

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 yellow, serif font.

GOA Rougheyeye & Blackspotted Rockfish

Shotwell, Hanselman, Heifetz

Outline

- Full assessment for RE/BS rockfish
- PT/SSC comments specific to RE/BS
- Data and trends
- Model results
- Harvest recommendations
- New research and priorities



RE/BS (Rougheye/Blackspotted)

- Tier 3a species – 2017 full assessment
 - Uses two surveys (bottom trawl & longline)
 - Updated research on 2-species genetic project
- Summary of Changes:
 - Data: new/updated catch, new trawl/longline survey, new fishery/survey age/size compositions
 - Trends: increase in both surveys, population trajectory very flat, stronger 2010 year class
 - No model changes from 2015 full assessment



SSC Comments

“The Team recommends exploring apportionment methods (such as the random effects model) for the next full assessment.”

- We include both random effects and weighted survey average for comparison and discuss results
- We plan to use guidelines from Survey Average Working Group on options for two surveys and consider two species adjustment

“The retrospective pattern for M4a is poor (Mohn's $\rho = -0.371$) and the SSC requests that the author explores the reason for this result.”

- Further inspection of retrospective model revealed coding error and correction results in much reduced Mohn's $\rho = 0.009$ for 2017.

“The Team recommends evaluating a Tier 5 approach by species with “worst-case” scenarios that consider total catch comprised of one species.”

- Evaluated simple T5 comparing total catch to what an individual OFL would be for each species in the complex.
- Compared at-sea results with genetically corrected results

RE/BS Genetic Study

- Summarized available data on two species

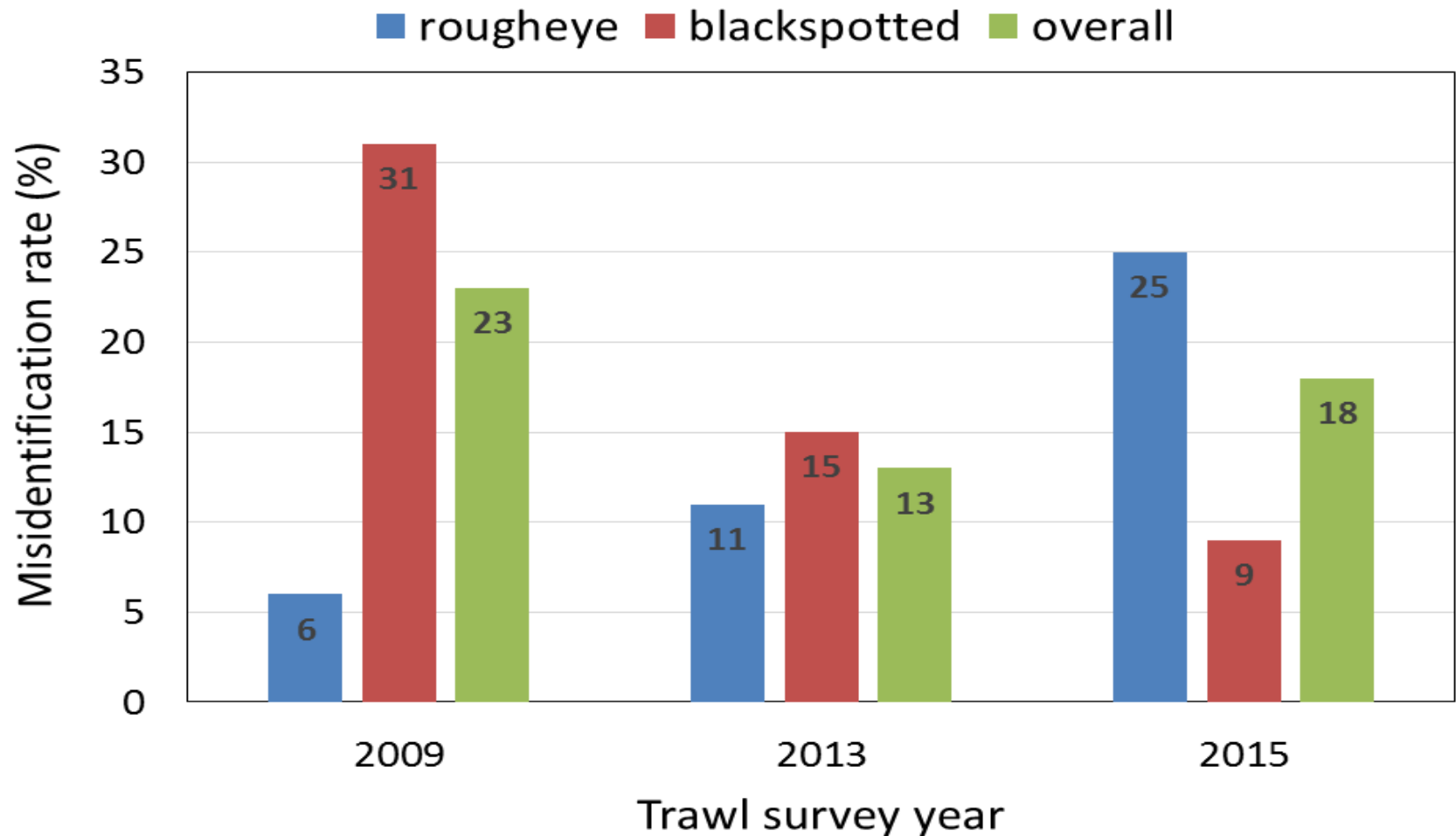
| Source | Project Data | Years Available |
|--------------------------|------------------|------------------------------------|
| Fisheries | Otolith metrics* | 1990, 2004, 2009, 2012, 2013, 2014 |
| | Maturity | 2008-2012 (Conrath 2017) |
| AFSC bottom trawl survey | Genetic ID* | 2009, 2013, 2015 |
| | Biomass Index | 2007, 2009, 2011, 2013, 2015, 2017 |
| | Age | 2007, 2009, 2011, 2013, 2015, 2017 |
| | Length | 2007, 2009, 2011, 2013, 2015, 2017 |
| | Otolith metrics* | 1990, 1999 |
| | Maturity | 2008-2012 (Conrath 2017) |

* Analysis is in progress

- Genetics
 - Mis-ID rate 13-23% overall and shifted from higher BS mis-ID in 2009 to higher RE mis-ID in 2015
 - RE younger on average than BS (15 vs 20 years) and grow faster with slightly greater max size (prelim.)

RE/BS Genetic Study

Misidentification rates of RE/BS Rockfish

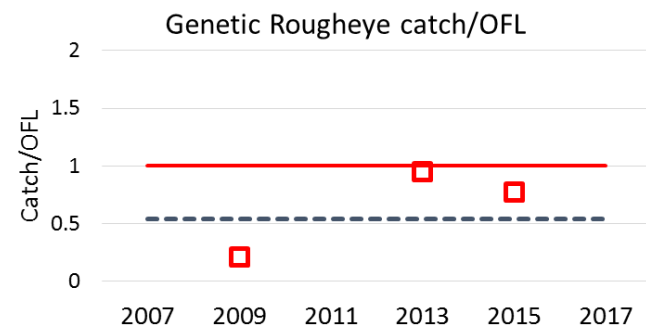
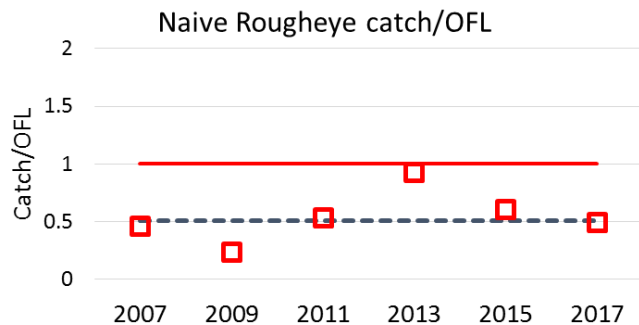
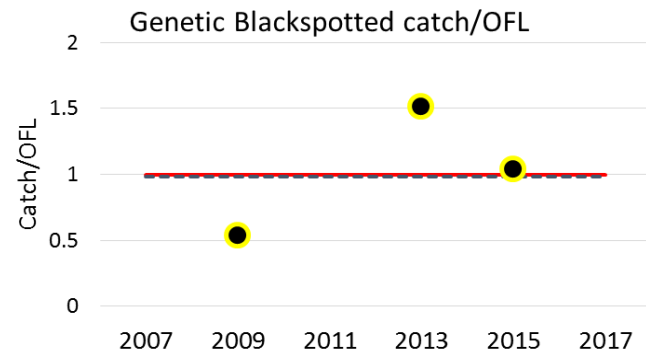
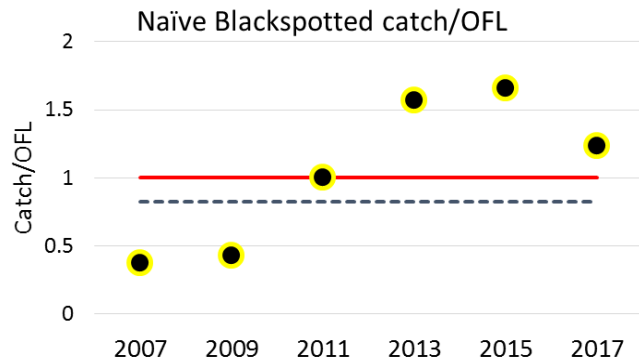
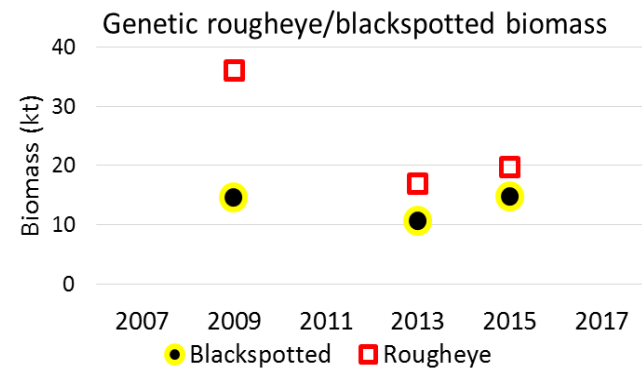
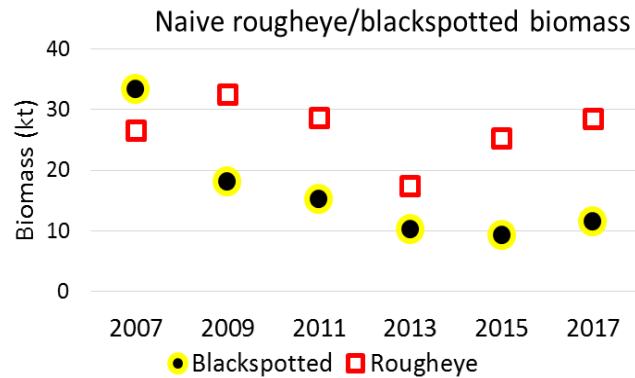


RE/BS Tier 5

- Requested by Plan Team for “worst-case”
 - Evaluated Tier 5 approach at extreme by comparing total catch to OFL for each species
 - Evaluated for at-sea time series (2007 to present) and genetic ID data (2009, 2013, 2015)
- Results
 - If all catch from BS hypothetical OFL would have been exceeded in some years, but none for RE



RE/BS Tier 5 Naïve vs Genetic



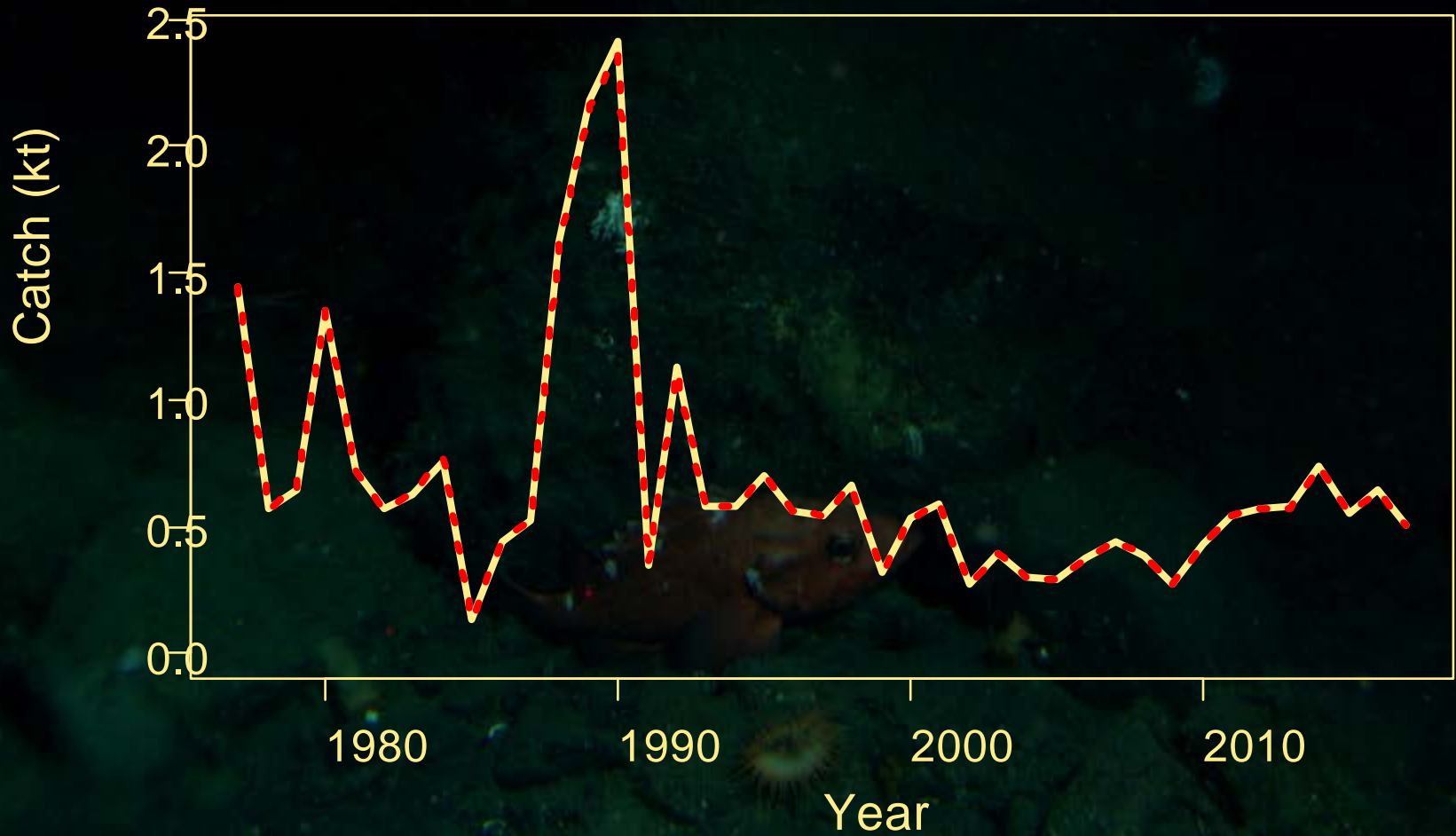
RE/BS Data Table

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

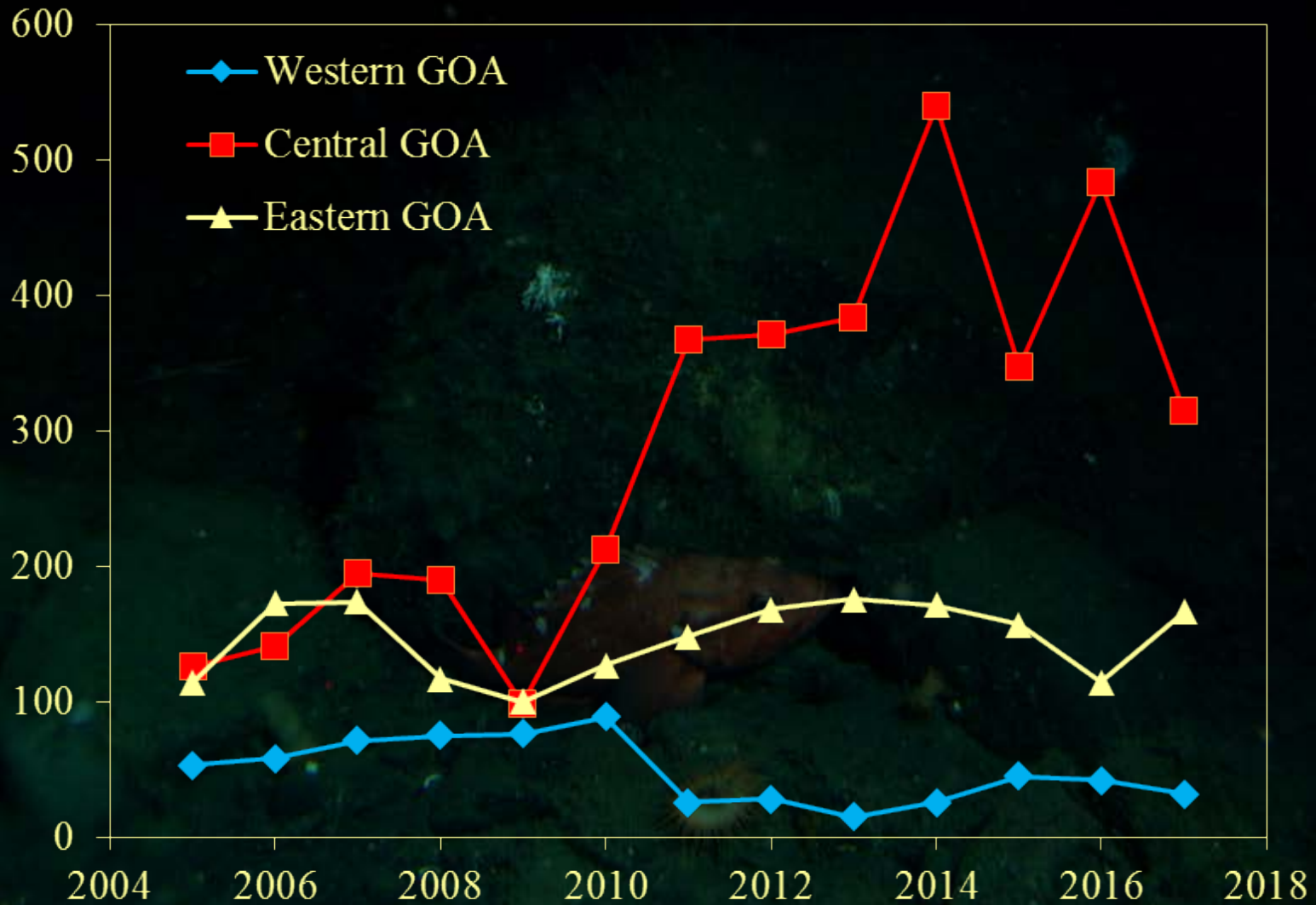
RE/BS Fishery

- Gulfwide catch has been relatively stable since 2010, around 570 t on average since then
- Increased in 2016 by 12% from average, back down to average in 2017
- Generally 20%-60% of TAC
 - WGOA steady decrease, CGOA variable, EGOA mostly stable with dip in 2016, no overages
 - Most changes due to rockfish fishery, decrease in longline fisheries

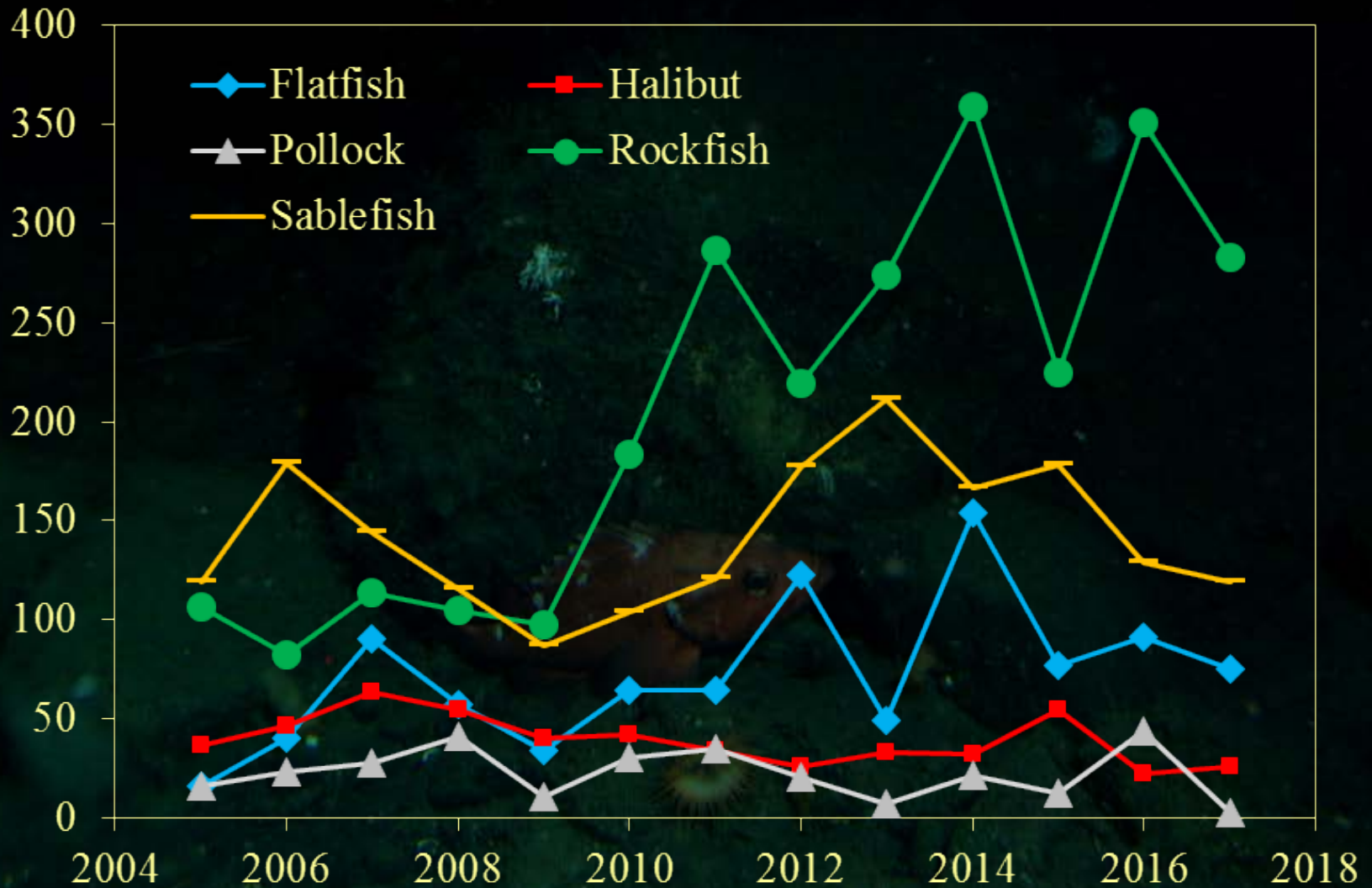
RE/BS Catch



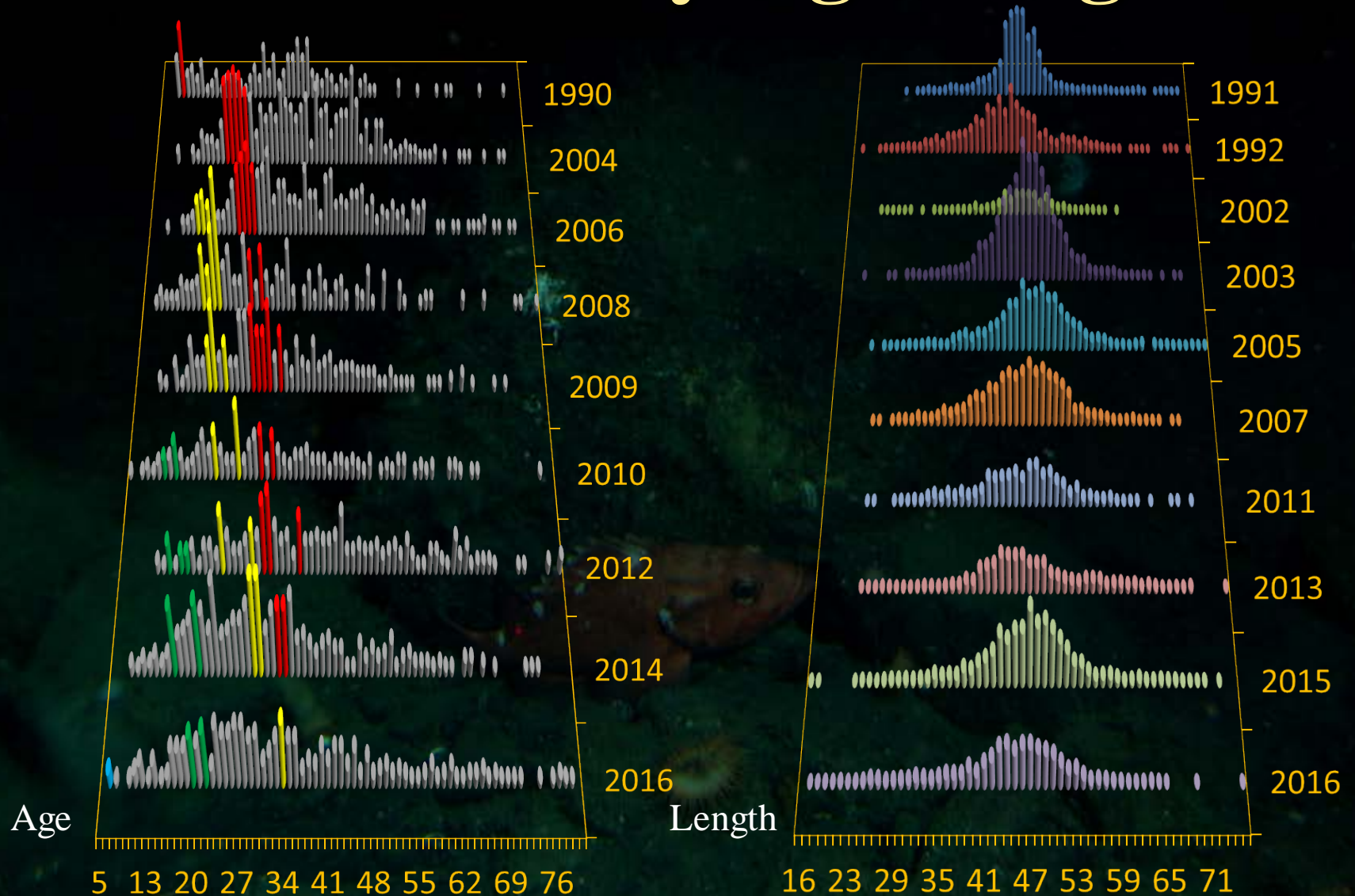
RE/BS Catch by Region



RE/BS Catch by Fishery



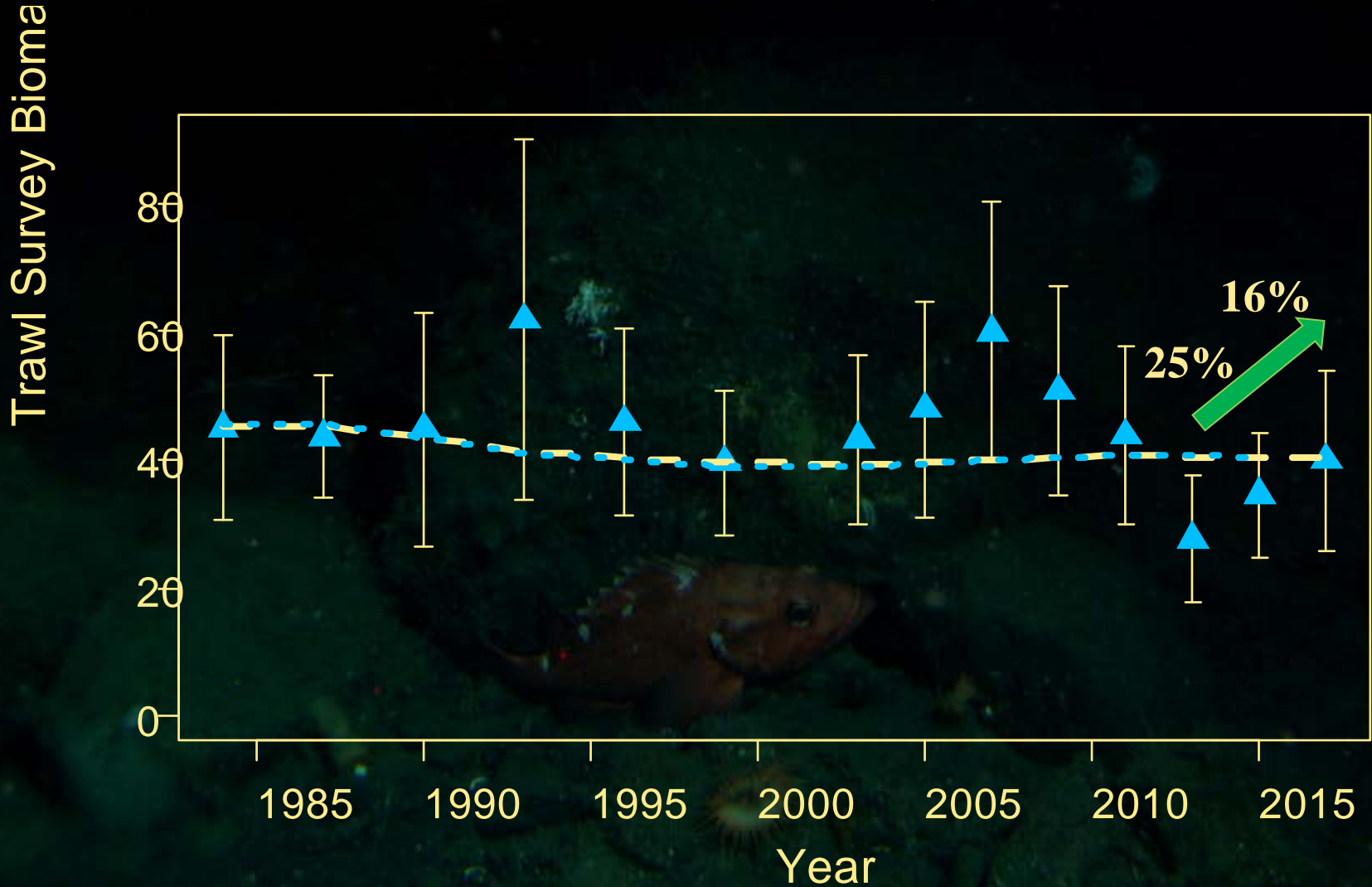
RE/BS Fishery Age/Length



RE/BS Surveys – Bottom Trawl

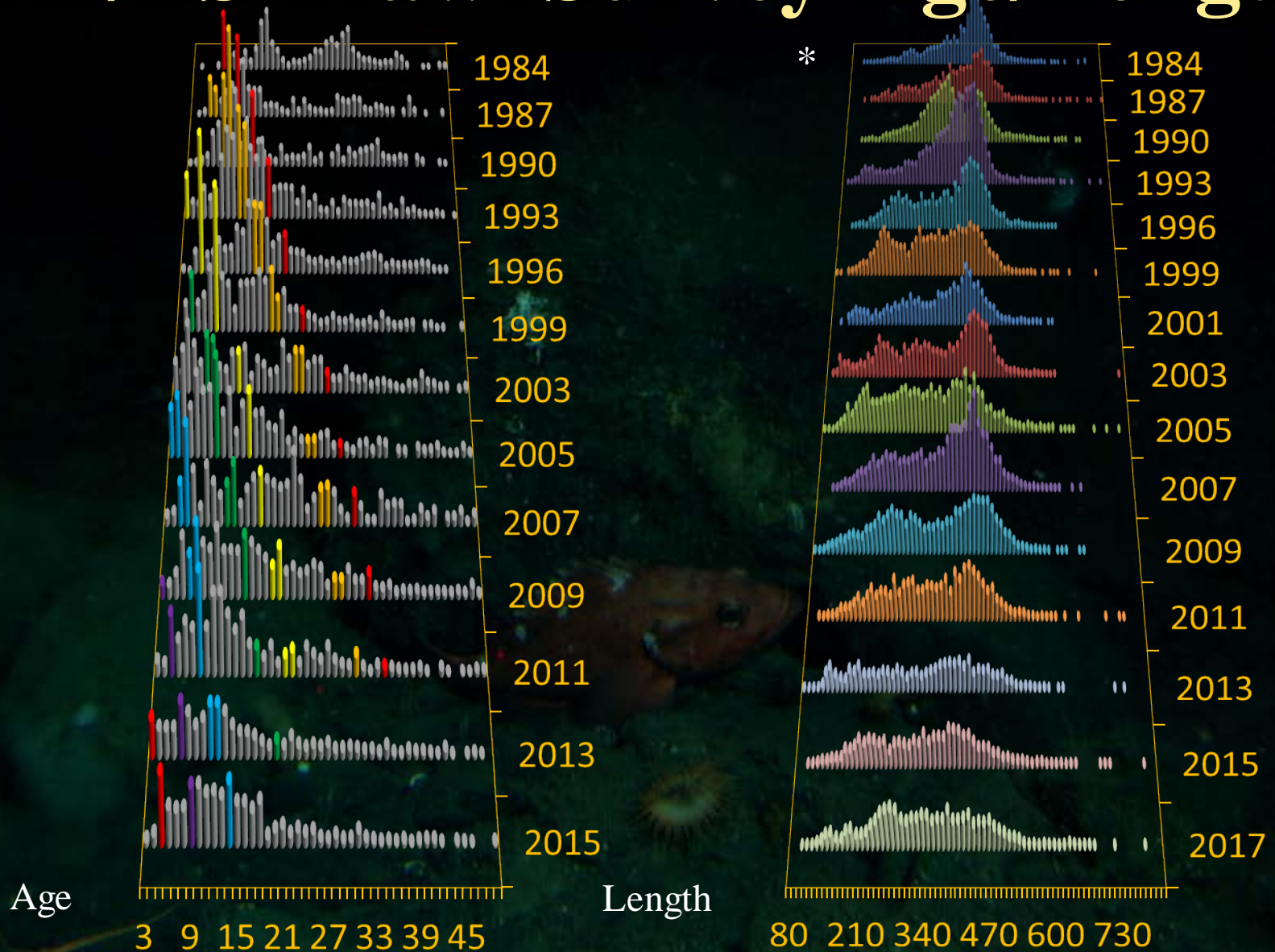
- Overall fairly low contrast (CIs overlap)
 - Main decrease in CGOA, up in WGOA and EGOA
 - Distribution of hauls usually fairly evenly distributed but more on shelf in CGOA
- 2017 survey estimate up by 16% from 2015
 - Decreases in CGOA, large increase in EGOA and moderate increase in WGOA
 - Spatial distribution of hauls different than 2015, larger catches in EGOA

RE/BS Trawl Survey Biomass



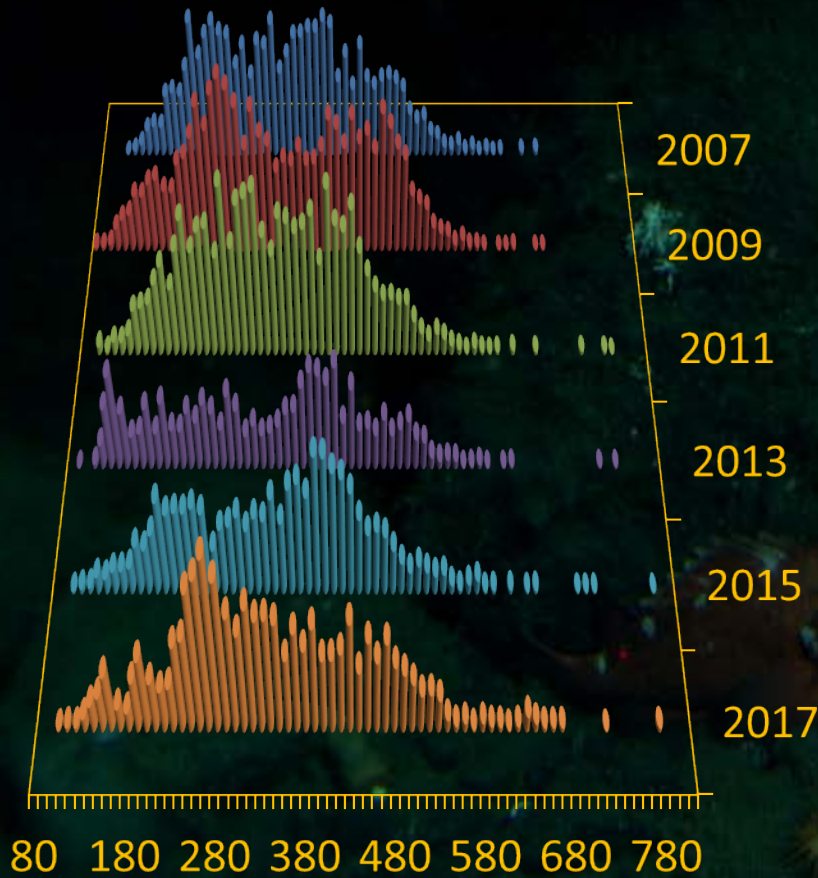
* Not fit in model

RE/BS Trawl Survey Age/Length

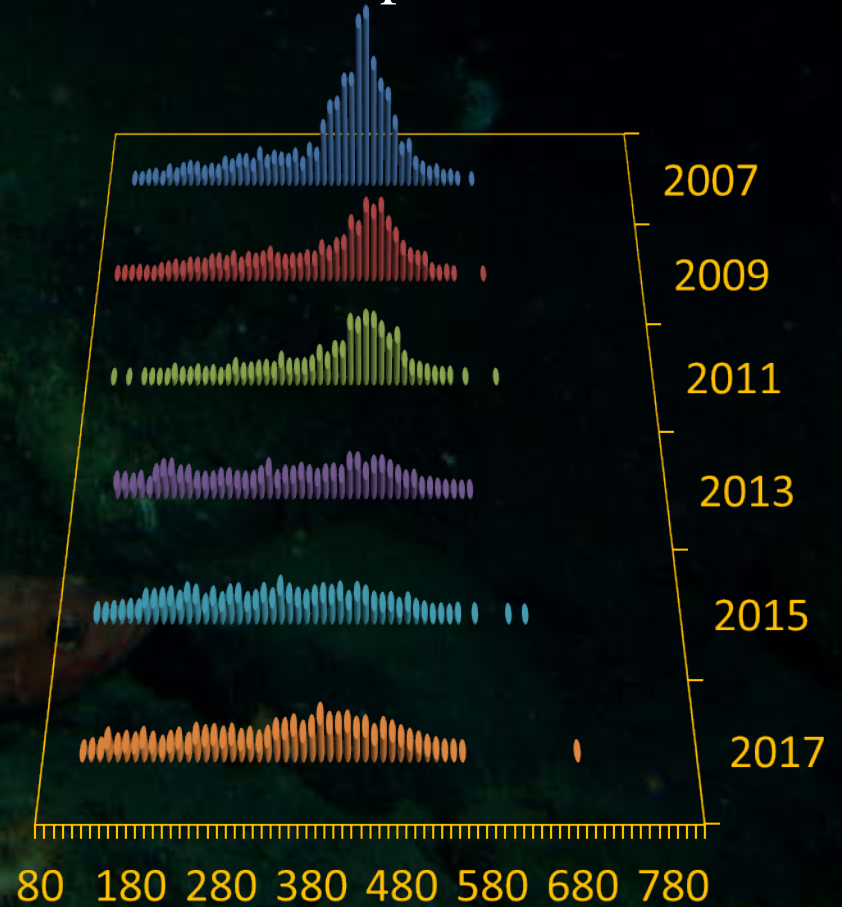


RE/BS Trawl Survey Length

Rougeye

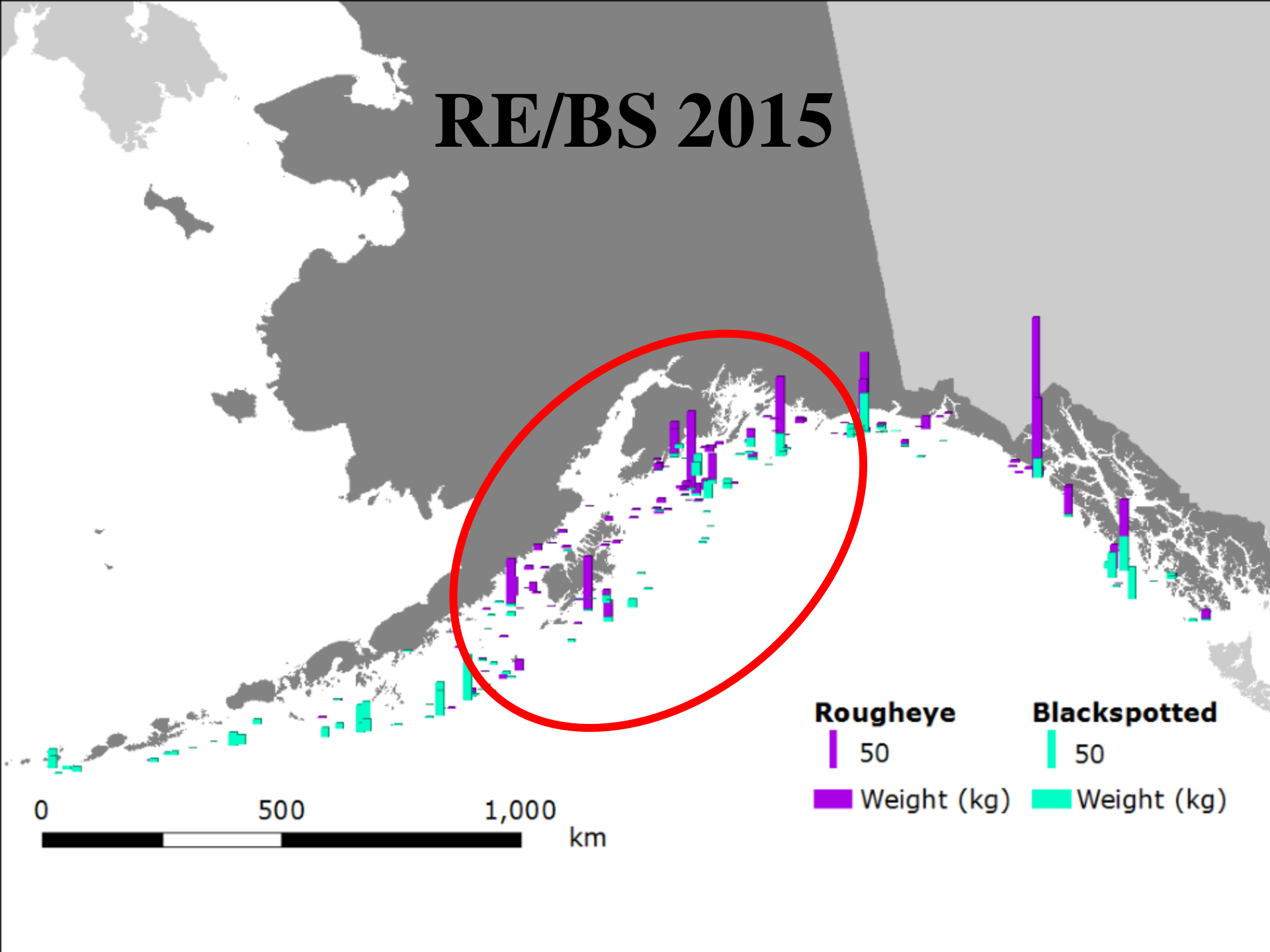


Blackspotted

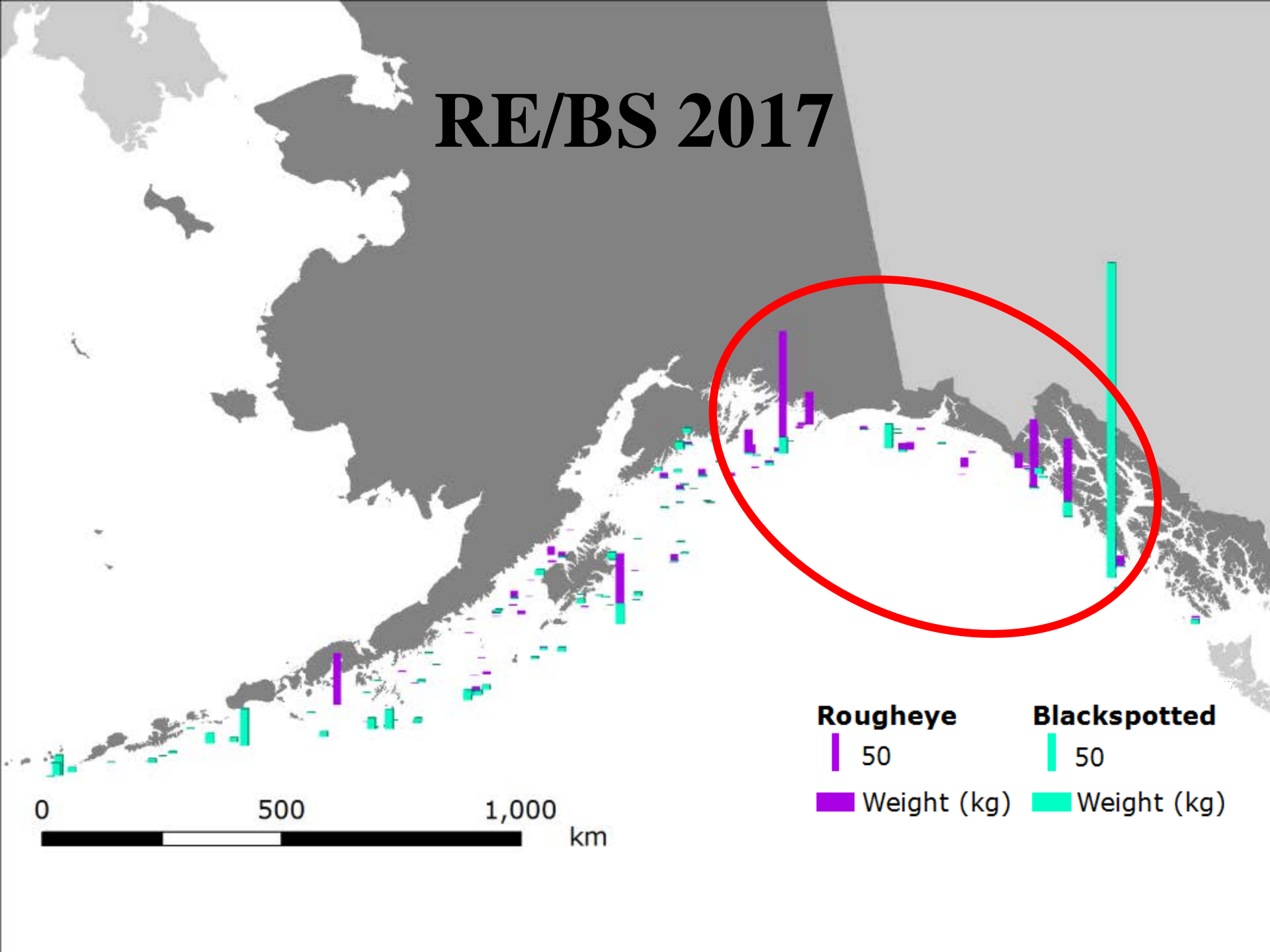


At-sea Identification

RE/BS 2015



RE/BS 2017

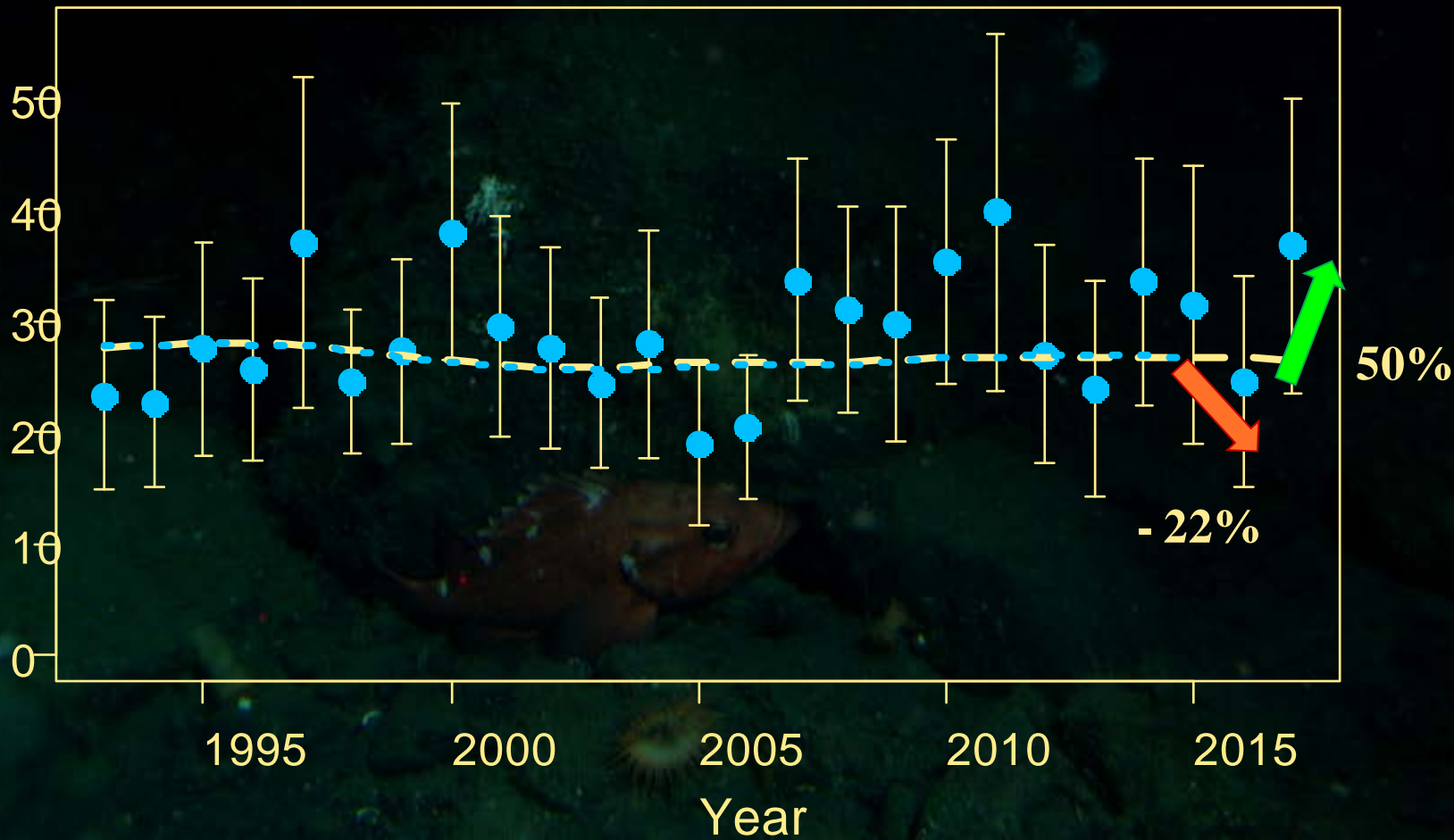


RE/BS Surveys – Longline

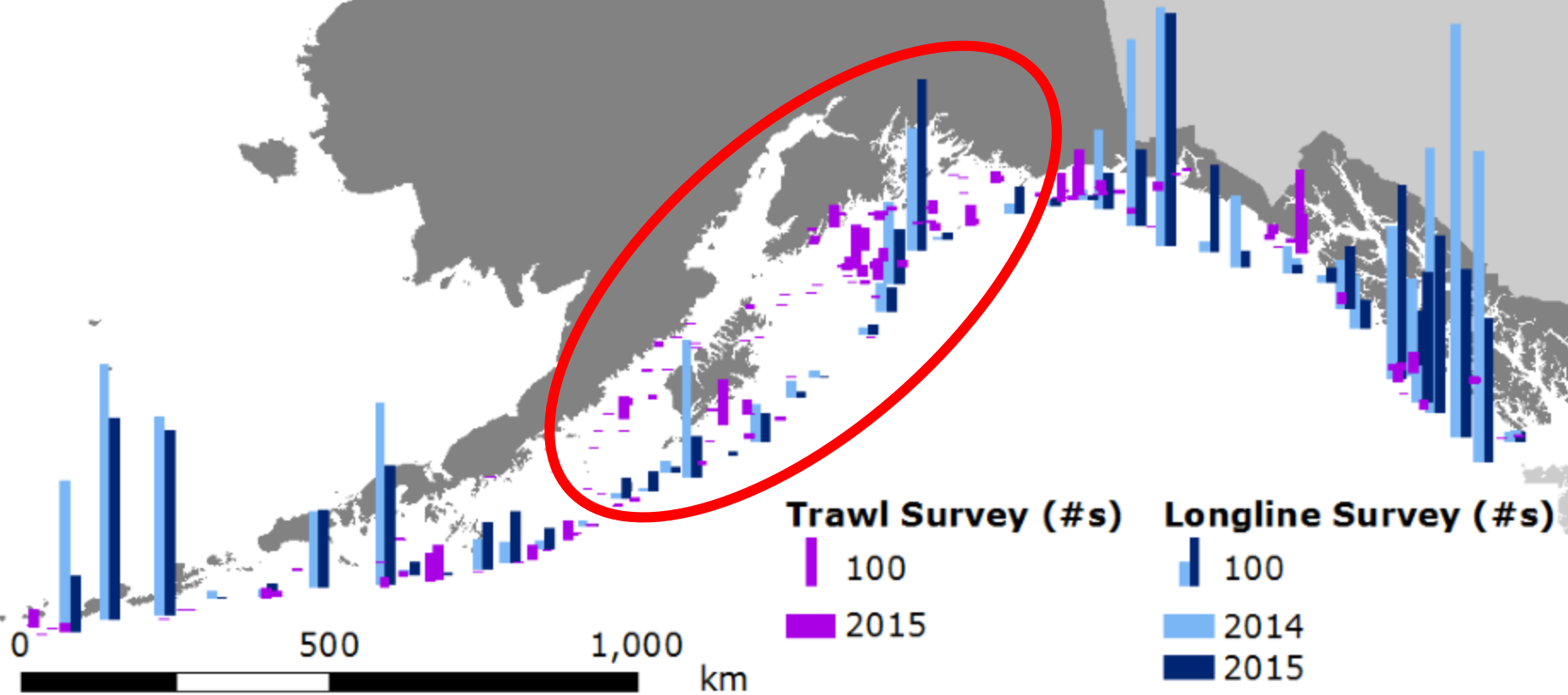
- Fully revised RPN index (1993-2017)
 - Uses new area sizes, RPN, new error estimates
 - Overall low contrast (all CI's overlap)
 - Generally samples slope environment
- 2016 survey down (22%), 2017 up (50%)
 - Large increases in time series do not match trawl, but recent decline 2012-2013 similar to trawl
 - Pattern reflected in all areas in both years
 - Currently 27% above long-term average

Longline Survey Biomass

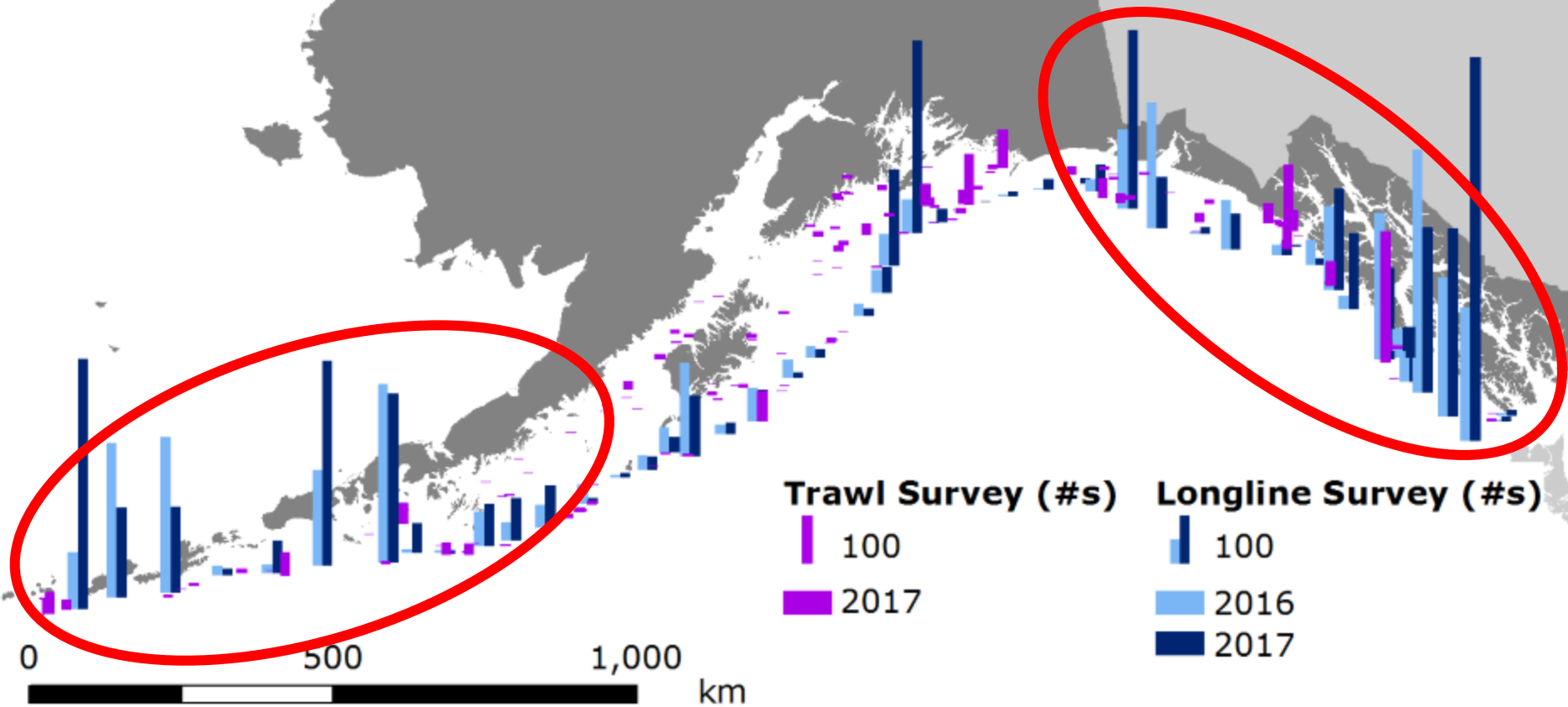
RE/BS LL Survey Abundance



Survey Comparison: 2015



Survey Comparison: 2017



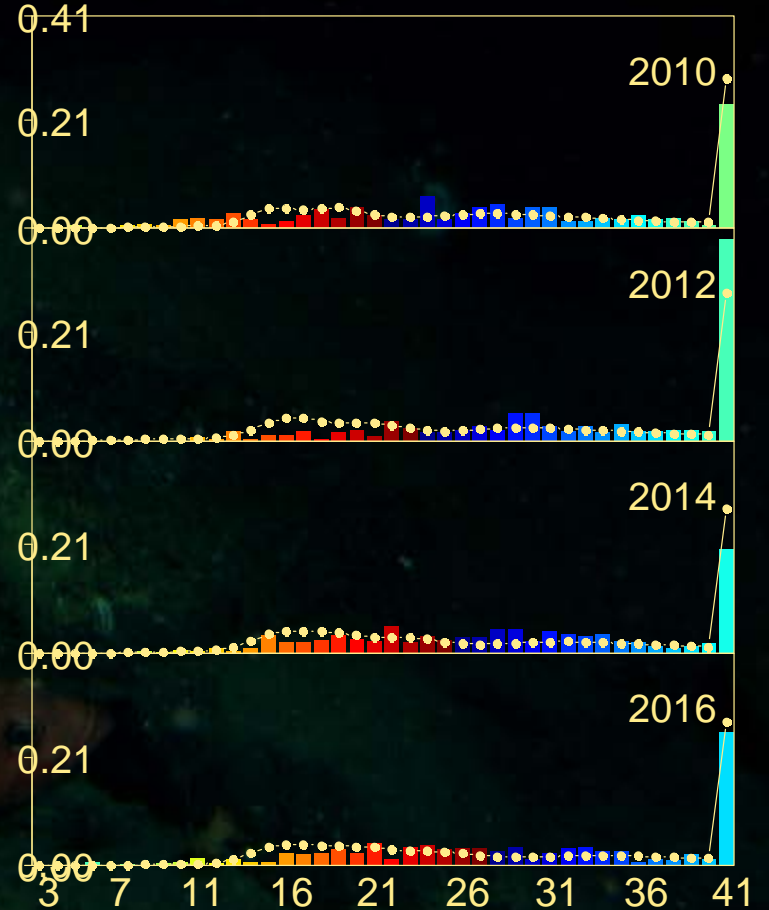
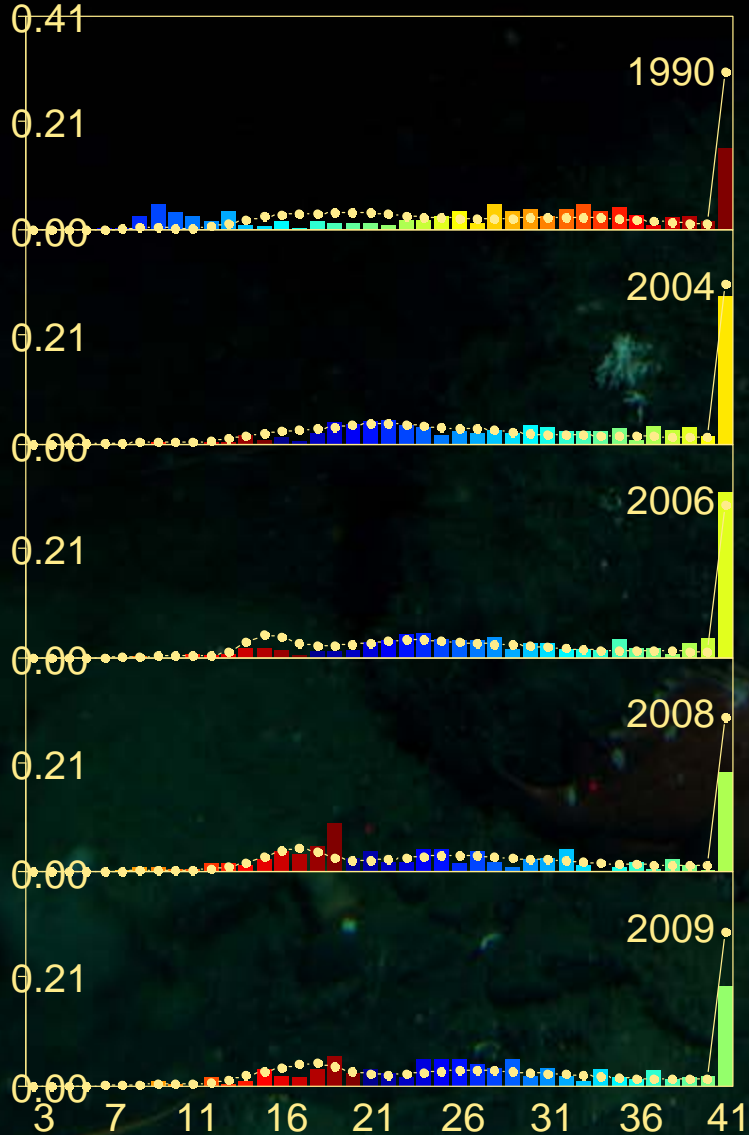
RE/BS – Biological Data Update

- Conrath (2017) maturity study
 - Data collected in survey and fishery (2008-2012)
 - Fork length at 50% maturity similar between the two species (45 cm RE, 44 cm BS)
 - Age at 50% maturity younger for RE at 19.6 years than BS at 27.4 years
- Otolith morphology (preliminary)
 - Application of method to RE/BS 2009 fishery ages found 43% RE and 57% BS in catch

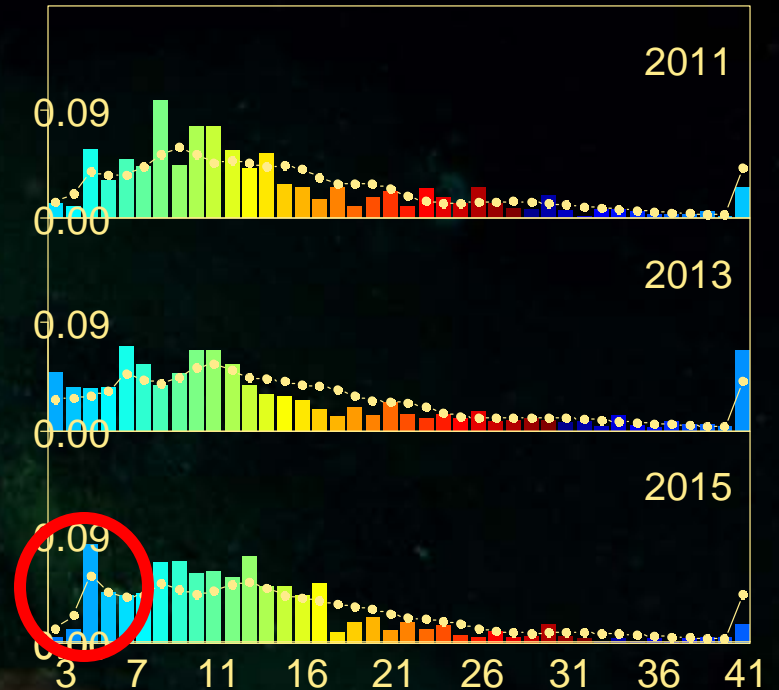
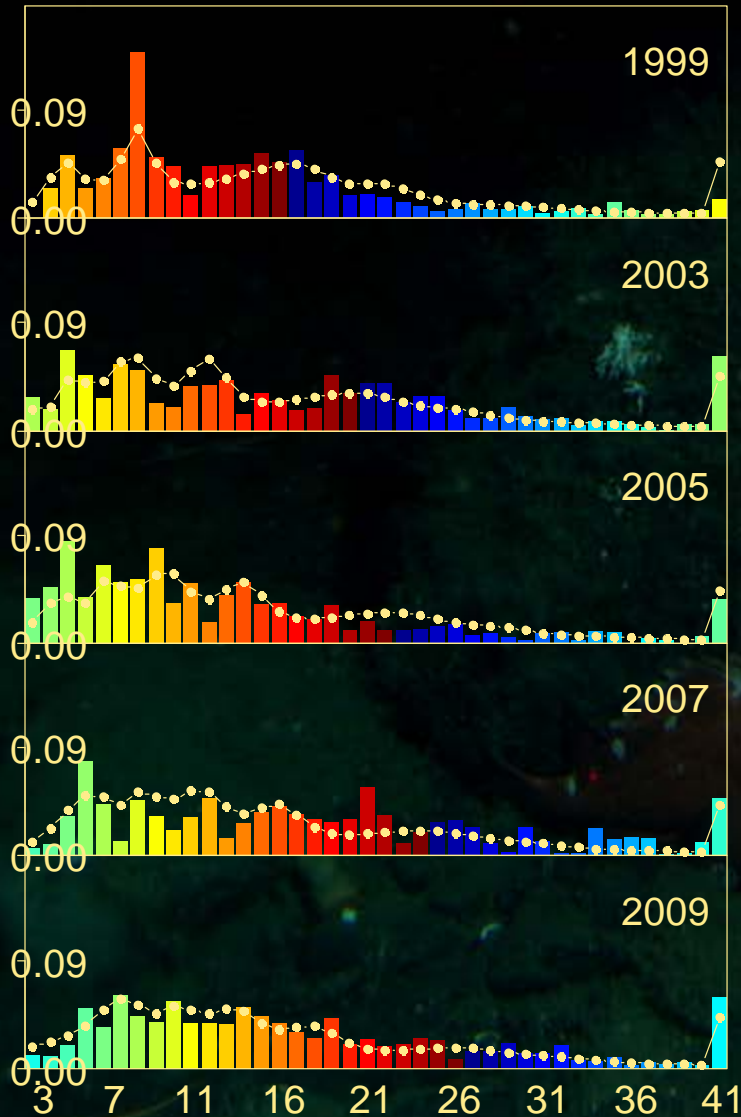
RE/BS – Results

- No changes in assessment methods
 - Same as 2015 (15.4): plus age group to 42
- Parameters – similar to 2015 model
 - Slightly lower survey catchabilities
 - Slightly higher mean recruitment (1.9 vs 1.8 mil)
- Model fit – similar to 2015 model
 - Good fit to survey ages, moderate fit fishery ages
 - Flattening of peaks in size comps

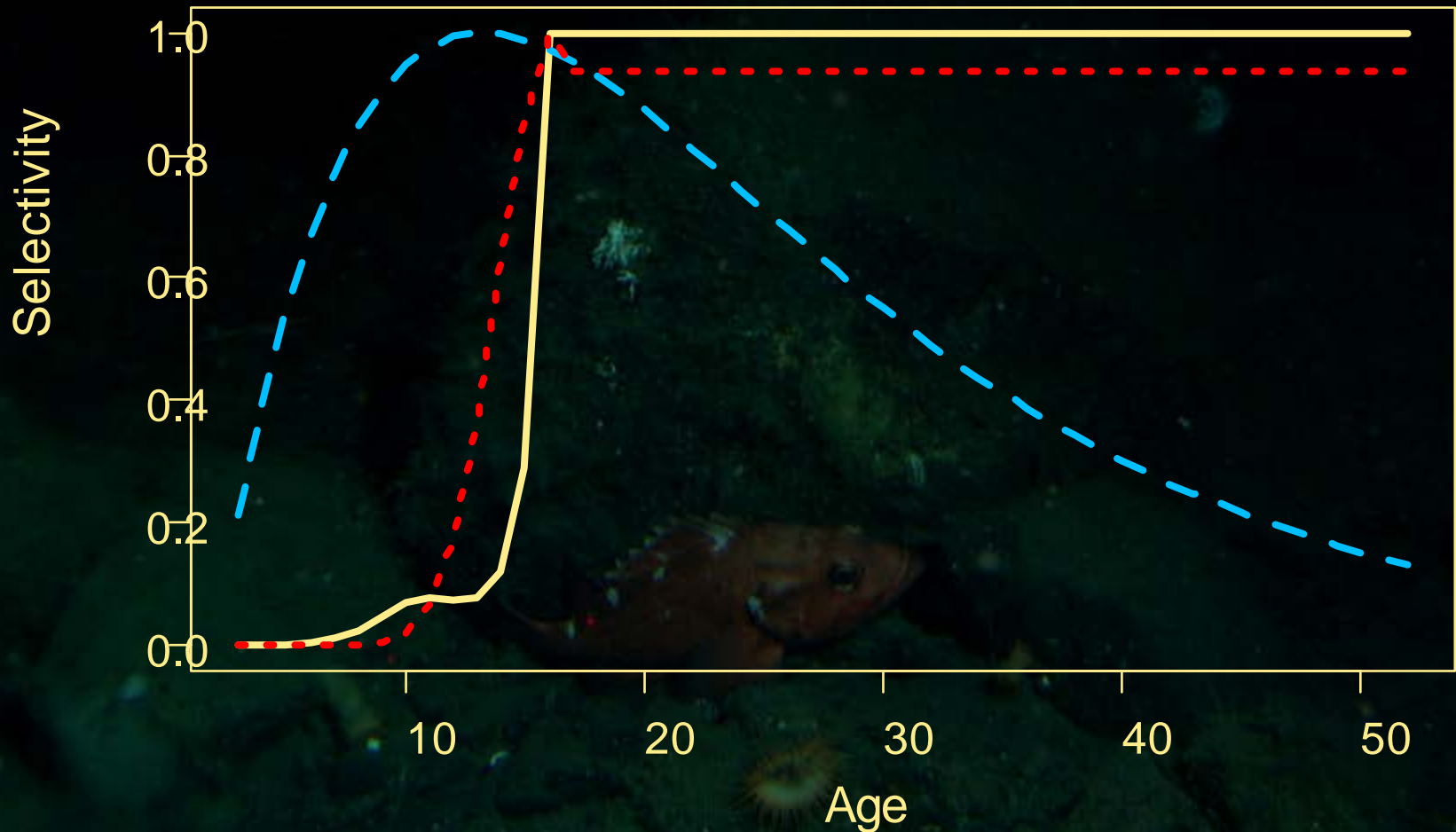
RE/BS Fishery Age



RE/BS Trawl Survey Age

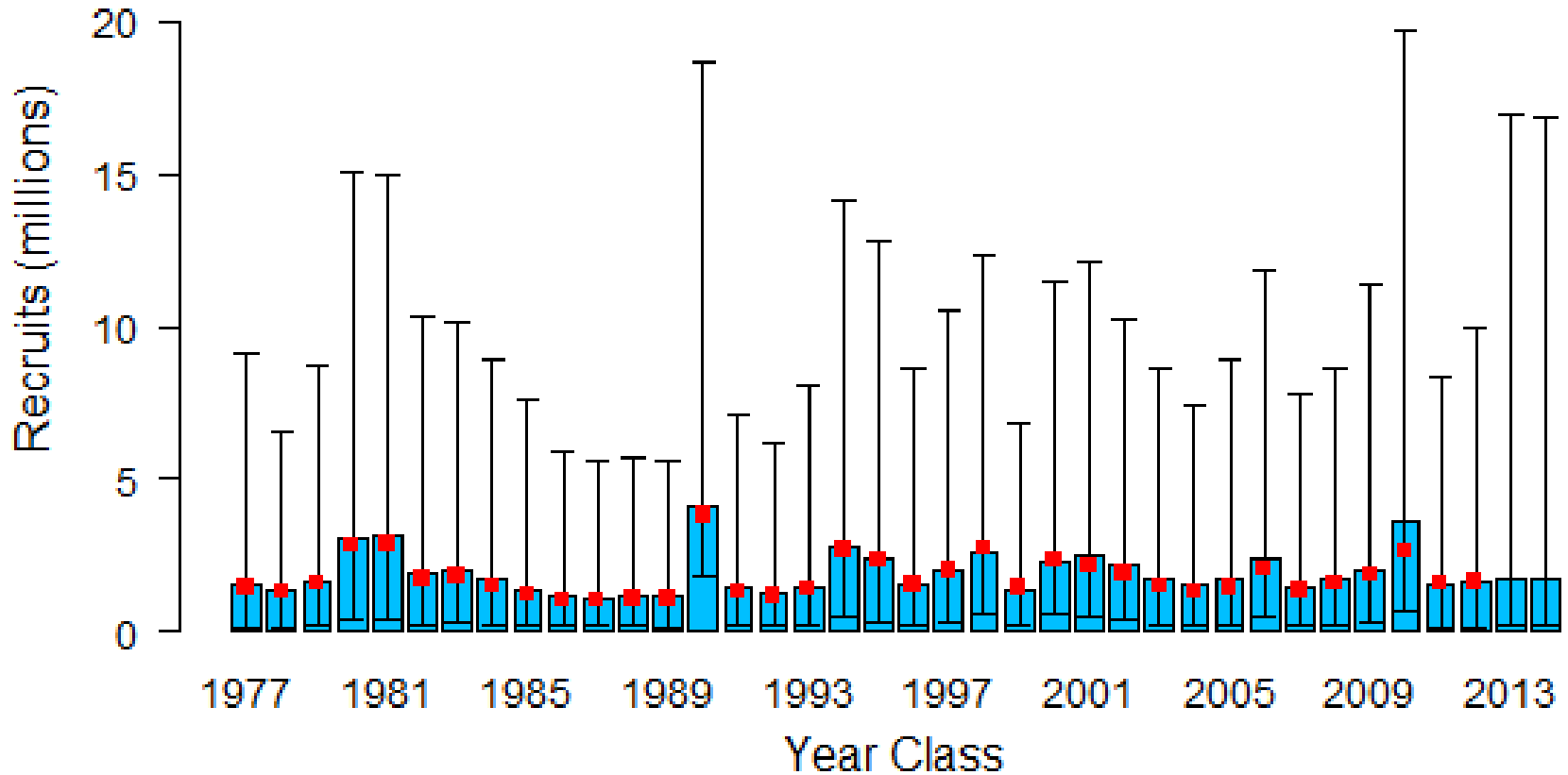


RE/BS Selectivity



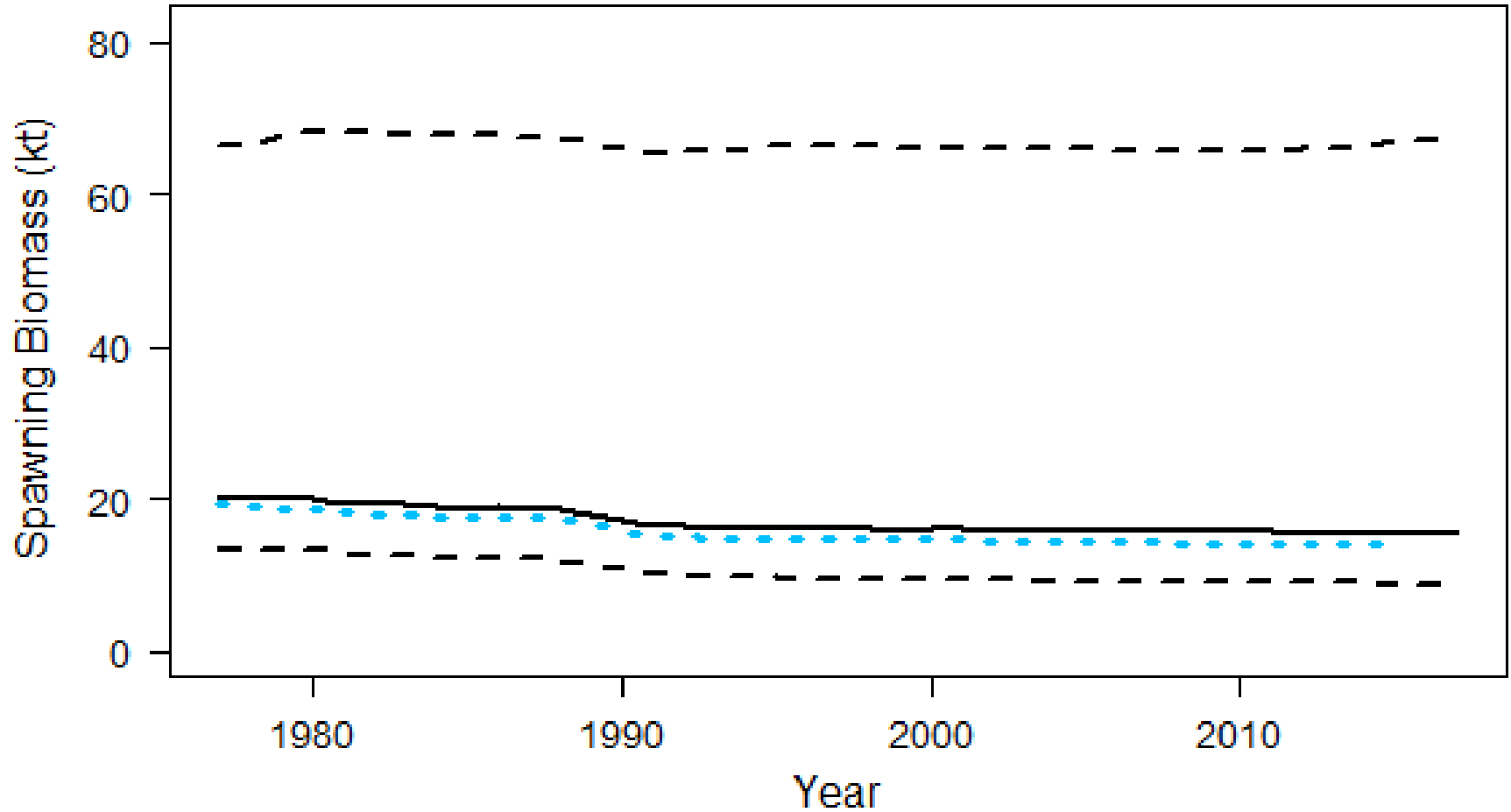
Blue line = Trawl Survey, Red line = Longline Survey, Yellow line = Fishery

RE/BS Recruitment



Red square = 2015, Blue bar = 2017

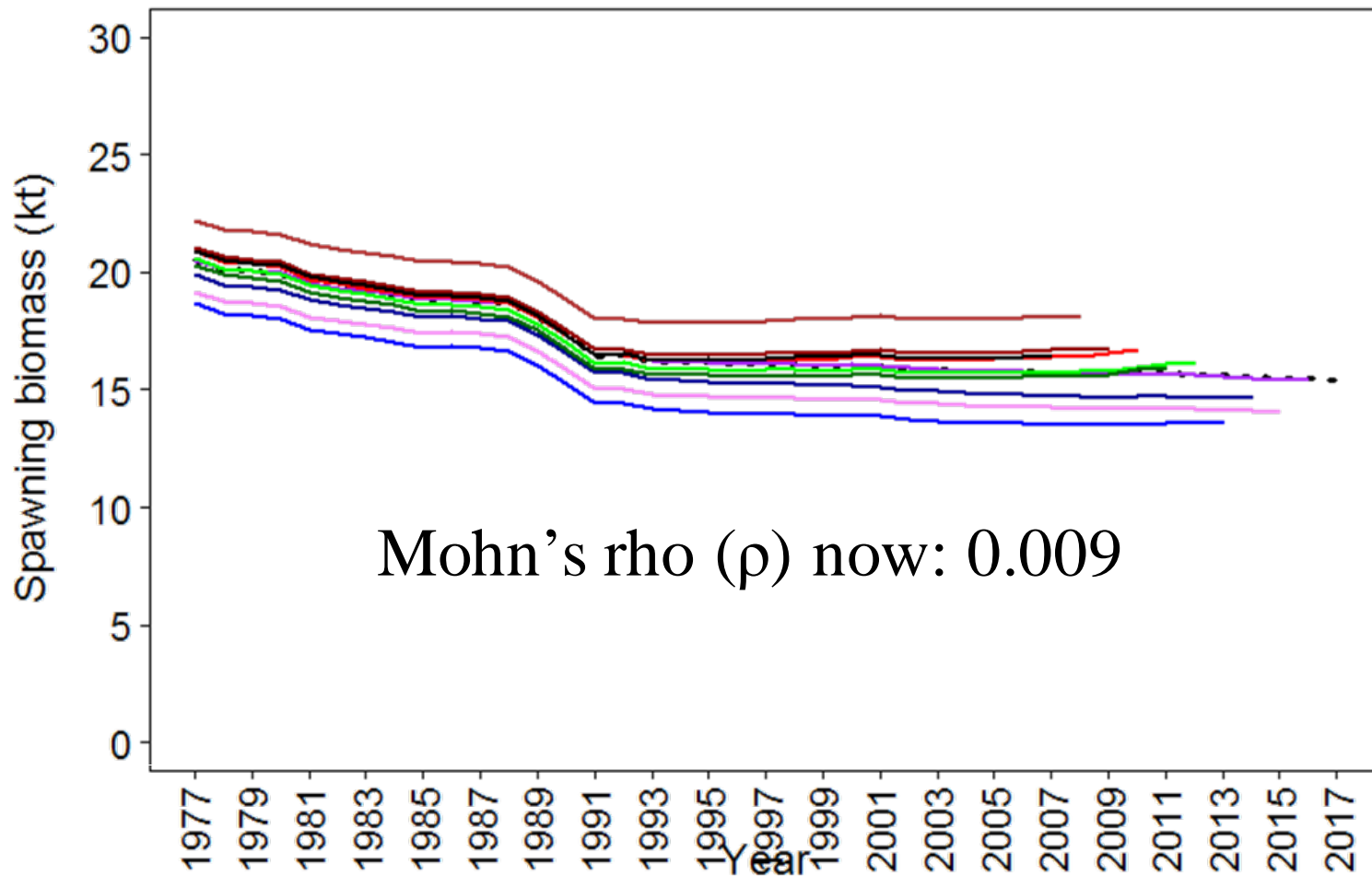
RE/BS Spawning Biomass



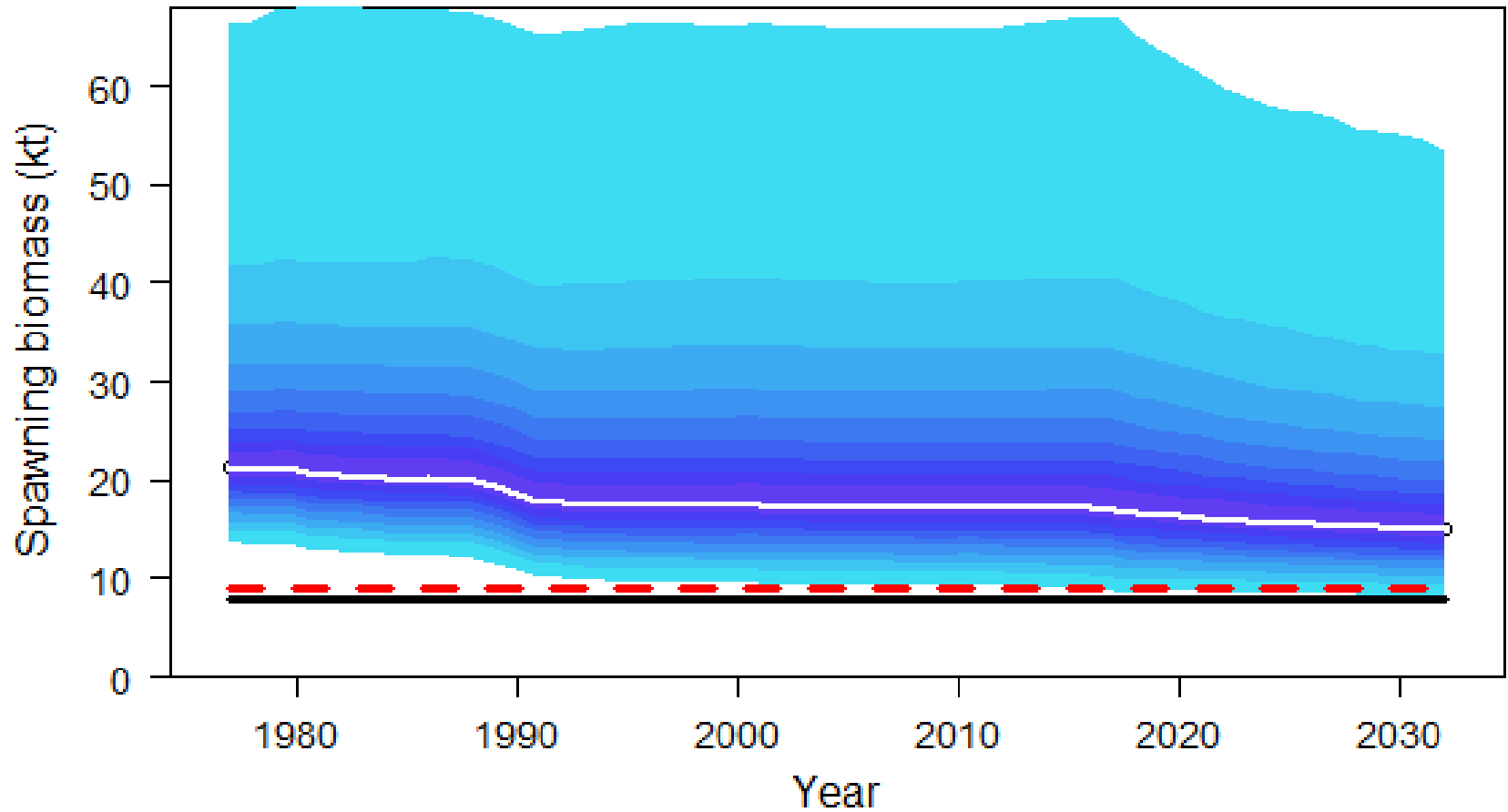
Blue dotted line = 2015, Black solid line = 2017

RE/BS Retrospective

| Statistic | 2015 (M15.4) | 2015 (M15.4) Updated | 2017 (M15.4) |
|-----------------------|--------------|----------------------|--------------|
| Mohn's revised ρ | -0.371 | 0.105 | 0.009 |



RE/BS Projection



RE/BS Recommendation

- Recommended 2018 ABC: **1,444 t**
 - 9% increase from last year's ABC of 1,327 t
- Summary
 - Both survey estimates up from previous years
 - Potential distribution changes in both surveys
 - More evidence of strong 2010 year class
 - Retrospective pattern is no more

RE/BS Apportionment

| | Western | Central | Eastern | Total |
|----------|---------|---------|---------|-------|
| 2017 ABC | 105 | 706 | 516 | 1,327 |
| 2018 ABC | 176 | 556 | 712 | 1,444 |
| 2018 OFL | | | | 1,735 |
| 2018 RE | 124 | 554 | 766 | 1,444 |
| 2019 ABC | 174 | 550 | 703 | 1,427 |
| 2019 OFL | | | | 1,715 |

Weighted Average

WGOA 12.2%

CGOA 38.5%

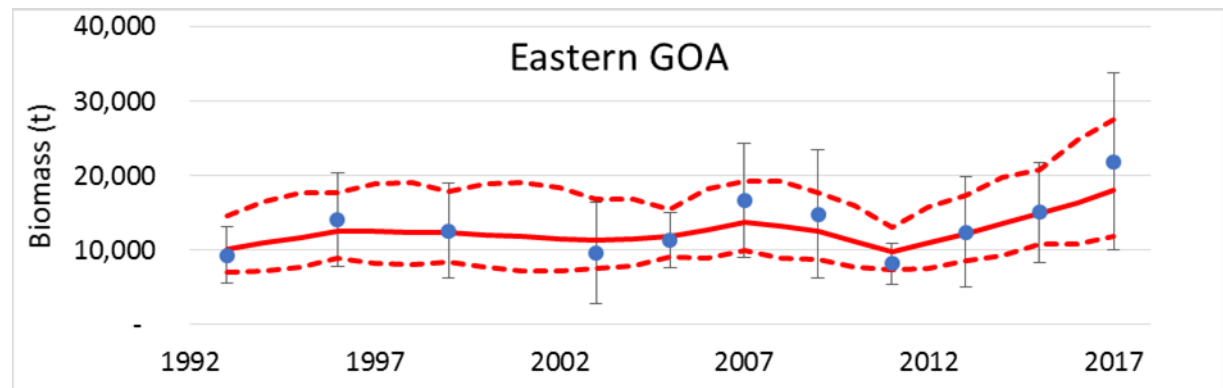
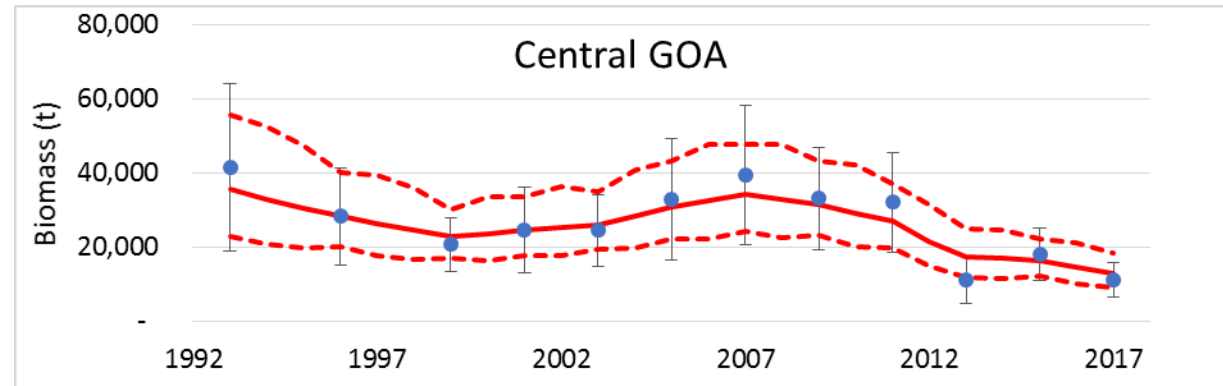
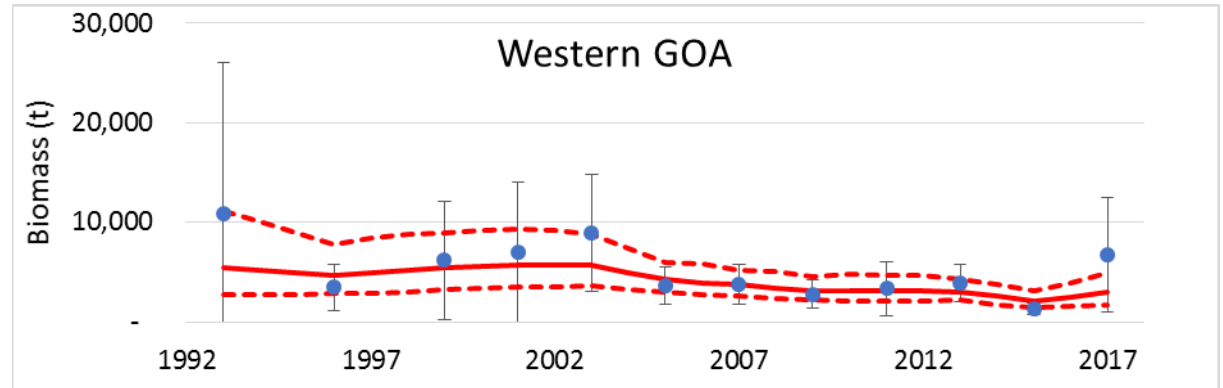
EGOA 49.3%

RE Model

WGOA 8.6%

CGOA 38.4%

EGOA 53.0%



Research Priorities

- Assess RE/BS rockfish density between untrawlable and trawlable grounds
- Examine potential age, growth, maturity differences between RE & BS rockfish
- Incorporate ESP when available