

An underwater photograph showing a group of reddish-brown fish, likely Blackspotted Rockfish, swimming near a large, green, branching coral structure. The background is dark, suggesting a deep-sea environment. The text is overlaid on the image in a white, serif font.

GOA Rougheye & Blackspotted Rockfish

Shotwell and Hanselman

Outline

- Full assessment for RE/BS rockfish
 - PT/SSC comments specific to RE/BS
 - Data and trends
 - Model results
 - Harvest recommendations, risk table
 - Appendix on two-species research
 - Future research priorities
- 
- The background of the slide is an underwater photograph. It shows a sandy ocean floor with some small, light-colored organisms. Two rockfish are swimming in the water; one is in the foreground, slightly to the right, and another is behind it. The lighting is somewhat dim, typical of an underwater environment.

RE/BS (Rougheye/Blackspotted)

- Tier 3a species – 2019 full assessment
 - Uses two surveys (bottom trawl & longline) for model and apportionment
 - Appendix on two-species research to date
- Summary of Changes:
 - Data: new/updated catch, new trawl/longline survey, new survey age, new fishery/survey sizes
 - Trends: increase in bottom trawl but very high CV, decrease in longline from 2017, strong 2010 yc
 - No model changes from 2015 full assessment



SSC Comments

“The SSC recommends the authors complete the risk table and note important concerns or issues associated with completing the table.”

- Since this is a full assessment we completed the risk table and provide details in the *Harvest Recommendation* section.

“The Team agreed with the authors that apportionment using the 4:6:9 standard was acceptable until the longline and trawl survey inputs can be combined to determine apportionment.”

- We evaluate the 4:6:9 trawl survey weighting method and the combined trawl survey and longline survey random effects models. We recommend using the new two survey random effects model because it is effectively using the most available data.

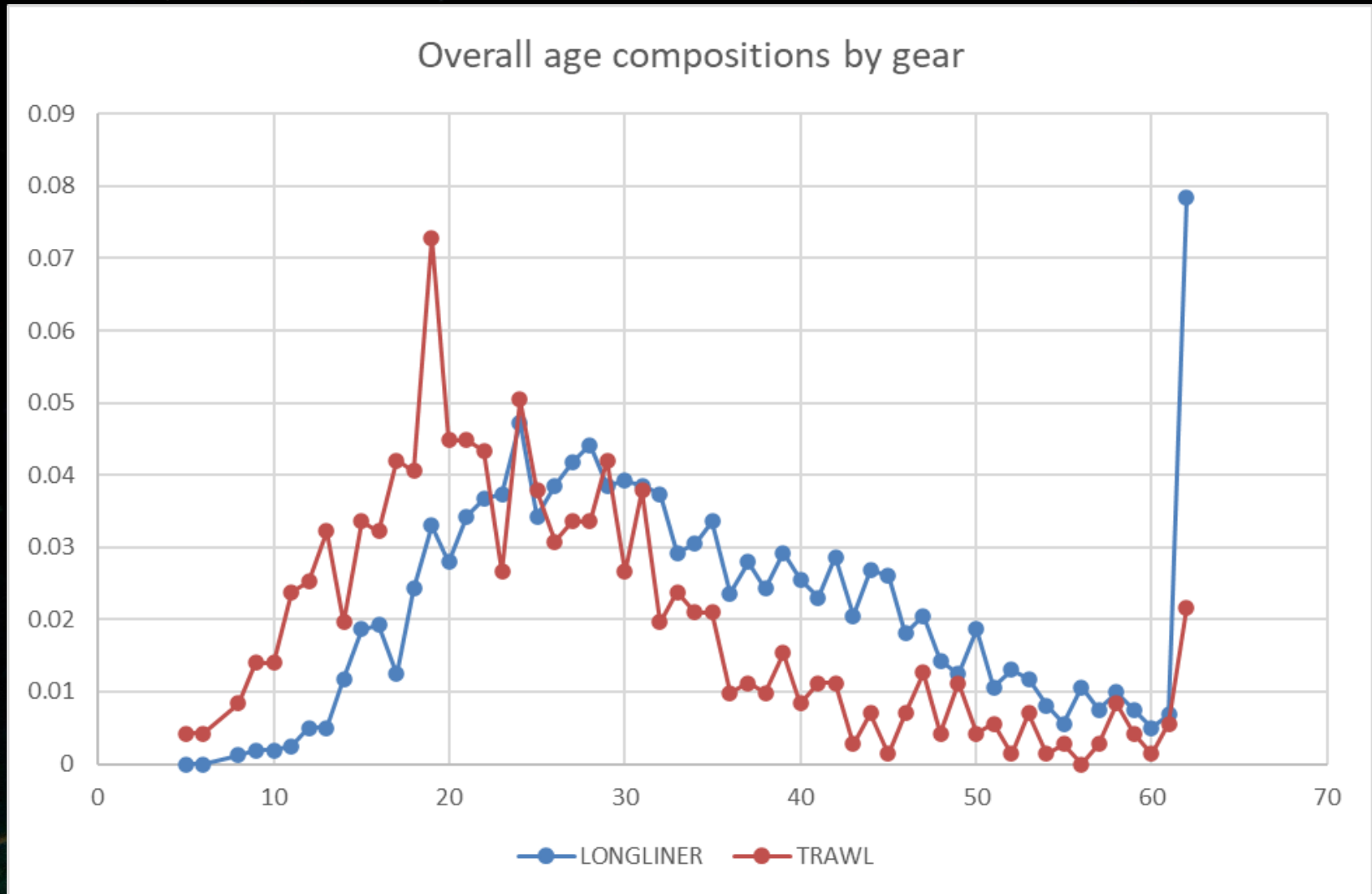
“The authors should clarify how the fishery age data by gear type is being incorporated into the model. A description of sample sizes from each gear-type, and the years for which age data by each gear-type was used for the model would provide additional information on this potential issue.”

- We provide a brief comparison of age data and catch for both longline and trawl gear types by area and time.

RE/BS Fishery Age Samples

- Provide summary of age data by gear type, area
 - Gear mixture of age samples dominated by longline gear, but trawl samples increasing recently
 - Compared age samples to catch by gear type, getting more samples for longline gear per ton catch
 - Proportion of ages by area has not changed, not been a spatial shift in observer age collections
 - Different gear types catch different components of population, see in overall comparison of age comps
- Future considerations
 - Age samples very small, broad age range and EM
 - Separate curves stretch data too thin, but could weight age comps by gear type in future

RE/BS Fishery Age Compositions



SSC Comments

“The SSC supports the Plan Team recommendation for an analysis that provides a more realistic range of management risk of combining RE/BS in one stock than is currently in the assessment. A variety of methods could be used, including catch composition analysis, genetic vs visual survey ids, maturity curve differences, etc.”

“The SSC supports the authors’ recommendation to evaluate maturity information and explore fitting separate maturity curves. This would allow treatment of the differences in maturity between the species within the assessment.”

- Stock identification, growth, and maturity analyses of GOA RE/BS rockfish are ongoing. We have collected a short summary of these studies to date in Appendix 13.B.
- At this time we do not evaluate the new maturity information due to concerns over the samples not being identified to species. We are currently investigating the use of otolith morphometrics to identify the study samples to species. We will evaluate this data within the model when that information becomes available.

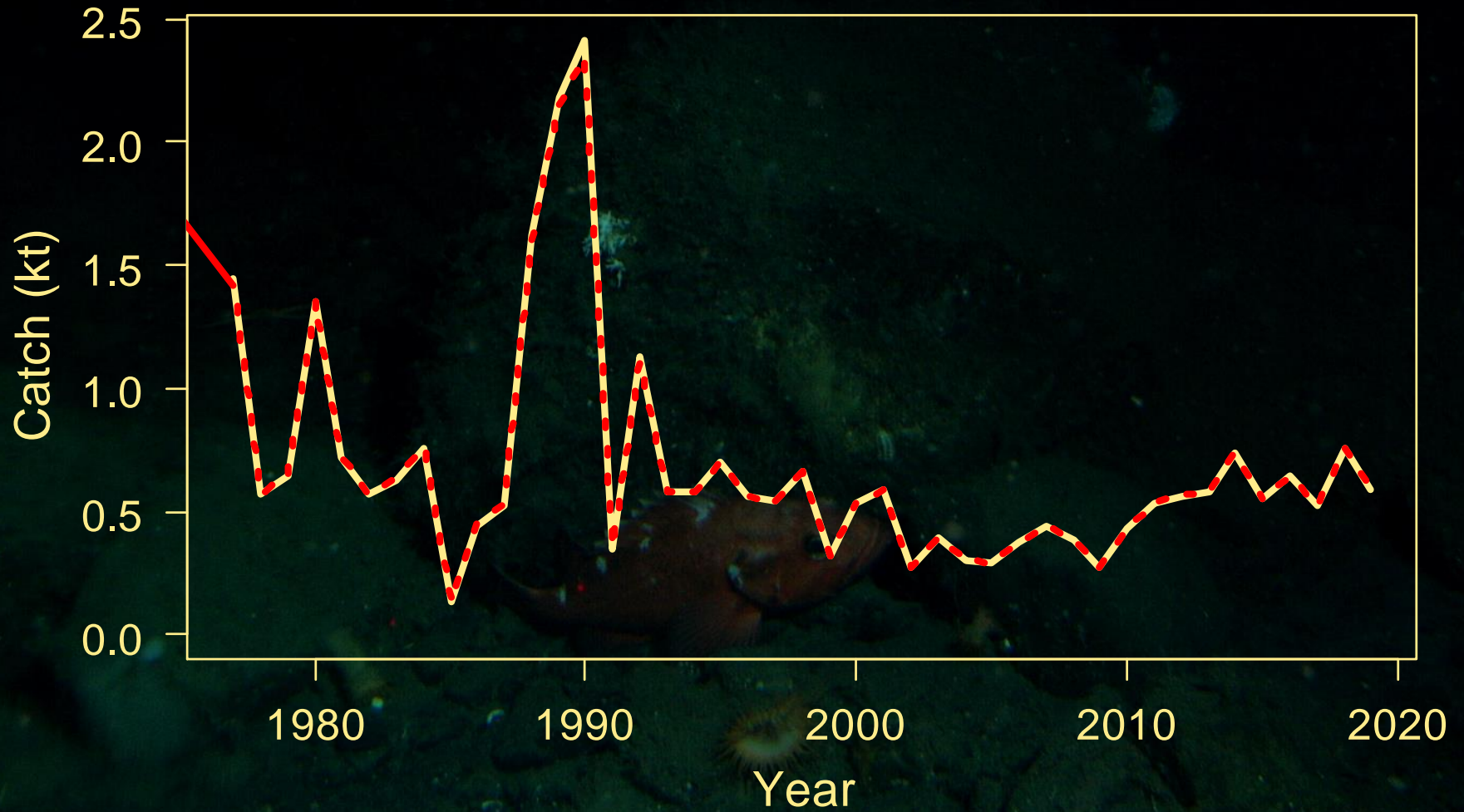
RE/BS Data Table

Source	Data	Years
Fisheries	Catch	1977-2017, 2018, 2019
	Age	1990, 2004, 2006, 2008, 2009, 2010, 2012, 2014, 2016
	Length	1991-1992, 2002-2003, 2005, 2007, 2011, 2013, 2015, 2017
NMFS trawl survey	Biomass index	1984, 1987, 1990, 1993, 1996, 1999, 2003, 2005, 2007, 2009, 2011, 2013, 2015, 2017, 2019
	Age	1984, 1987, 1990, 1993, 1996, 1999, 2003, 2005, 2007, 2009, 2011, 2013, 2015, 2017
AFSC longline survey	Relative Population Number (RPN)	1993-2017, 2018, 2019
	Length	1993-2017, 2018, 2019

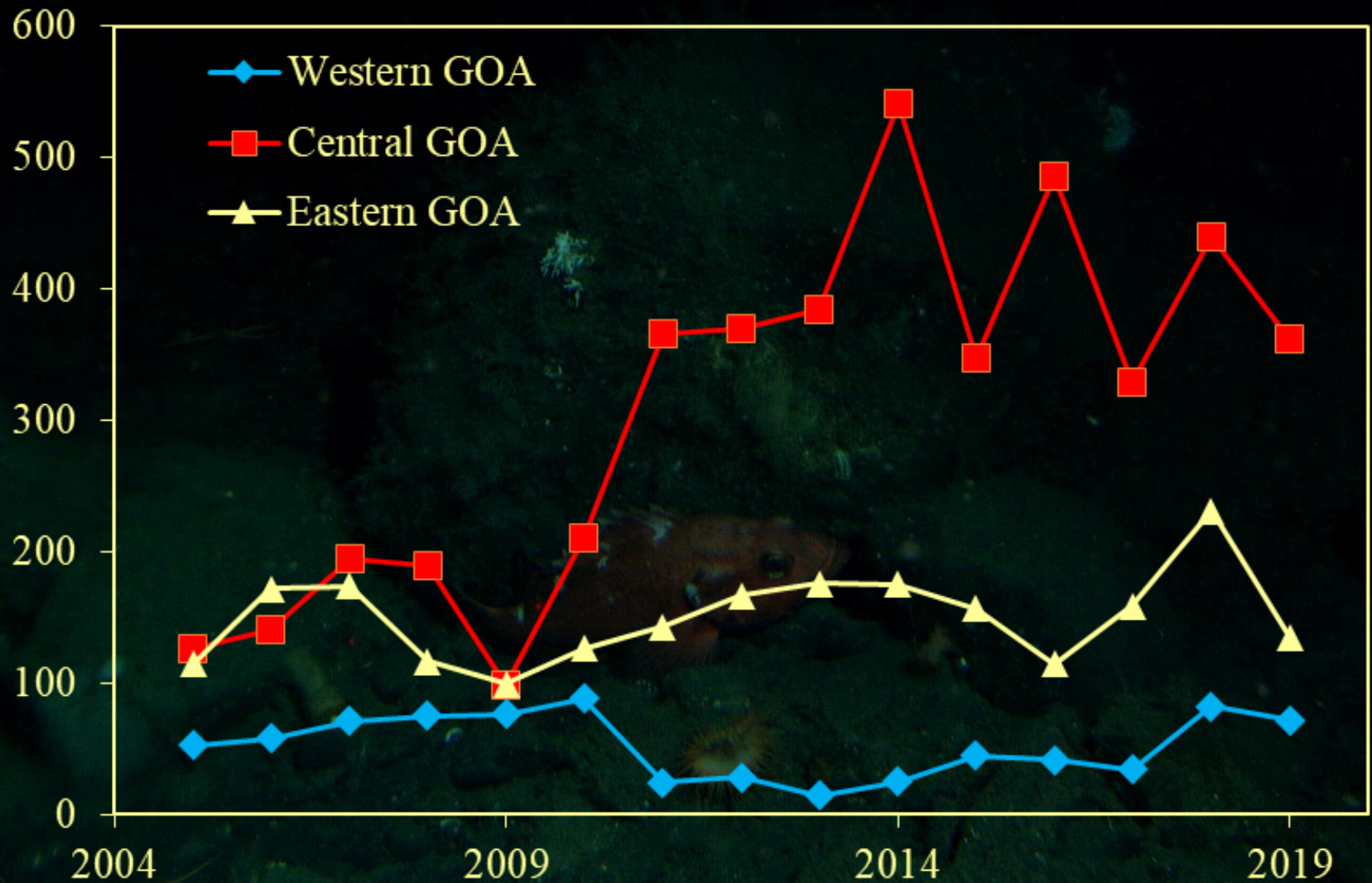
RE/BS Fishery

- Gulfwide catch has been relatively stable since 2010, around 588 t on average since then
- Increased discard rate in 2018 to 42%, but back down to below average at 16% in 2019
- Generally 20%-60% of TAC
 - Catch increase then decrease in EGOA and CGOA, increase in WGOA, no overages
 - Most increase in rockfish, increase then decrease in sablefish and flatfish fisheries, some increase in pollock fishery, stable in halibut fishery

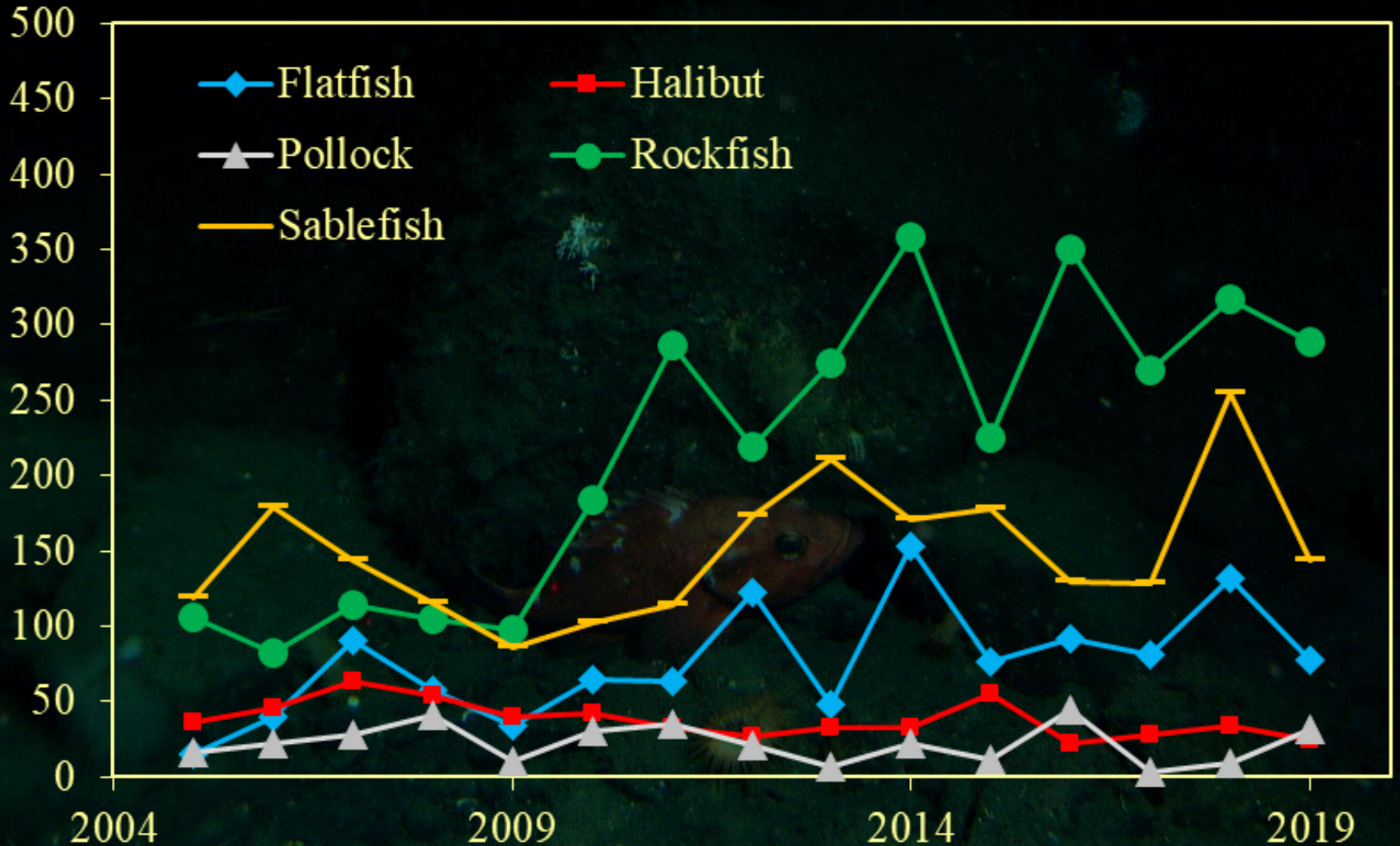
RE/BS Catch



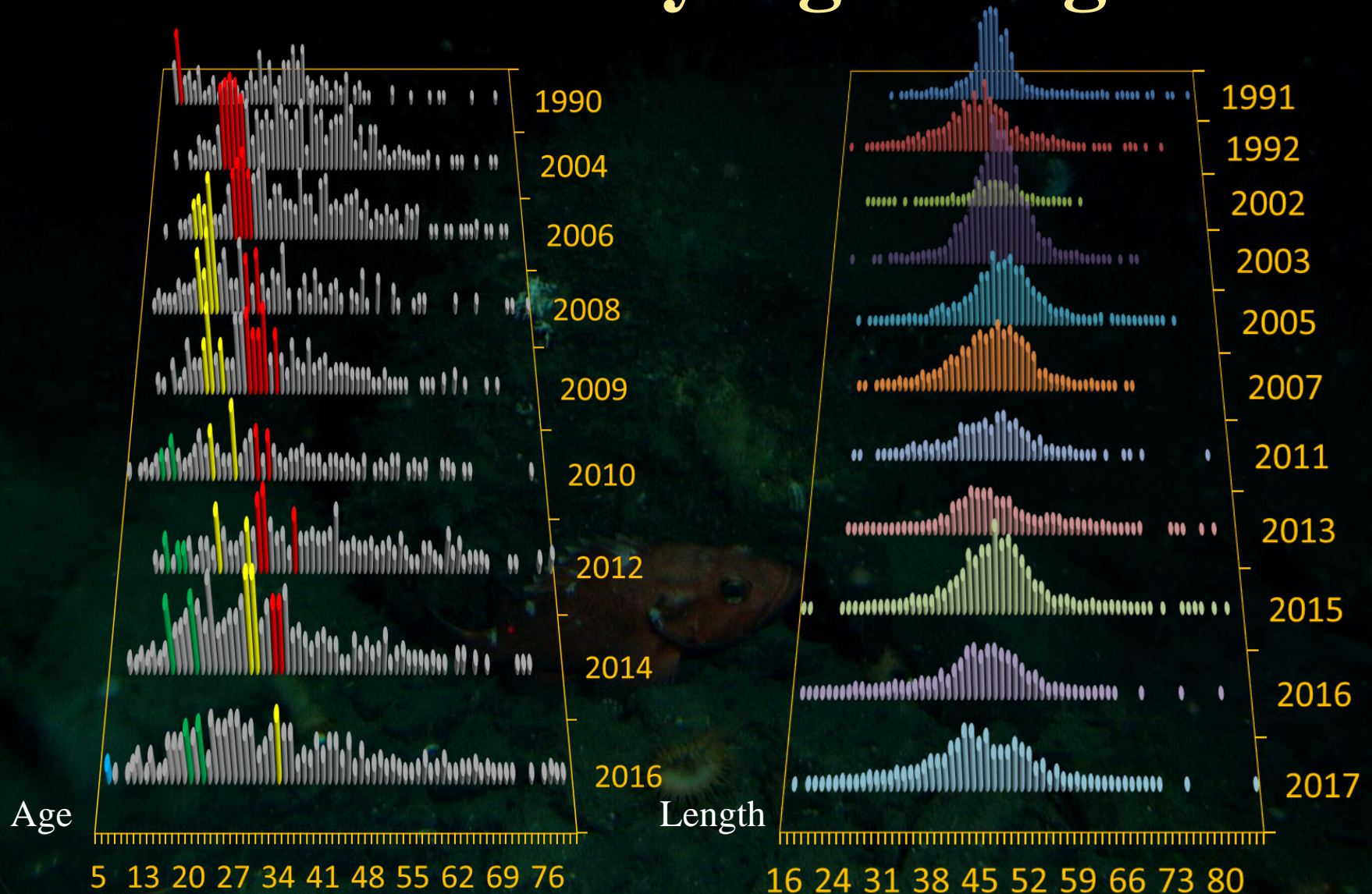
RE/BS Catch by Region



RE/BS Catch by Fishery



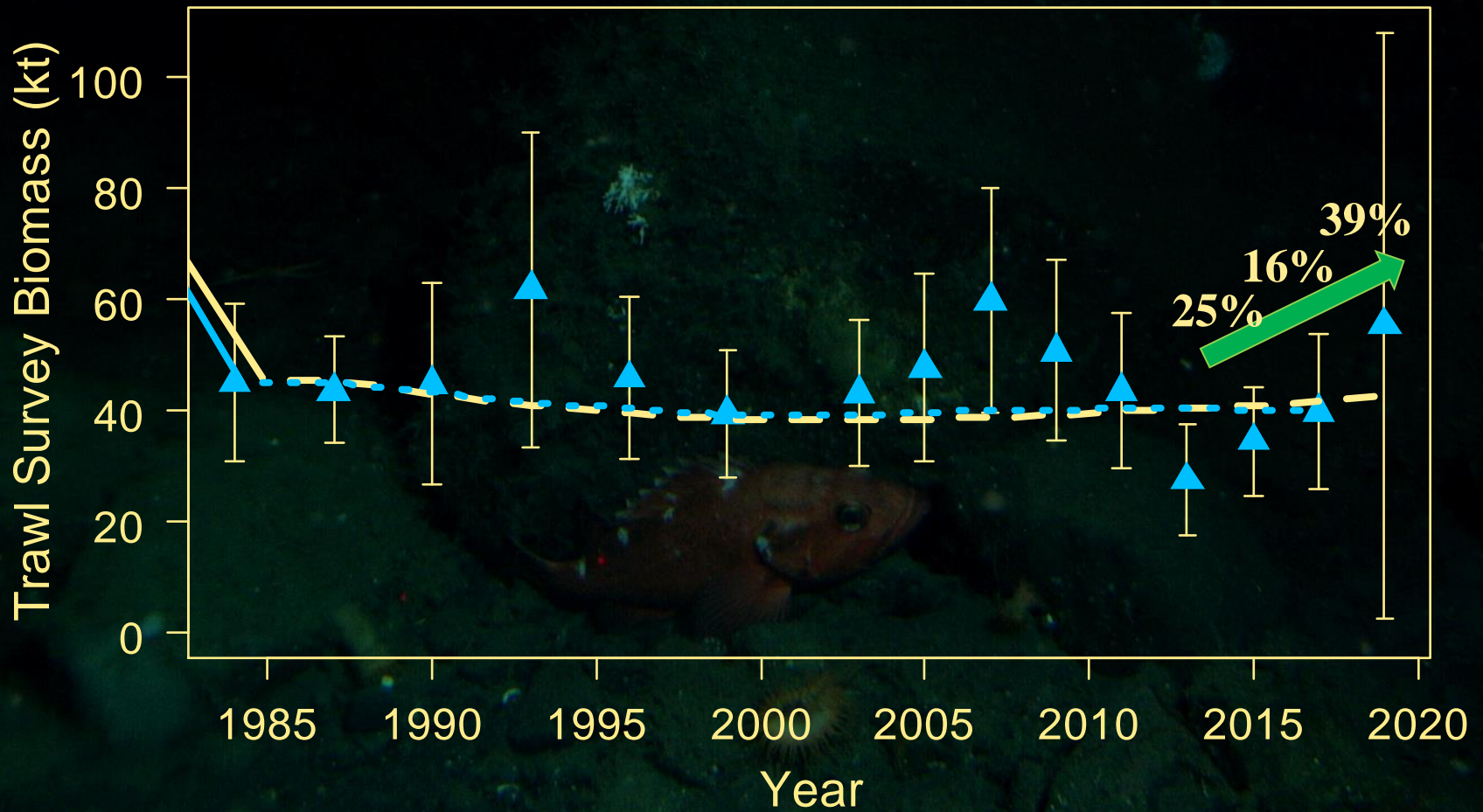
RE/BS Fishery Age/Length



RE/BS Surveys – Bottom Trawl

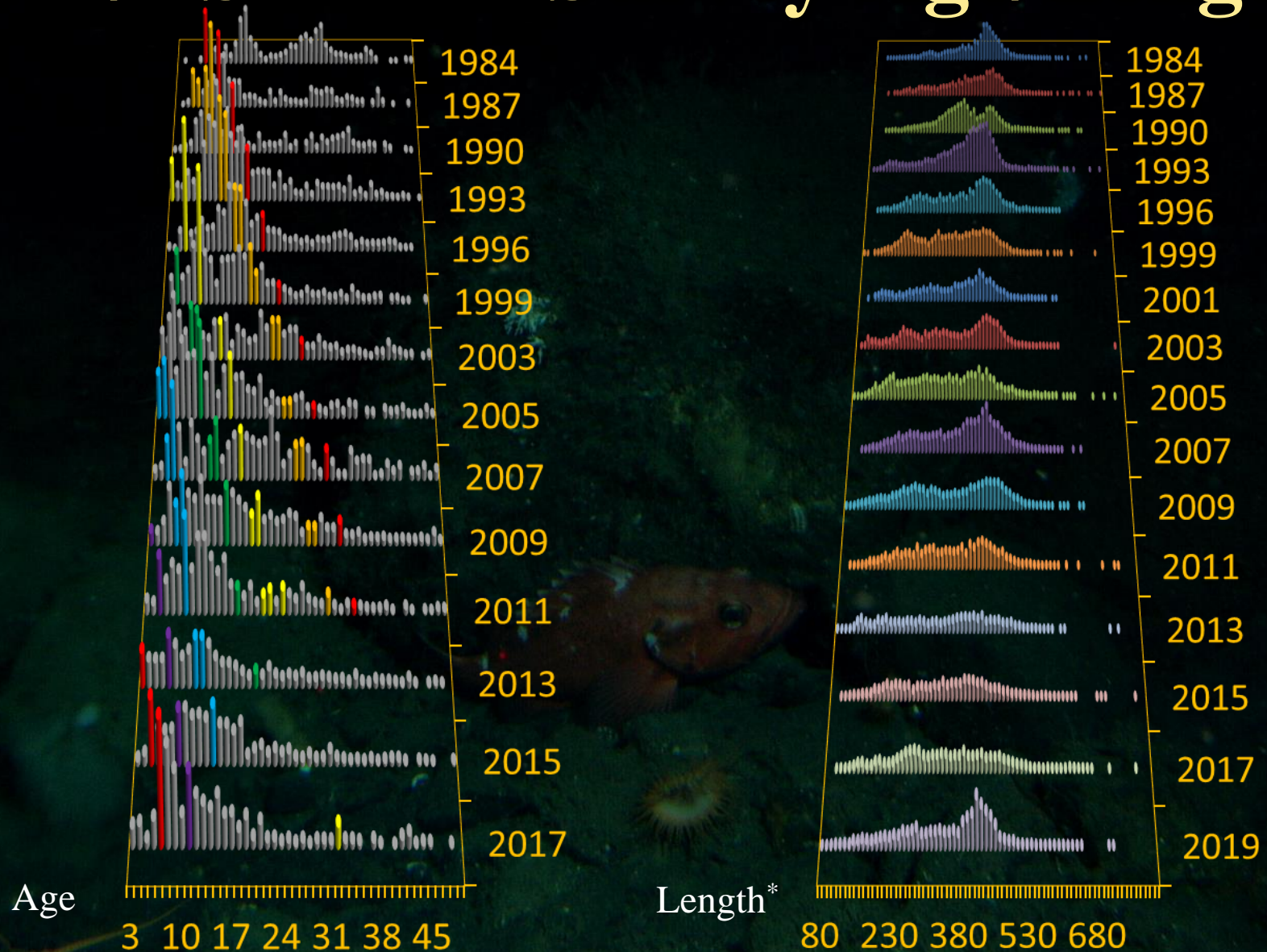
- Overall fairly low contrast (CIs overlap)
 - Steadily increasing since low in 2013
 - Spatial distribution generally even along slope but more catches on shelf in CGOA
- 2019 survey estimate up by 39% from 2017
 - One very large haul of at-sea ID blackspotted in CGOA near Kodiak, causes very high CV
 - Very few catches in WGOA and decreasing in EGOA, overall fewer at-sea ID roughey
 - Overall, 22% above long term average

RE/BS Trawl Survey Biomass



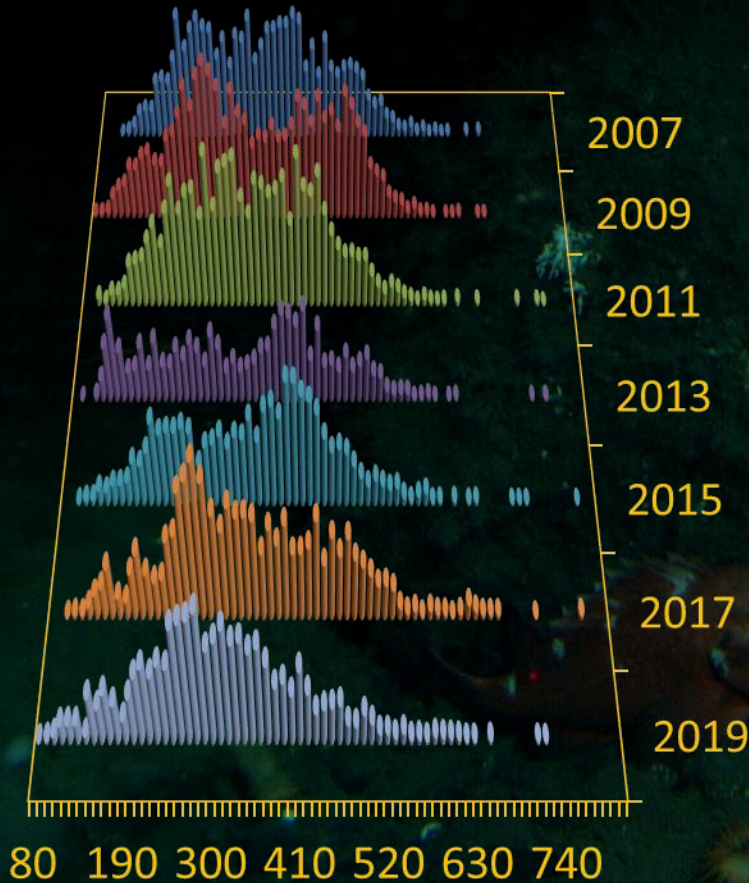
* Not fit in model

RE/BS Trawl Survey Age/Length



RE/BS Trawl Survey Length

Rougeye

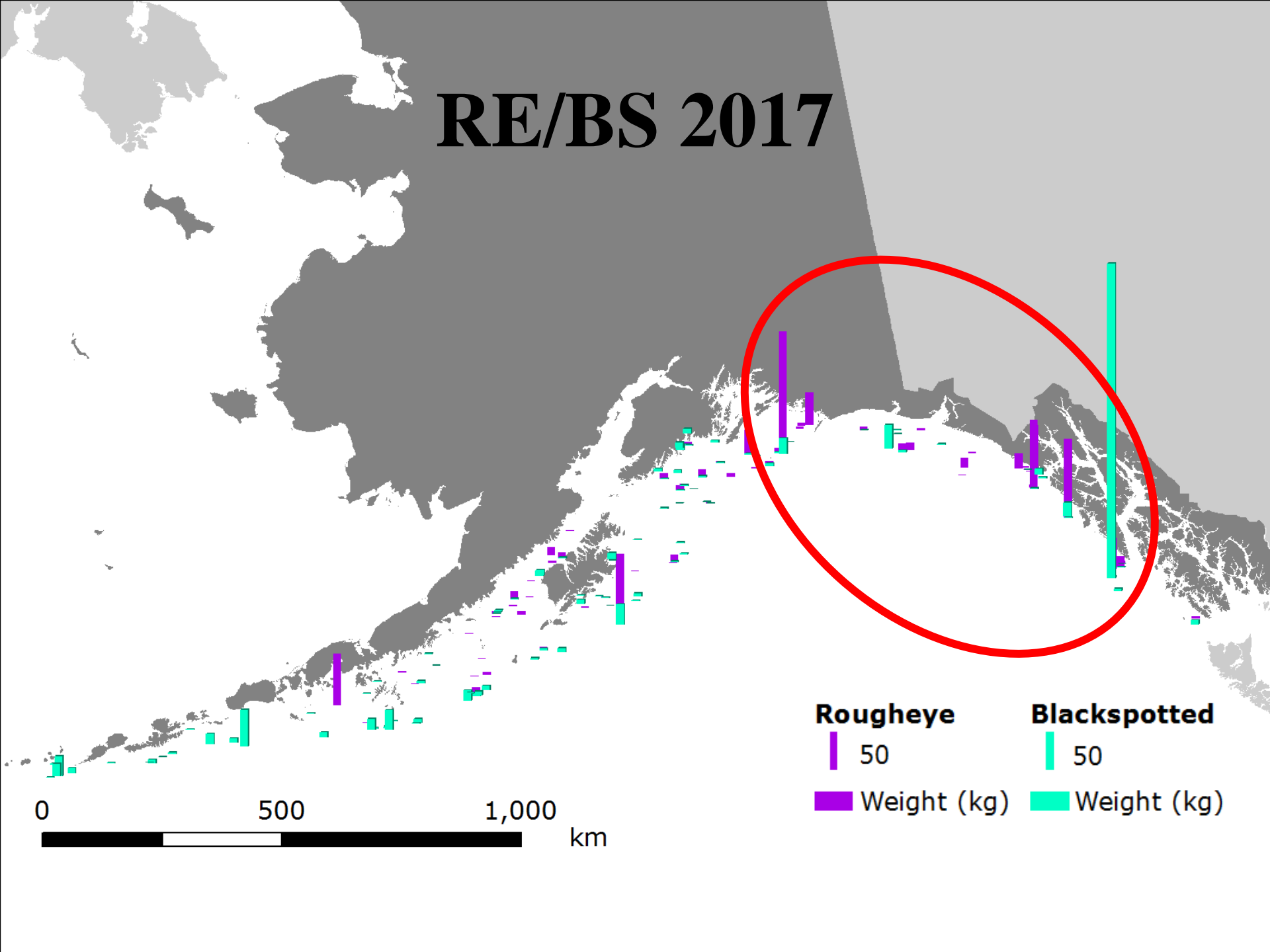


Blackspotted

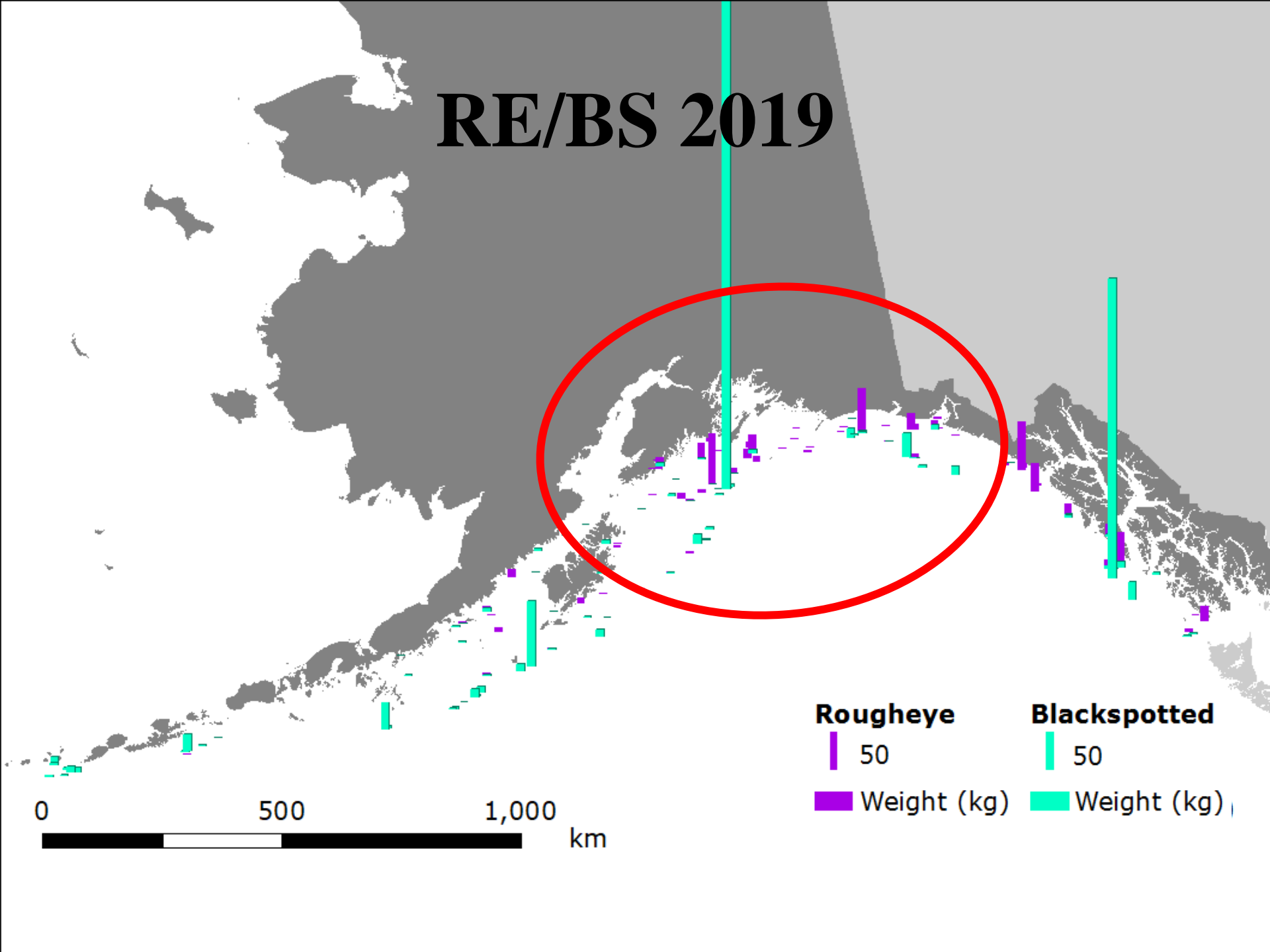


At-sea Identification

RE/BS 2017



RE/BS 2019



0 500 1,000 km

Rougheye

50

Weight (kg)

Blackspotted

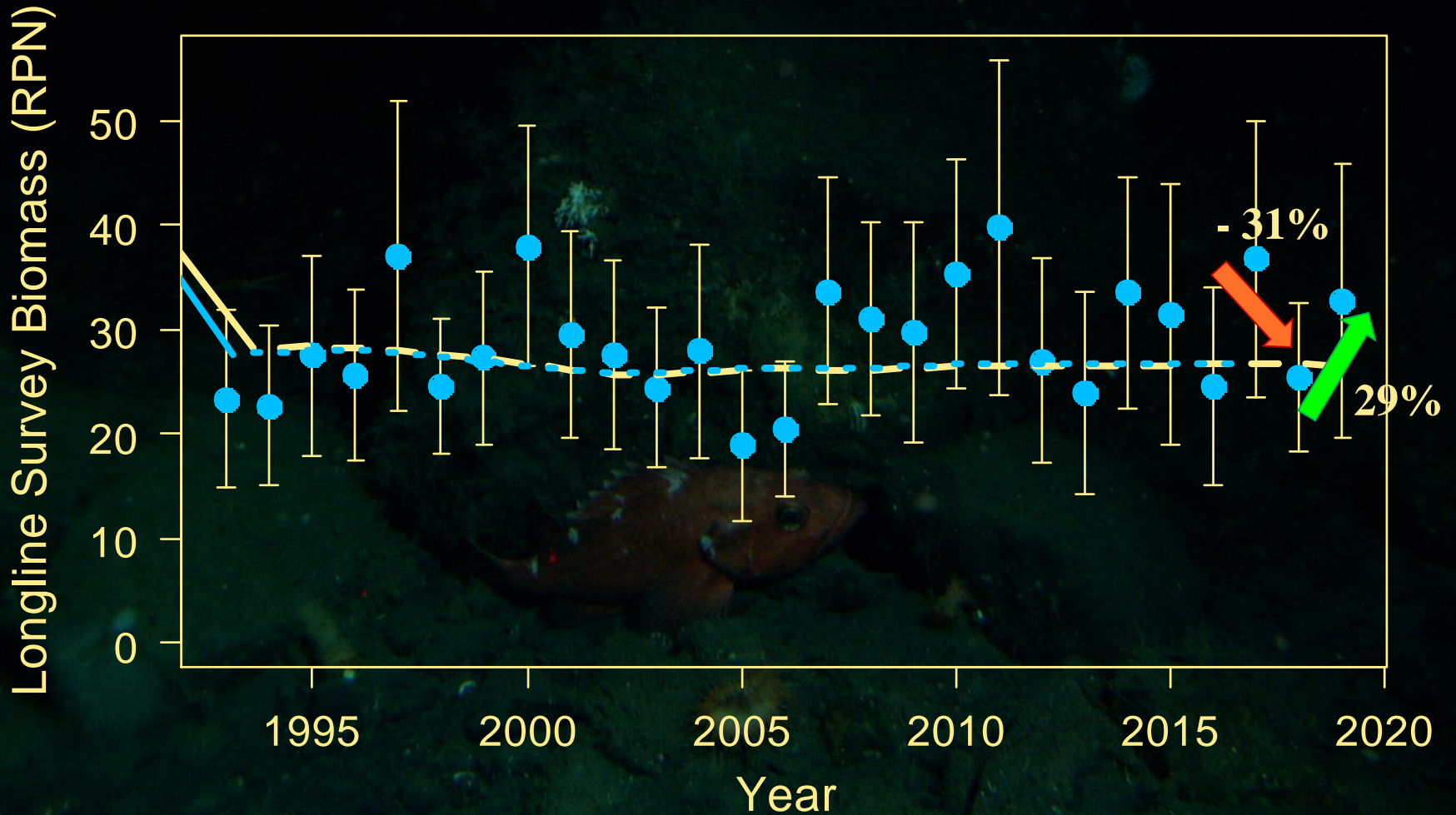
50

Weight (kg)

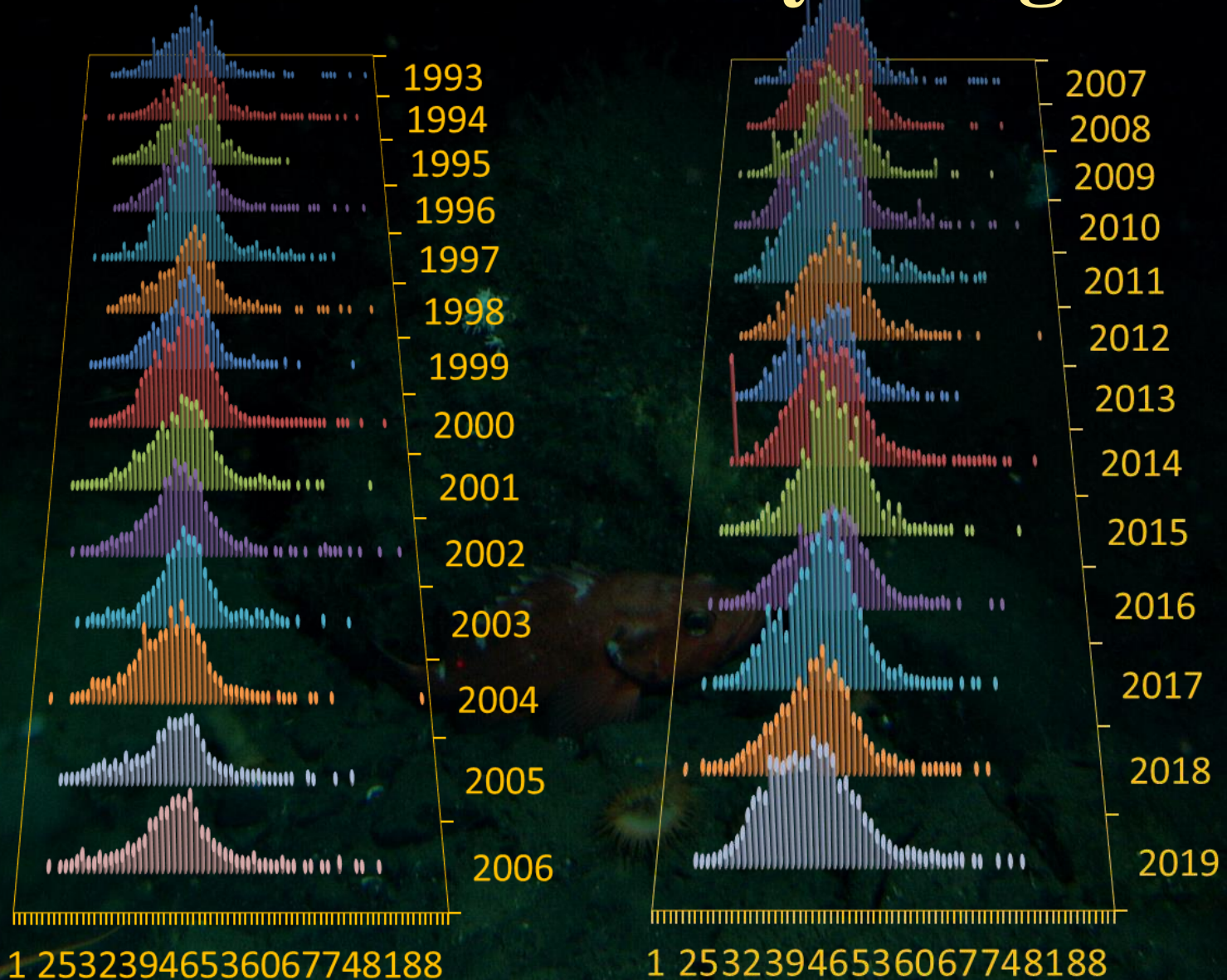
RE/BS Surveys – Longline

- Fully revised RPN index (1993-2019)
 - Uses new areas sizes, RPN, new error estimates
 - Overall low contrast, all CI's overlap
 - Generally samples slope environment
- 2018 survey down (-31%), 2019 up (29%)
 - Large increases in time series do not match trawl, but recent decline in 2012-2013 similar to trawl
 - Cyclic pattern increasing in amplitude recently
 - Catches in WGOA increasing, EGOA decreasing, CGOA relatively stable, 13% above average

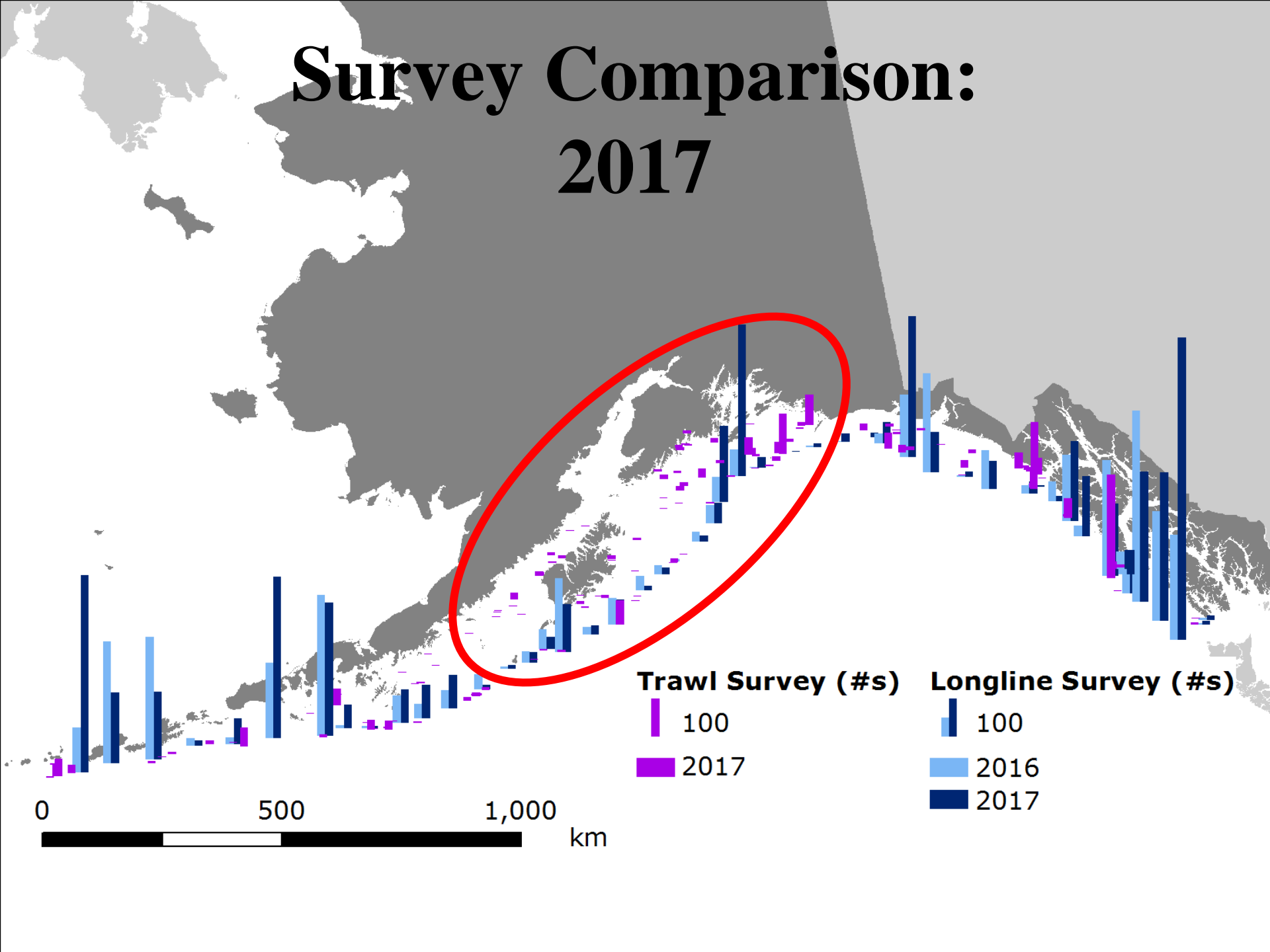
RE/BS LL Survey Abundance



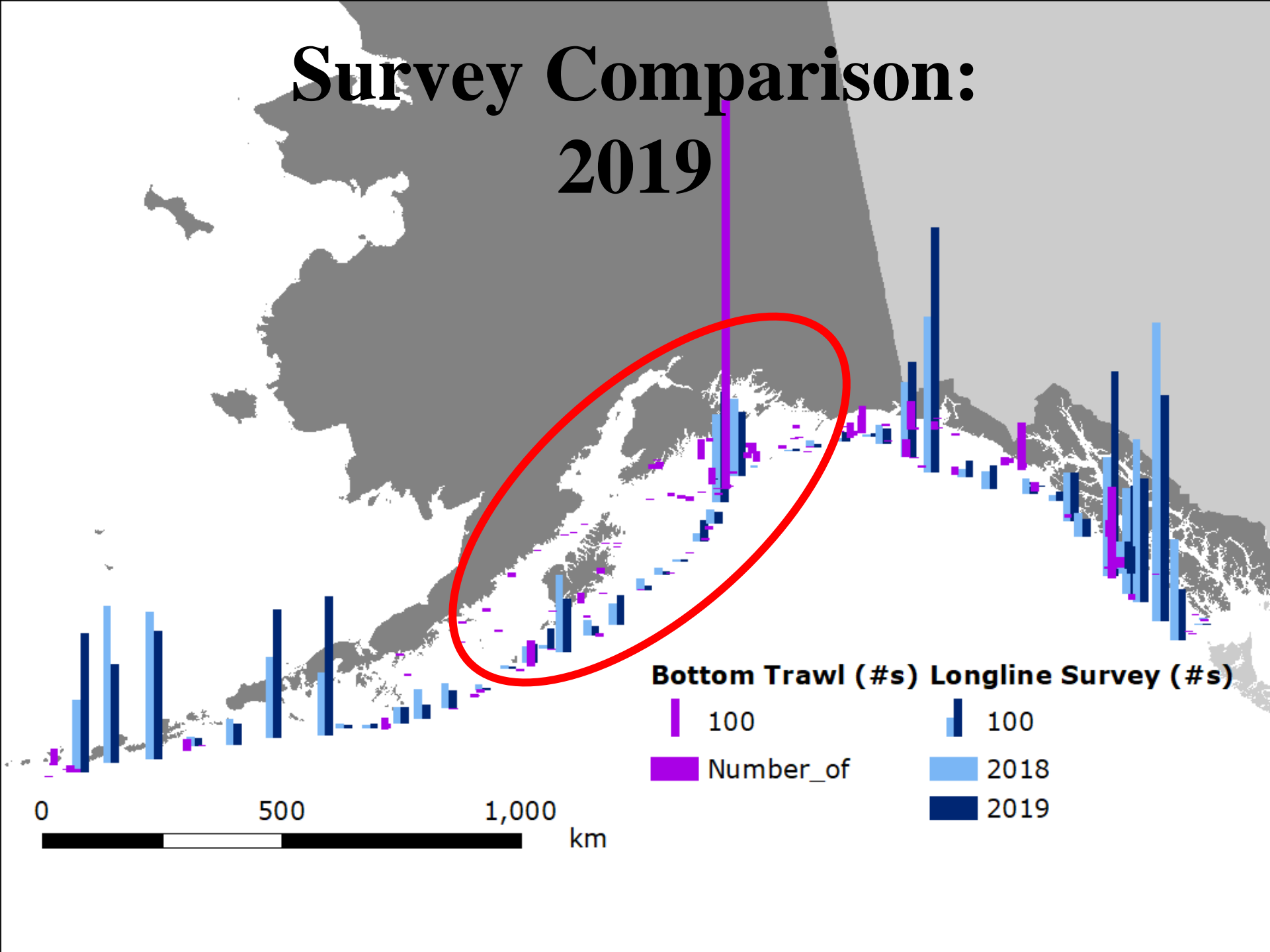
RE/BS LL Survey Length



Survey Comparison: 2017



Survey Comparison: 2019



Bottom Trawl (#s) **Longline Survey (#s)**

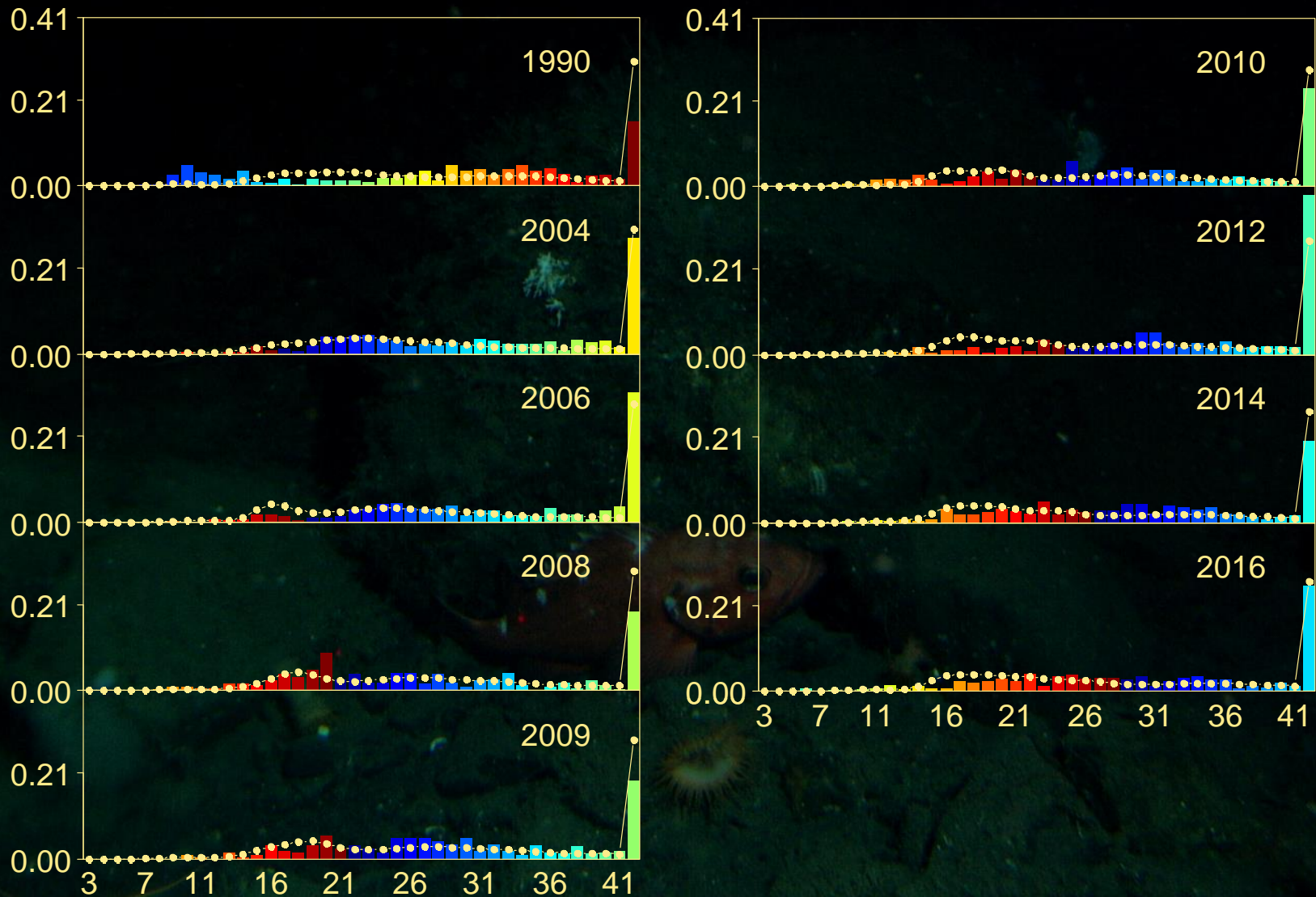
100 100
Number_of 2018 2019

0 500 1,000 km

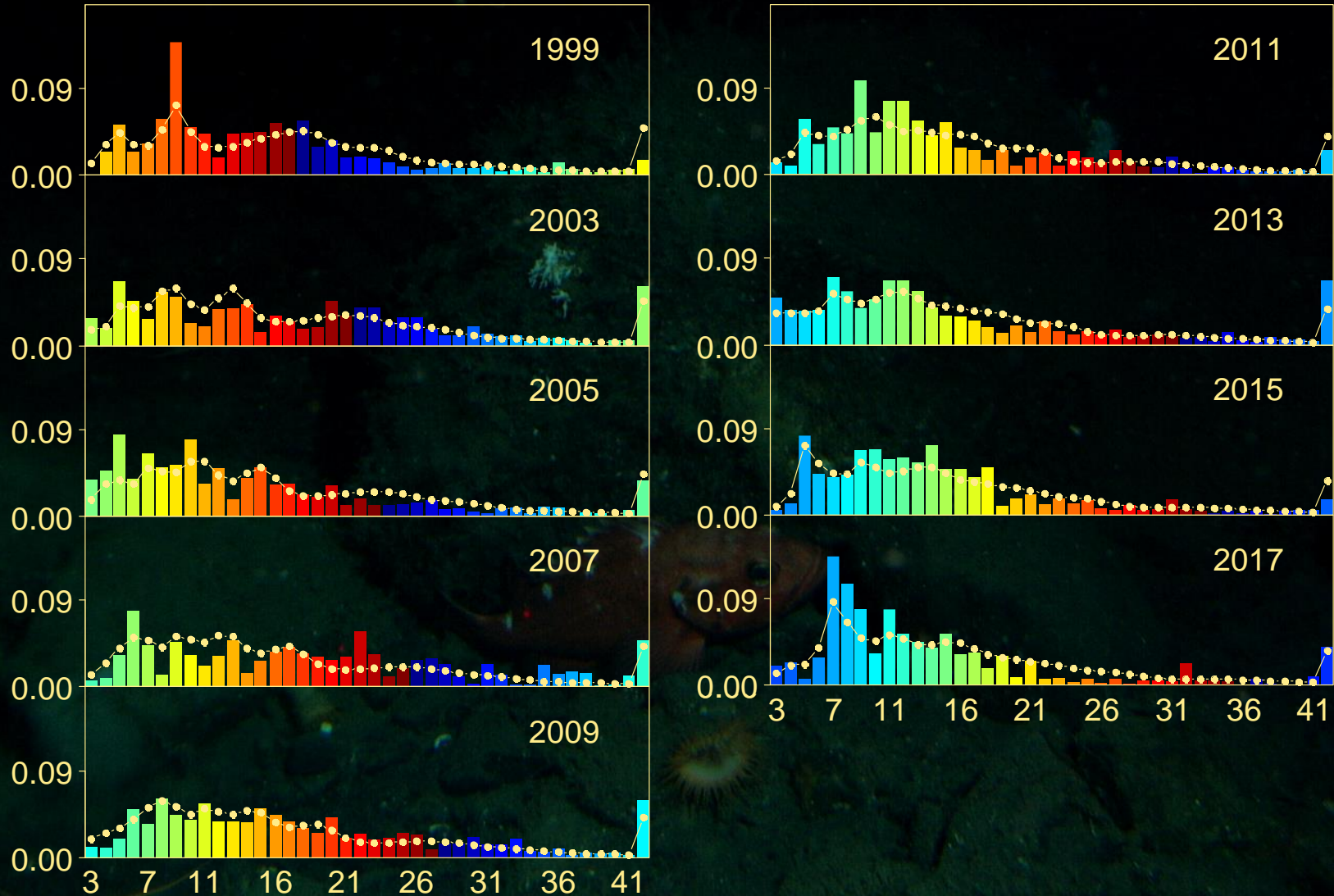
RE/BS – Results

- No changes in assessment model
 - Same as 2015 (15.4) model
- Parameters – similar to 2017 model
 - Slightly higher survey catchabilities, dome LL
 - Slightly lower mean recruitment (1.8 vs 1.9 mil)
- Model fit – similar to 2017 model
 - Moderate fit to fishery ages (plus group ok), good fit to survey ages, misses some peaks
 - Flattening of some peaks in size comps

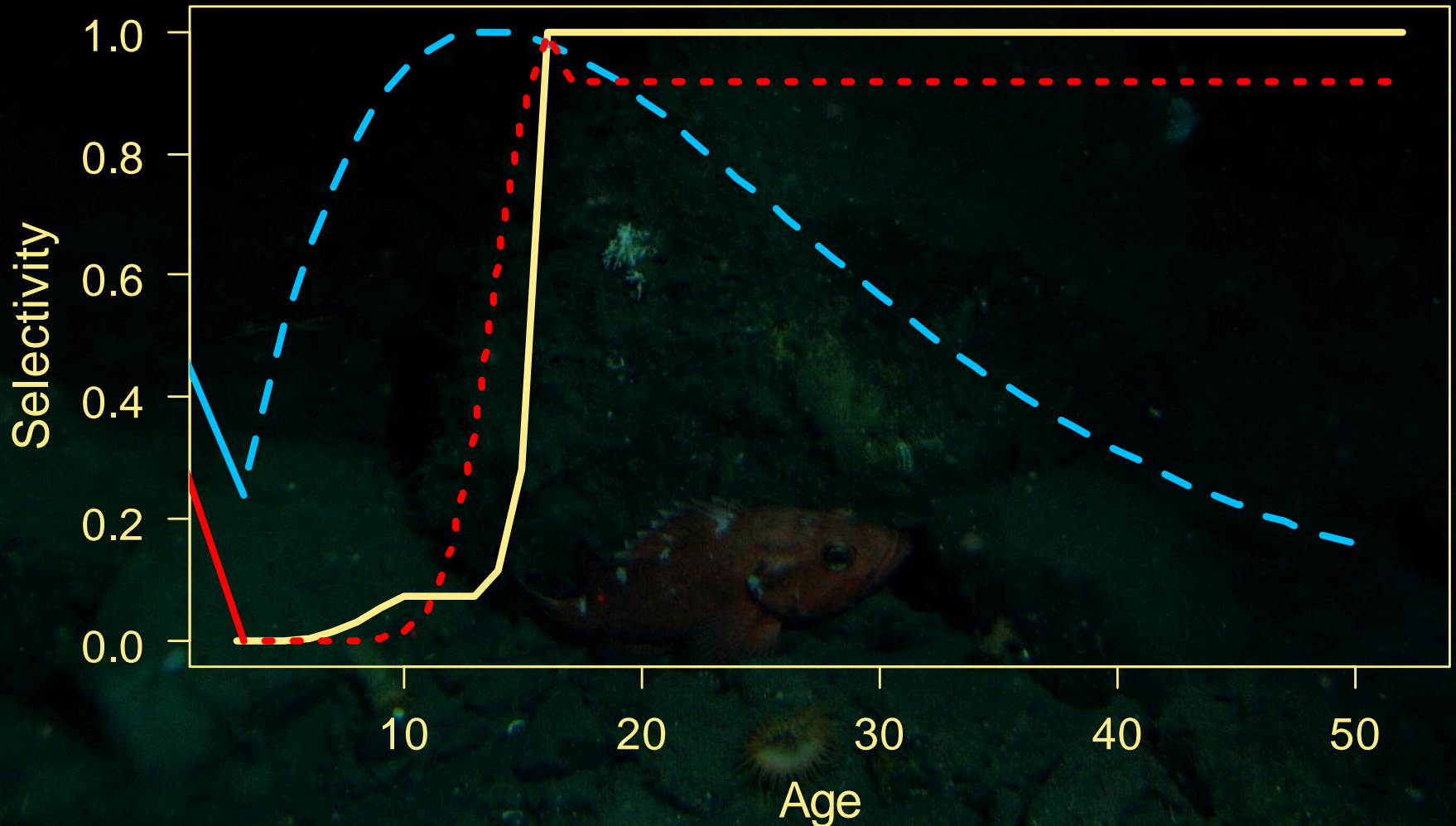
RE/BS Fishery Age



RE/BS Trawl Survey Age

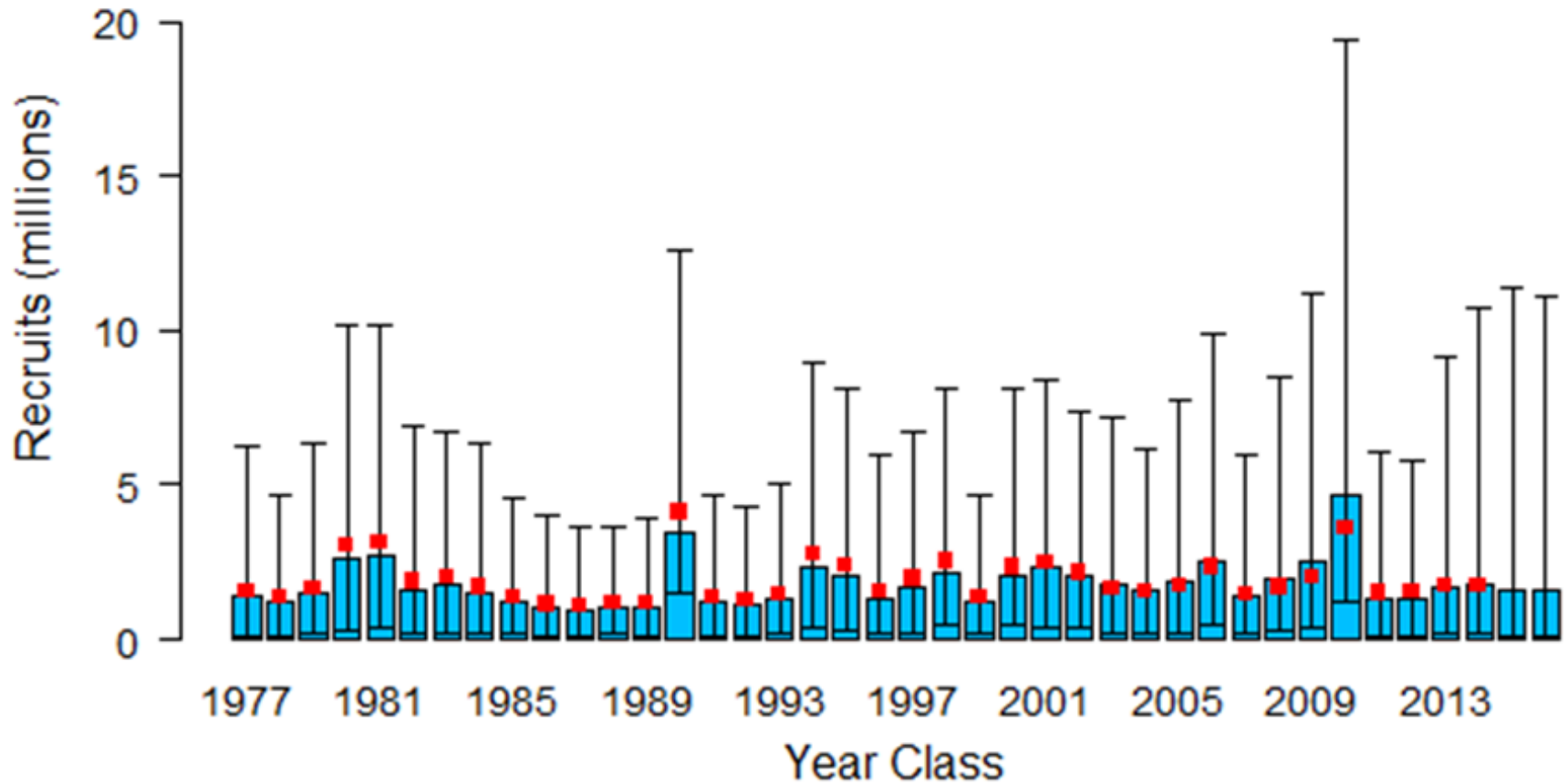


RE/BS Selectivity



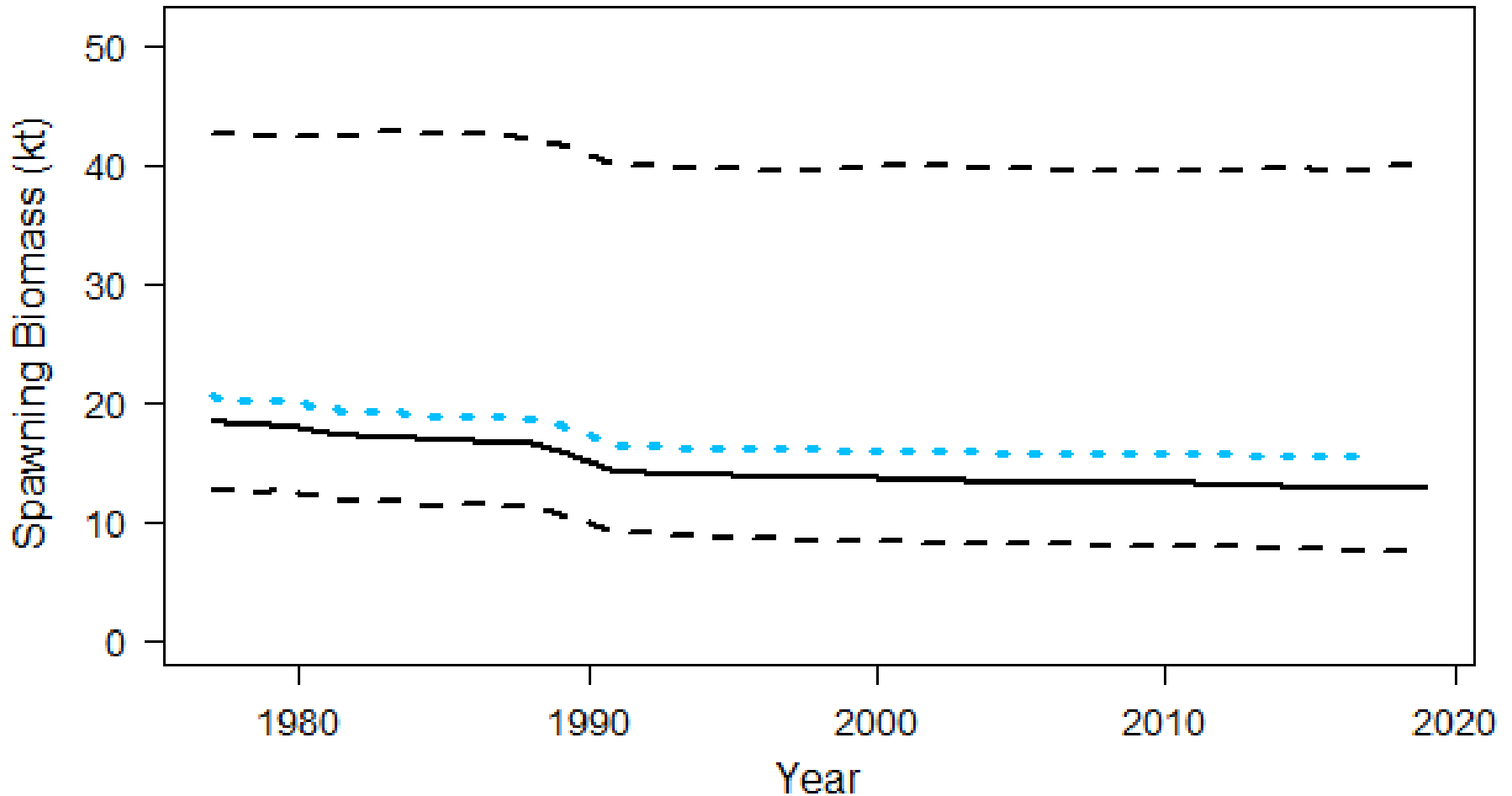
Blue line = Trawl Survey, Red line = Longline Survey, Yellow line = Fishery

RE/BS Recruitment



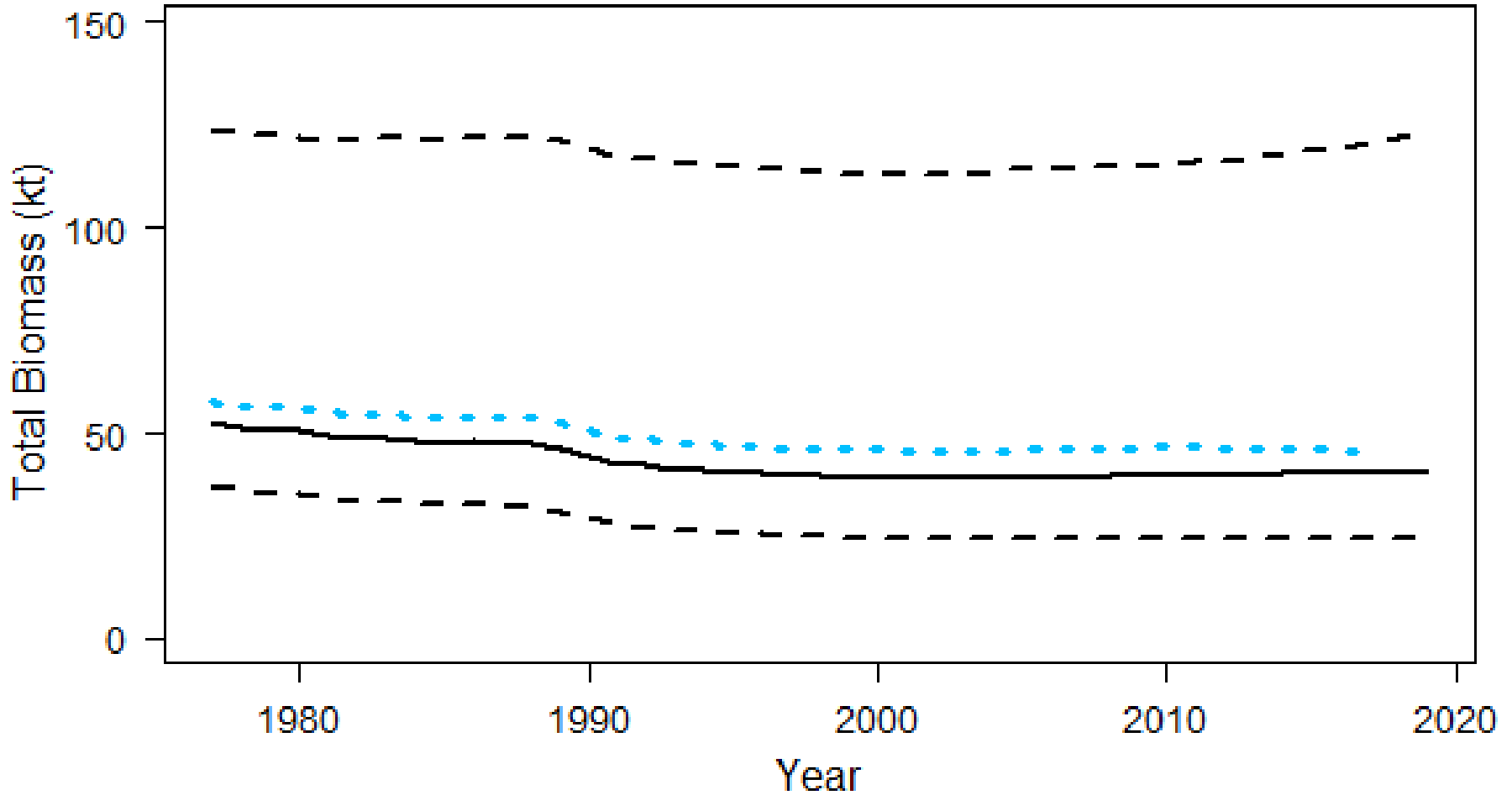
Red square = 2017, Blue bar = 2019

RE/BS Spawning Biomass



Blue dotted line = 2017, Black solid line = 2019

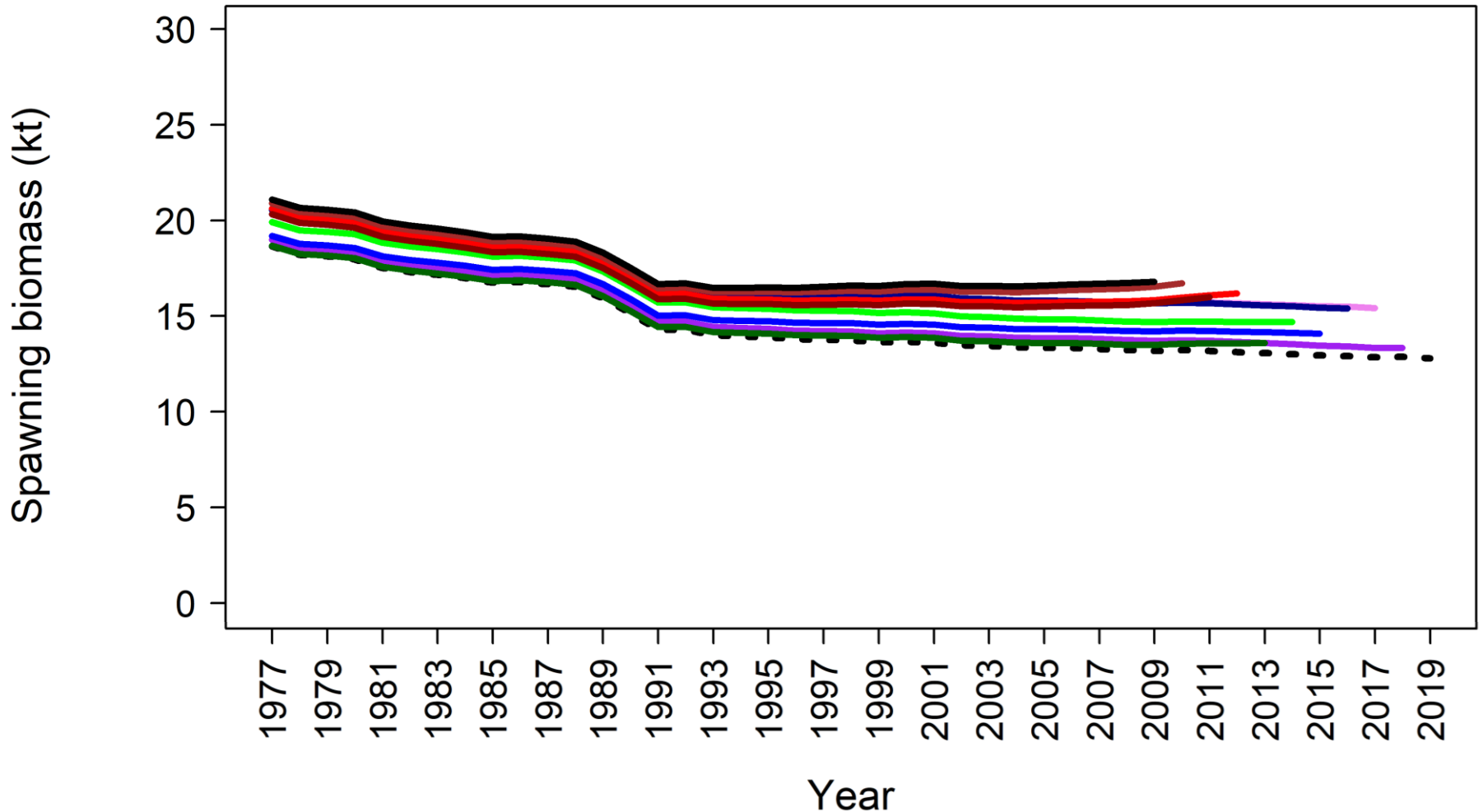
RE/BS Total Biomass



Blue dotted line = 2017, Black solid line = 2019

RE/BS Retrospective

Statistic	2015 (M15.4)	2017 (M15.4)	2019 (M15.4)
Mohn's revised ρ	0.105	0.009	0.167



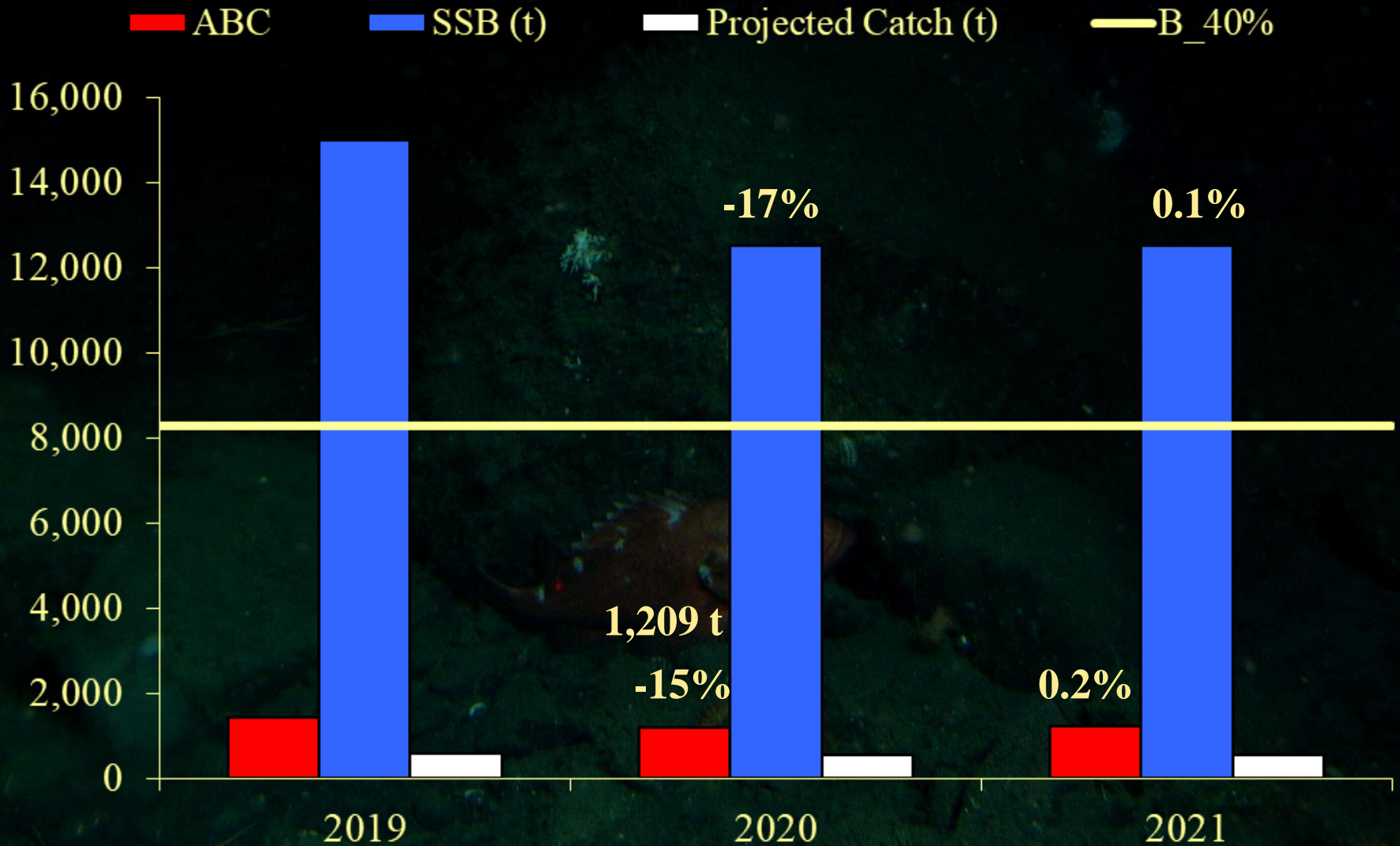
RE/BS Recommendation

- Recommended 2020 ABC: **1,209 t**
 - 15% decrease from last year's ABC of 1,428 t
- Summary, no model changes
 - Lack of larger exploitable fish in the last several years of age and length compositions, increase in younger fish from the 2010 year-class
 - ABC decreasing despite large uncertain increase in the trawl survey biomass estimate
 - Shift in age and length compositions to the appearance of a younger stock
 - Female spawning biomass is well above $B_{40\%}$, and projected to be stable

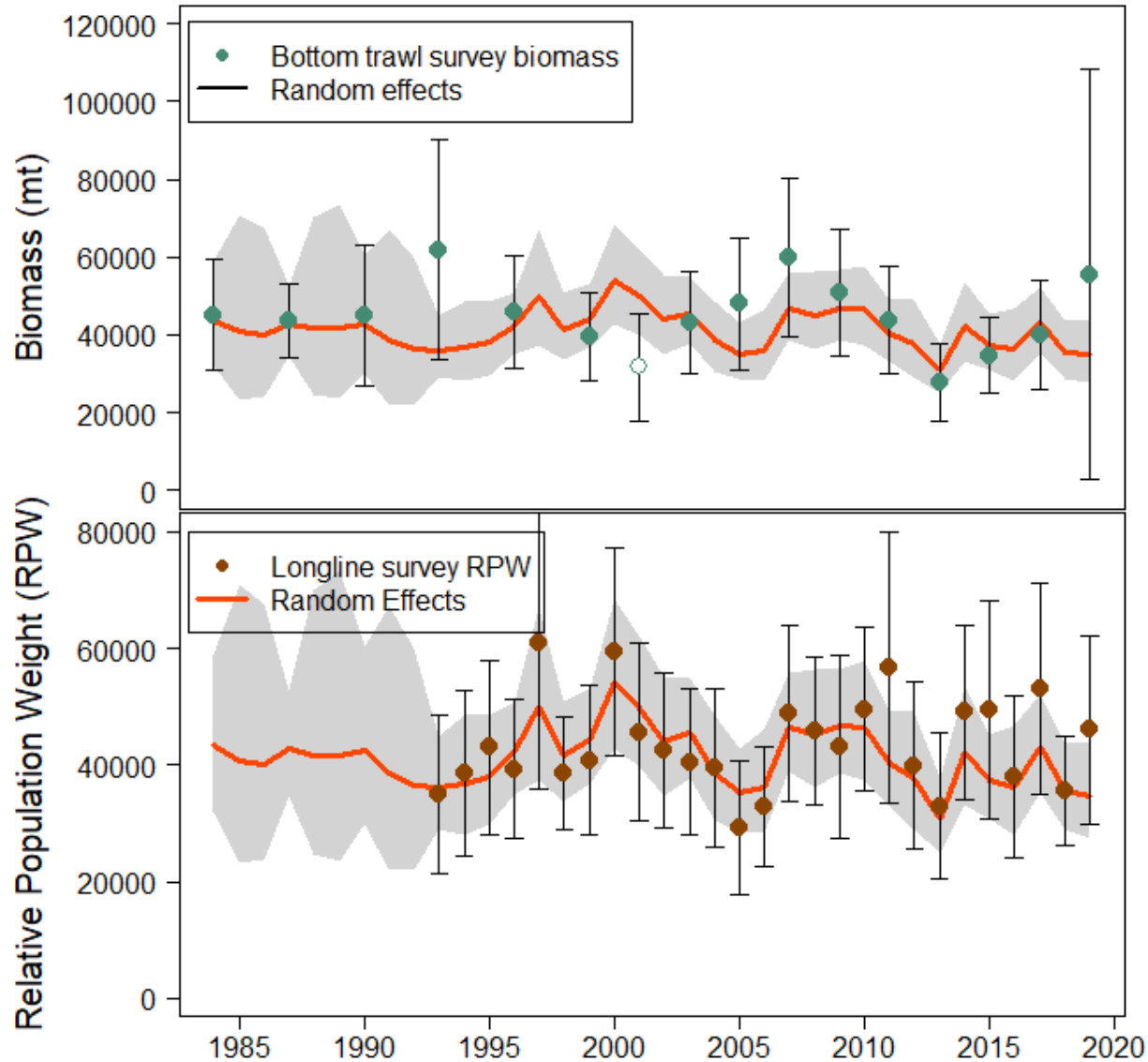
RE/BS Risk Table

- Overall score of Level 1
 - Suggests no need to consider ABC below max permissible, NOTE: this was not a quick exercise!
- Summary points for each consideration
 - Assessment: moderate retro bias, good fit to age data, no distinct trend in fit to two surveys
 - Pop dy: different maturity but no ID to species, growth differences, but ongoing research, impact unknown
 - Ecosystem: heatwave impact on early life but slope buffer, mixed signals on prey reduction
 - Fishery Perf: no directed fishery and catch trends are relatively stable, below TAC, and low discard rates

RE/BS Summary

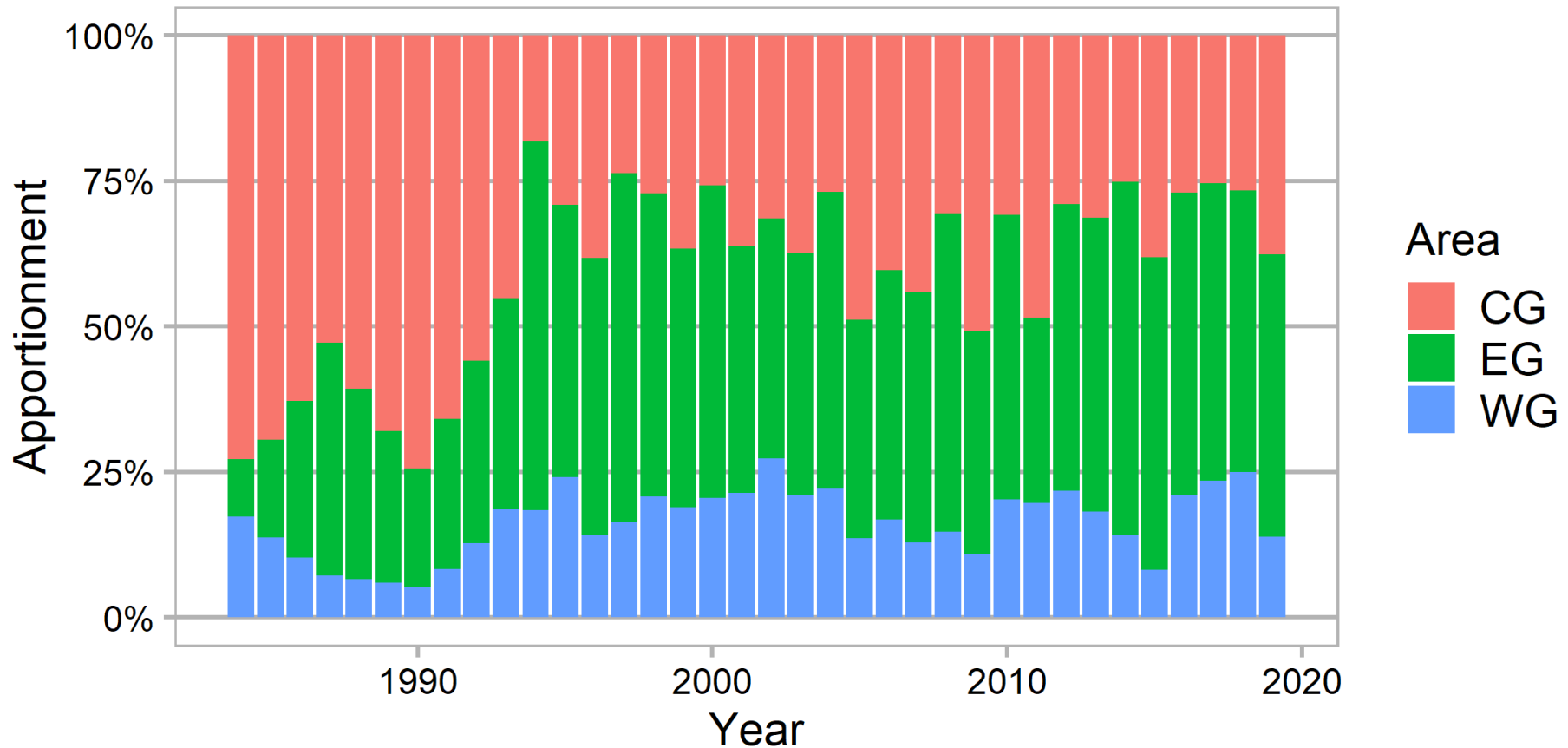


RE/BS Apporttionment



RE/BS Apportionment

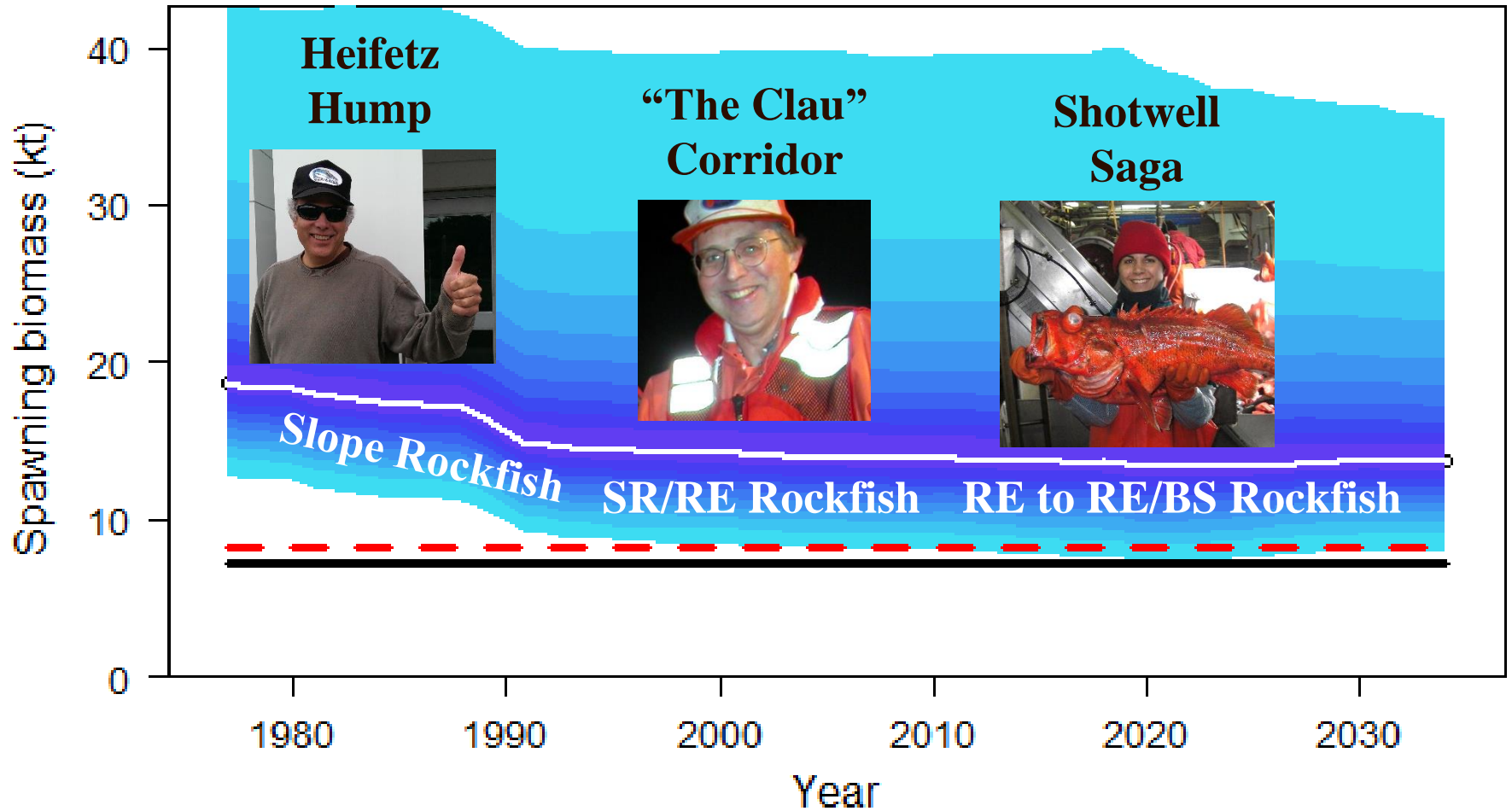
Method	WGOA	CGOA	EGOA
Weighted Avg	6.6%	55.7%	37.7%
2 Survey RE	13.9%	37.6%	48.5%



RE/BS Apportionment

Method	Area Allocation		Western GOA	Central GOA	Eastern GOA	Total
Three Survey Weighted Average			6.63%	55.70%	37.67%	100%
	2020	Area ABC (t)	80	673	456	1,209
		OFL (t)				1,452
	2021	Area ABC (t)	80	675	456	1,211
	OFL (t)				1,455	
Two Survey Random Effects			13.88%	37.61%	48.51%	100%
	2020	Area ABC (t)	168	455	586	1,209
		OFL (t)				1,452
	2021	Area ABC (t)	169	455	587	1,211
	OFL (t)				1,455	

RE/BS Projection

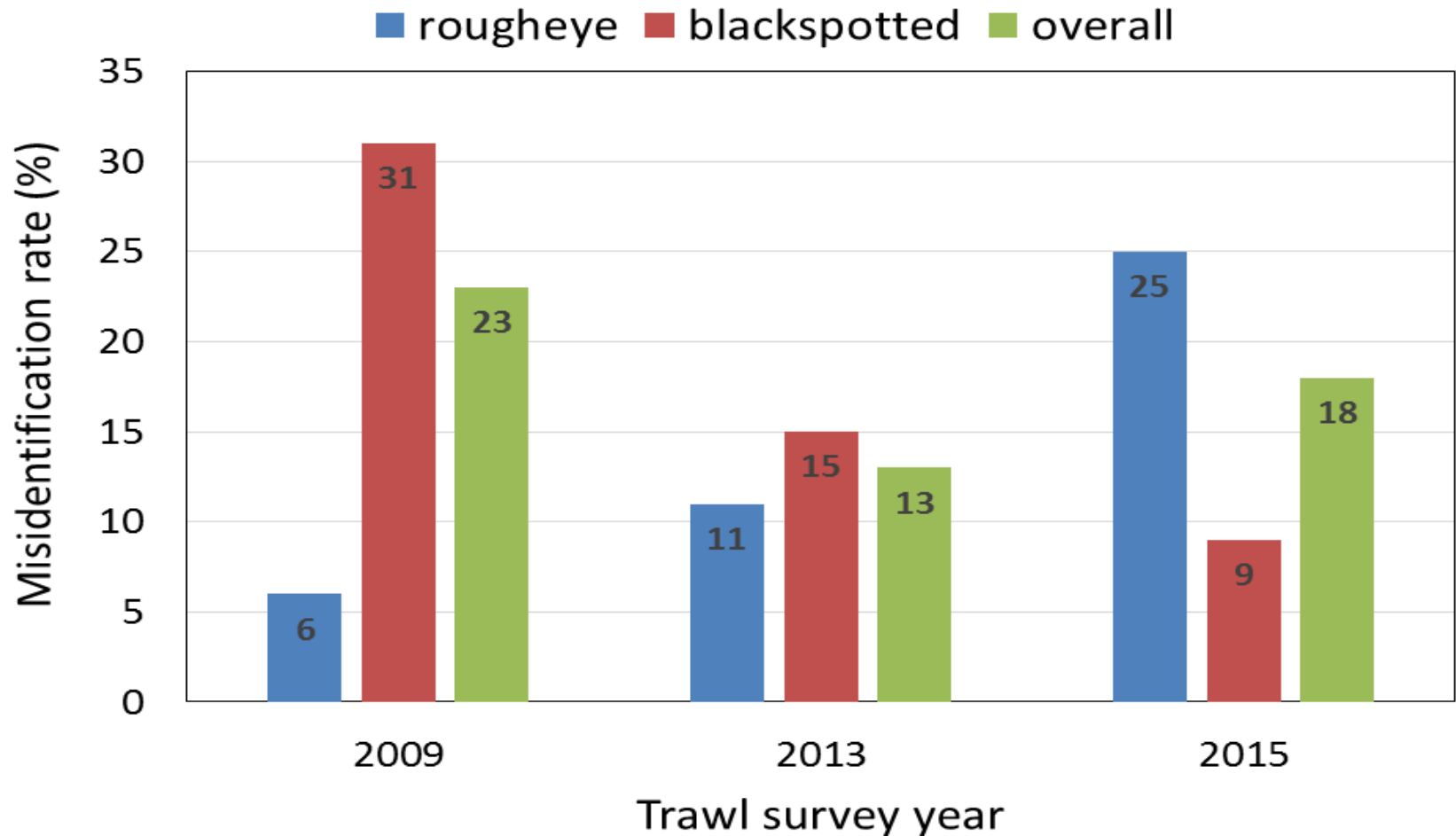


RE/BS Two-species Summary

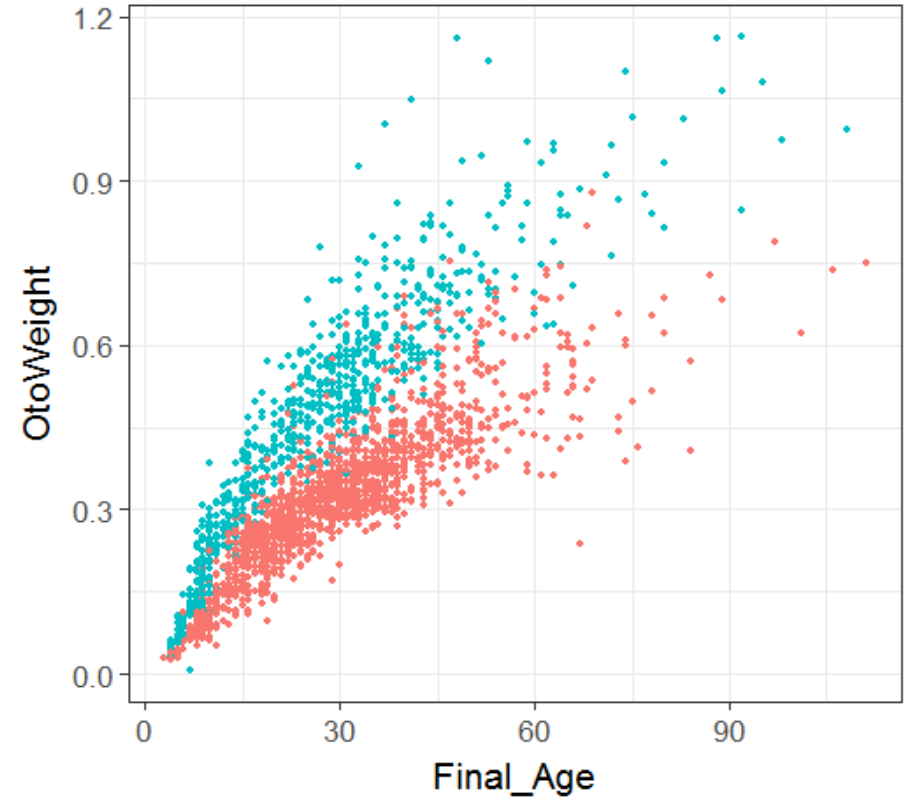
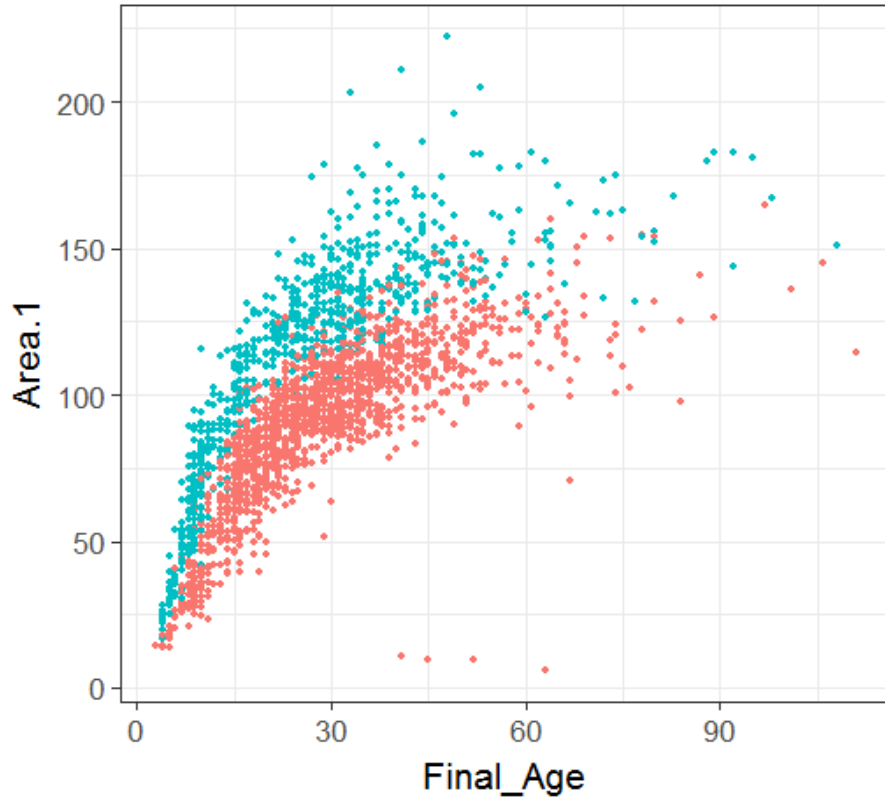
- Appendix 13.B
 - Summary of work to date on two-species
 - Organized by ID, growth, and maturity
- Overall considerations
 - Two options for identifying to species, oto is cost effective and potential for historic reconstruction
 - Growth and maturity data could be incorporated into the assessment, important to ID to species
 - Research is in progress for many studies...

RE/BS Two-Species Genetic ID

Misidentification rates of RE/BS Rockfish

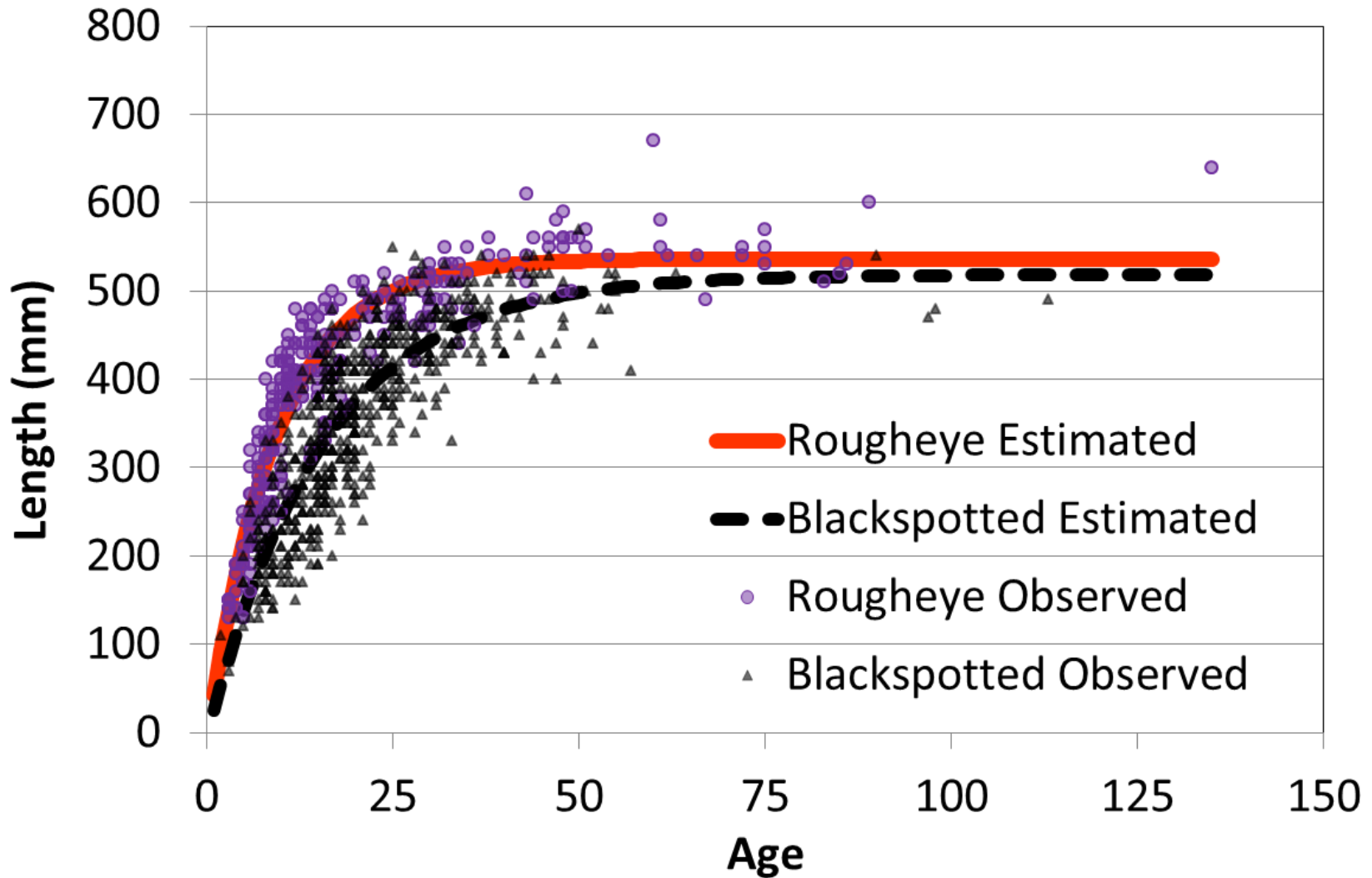


RE/BS Two-Species Otolith ID



**Red dot = Blackspotted (2/3), Blue dot = Rougheye (1/3),
more longline samples**

RE/BS Two-Species Growth

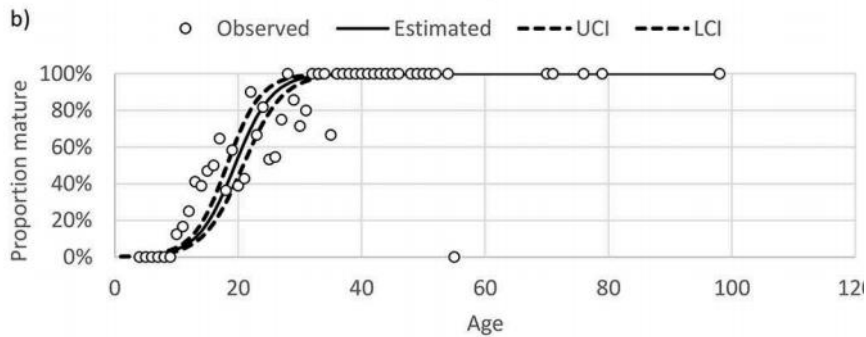
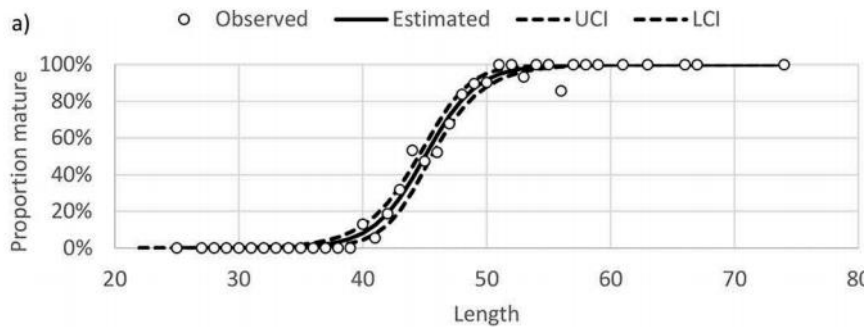


RE/BS Two-Species Maturity

Rougeye:

L50% = 45.0cm

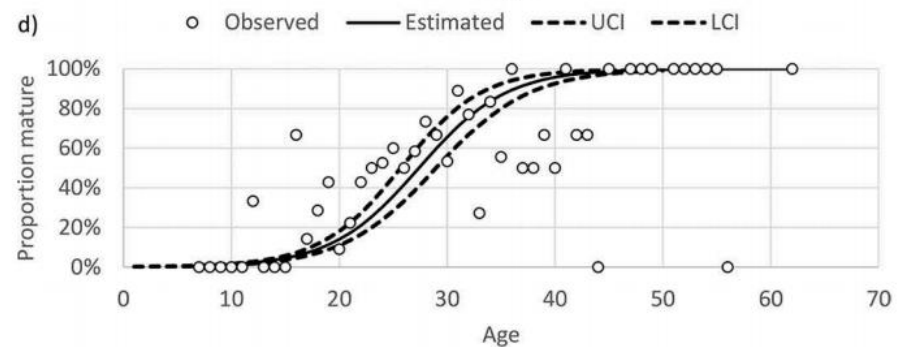
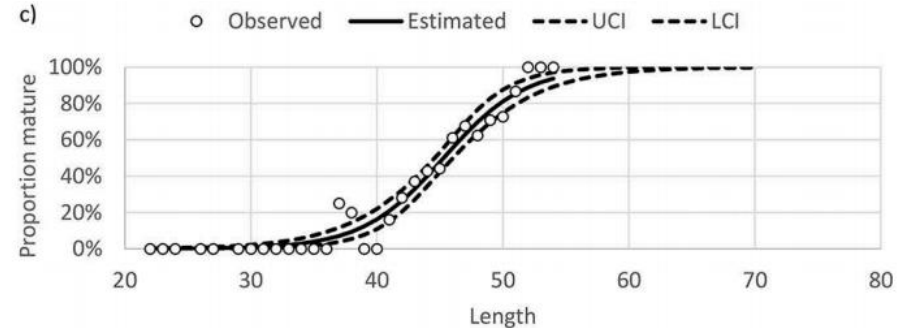
A50% = 19.6 yrs



Blackspotted:

L50% = 45.3cm

A50% = 27.4 yrs



Reproduced from Conrath (2017)

Research Priorities

- Two-species information
 - Complete misidentification projects for genetics and otolith morphometrics in fishery and surveys
 - Determine potential differences in growth between two species using species-identified samples
 - Update maturity information with new data and explore otolith morphometrics for samples
- Model considerations
 - Explore sensitivity to size/age matrix and update matrix
 - Consider weighting fishery age composition by gear type
- Consider ESP report to investigate two species model



Questions?