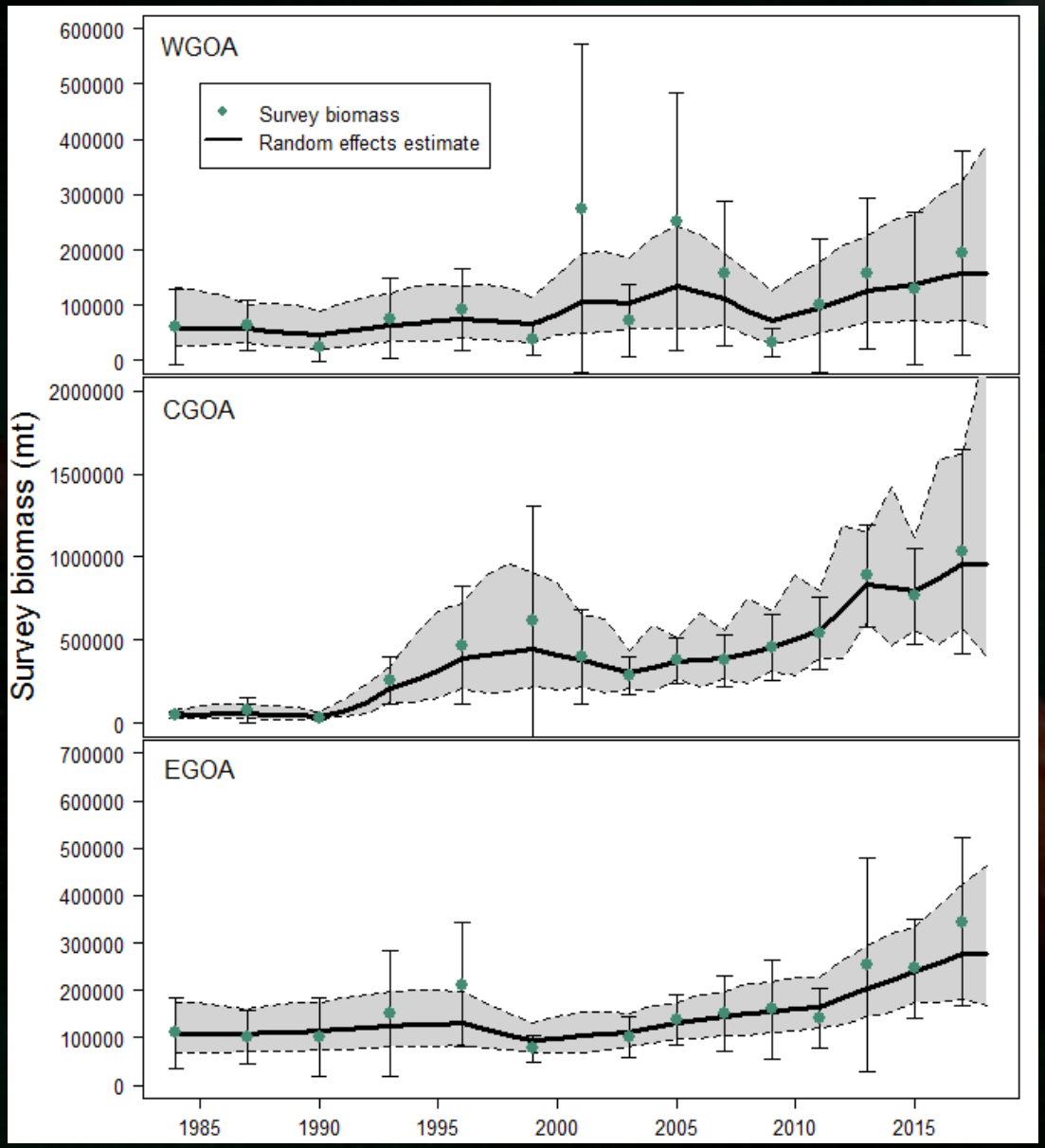


Apportionment – ABC

	Western	Central	Eastern	Total
2017 ABC	2,679	16,671	4,568	23,918
2018 ABC	**3,312**	**20,112**	**5,812**	**29,236**
2019 ABC	**3,240**	**19,678**	**5,687**	**28,605**

	WYAK (58%)	EYAK/SE (42%)	Total
2017 ABC	2,786	1,782	4,568
2018 ABC	**3,371**	**2,441**	**5,812**
2019 ABC	**3,298**	**2,389**	**5,687**

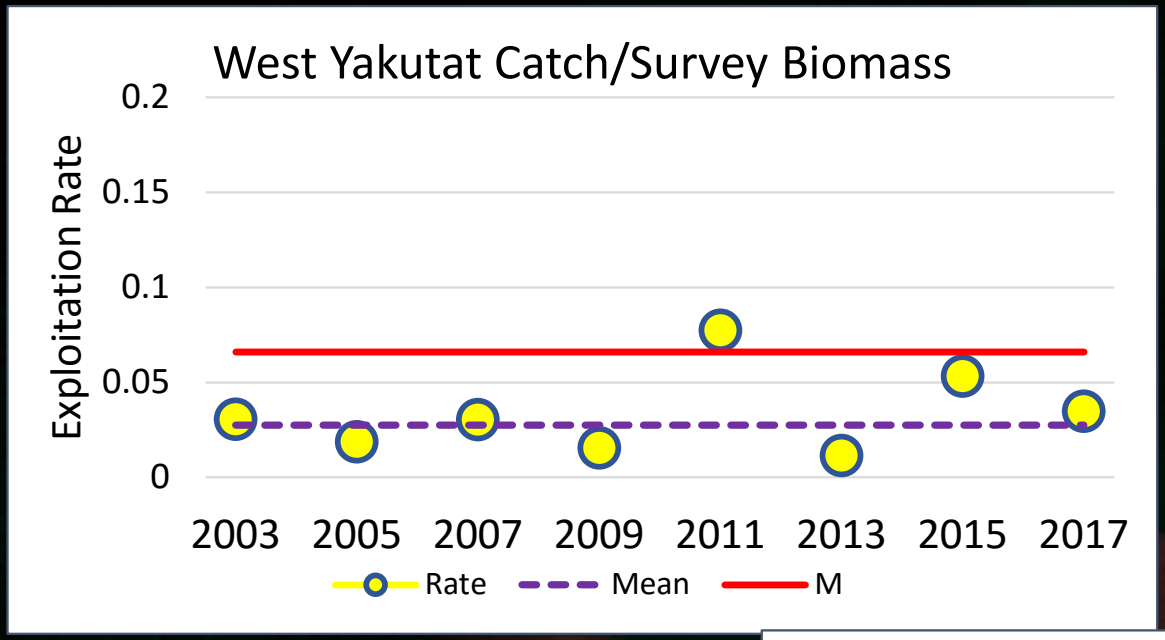
Apportionment – ABC



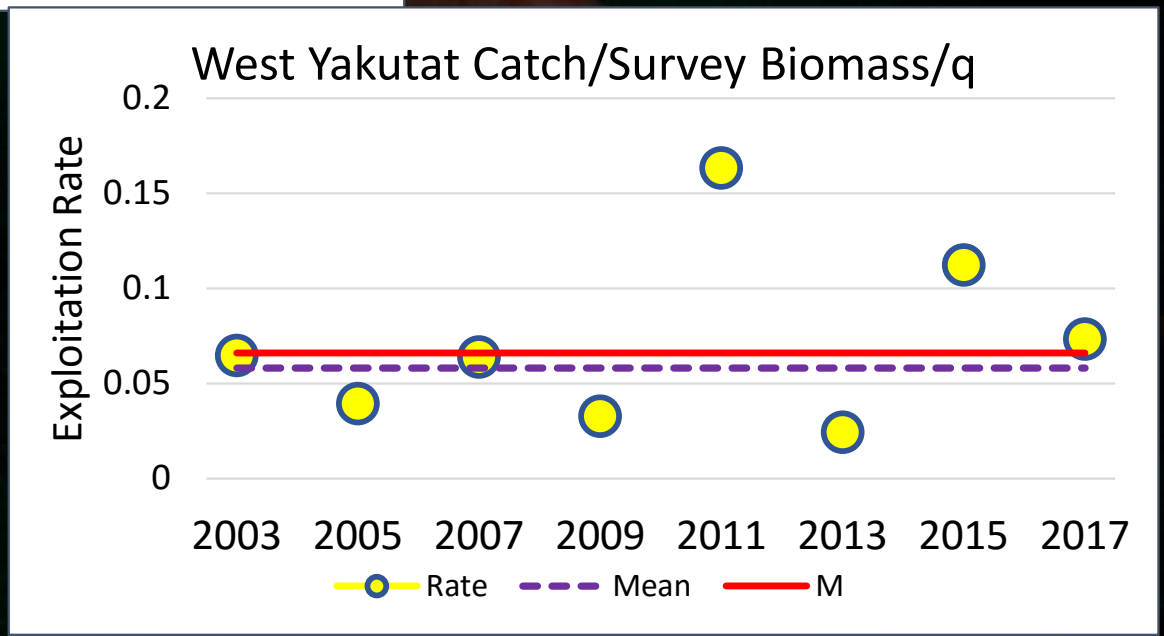
Apportionment - OFL

	W/C/WYAK	EYAK/SE	Total
2017 OFL	25,753	2,073	27,826
2018 OFL	**31,860**	**2,902**	**34,762**
2019 OFL	**31,170**	**2,840**	**34,010**

POP – WYAK exploitation



$$F_{ABC} = 0.09$$

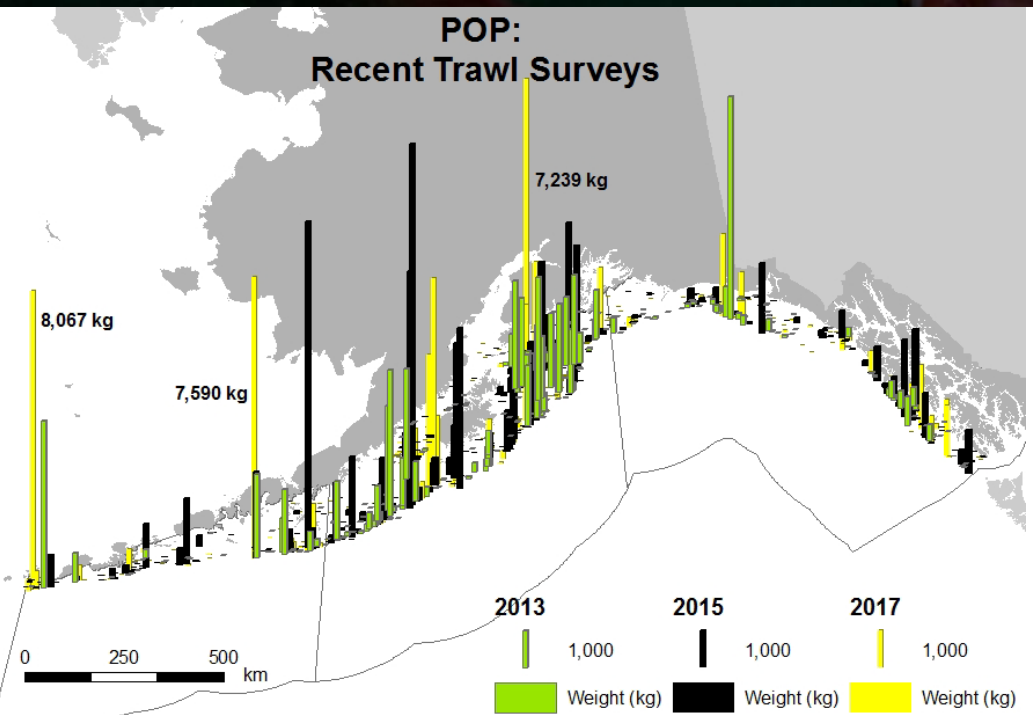


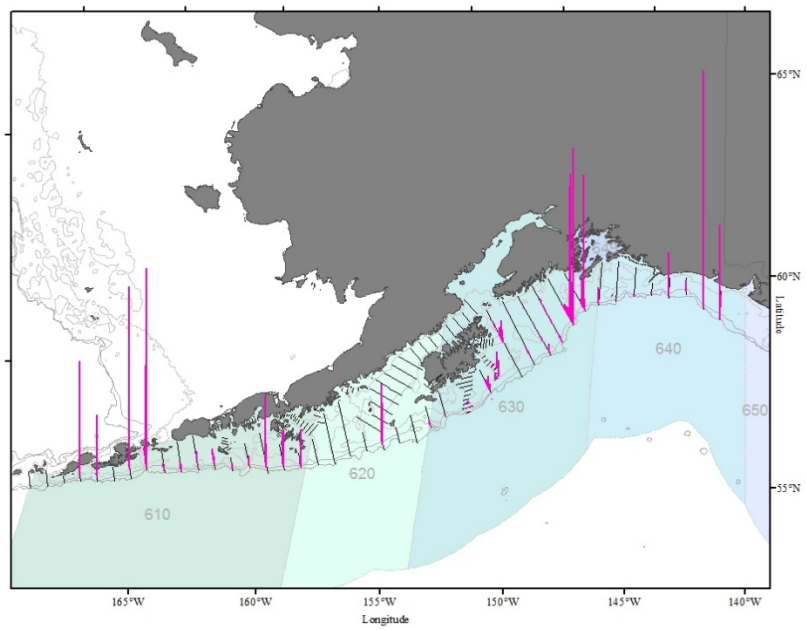
POP – Economic performance (new section)

	Avg 07-11	2012	2013	2014	2015	2016
First-wholesale production K mt	11.4	13.0	12.3	14.2	14.5	18.1
First-wholesale value M US$	$28.1	$42.8	$28.2	$34.1	$34.3	$37.0
First-wholesale price/lb US$	$1.12	$1.50	$1.04	$1.09	$1.07	$0.93
Pac. Ocn. perch share of value	58%	56%	53%	58%	63%	67%
Pac. Ocn. perch price/lb US$	$1.07	$1.47	$0.94	$0.98	$0.96	$0.83
Northern rockfish share of value	15%	18%	16%	15%	11%	8%
Northern rockfish price/lb US$	$1.01	$1.35	$0.86	$1.04	$0.98	$0.89
Dusky rockfish share of value	11%	14%	12%	11%	11%	8%
Dusky rockfish price/lb US$	$0.96	$1.48	$0.93	$1.07	$1.20	$0.86
H&G share of value	74%	78%	70%	76%	74%	68%

POP – MACE survey

- MACE summer acoustic survey
  - 2015 estimate = 408,000 t
  - 2017 estimate = 215,074 t
- NOT a POP survey, should expect variability





POP – Summary/Future work

- All sources of information indicate health pop'n
- To do for next full assessment specific to POP:
  - Continue investigation of model fit to trawl survey biomass (time-dependent parameters with environmental indices)
  - Investigate retrospective pattern
  - Evaluate ways to utilize acoustic information (auxiliary information for on/off-bottom availability to trawl survey)