Alaska Sablefish

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Outline

- New data
- Model results
- Extra recruitment analysis
- ESP (Ecosystems and Socioeconomics)
- Additional ABC/ACL Considerations
- Future

SSC and PT Comments

SSC

- ✓ Model naming
- ✓ Ecosystem status
- ✗ Natural mortality prior
- ✓ Whale adjusted OFL
- ✗ Re-examine growth

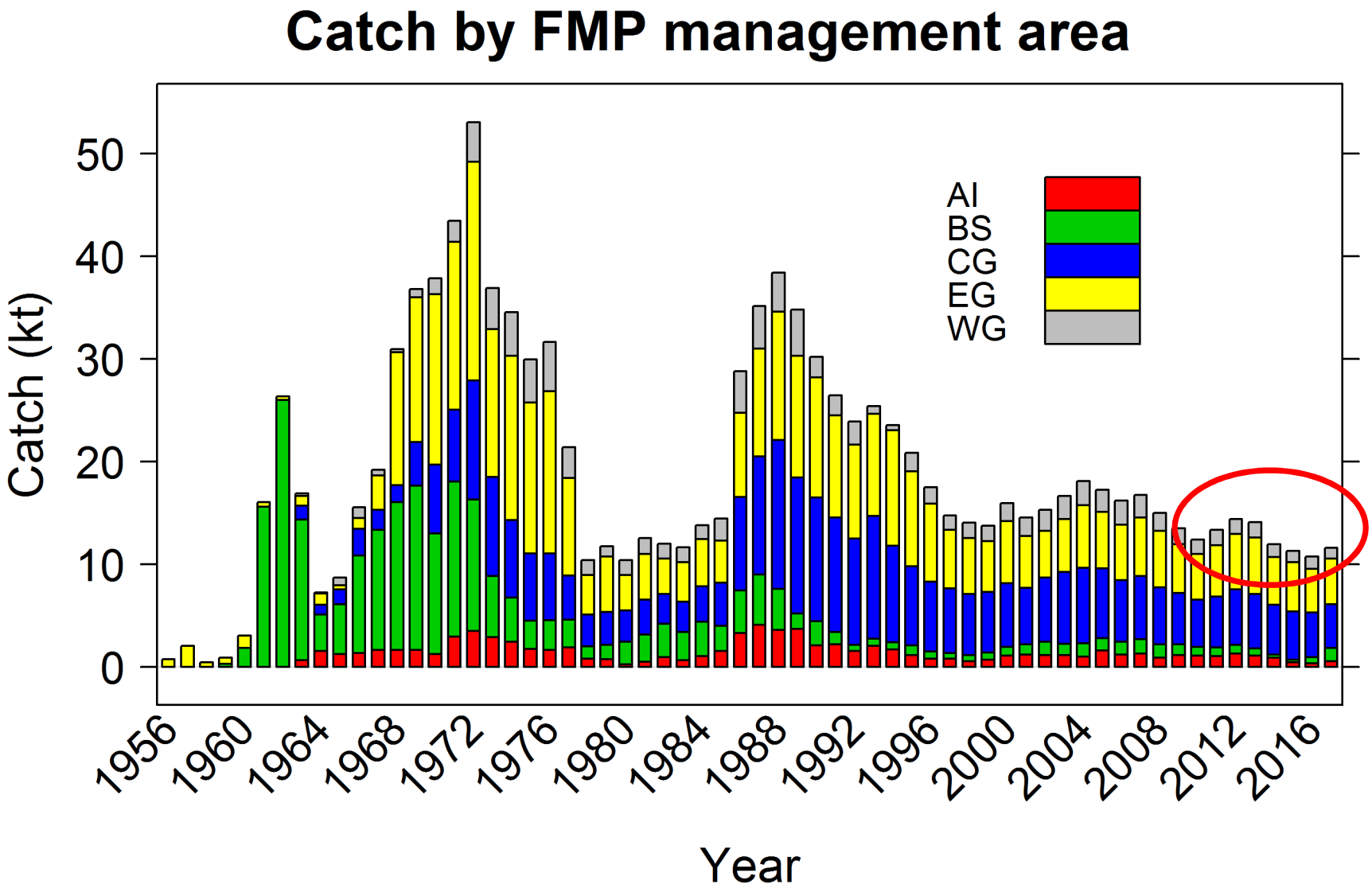
Plan Teams

- ✗ Survey Residuals
- ✗ Shared process error

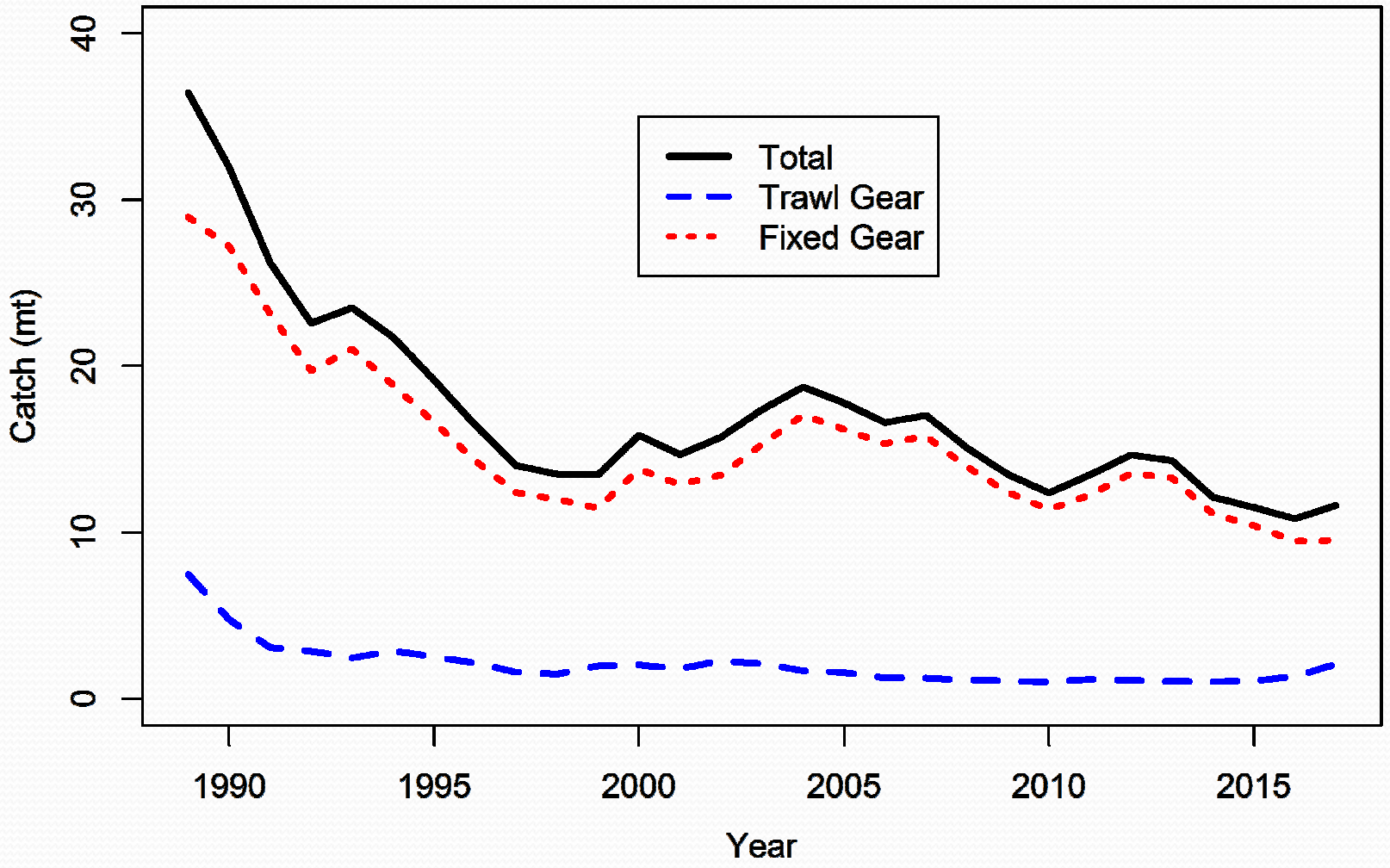
New data

- Catch: updated catch for 2016, new 2017-2019 ests
- Relative abundance: 2017 Longline survey, 2016 Longline fishery, 2017 GOA trawl survey
- Ages: 2017 Longline survey, 2017 fixed gear fishery
- Lengths: 2017 Longline survey, 2016 fixed gear fishery, 2017 GOA trawl survey, and 2016 trawl fishery
- ALSO: New ESP (Ecosystem and Socioeconomic Profile)

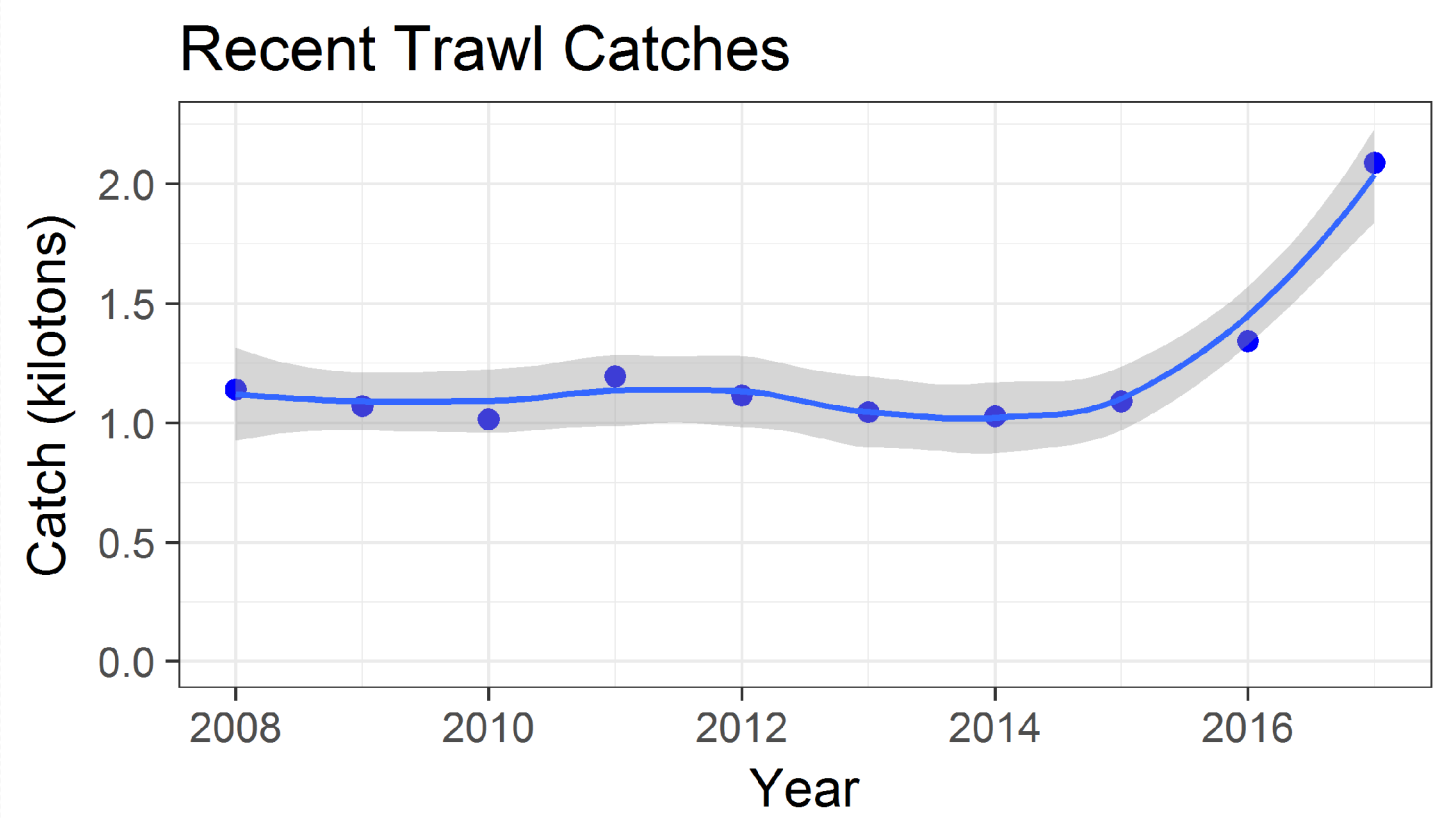
Catch


Catch by FMP management area
Catch (kt)
0
10
20
30
40
50
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012
2016
Year
AI
BS
CG
EG
WG

Increased trawl catch

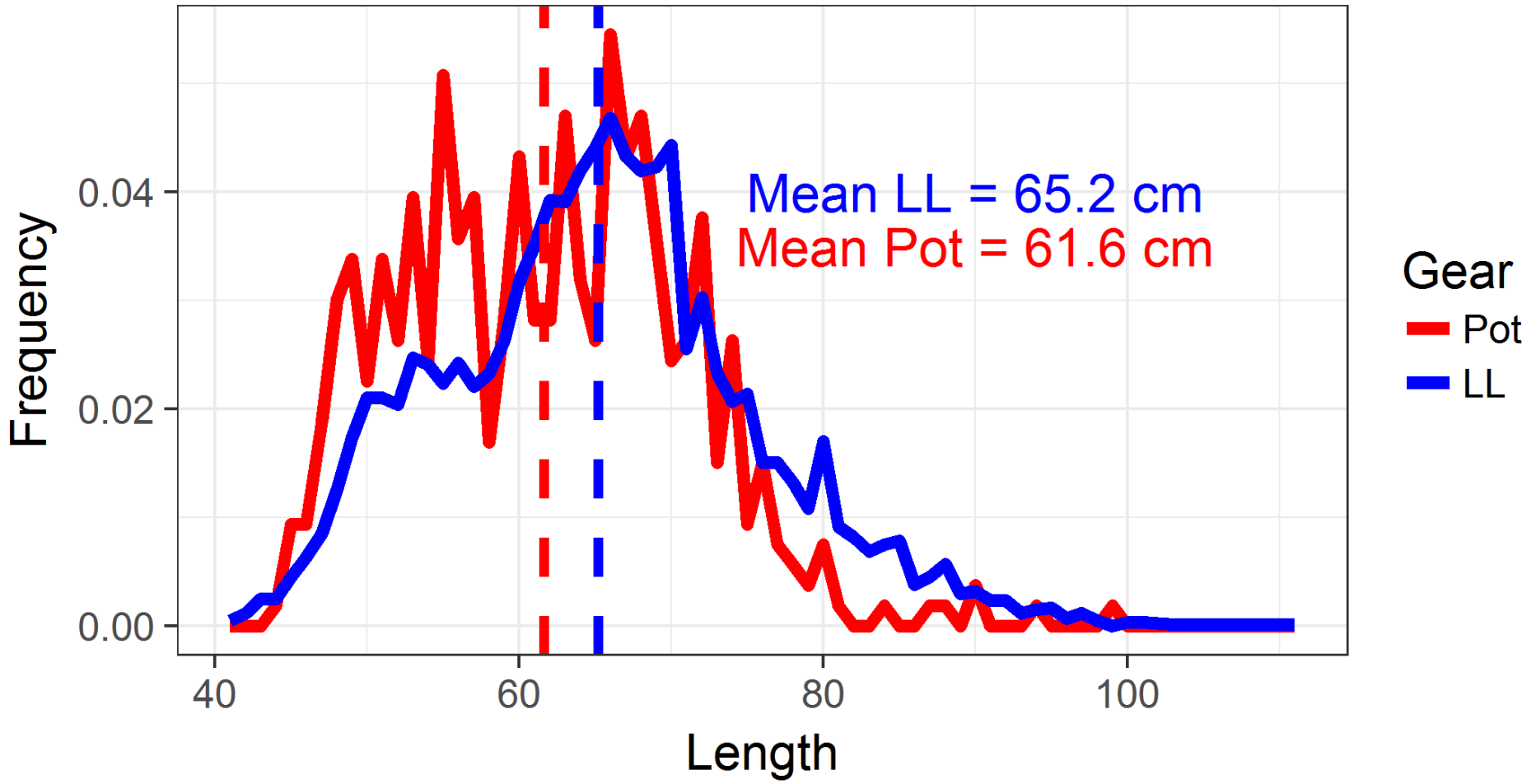


Increased trawl catch



Big increase in the Eastern Bering Sea

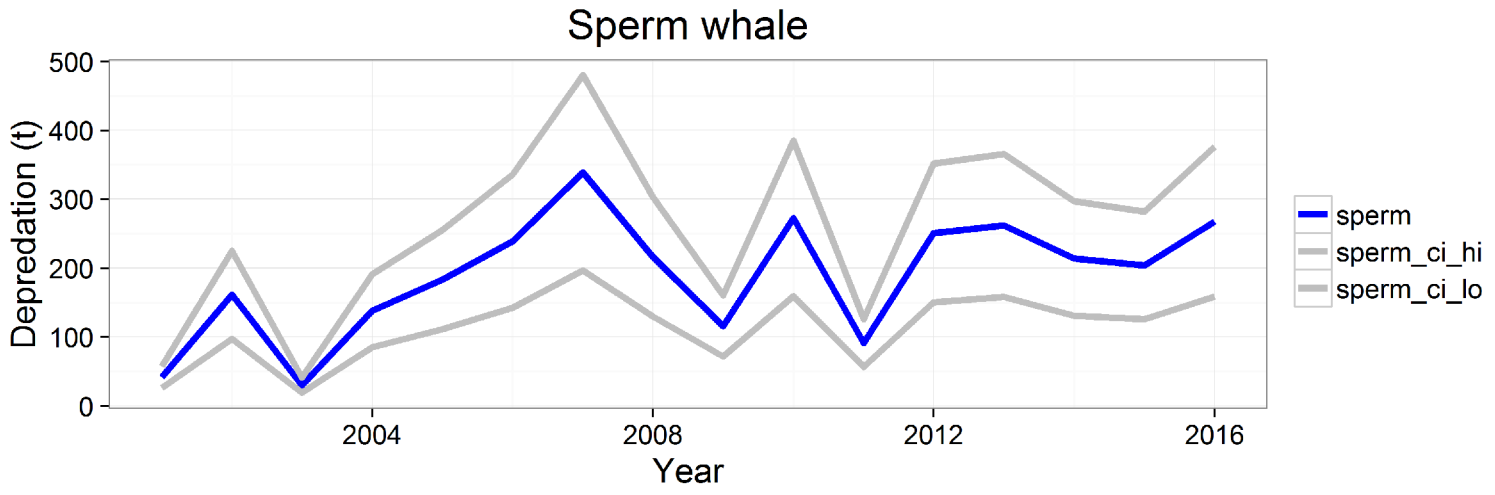
2017 Length Frequencies GOA sablefish

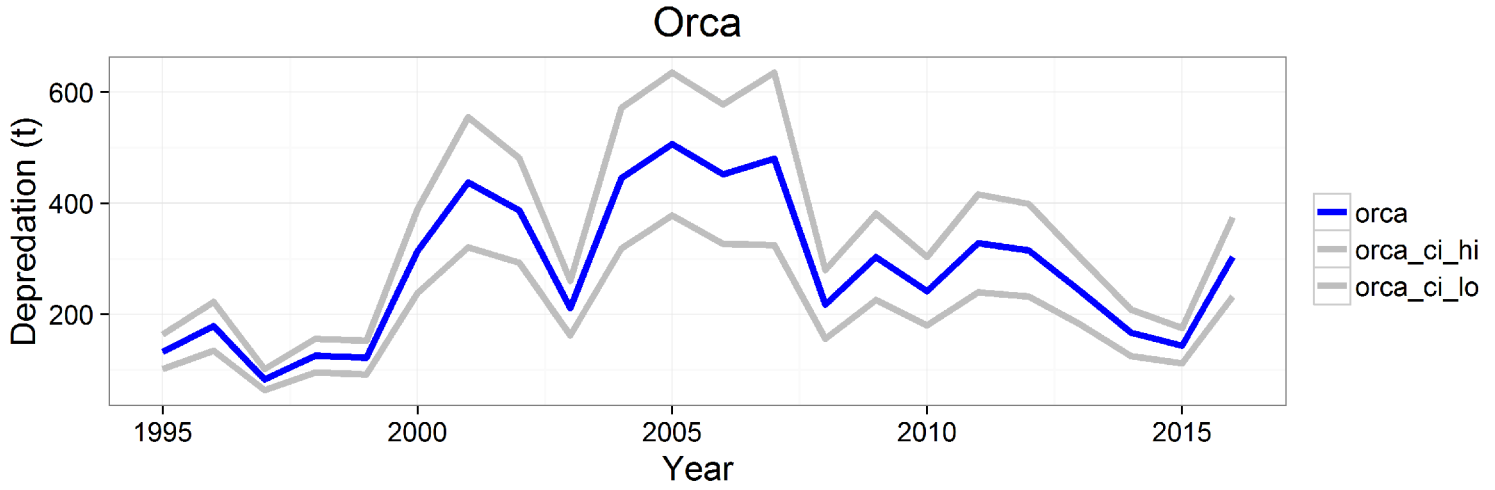


Limited data to examine at this point

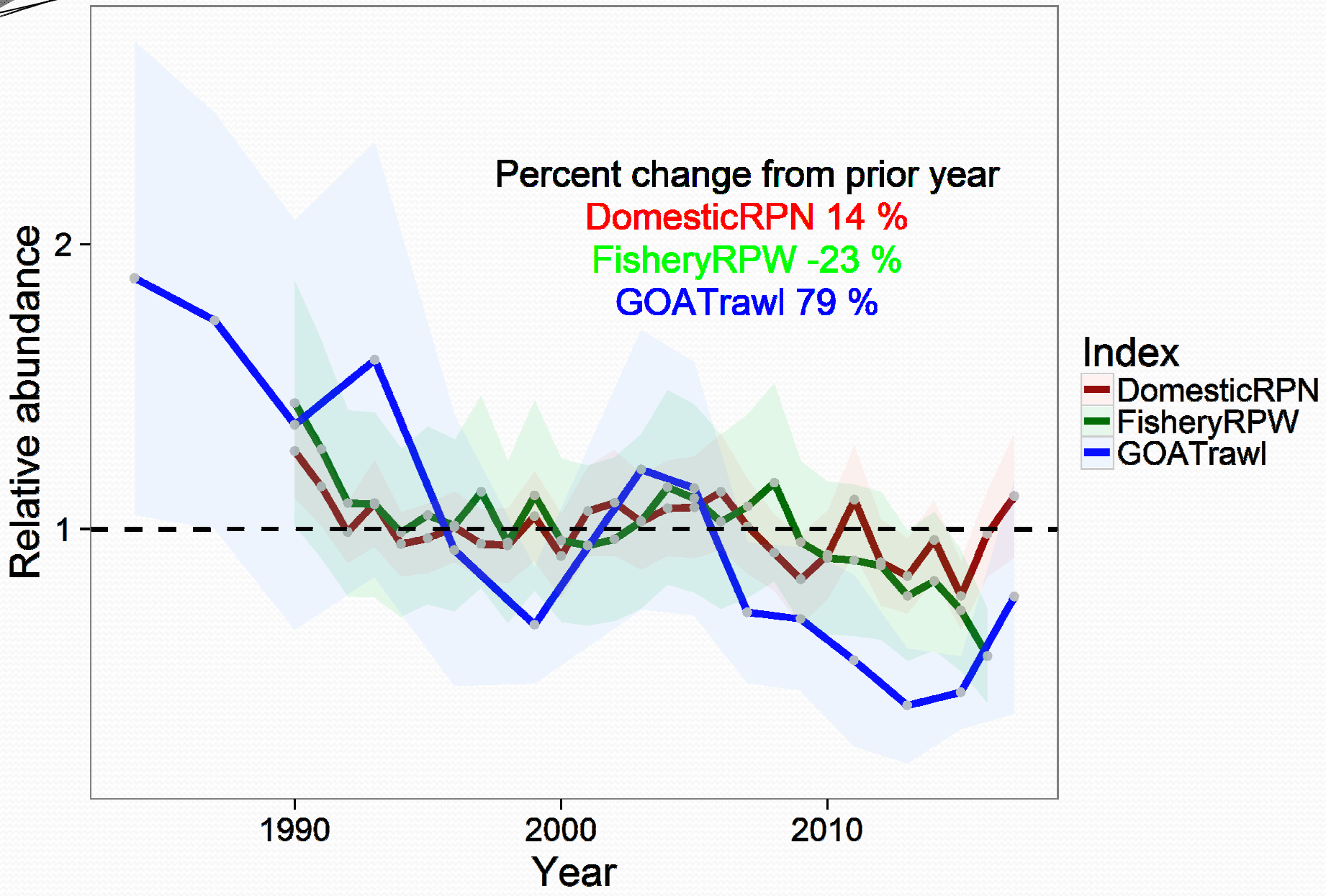
Depredation by Whales

Whale depredation in the fishery

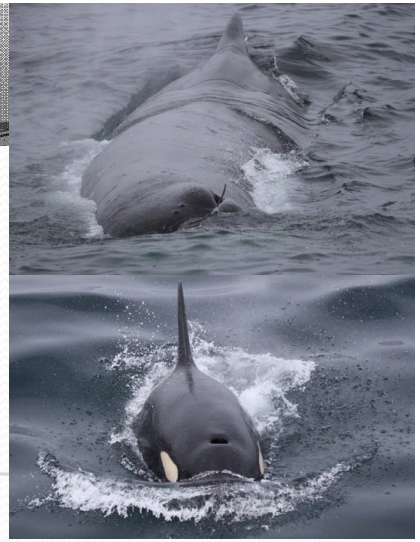


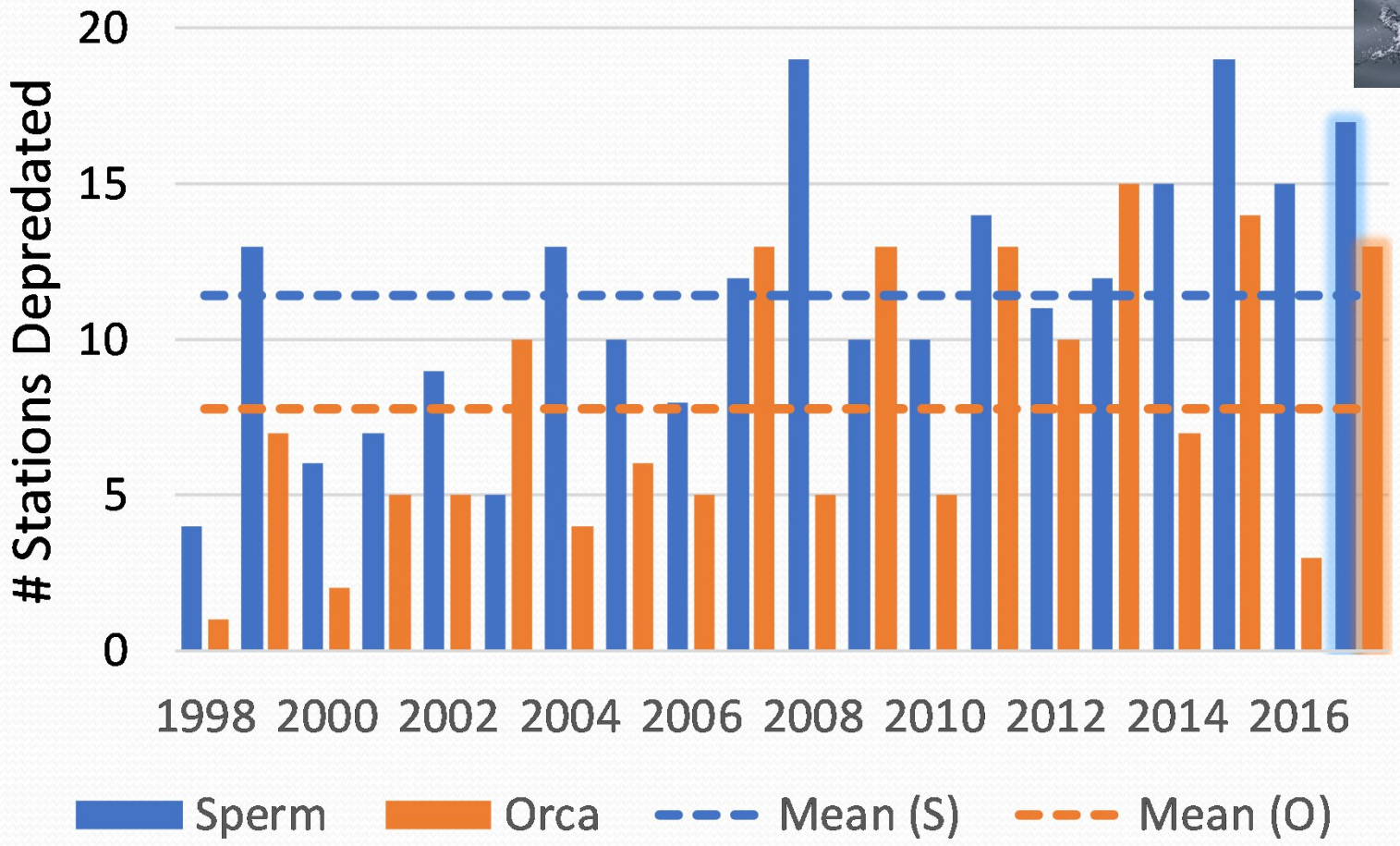


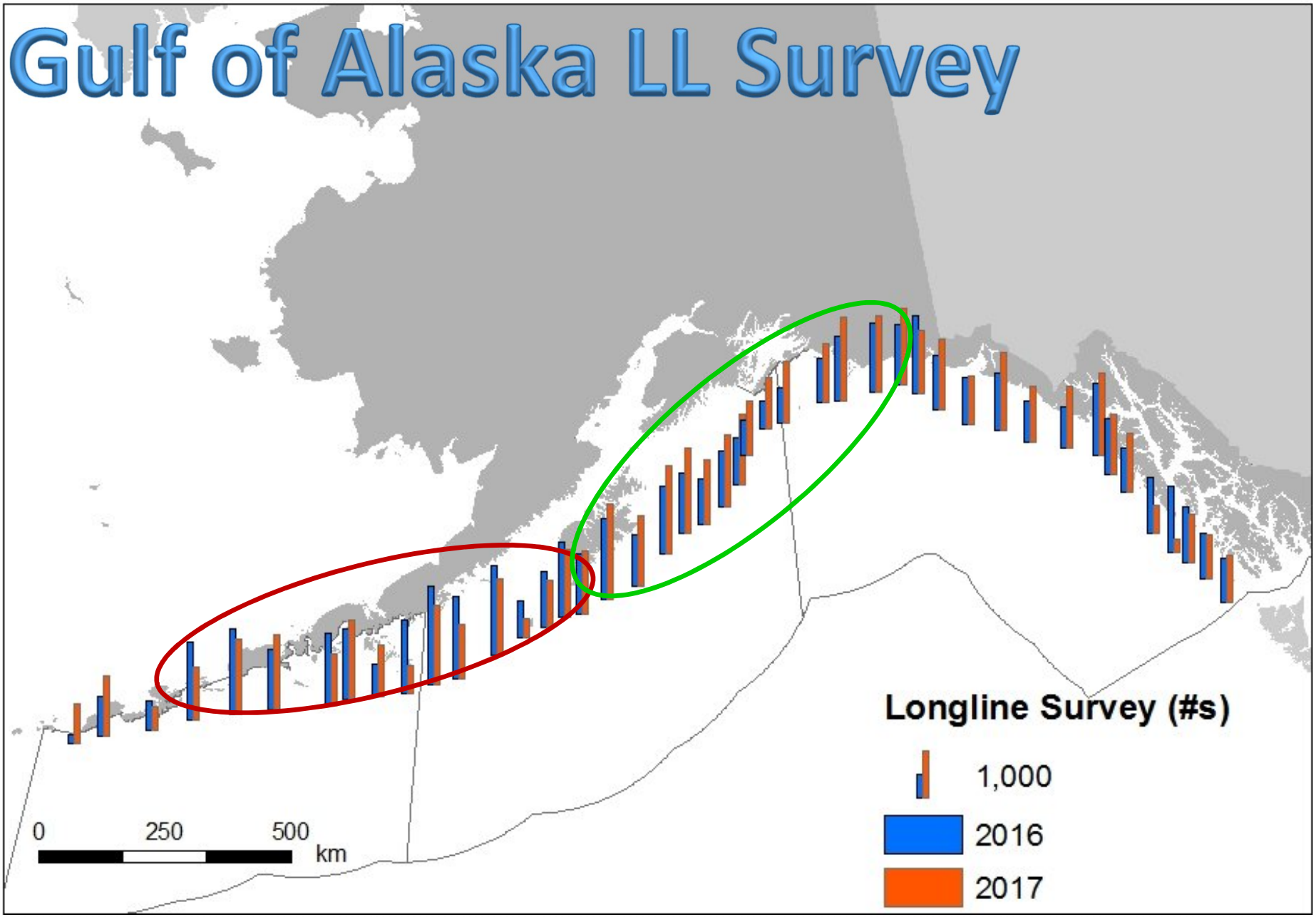
Sablefish abundance indices

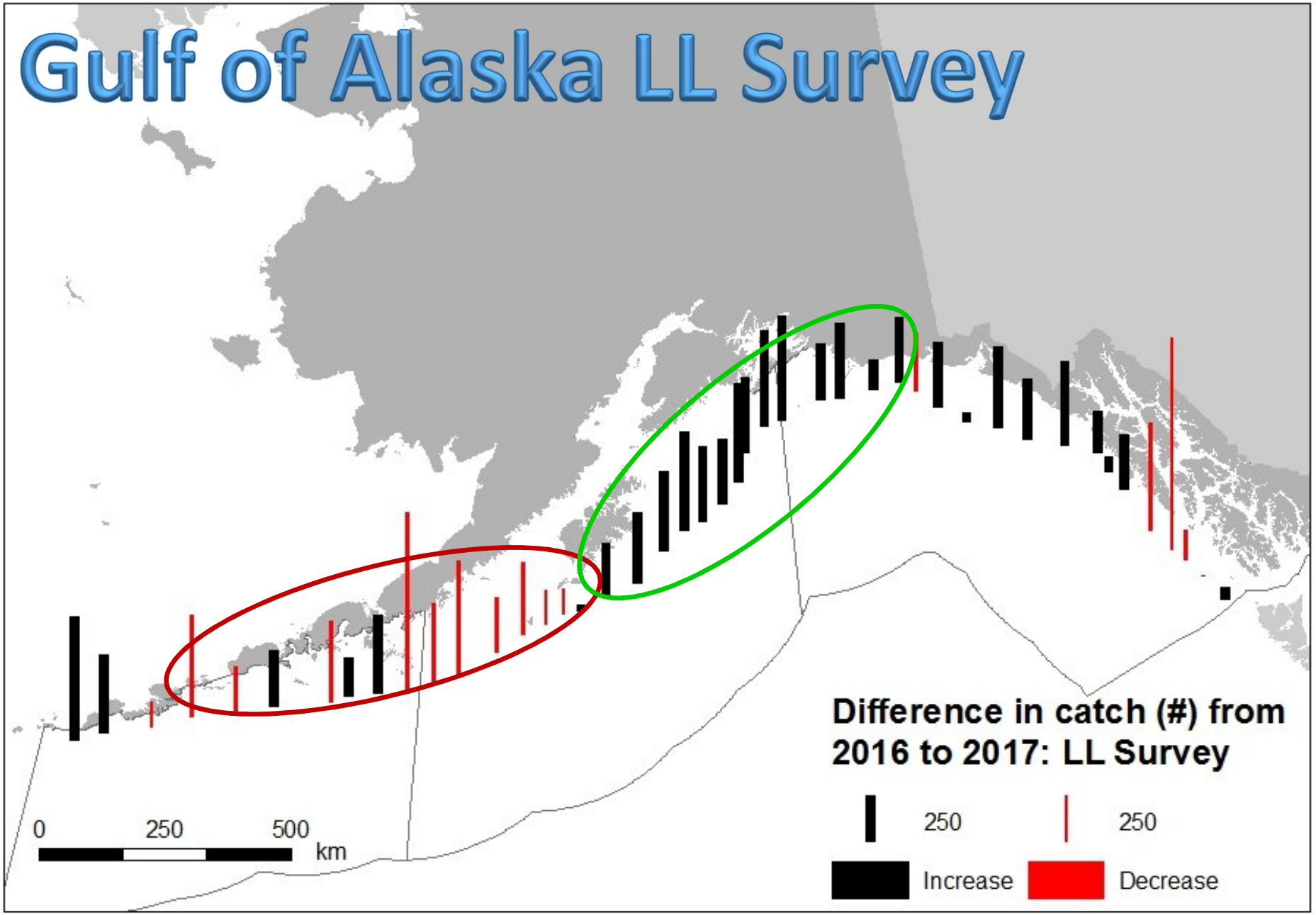


Whale depredation

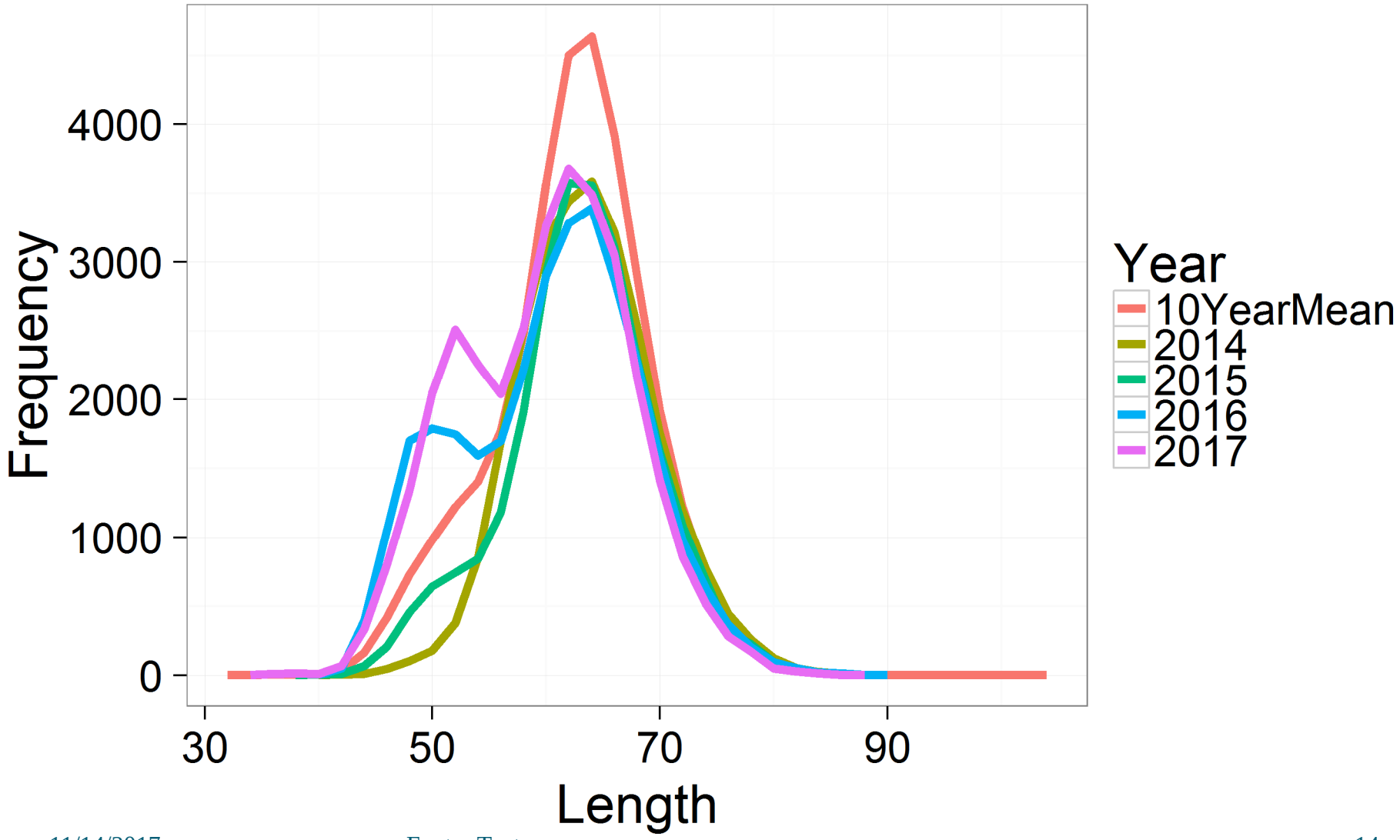




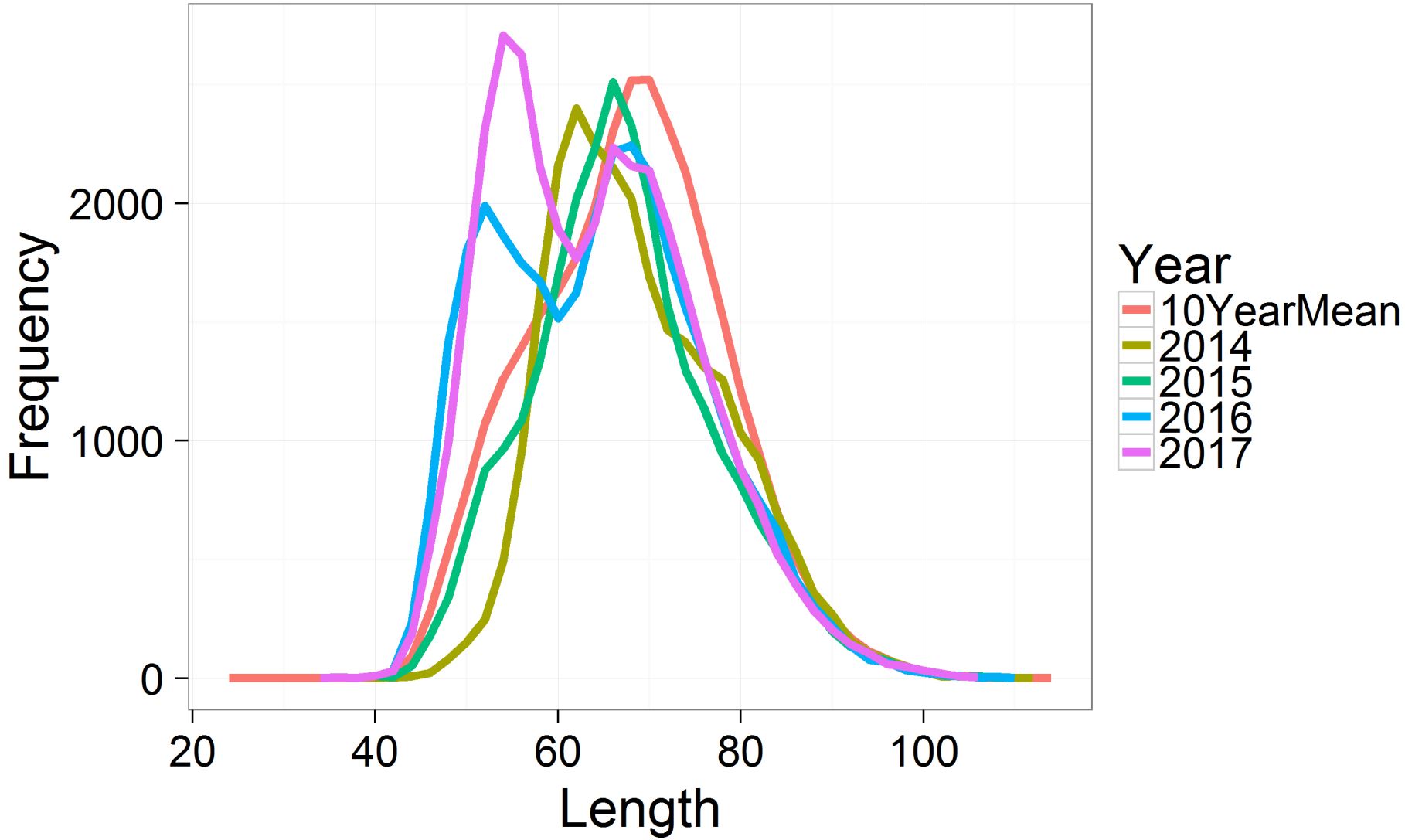

Gulf of Alaska LL Survey
Longline Survey (#s)
1,000
2016
2017
0
250
500
km

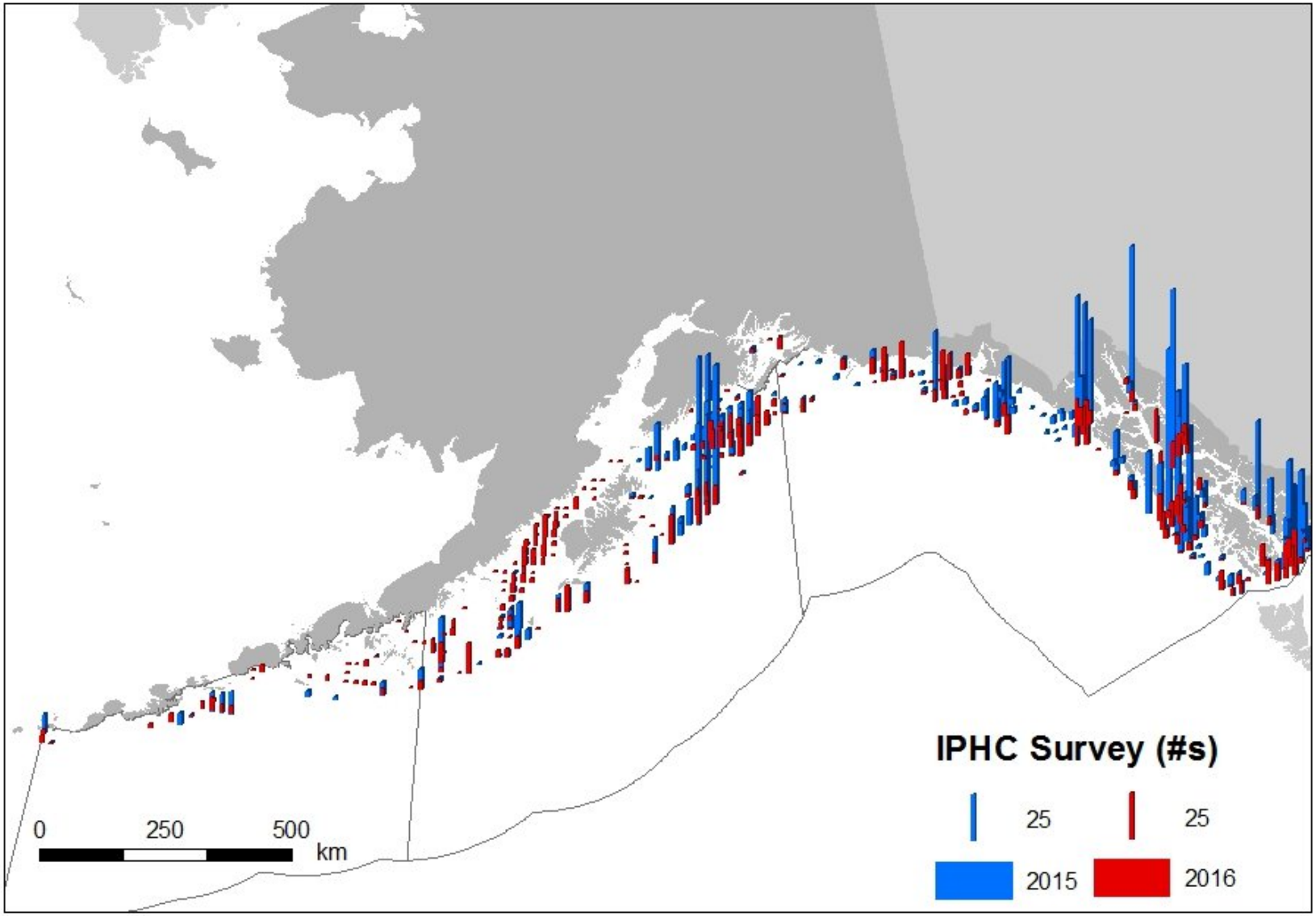

Gulf of Alaska LL Survey
Difference in catch (#) from 2016 to 2017: LL Survey
250
250
Increase
Decrease
0
250
500
km

Recent male sablefish length frequencies

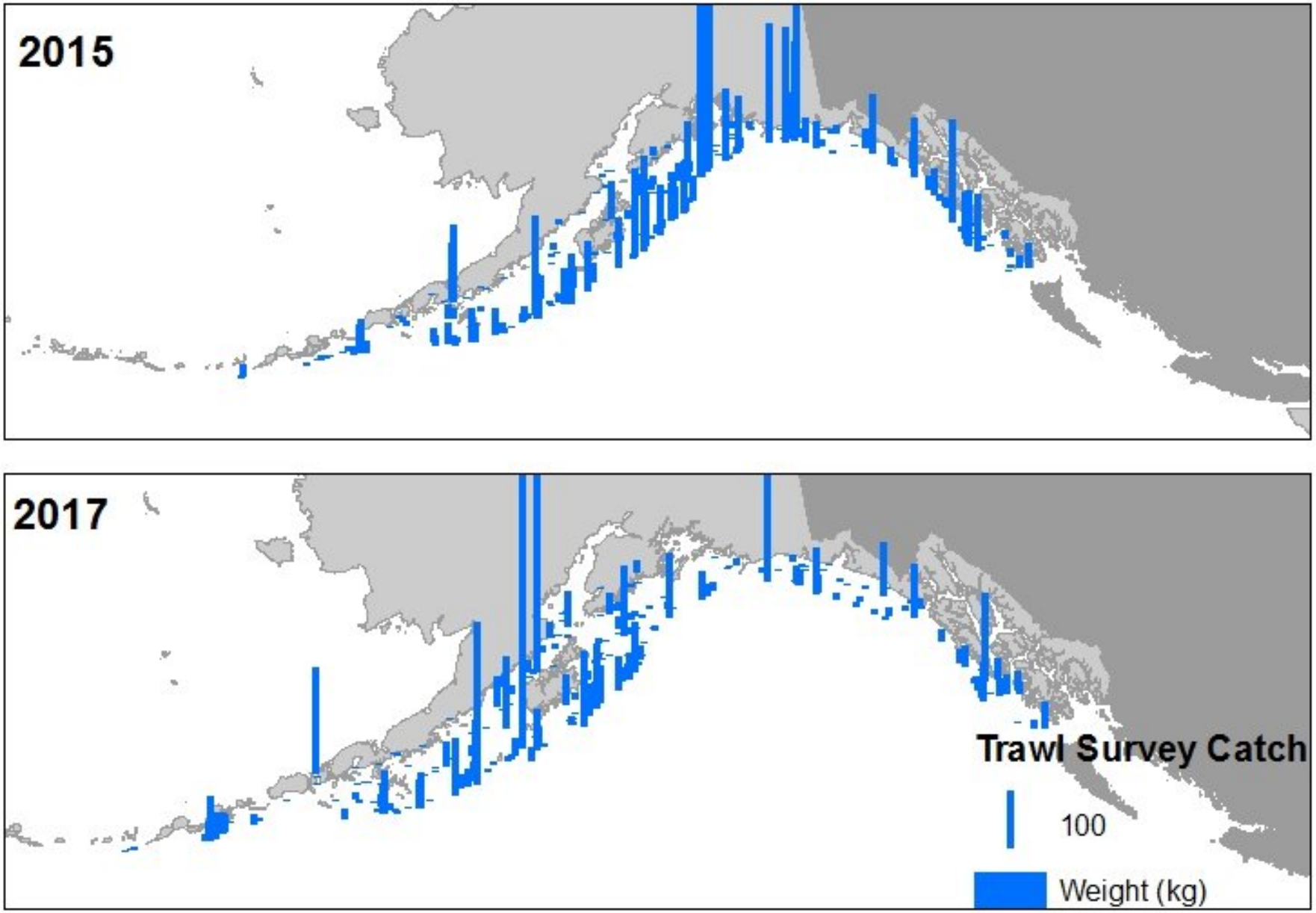


Recent female sablefish length frequencies



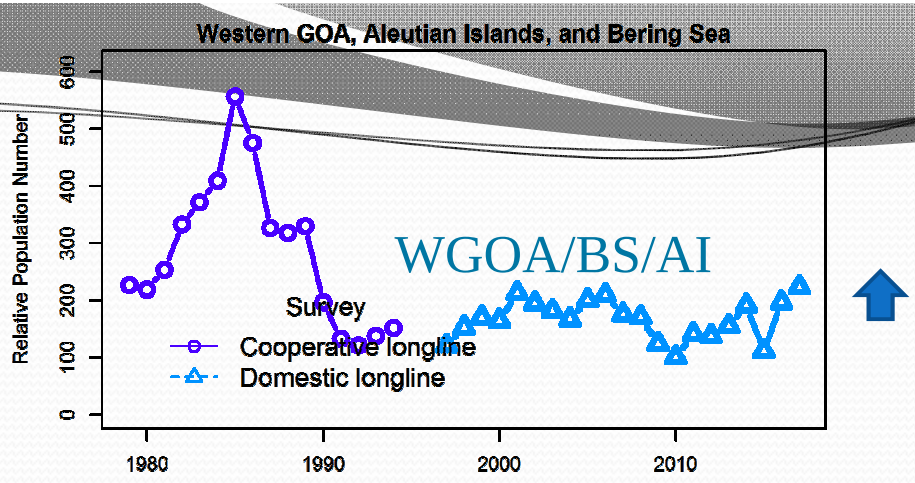


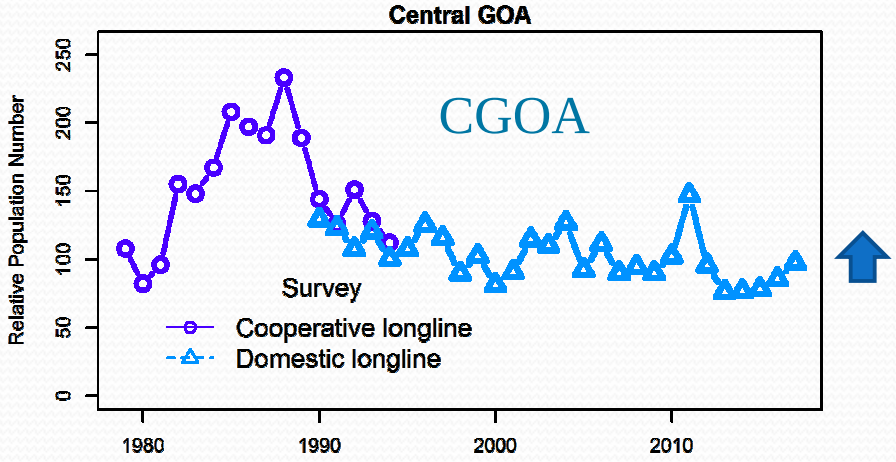
Gulf of Alaska IPHC Survey

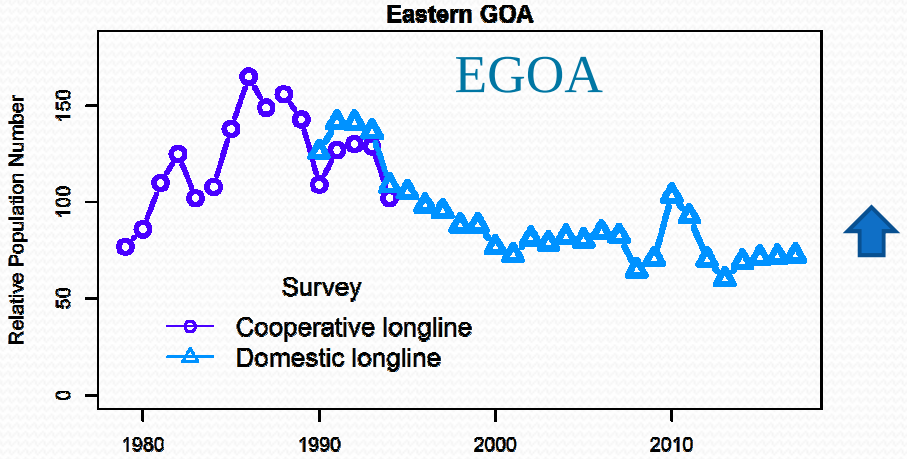


Gulf of Alaska Trawl Survey

LL Survey RPNs

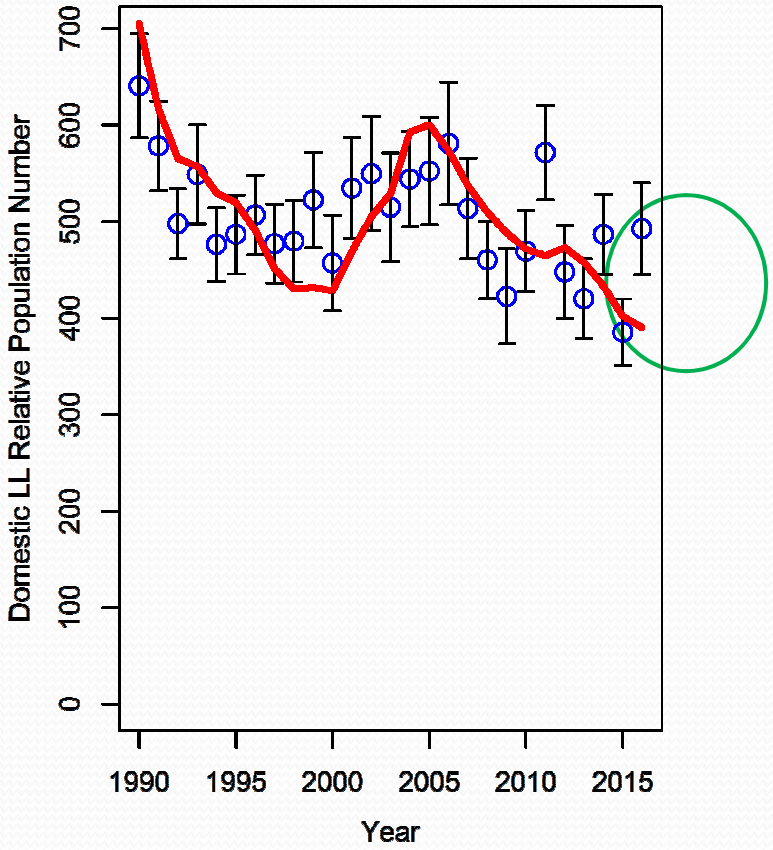




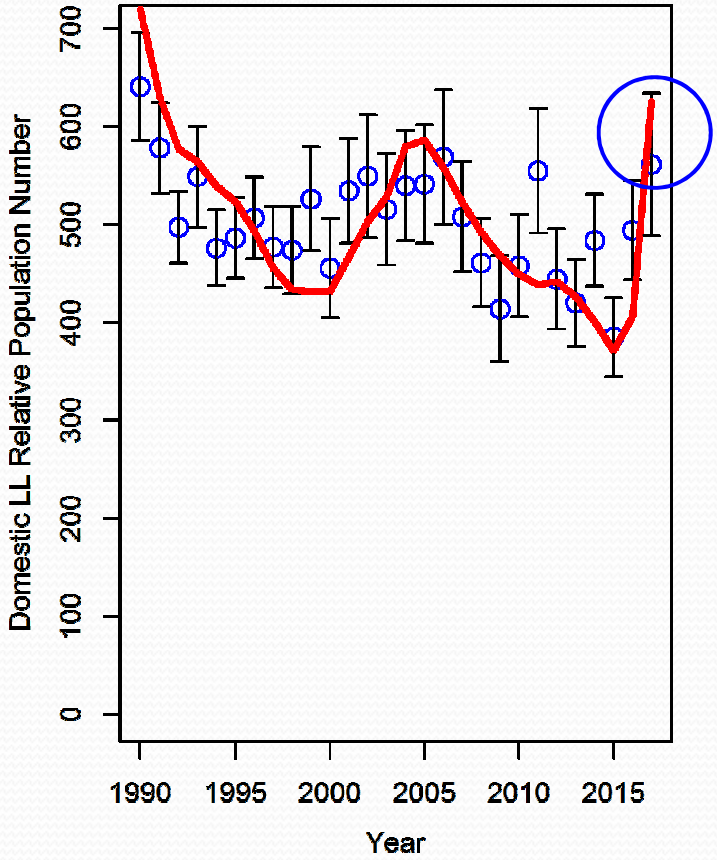


Model fit to LL Survey RPN

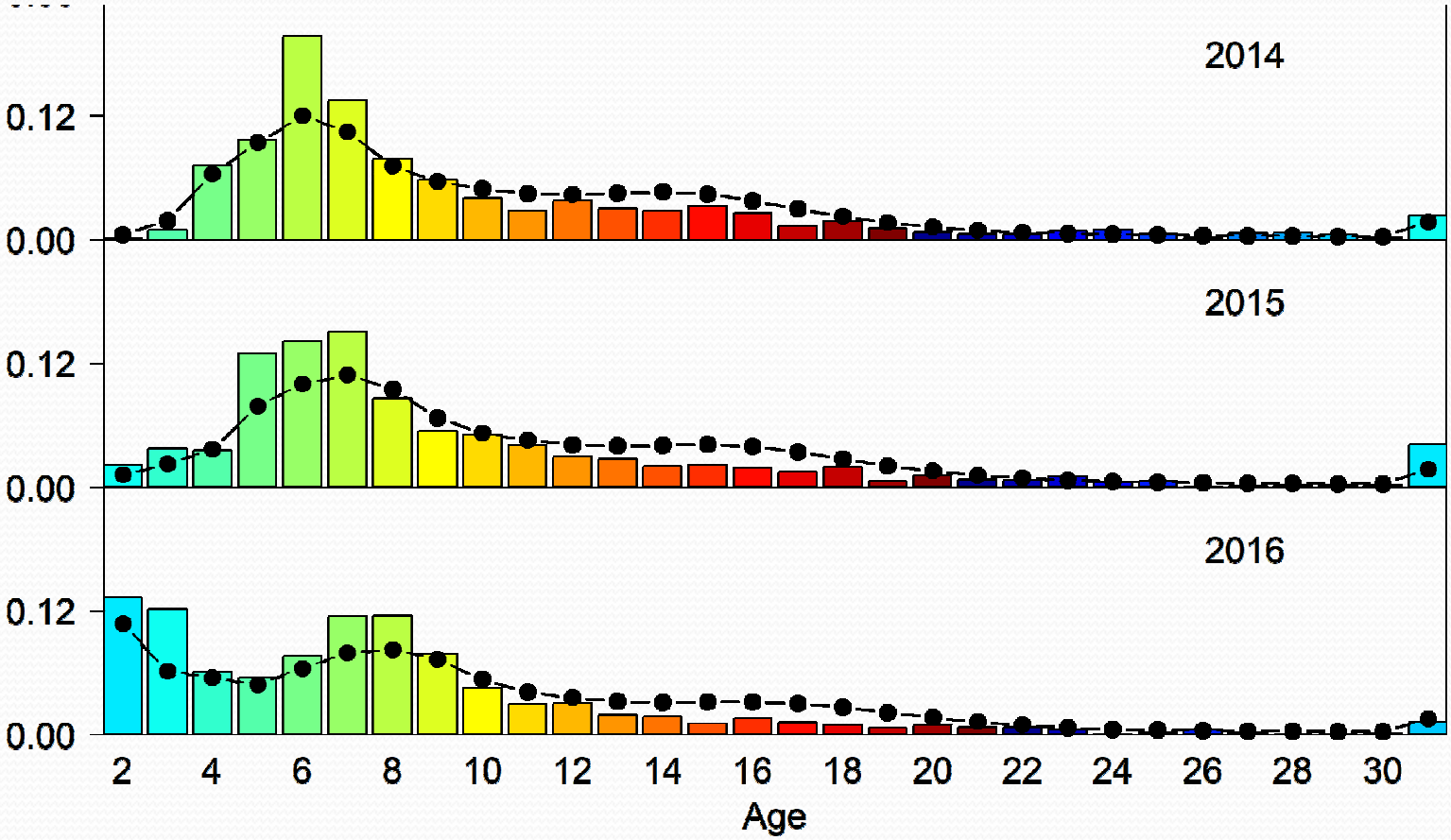
2016



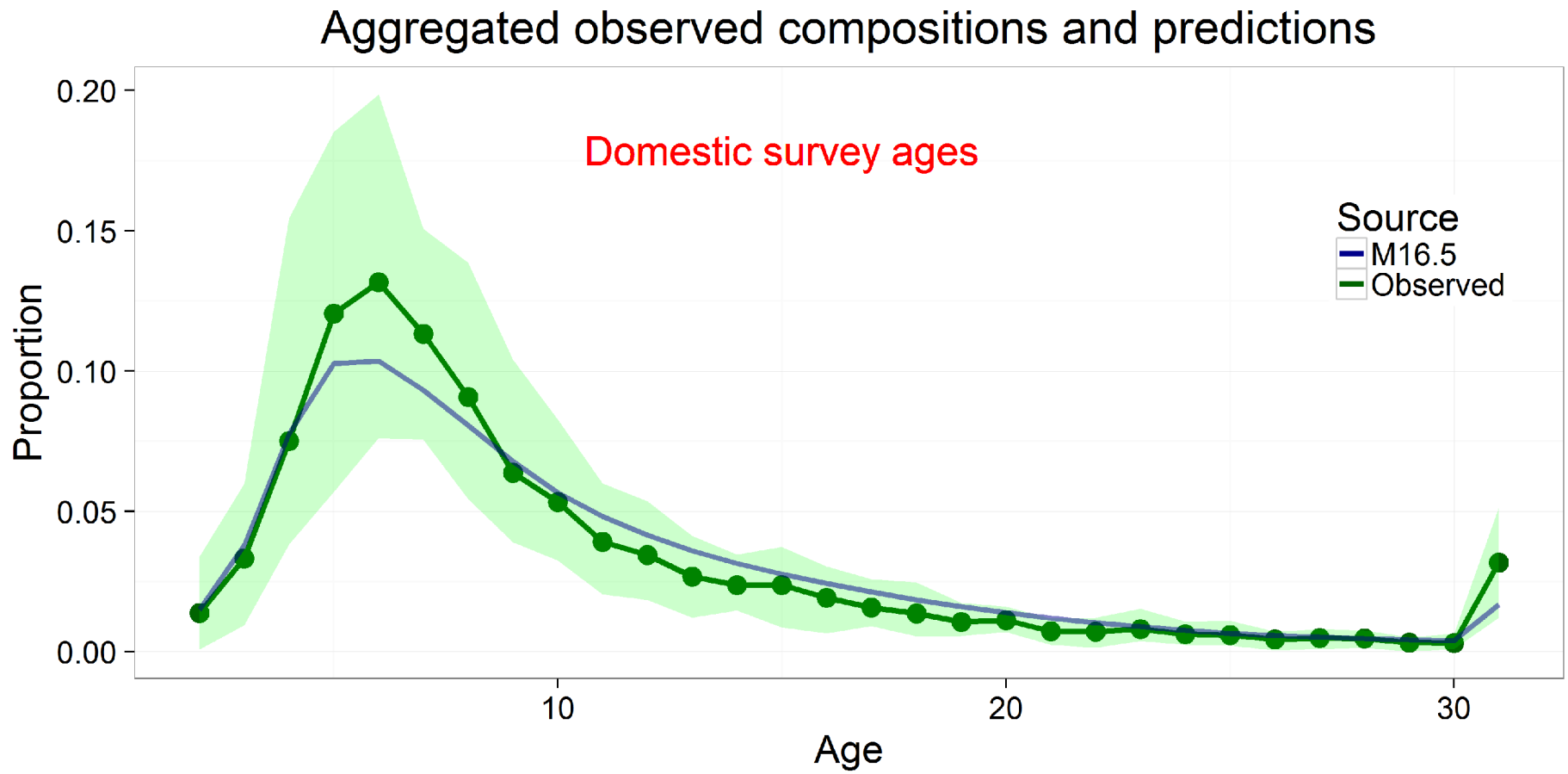
2017



Survey Ages (all areas)

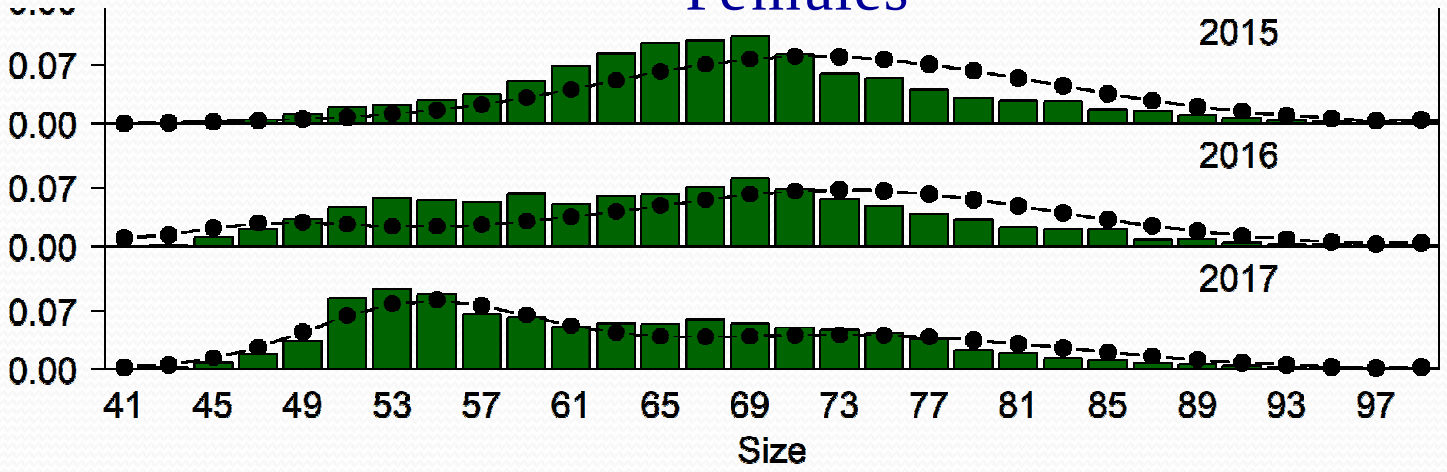


All at once, now..

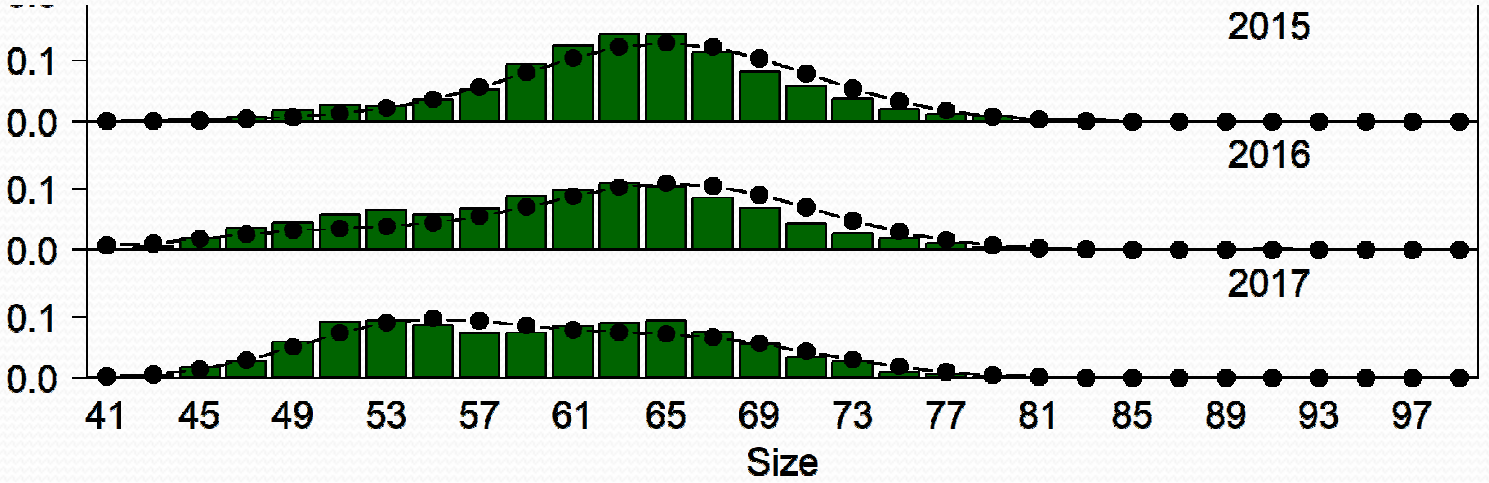


LL Survey lengths

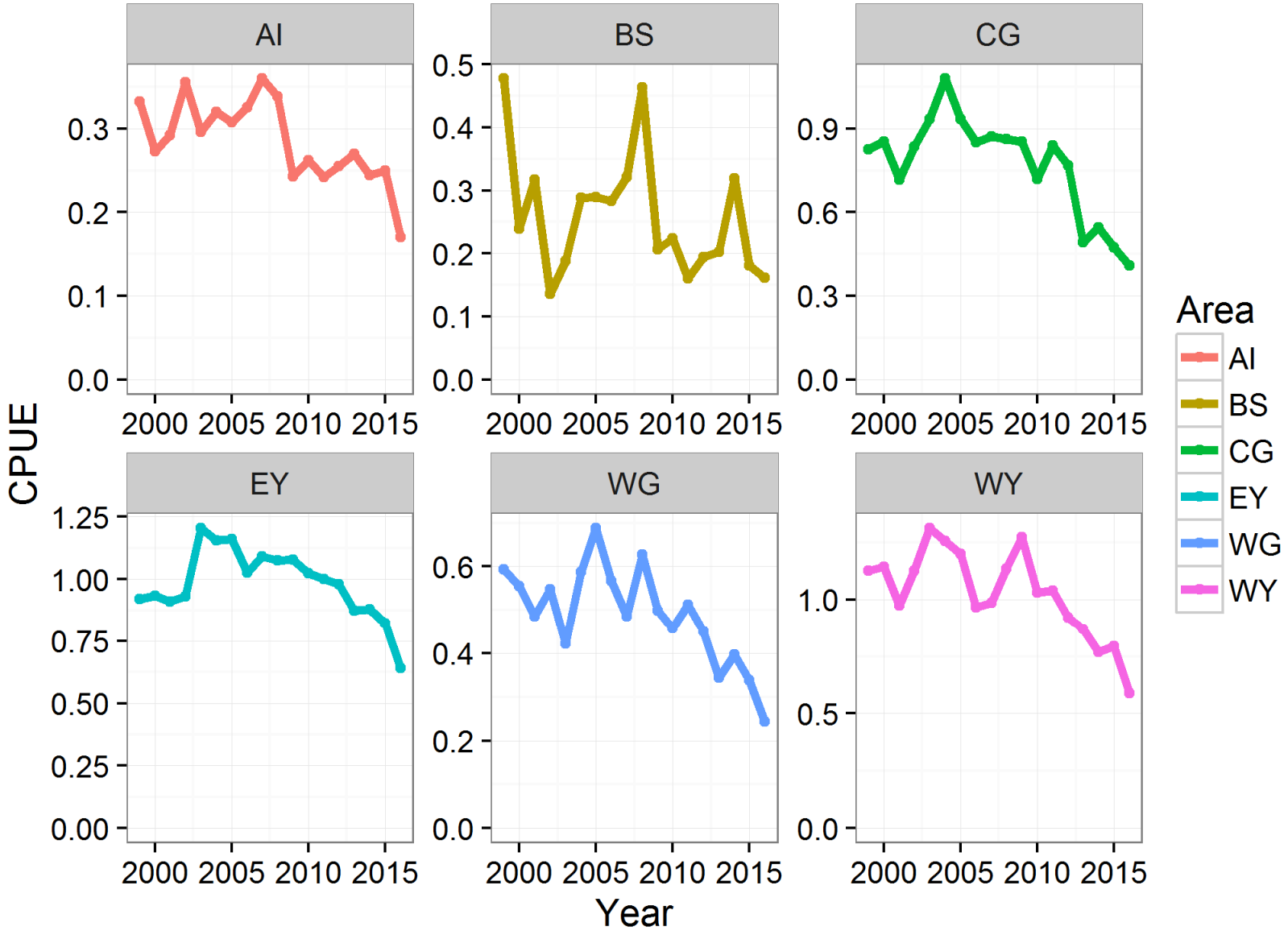
Females



Males

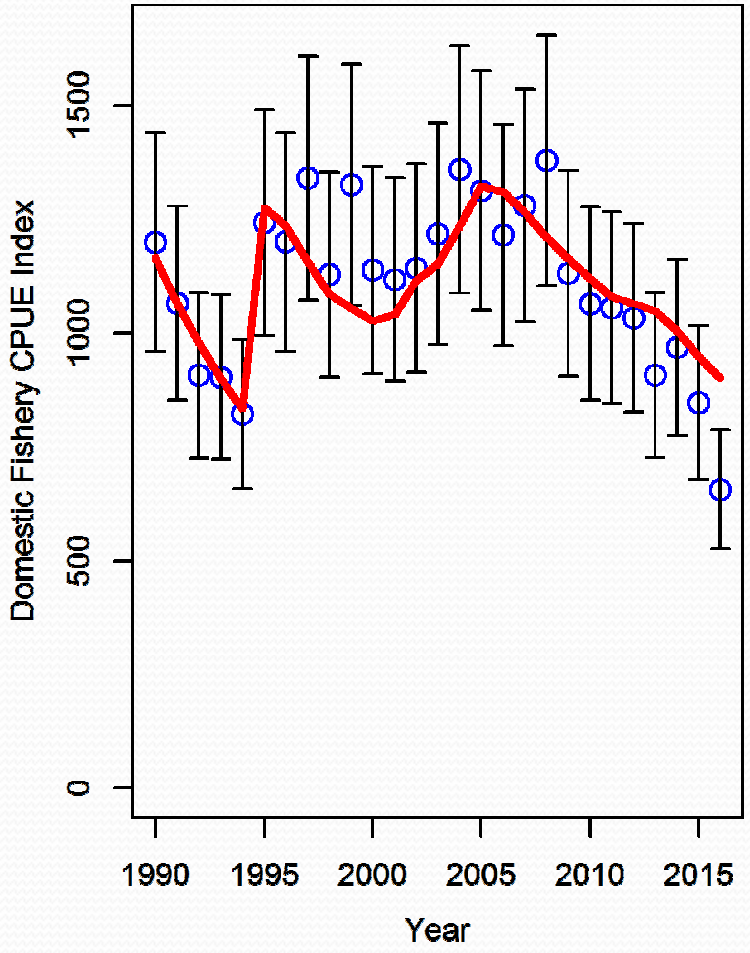


Fishery CPUE by area

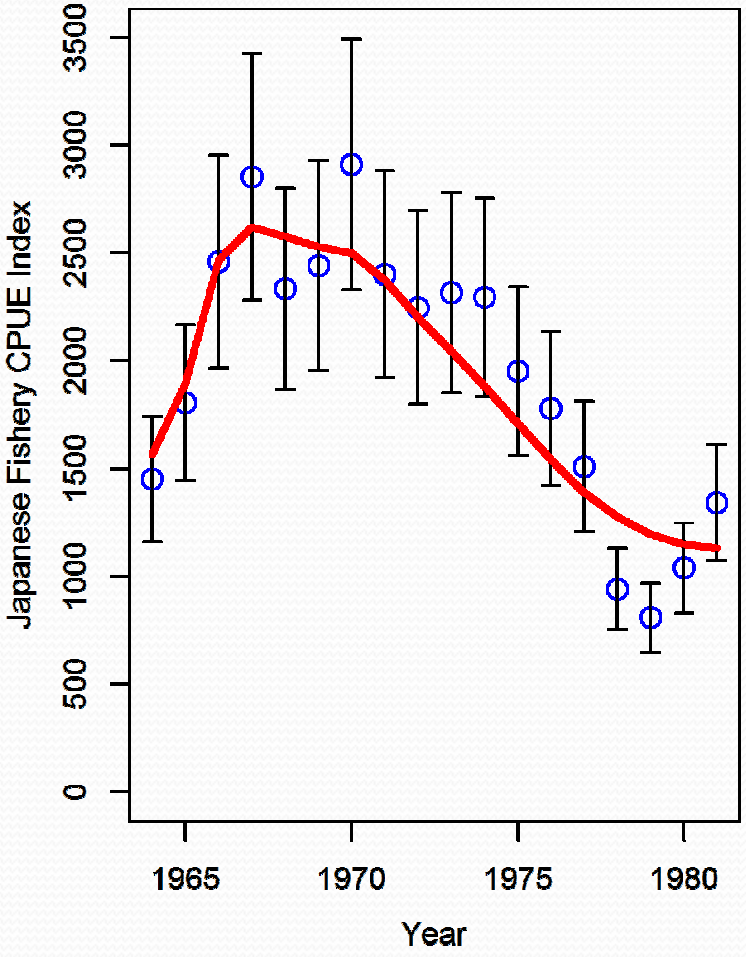


Model fit to Fishery RPW

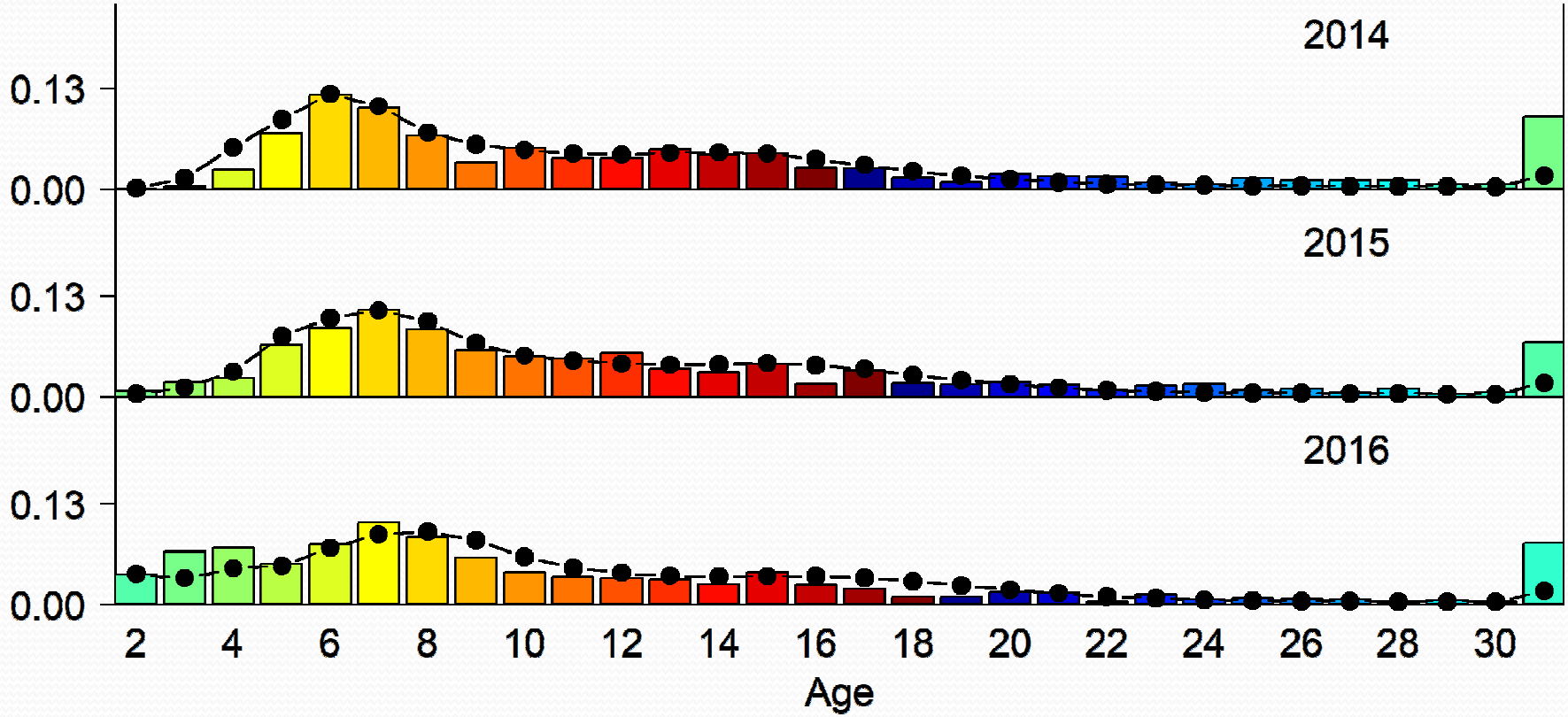
Domestic



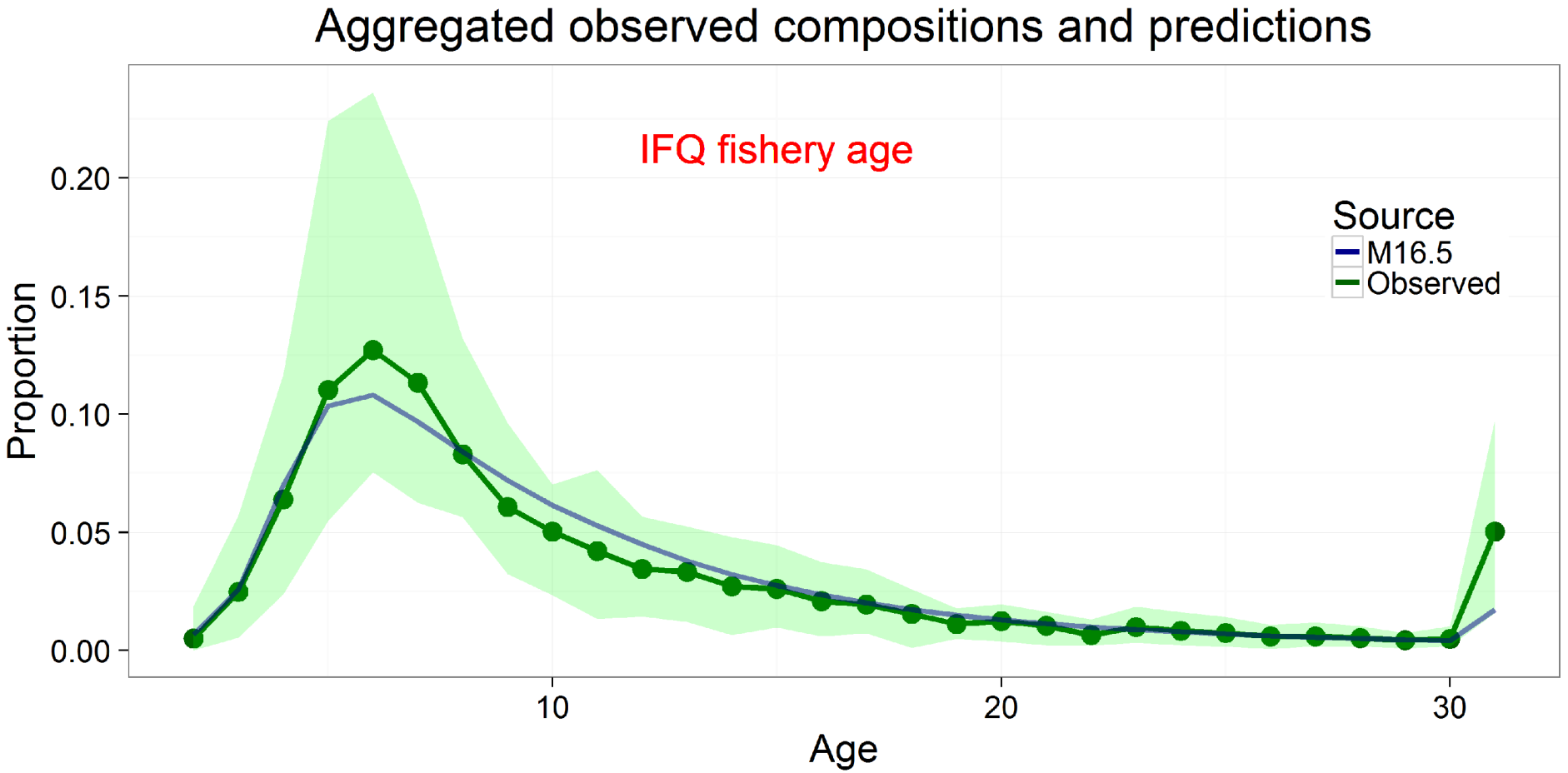
Japanese



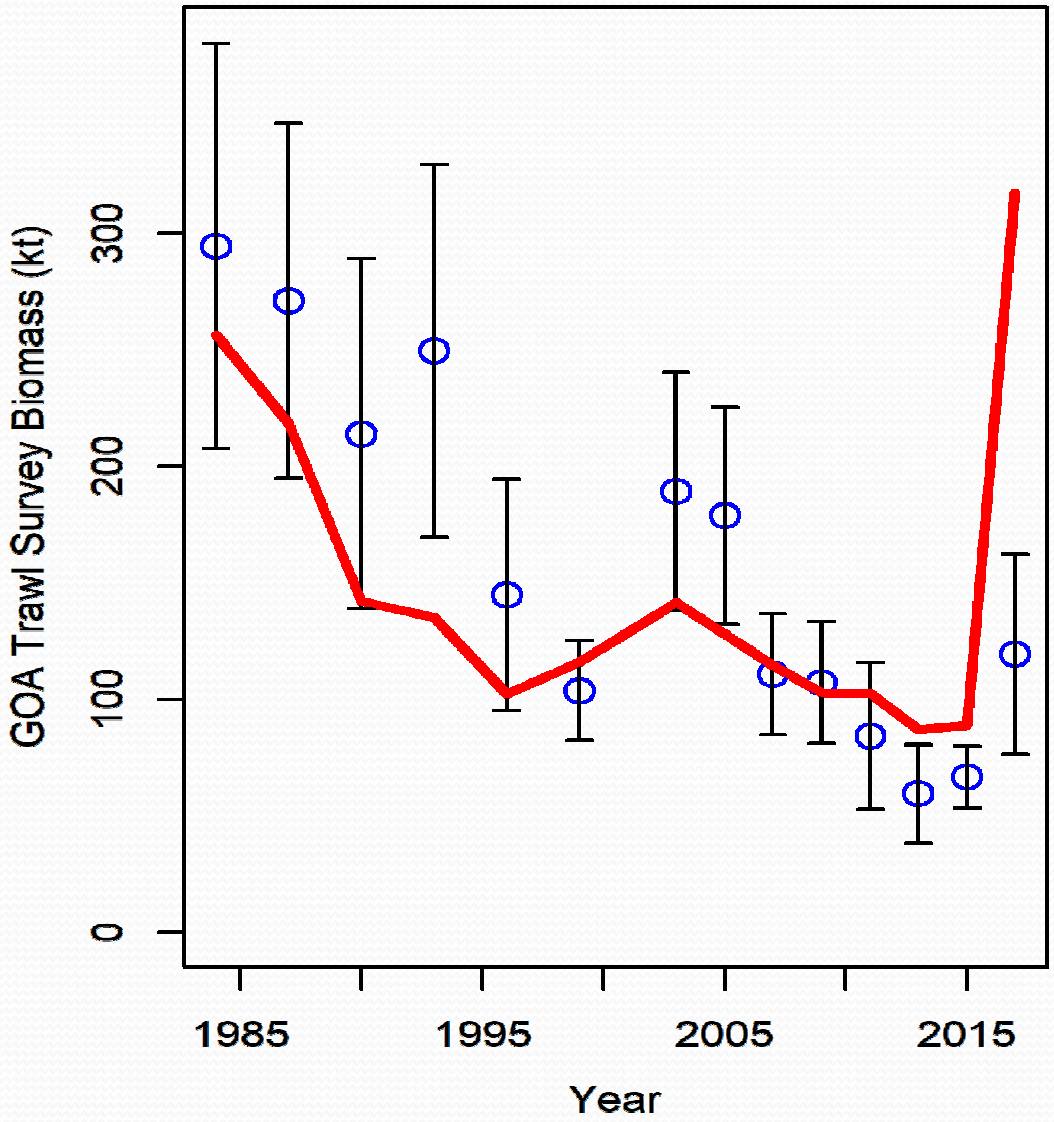
Fishery Ages



Fishery ages

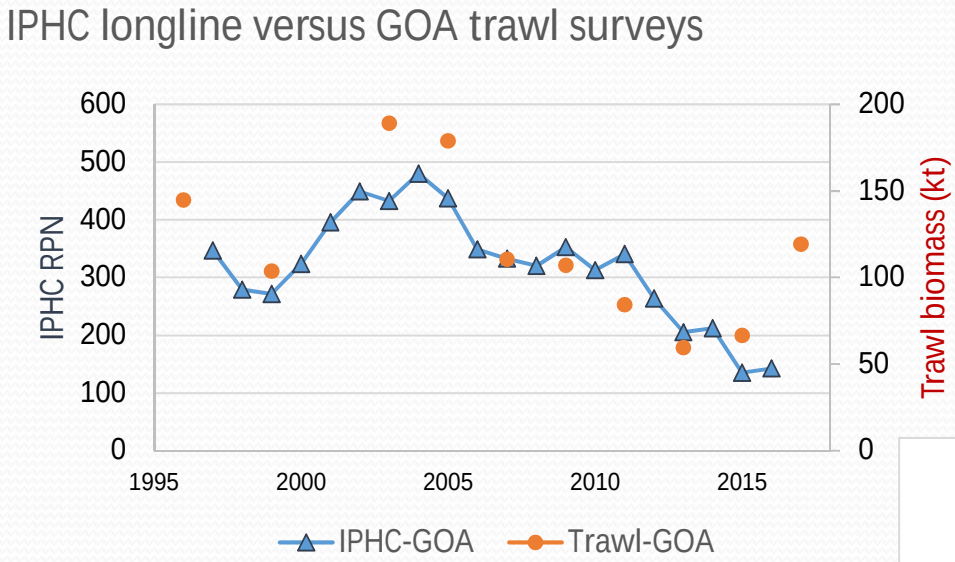


Model fit to GOA Trawl Survey

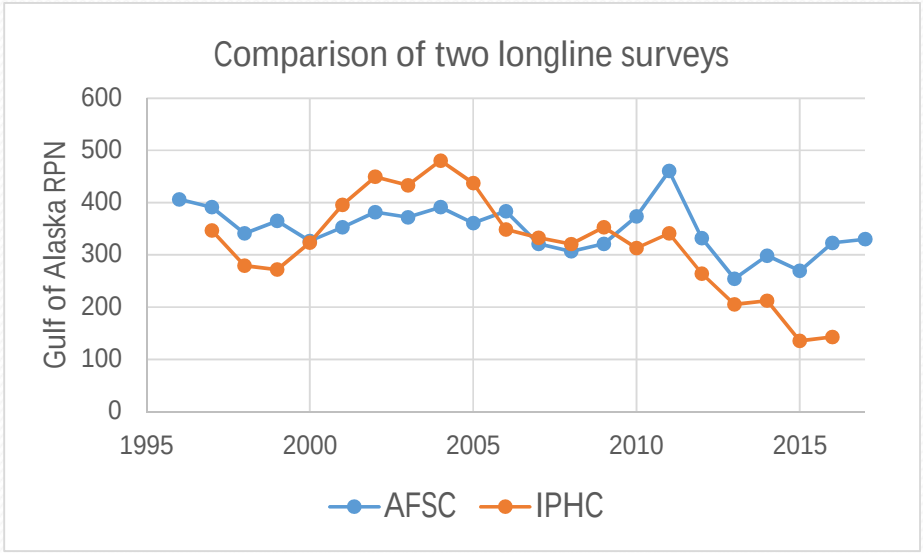


IPHC Survey

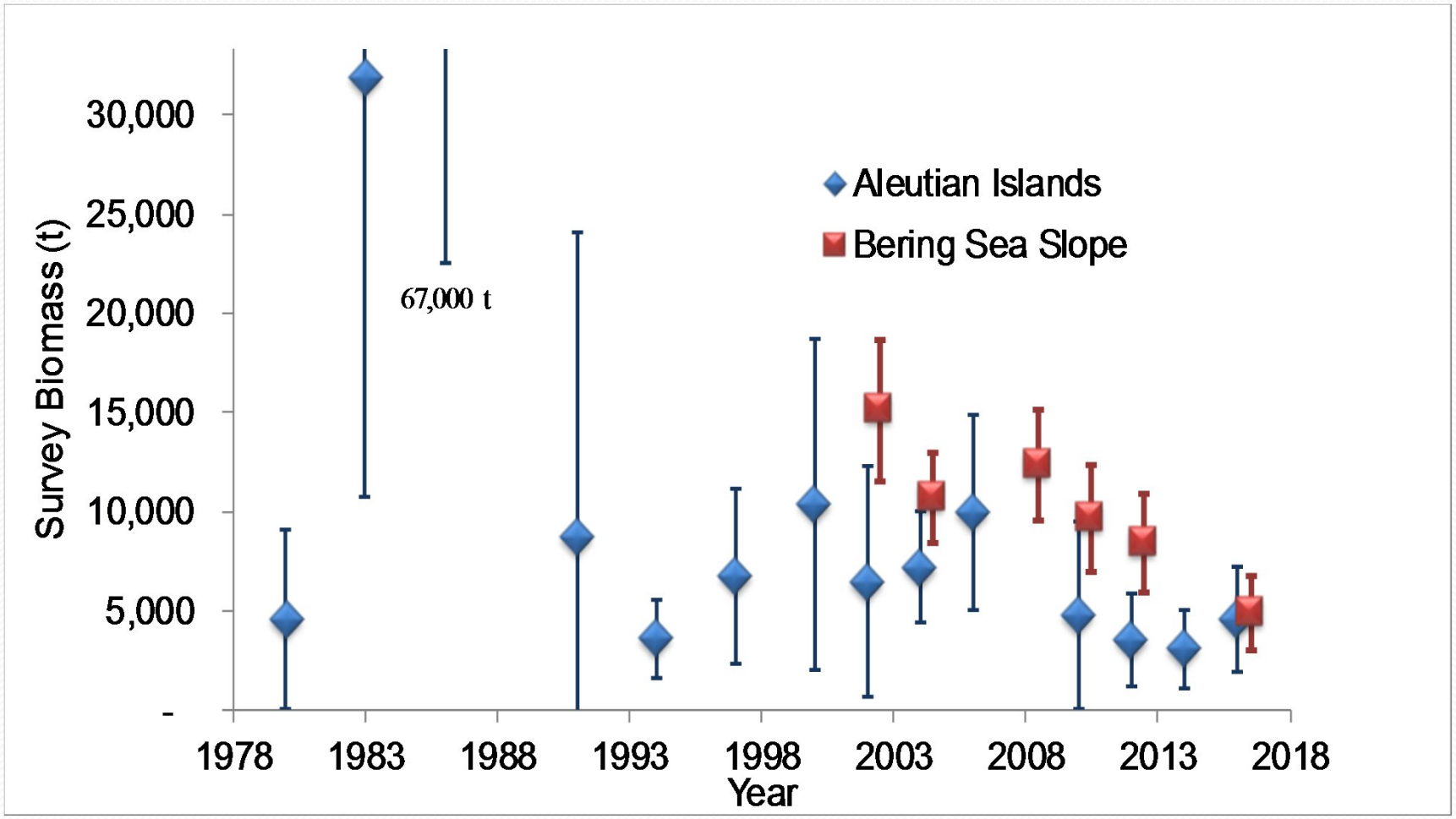
Gulf of Alaska



- Showed some uptick in 2011 (possibly also 2008 year class)
- AFSC shows stabilizing in GOA, IPHC sees decline
- Closely correlated to GOA trawl survey



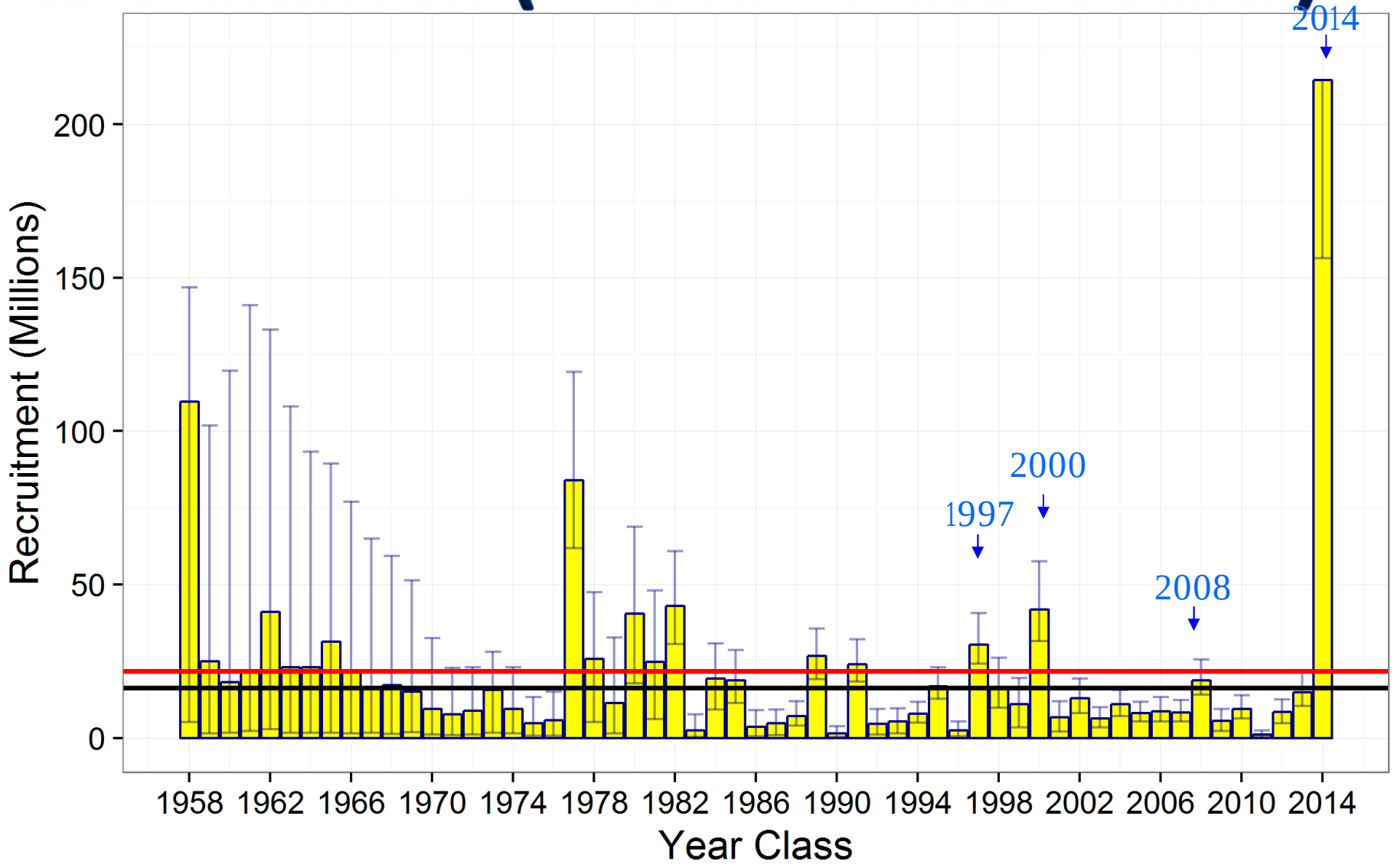
NMFS BS/AI trawl surveys



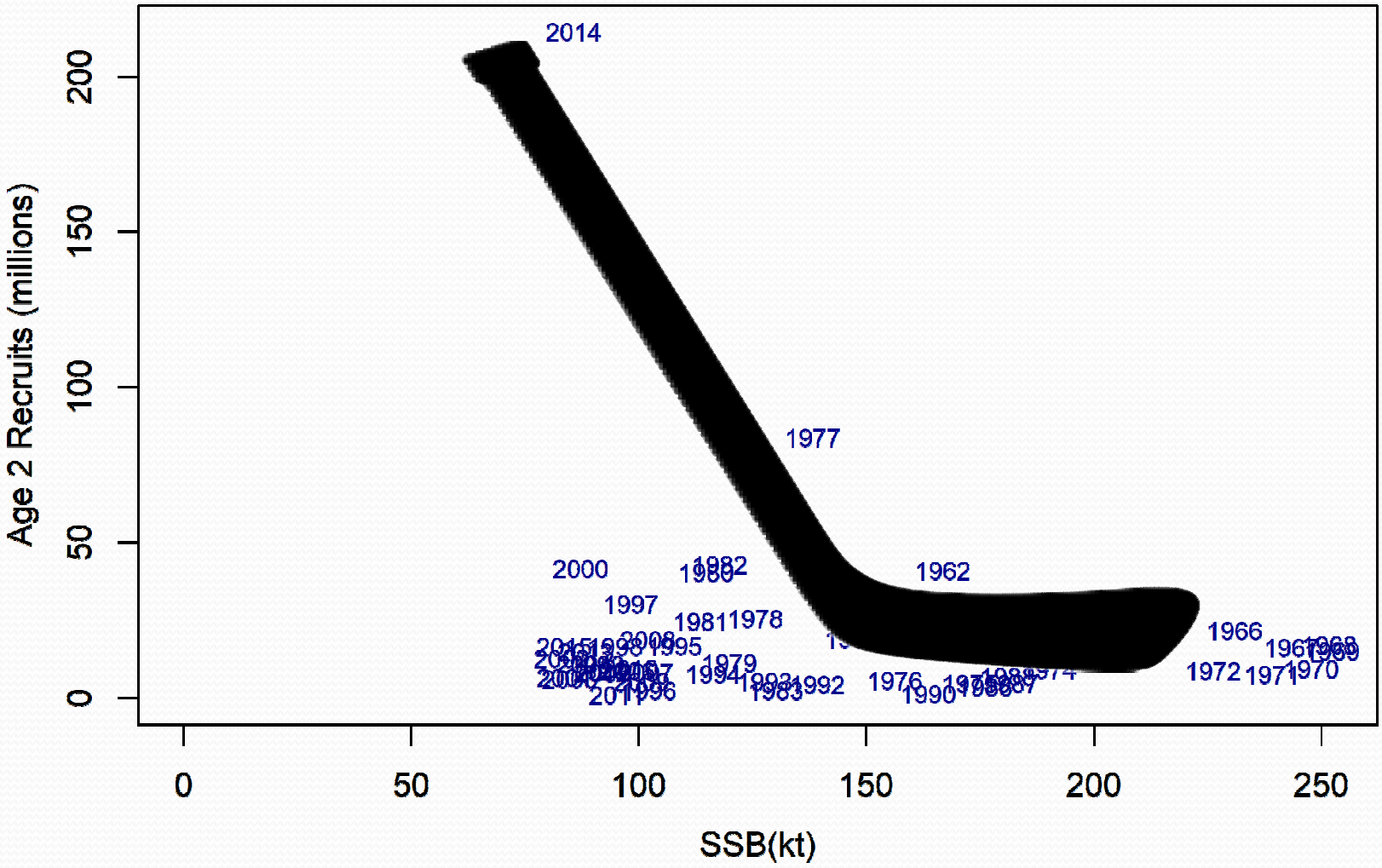
Bring on the blob?

- 2014:
  - Lots of YOYs caught in surface trawl surveys
  - Lots of fishermen reports of YOY in coho bellies
- 2015:
  - One year olds reported all over by sport fishermen
  - YOYs found in coho and pomfret stomachs on GOA project survey
  - More fisherman reporting YOY in coho stomachs
- 2016:
  - Many YOY caught in new surface trawl experiment EGOA
  - More fisherman reporting YOY in coho stomachs
- 2017: Widespread reporting of small fish in the fishery

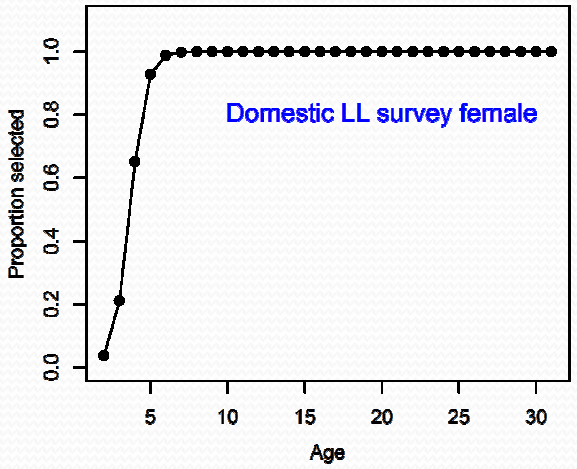
Recruitment (return of the locusts)

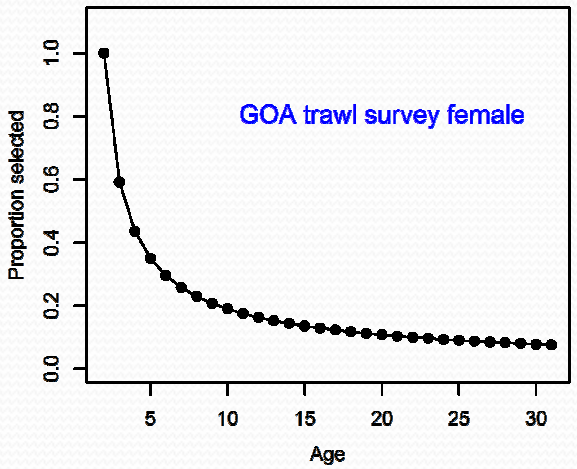


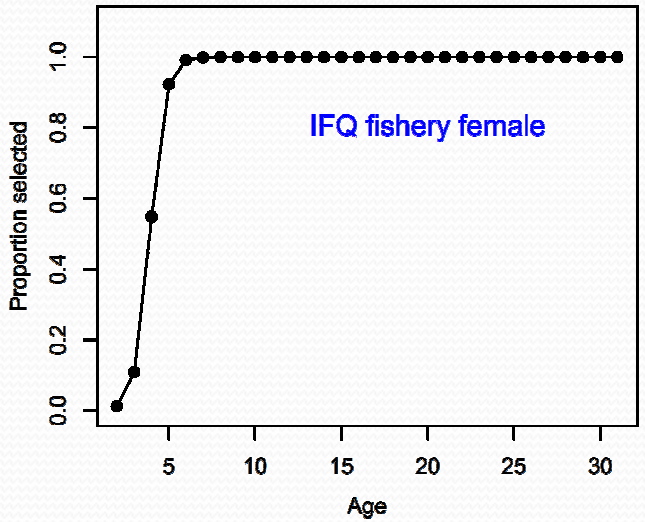
The elusive hockey stick S-R

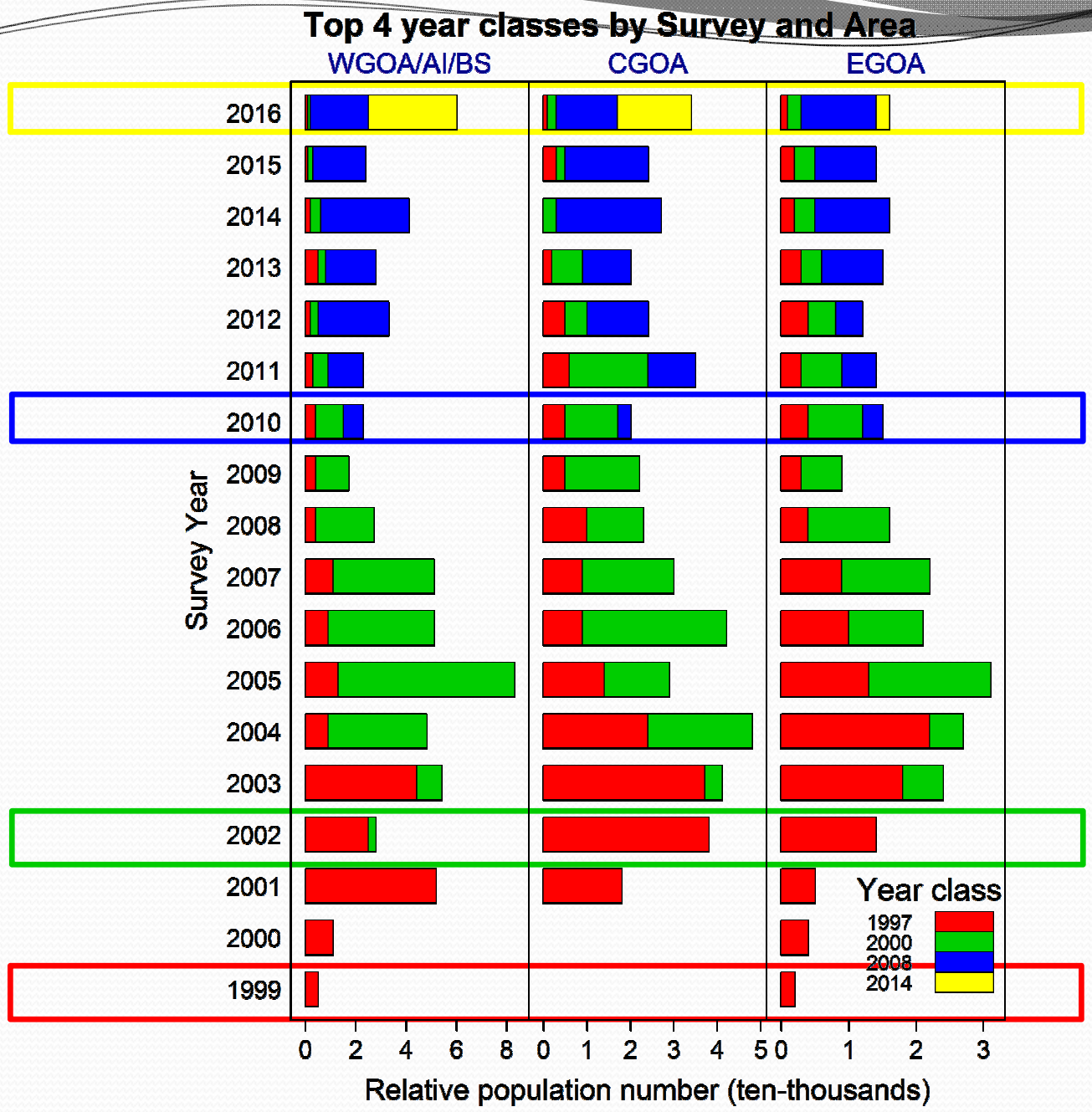


A few words on selectivity

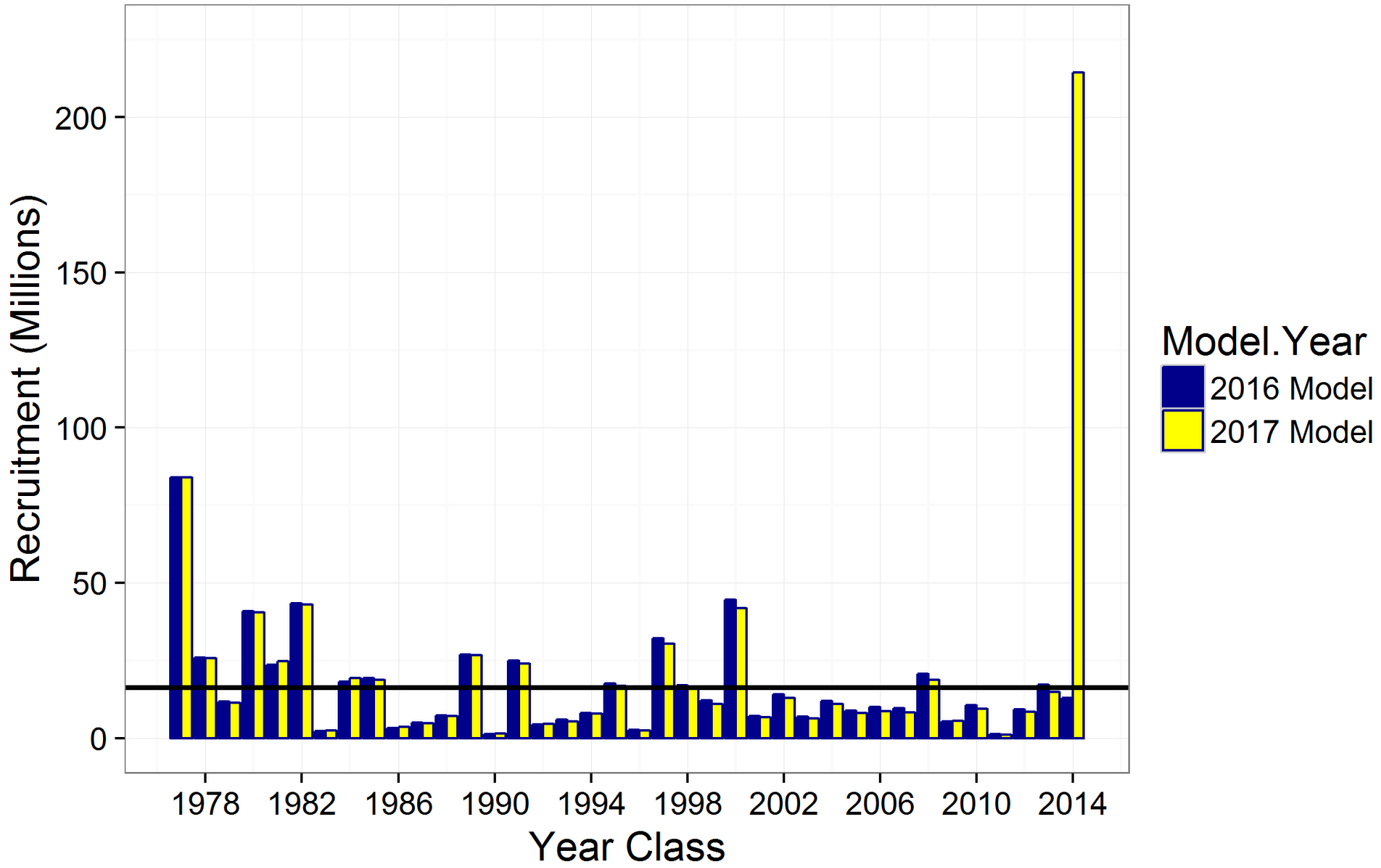




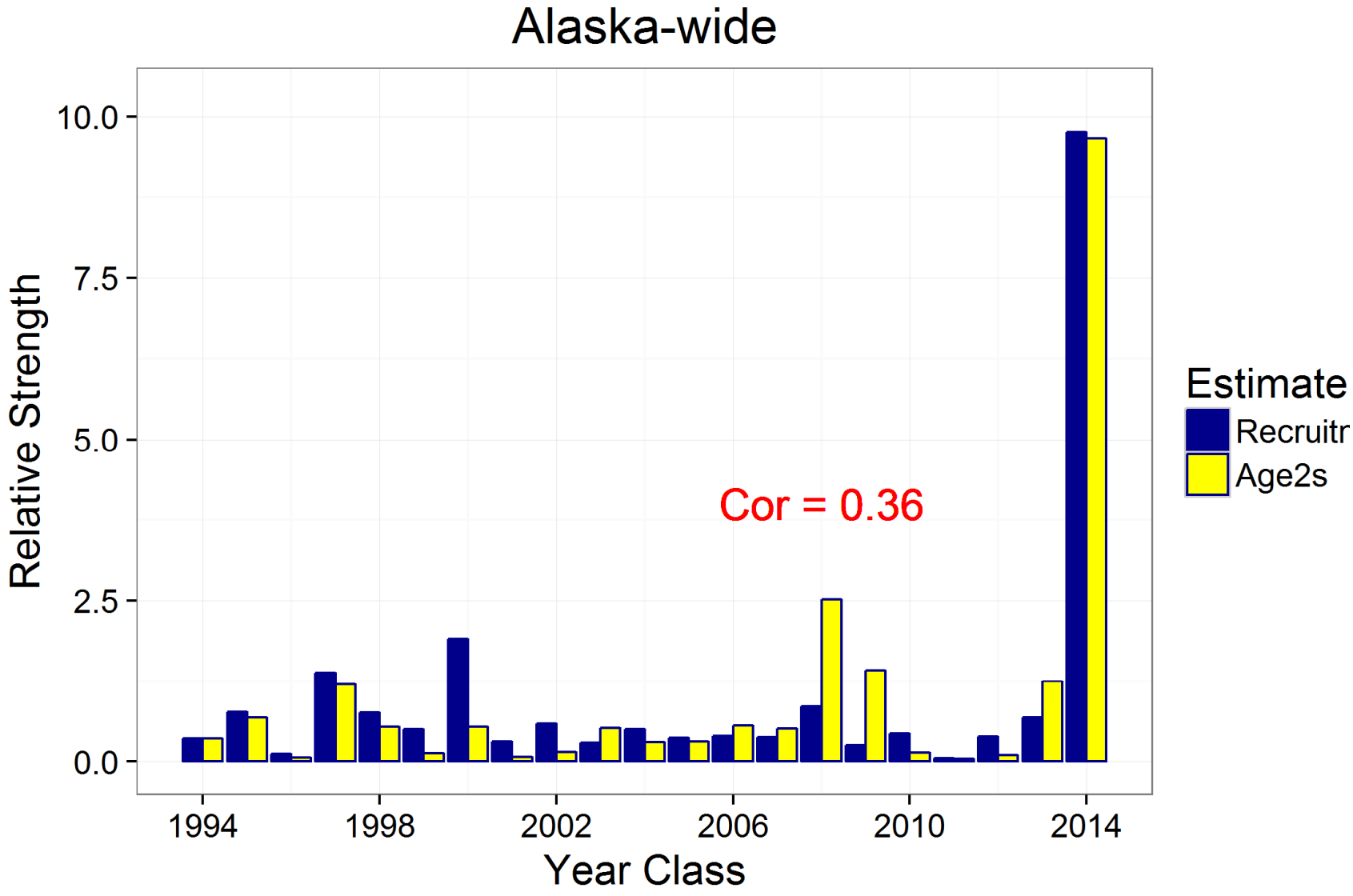



Top 4 year classes by Survey and Area
WGOA/AI/BS
CGOA
EGOA
Survey Year
2016
2015
2014
2013
2012
2011
2010
2009
2008
2007
2006
2005
2004
2003
2002
2001
2000
1999
0 2 4 6 8
0 1 2 3 4 5
0 1 2 3
Relative population number (ten-thousands)
Year class
1997
2000
2008
2014

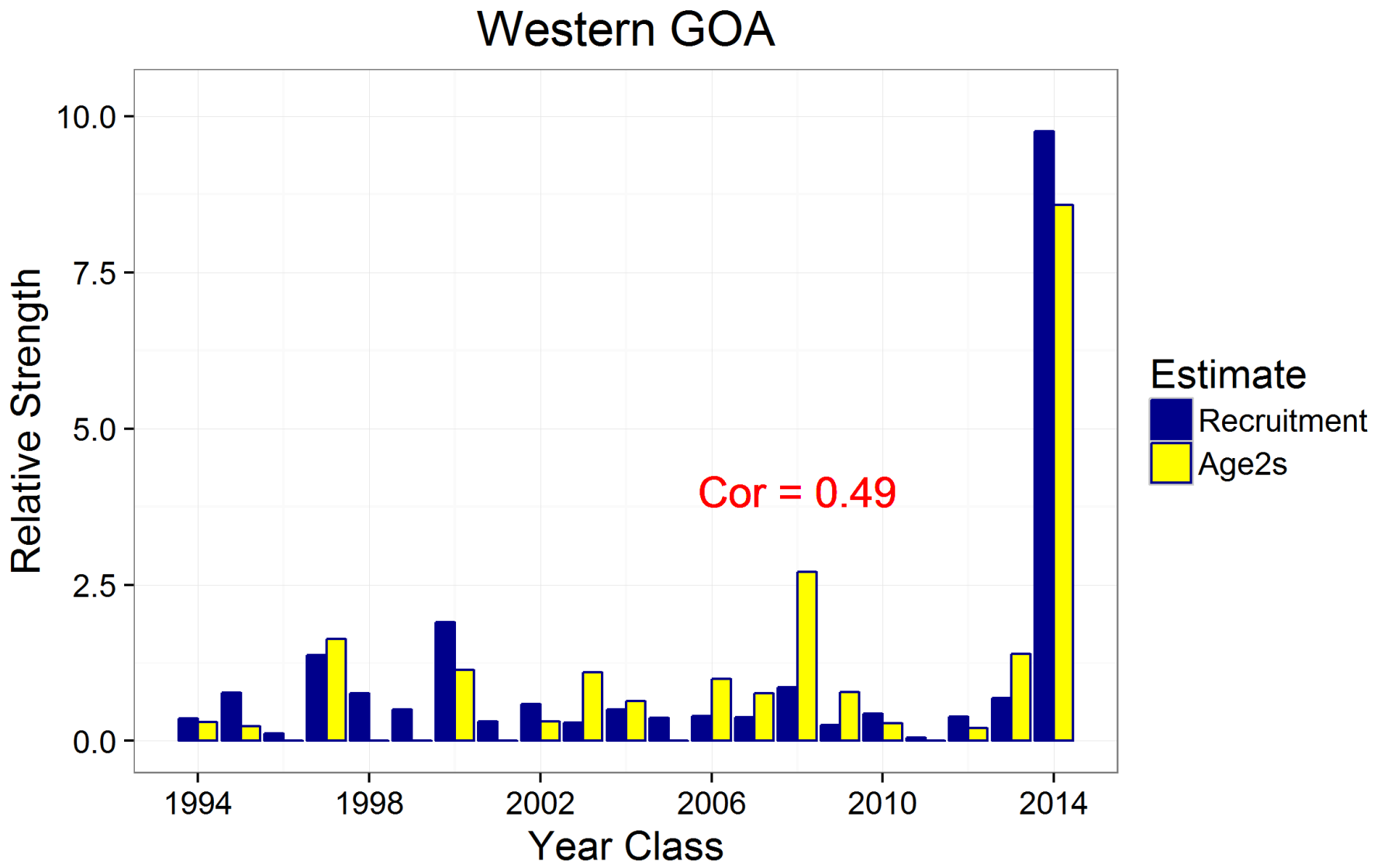
Recruitment



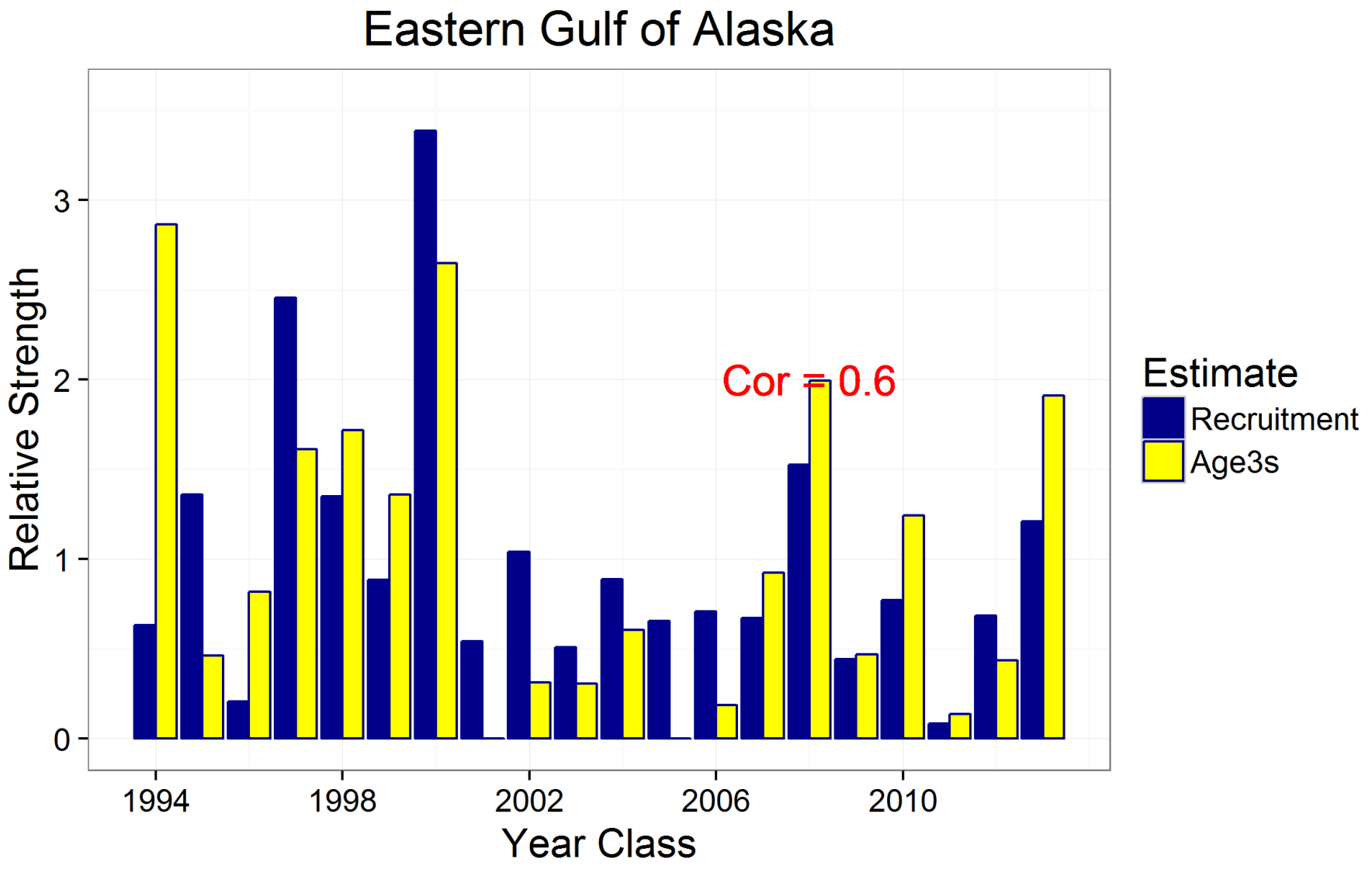
Recruitment



Recruitment

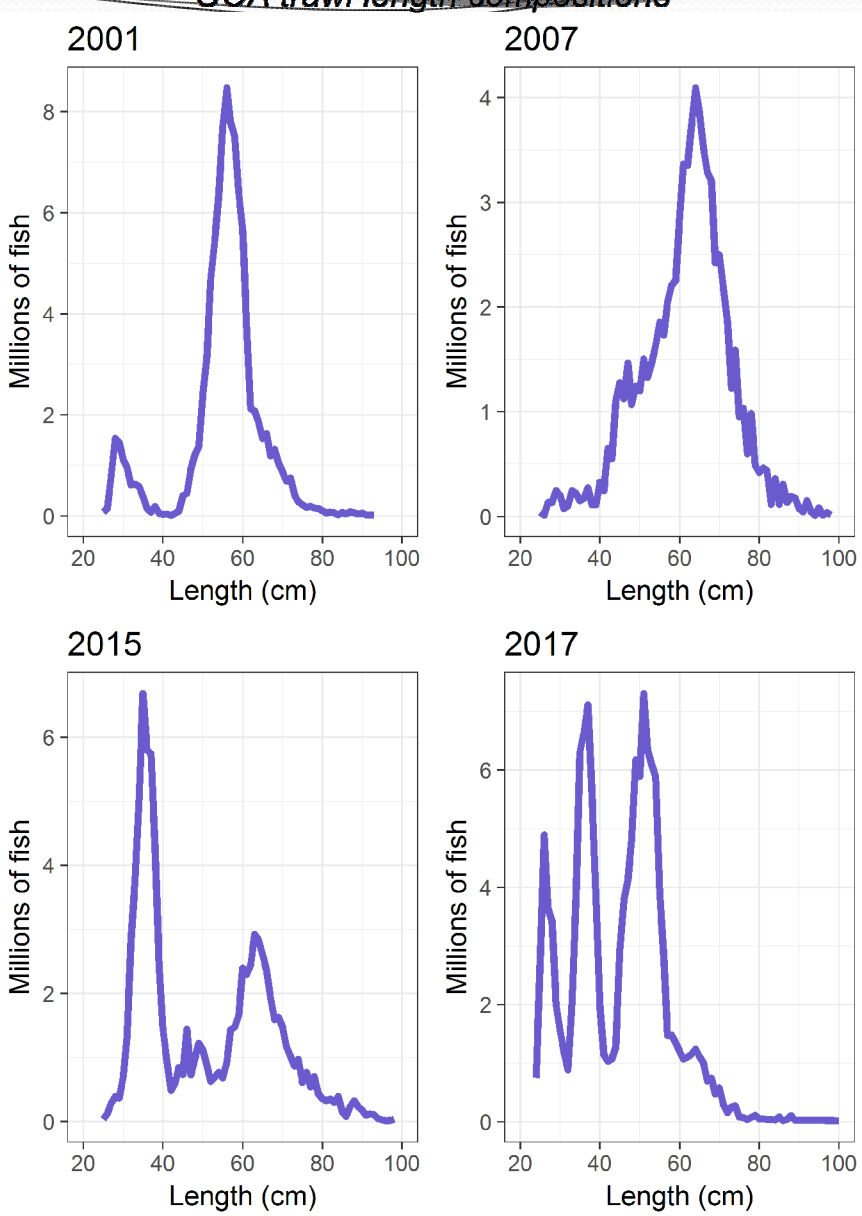


Recruitment

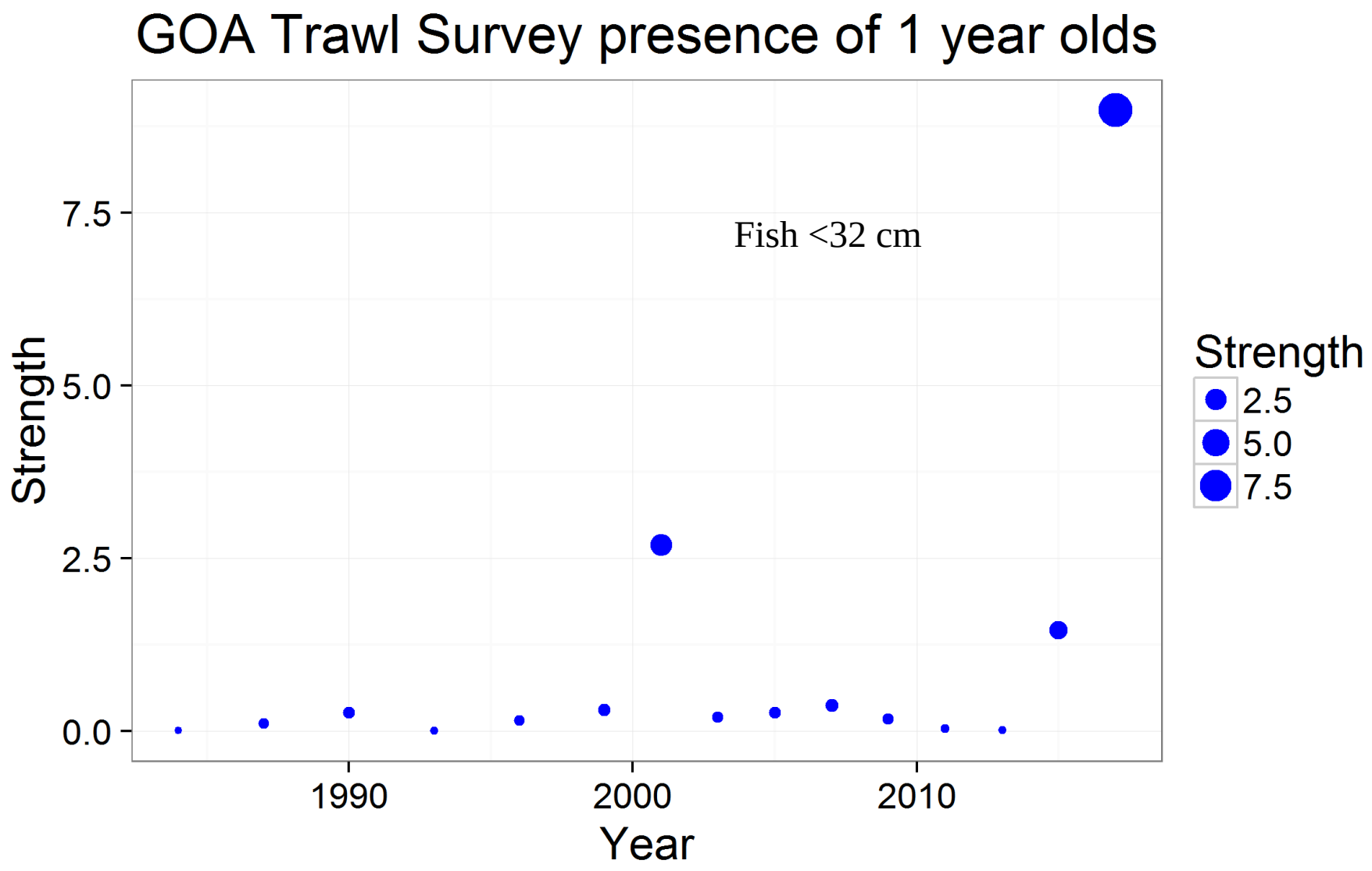


Recruitment

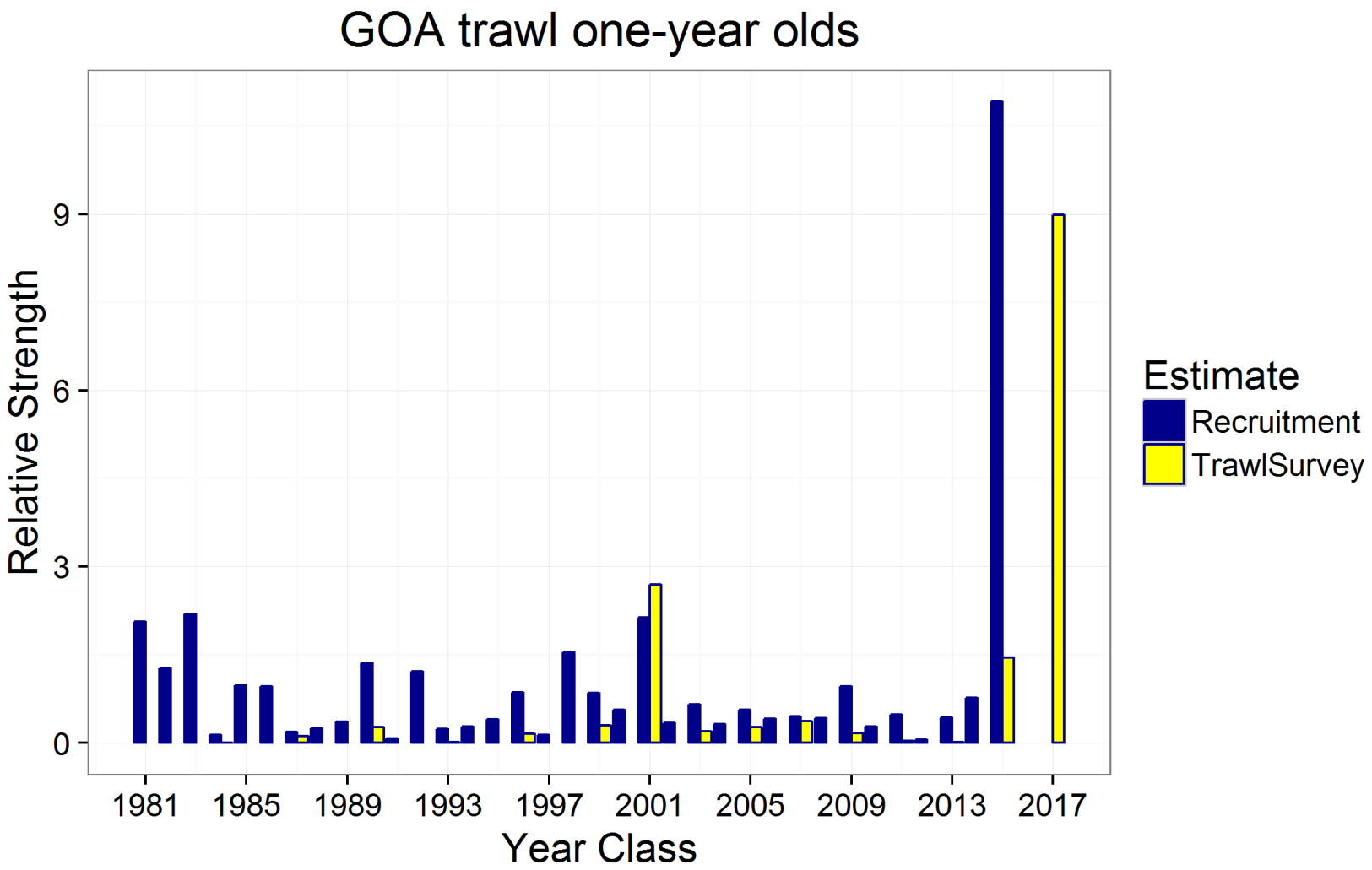
- 2000 year class showed up in 2001 (some)
- Low recruitments after 2000 showed no extra modes (2007)
- 2015 showed solid 1 year olds
- 2017 shows 3 modes, potentially 2 or more year classes

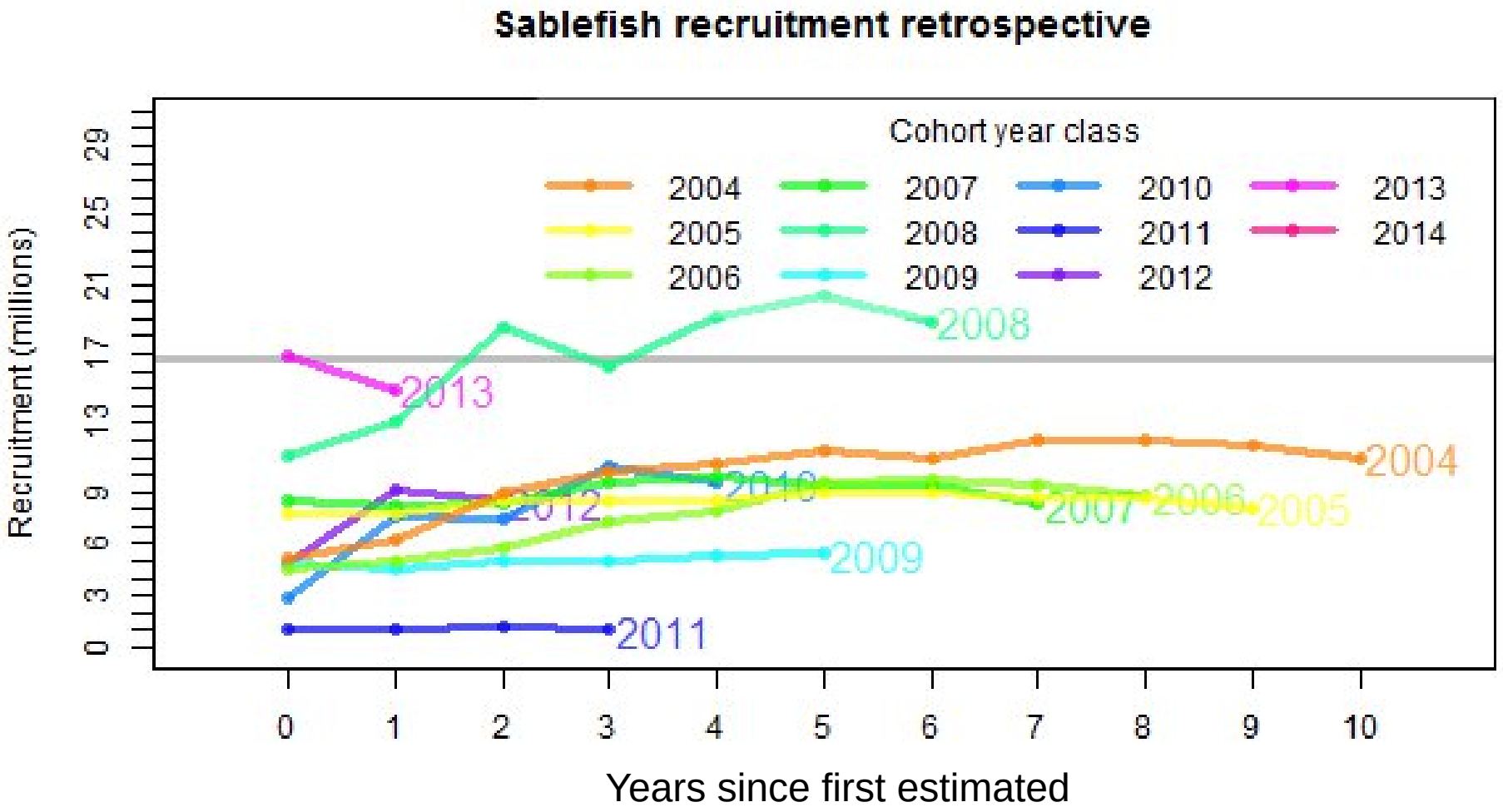


Recruitment

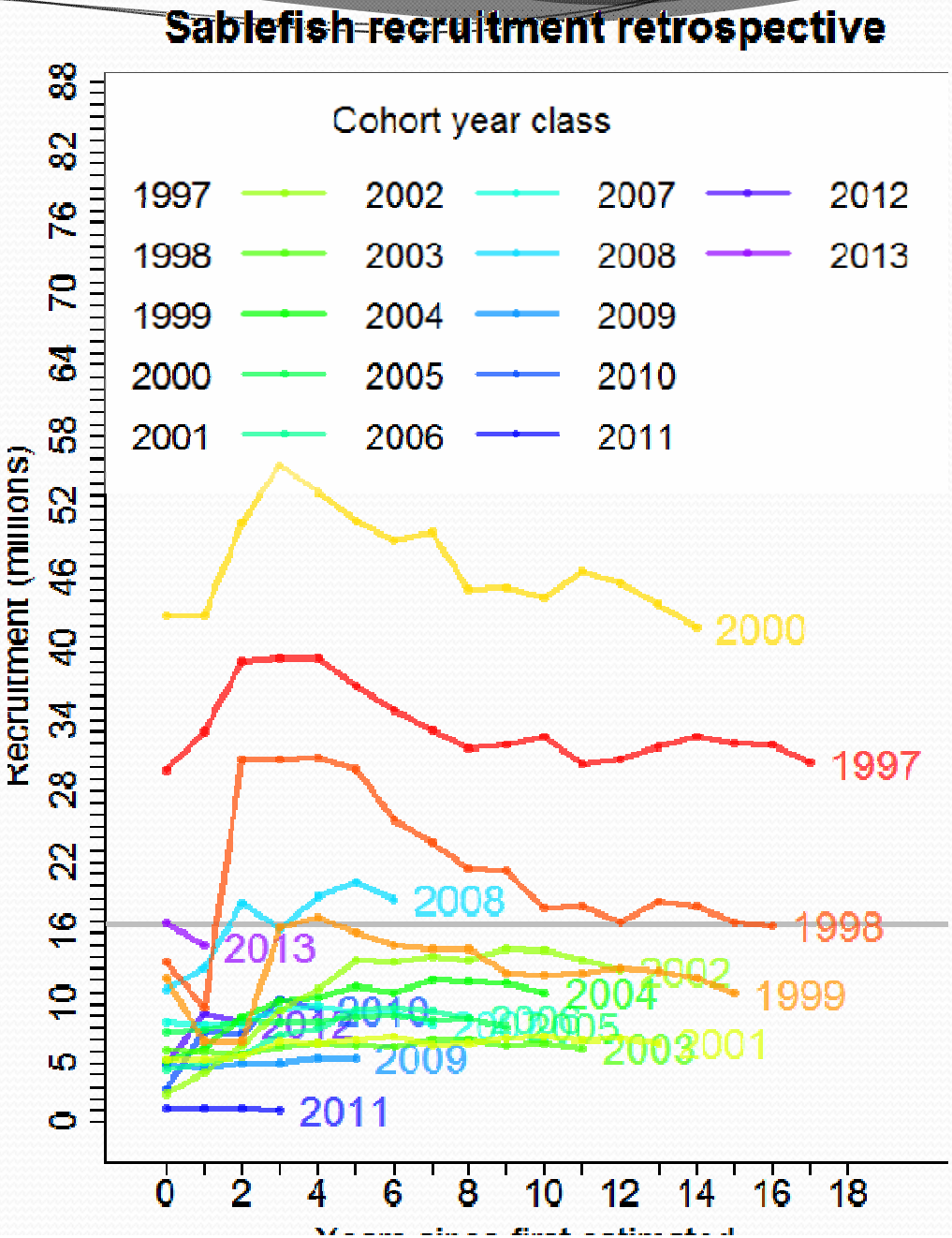


Recruitment

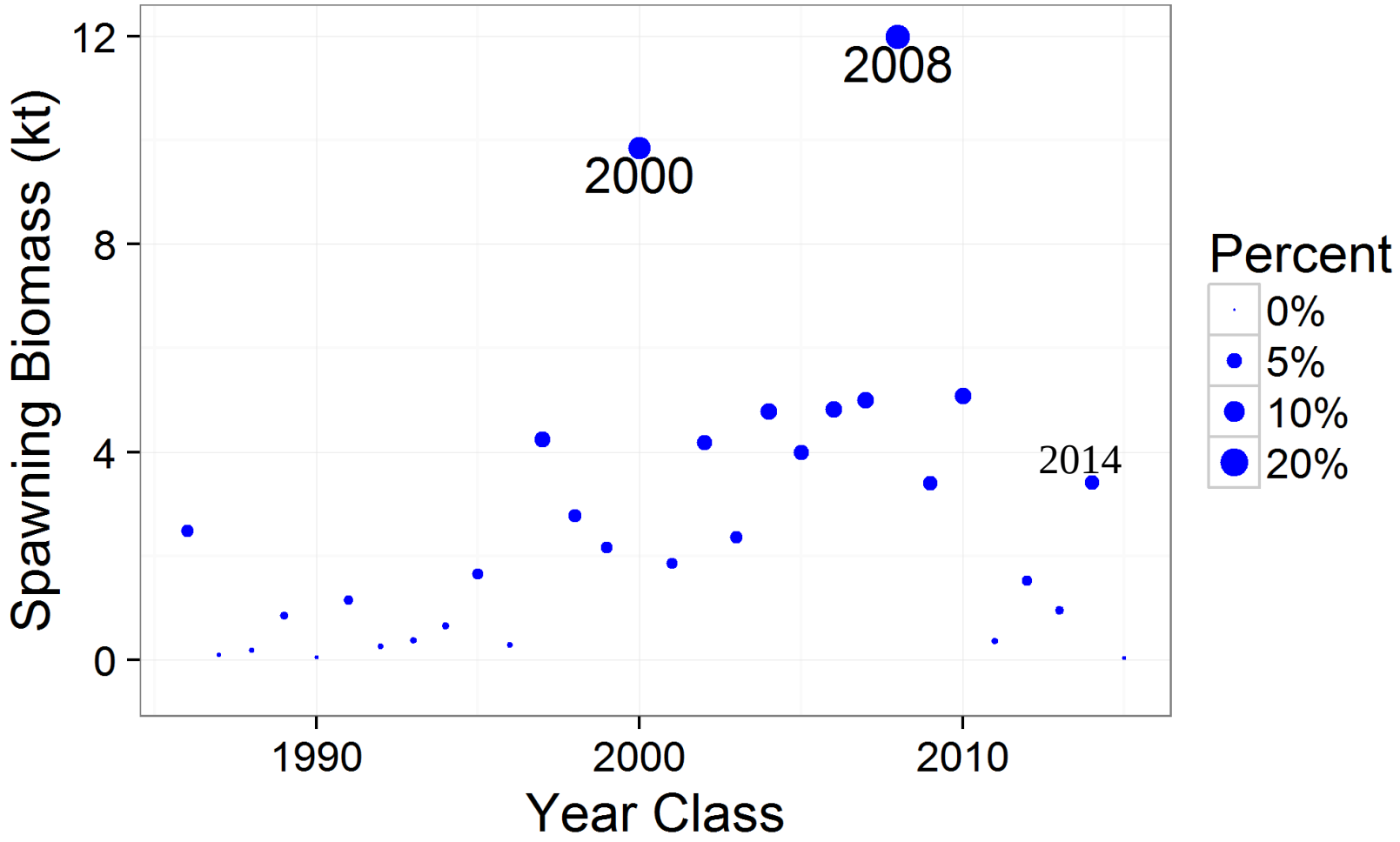


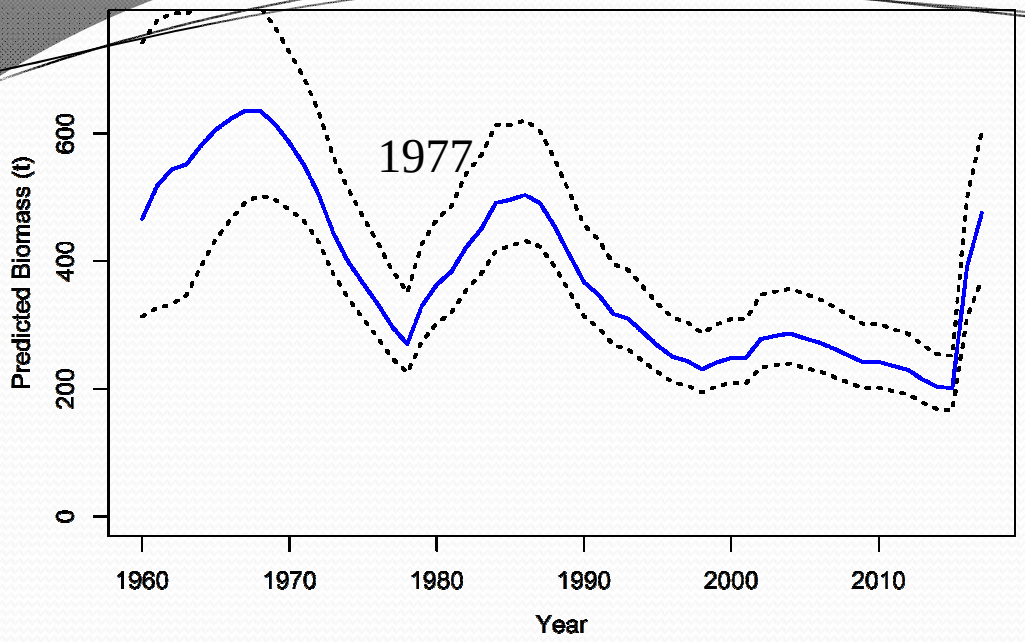

Sablefish recruitment retrospective
Cohort year class
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Recruitment (millions)
0
3
6
9
13
17
21
25
29
2008
2013
2004
2010
2012
2007
2006
2005
2009
2011
0
1
2
3
4
5
6
7
8
9
10
Years since first estimated

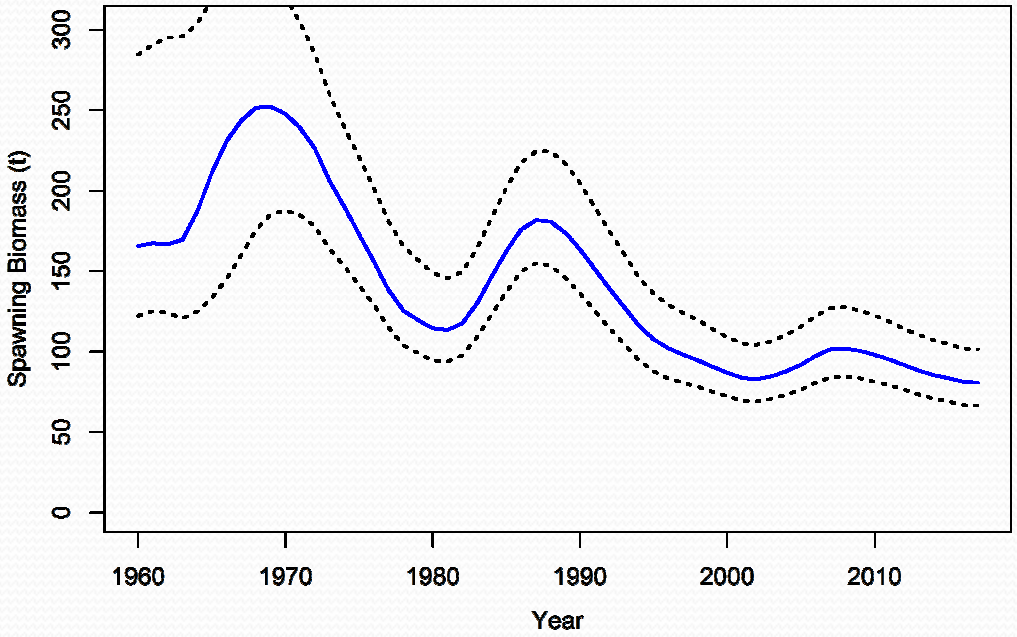
- Recruitment pattern for larger recruitments seems similar
- We do not know what a really large recruitment pattern might look like



2018 spawners by year class







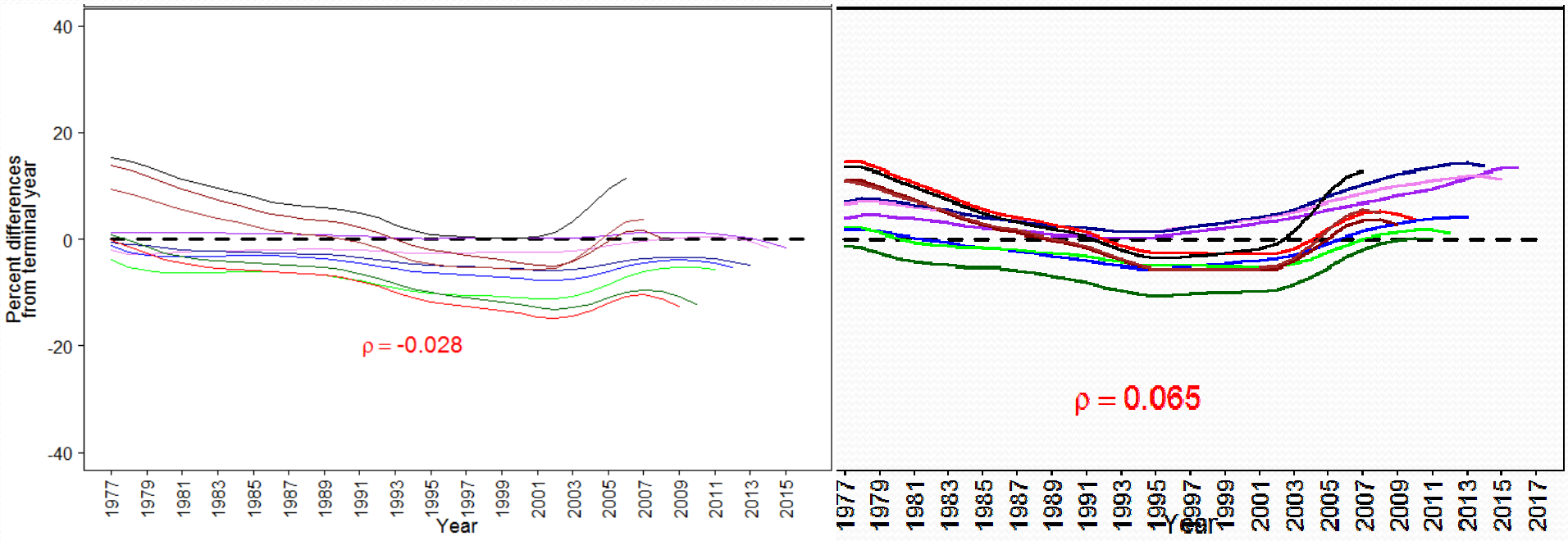
Trends

- Total biomass has been slowly decreasing since 2003 (until 2017!)
- Total biomass increased somewhat sharply after 1977 year class
- Spawning biomass leveled and trending slightly down

Retrospective comparison (SSB)

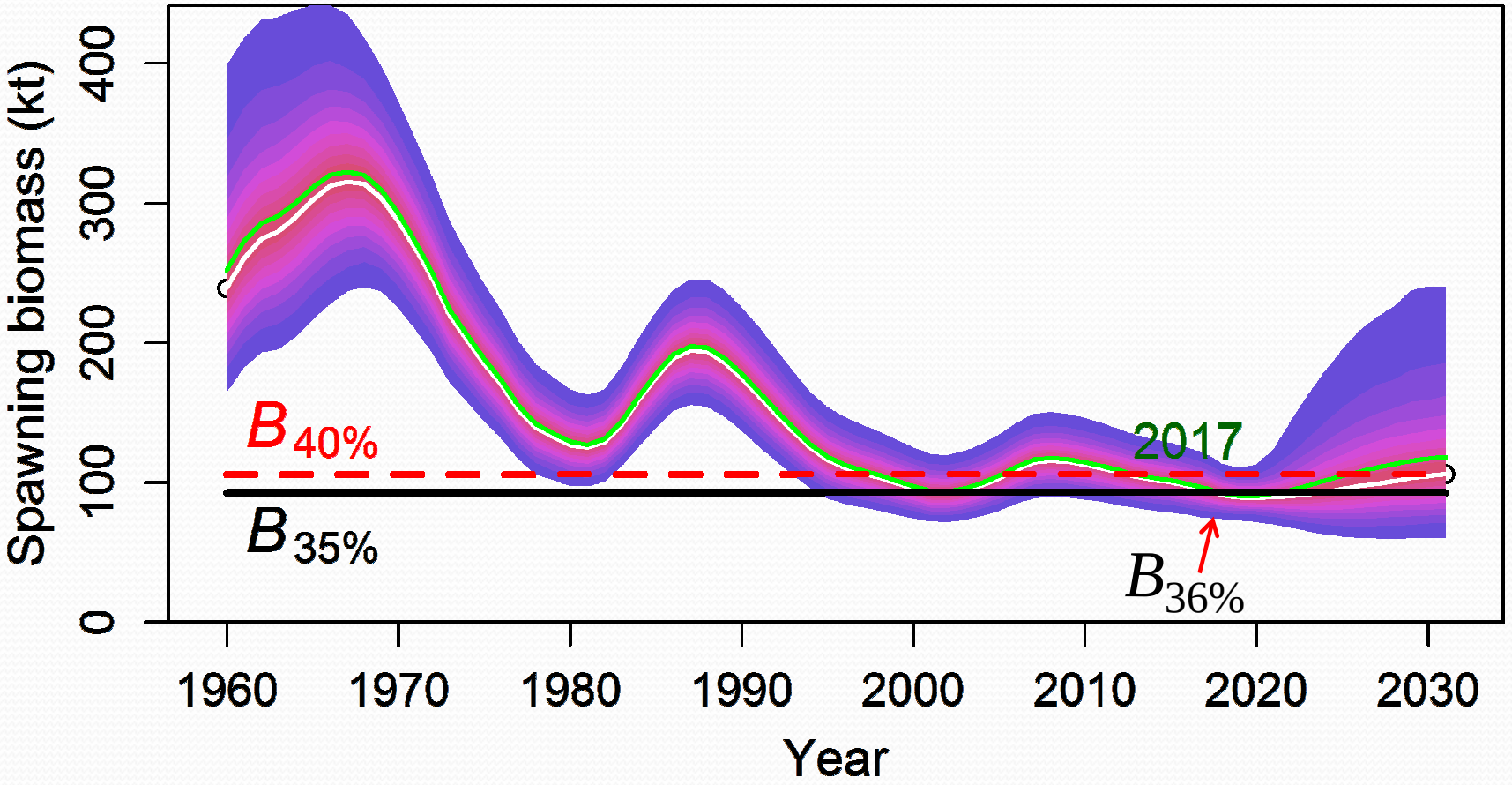
2016 assessment

2017 assessment

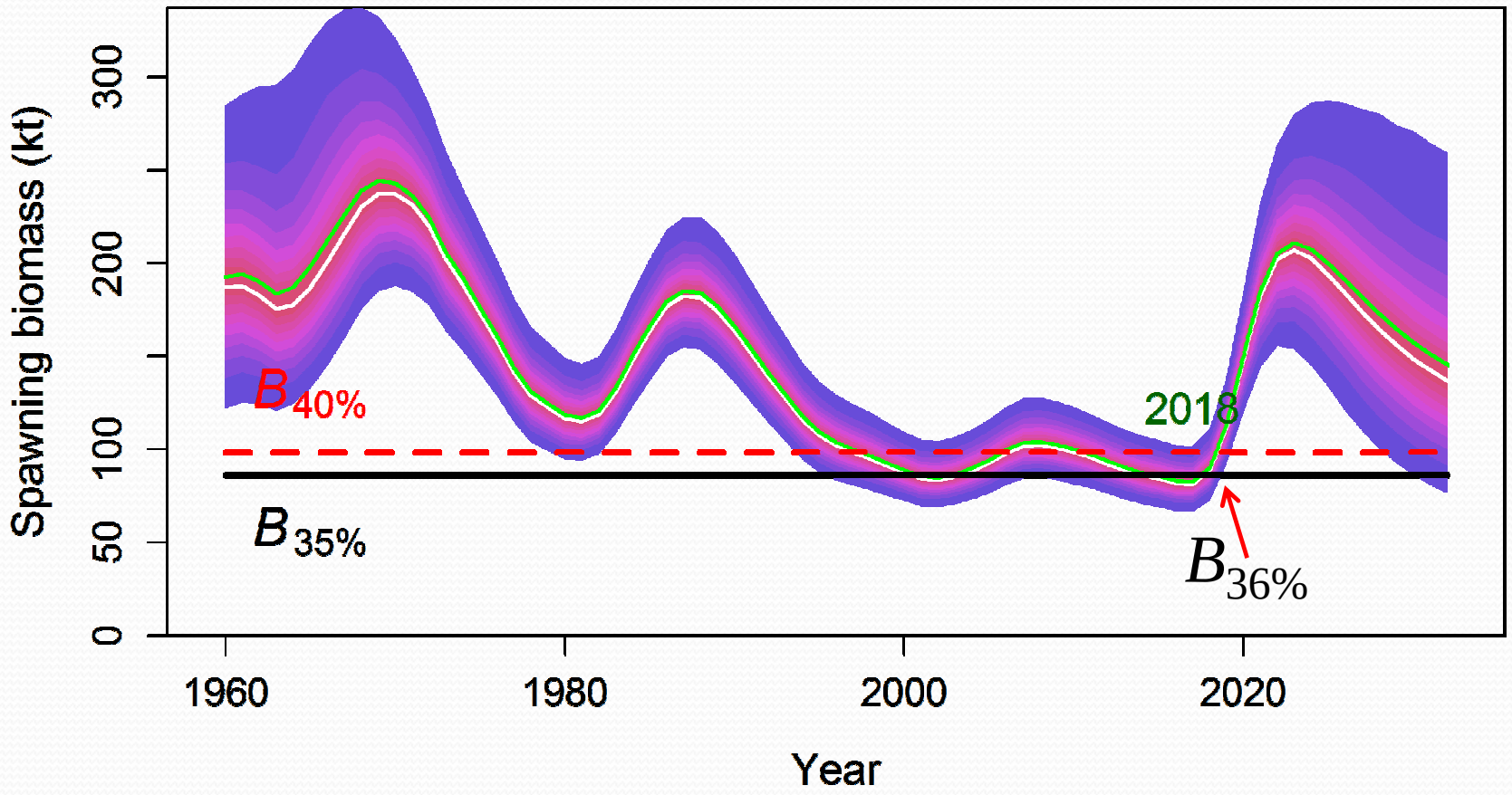


0.065 is still low, but flipped from -0.028 in 2017

2016 Projection



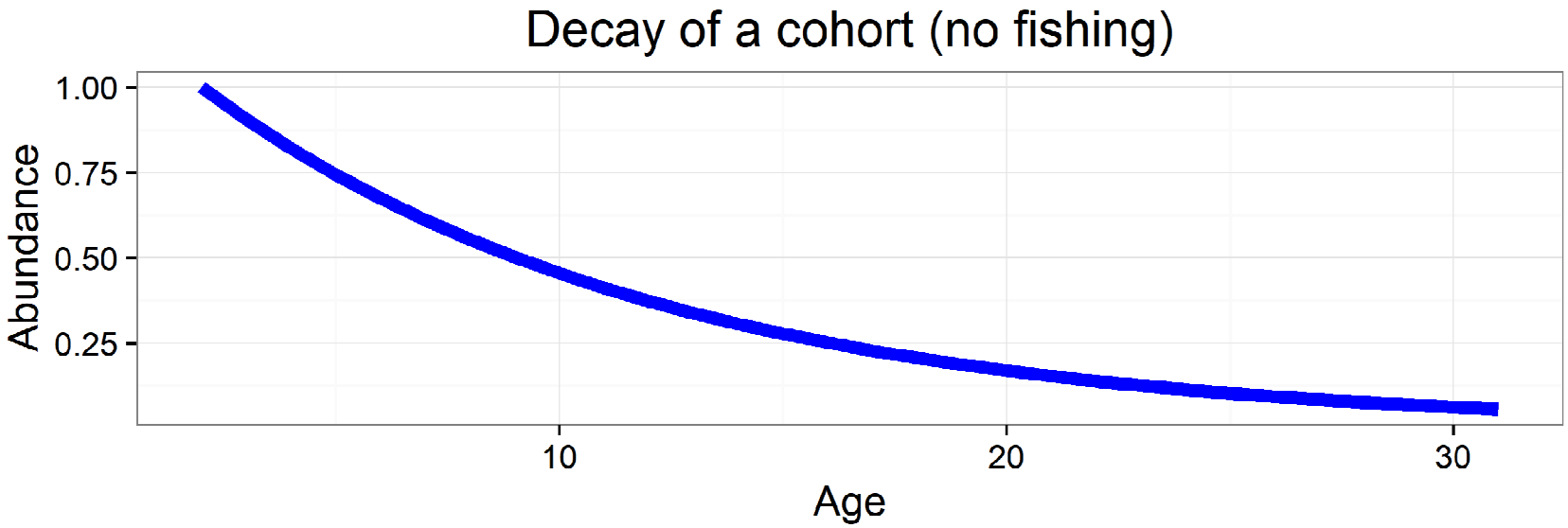
2017 Projection

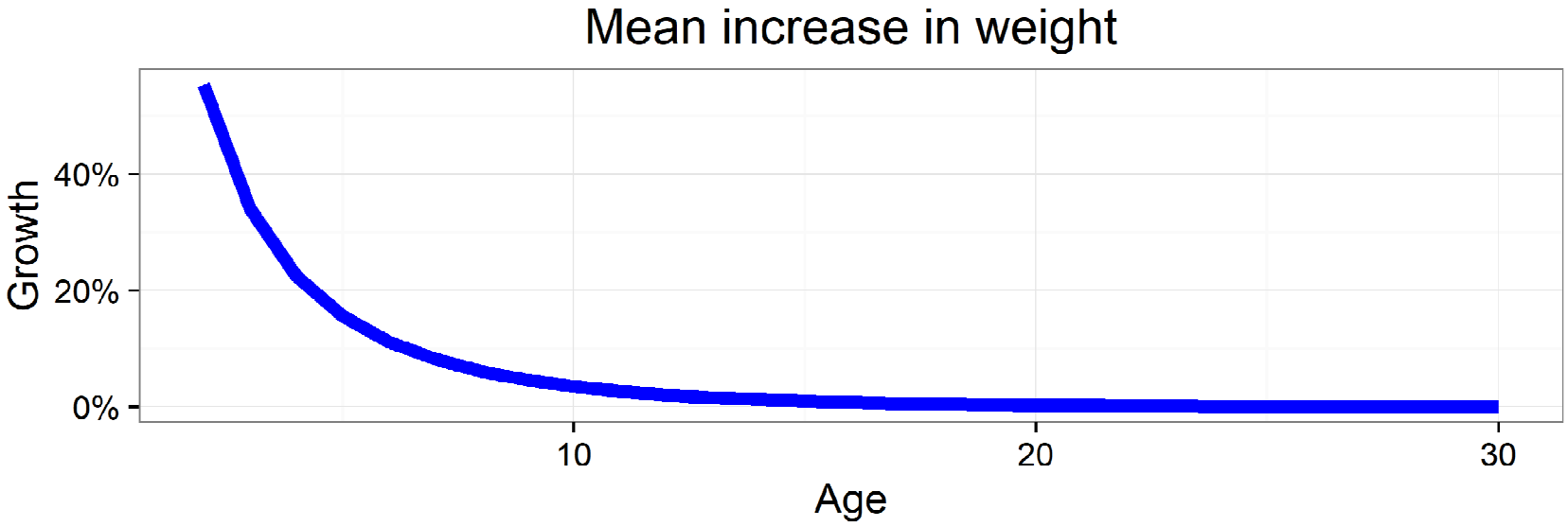


So everything is good right?

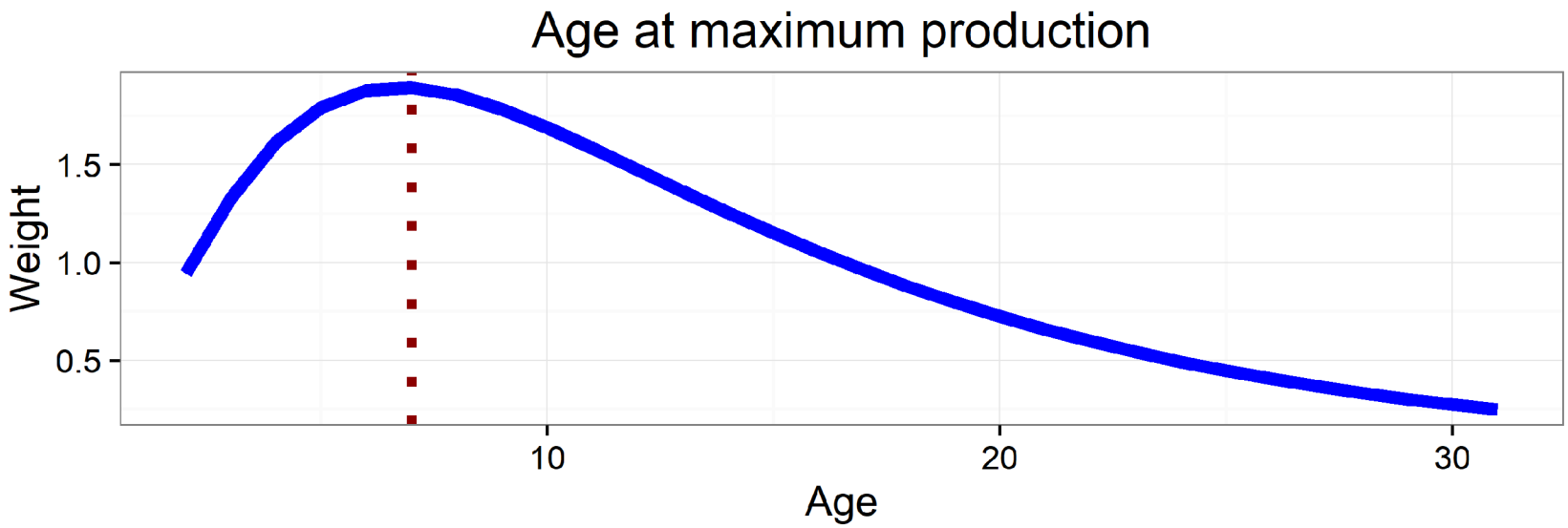
- Despite low SSB, the projected maxABC is an increase of 87% from 2017
- Most of that increase is based on the estimate of one really large year class
- Consider some other factors when recommending an ABC

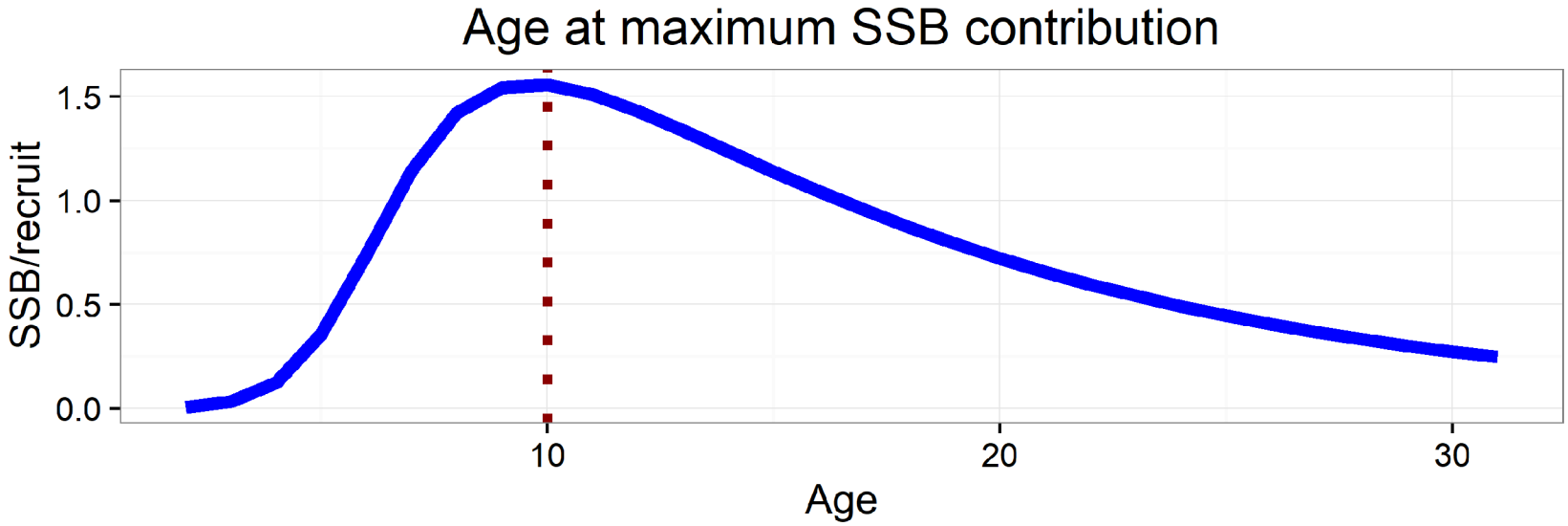
Baby pop-dy


Decay of a cohort (no fishing)
Abundance
1.00
0.75
0.50
0.25
10
20
30
Age

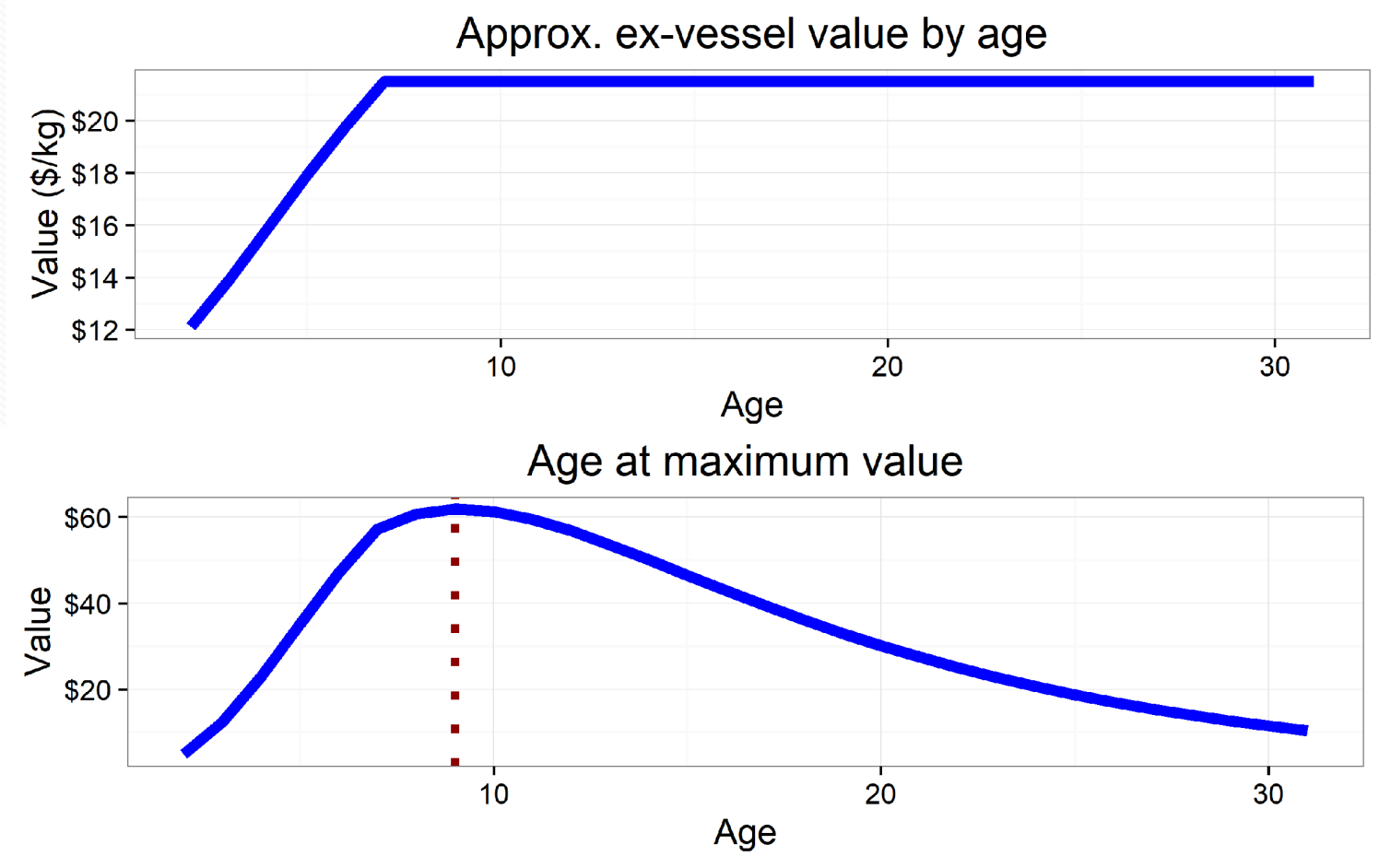

Mean increase in weight
Growth
40%
20%
0%
10
20
30
Age

Baby pop dy


Age at maximum production
Weight
1.5
1.0
0.5
10
20
30
Age


Age at maximum SSB contribution
SSB/recruit
1.5
1.0
0.5
0.0
10
20
30
Age

Ecosystem and Socioeconomic Profile (ESP)

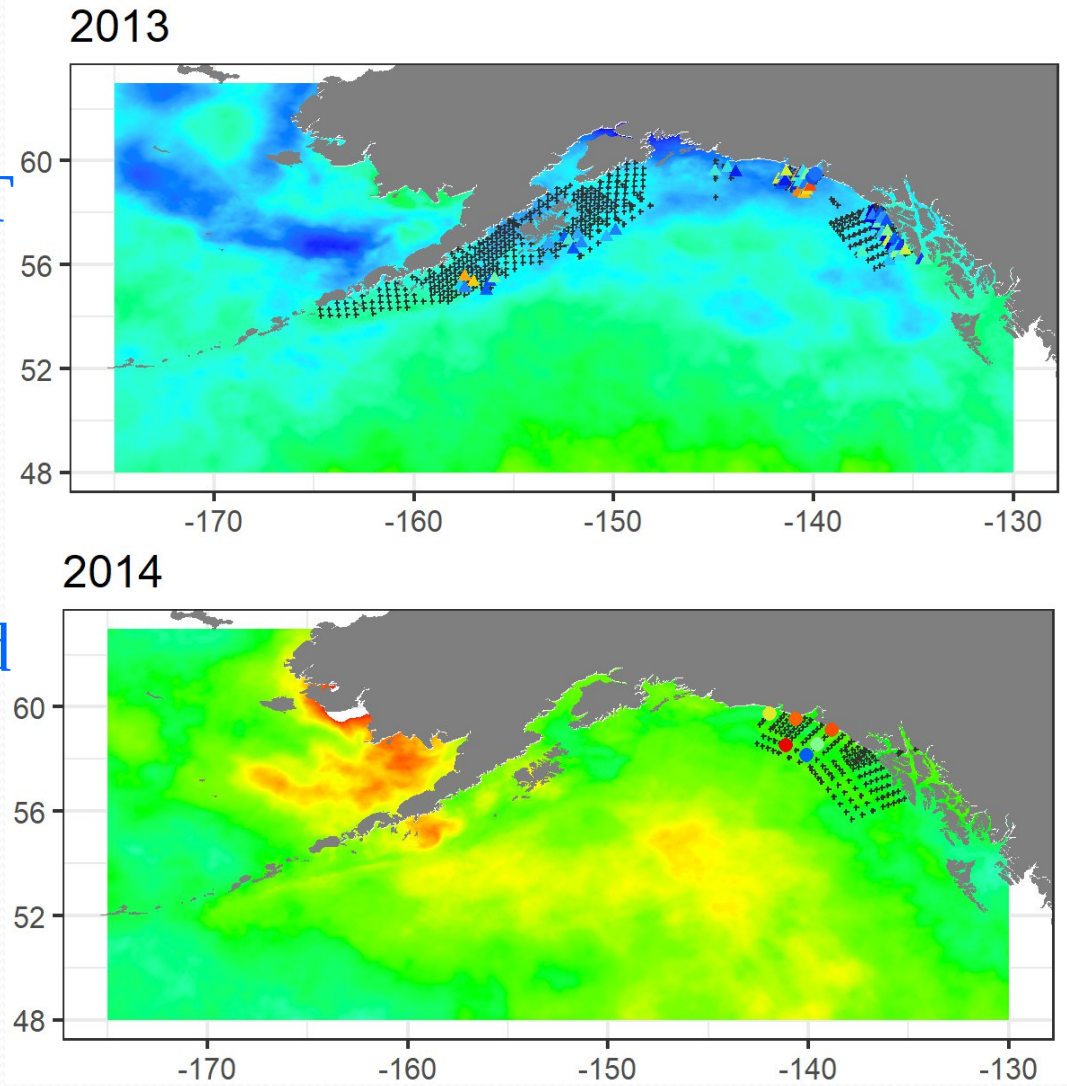


Ecosystem and Socioeconomic Profile (ESP)

	2003-2012 Average	2013	2014	2015	2016
Quantity K mt	8.59	7.83	6.70	6.06	5.86
Value M US$	$101.5	$96.2	$99.0	$91.0	$99.7
Price/lb US$	$5.36	$5.57	$6.70	$6.81	$7.72
H&G share	95%	97%	97%	98%	97%

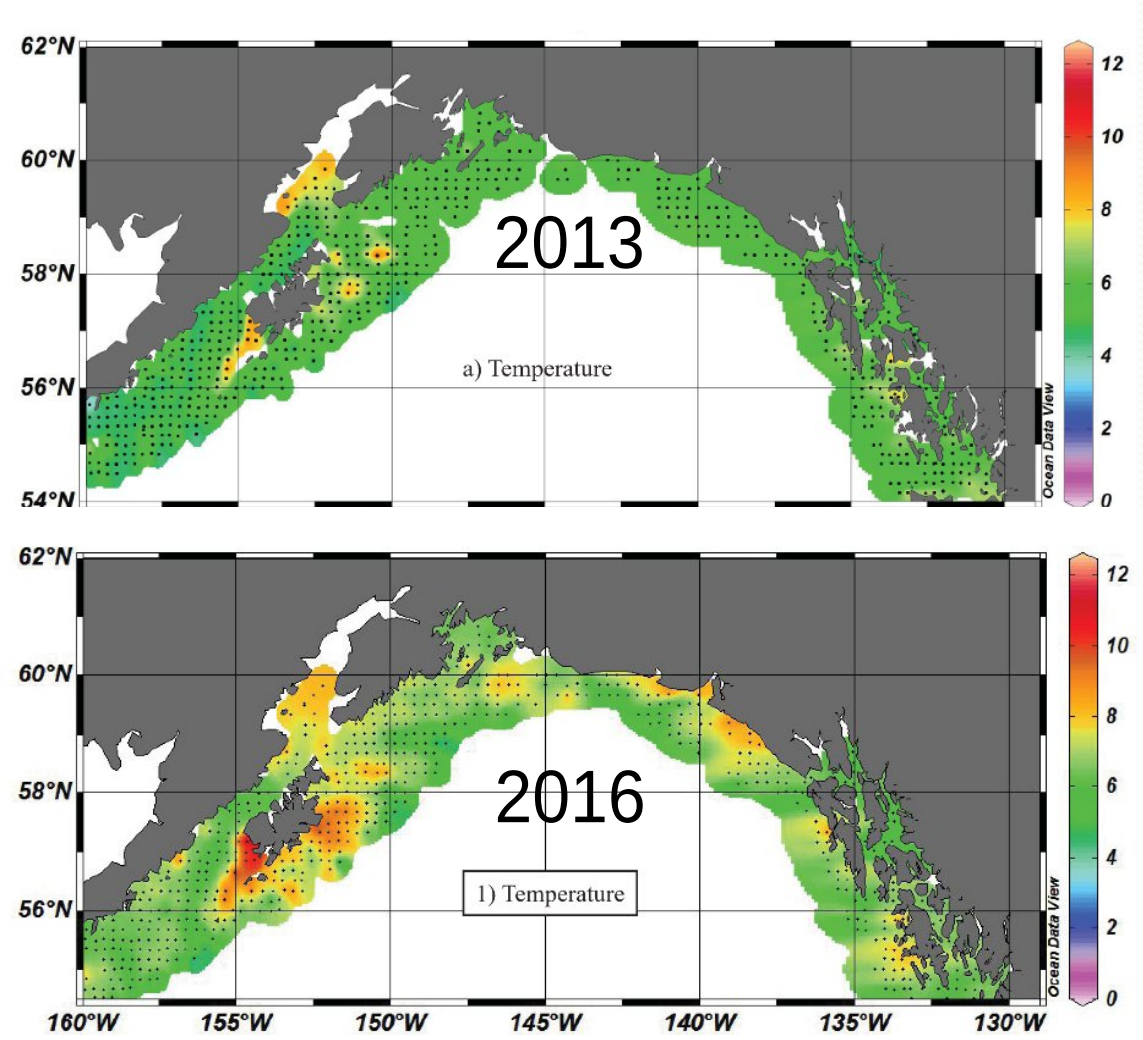
Ecosystem and Socioeconomic Profile (ESP)

- Big change in GOA SST
- Very warm offshore in the GOA in 2014 (and 2015)
- These conditions seemed to have favored sablefish larvae

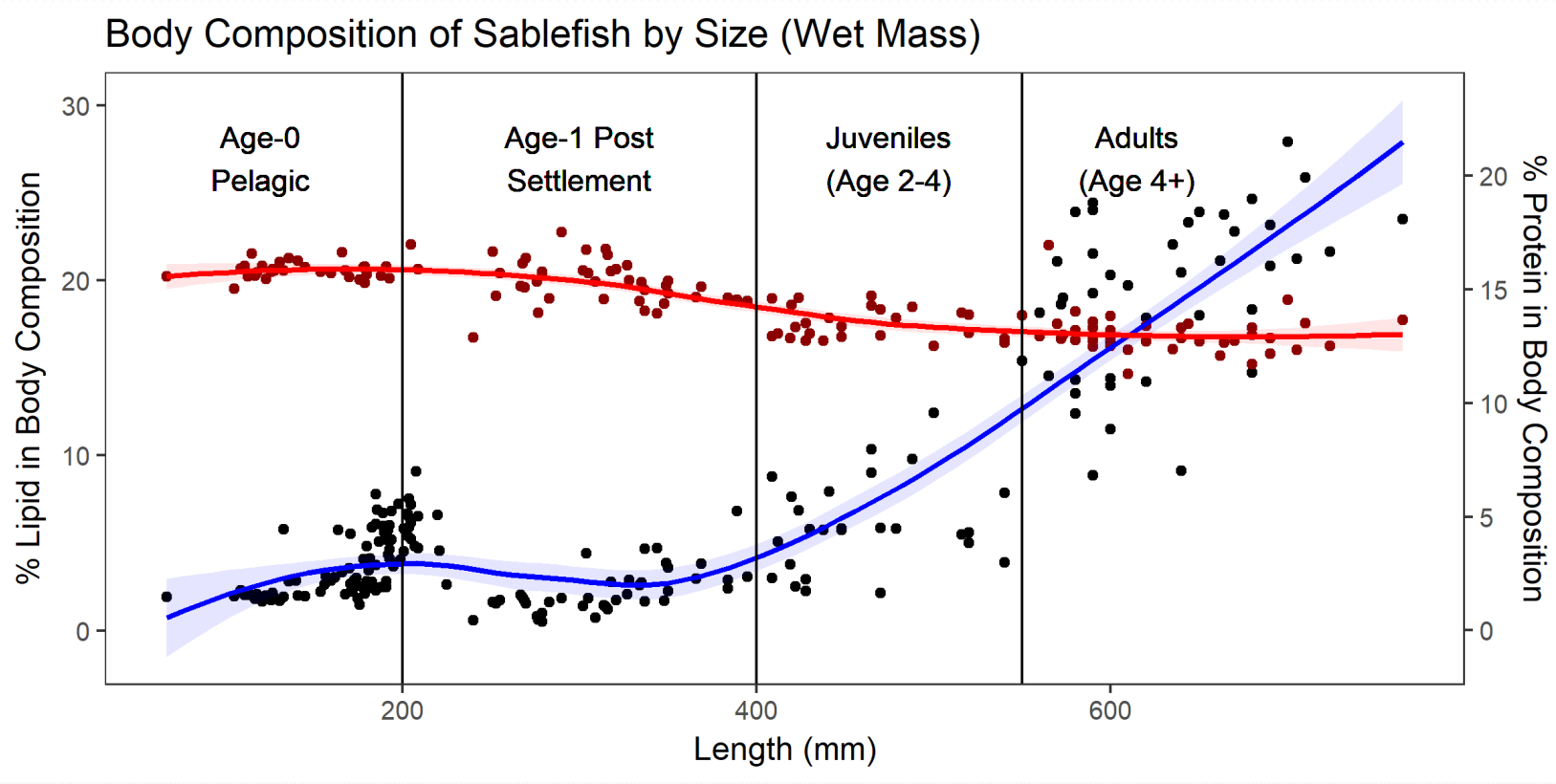


Ecosystem and Socioeconomic Profile (ESP)

- I'm not an oceanographer
- But warm SST seems to translate to warm bottom temperature later
- Could influence selectivity
- Moving out earlier because of food or preference



Ecosystem and Socioeconomic Profile (ESP)



Alternative ABC/ACL Considerations

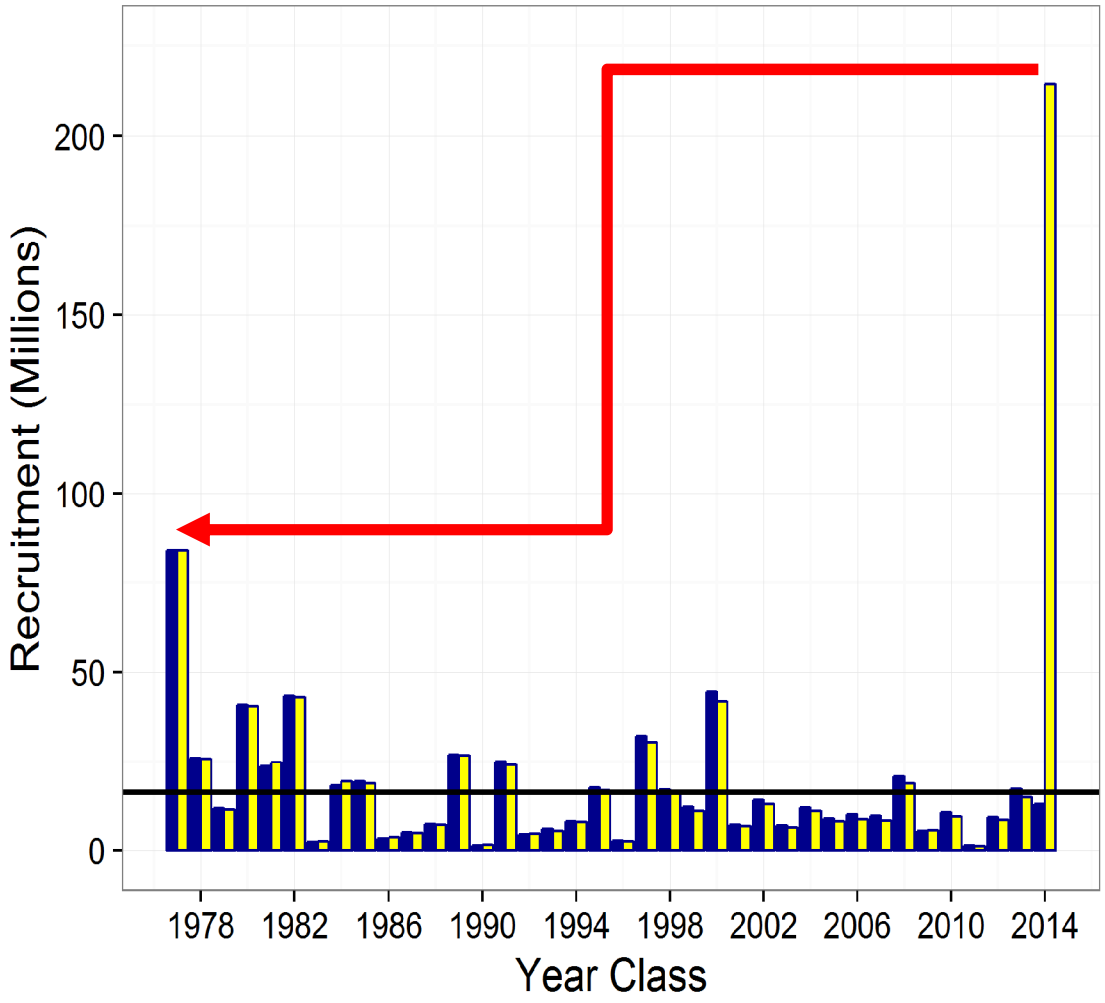
- Record high recruitment based on one year of survey age compositions
- Recruitment is 10 x higher than average
- GOA Trawl survey did not see it as strongly in 2017
- Spawning biomass is lower than last year
- See GOA Pacific cod 2012 year class
- Ecosystem variability is high(er)
- MaxABC would be similar to quota in 1993 (and scary in 2003)
- Allowing year class to grow will help build spawning biomass and economic value

Historic alternatives

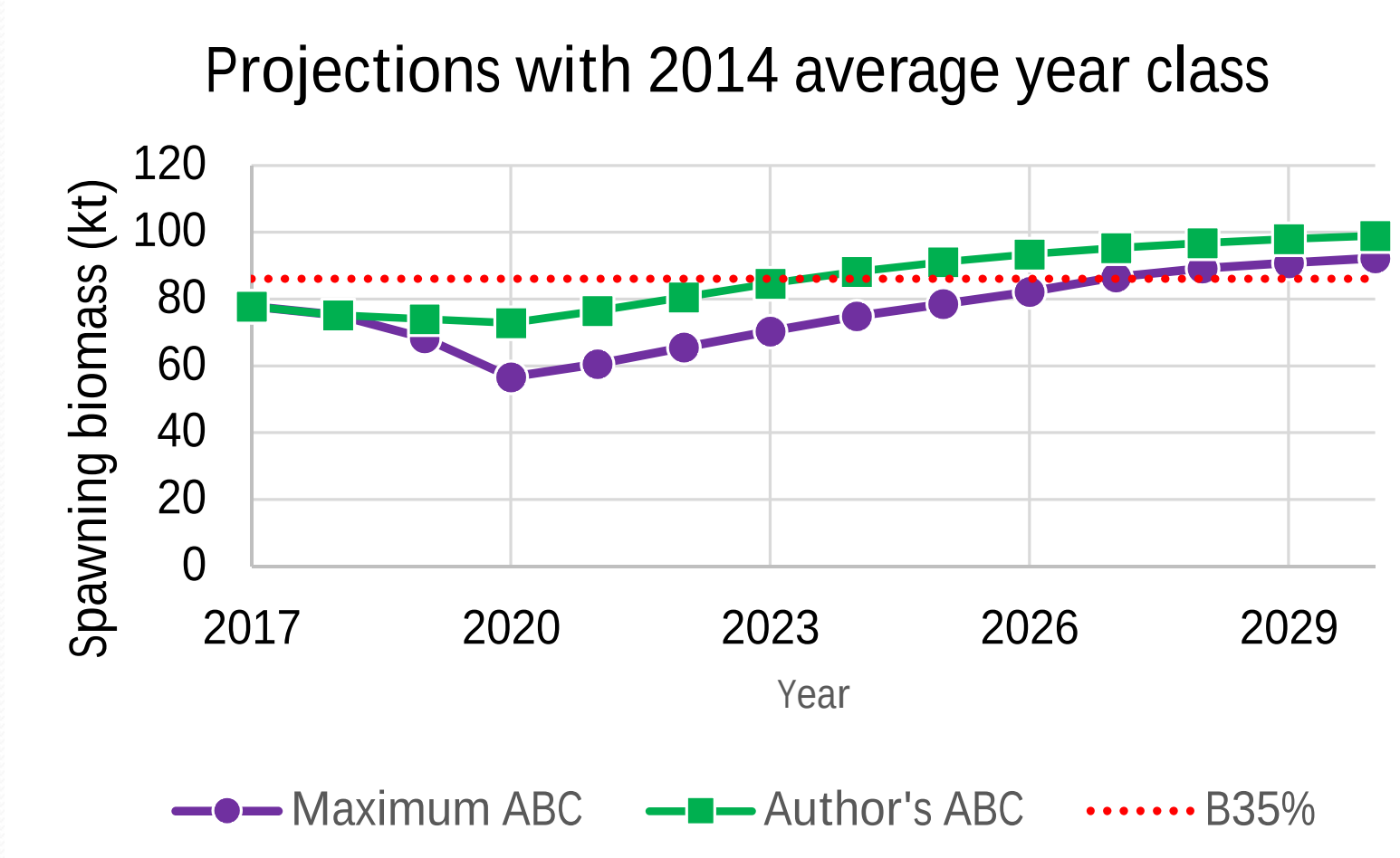
- The 2003 assessment max ABC was 25,400 (eerie)
- Because SSB had been low, the authors proposed two lower ABCs:
  - 23,000 t
    - Stock is now at target (B_{40}), but expected to decline
  - 20,700 t
    - Similar to prior year, consistent with the abundance trend
- Lack of author recommended ABC led to a careful and deliberate discussion of all the issues

Alternative ABC/ACL

- Set 2014 year class = 1977 year class
- Still 2.5 x average
- 40% of estimated value
- Changes max ABC from 25 kt to 15 kt



Considering risk



2018 ABC Corrected For Depredation

Area	AI	BS	WG	CG	WY*	EY*	Total
2017 ABC	1,783	1,318	1,457	4,608	1,550	2,793	13,509
2018 ABC	2,030	1,501	1,659	5,246	1,765	3,179	15,380
Run with whale corrections for survey and fishery							
3 year average depredation	37	33	101	77	81	43	371
Ratio of 2017 ABC/2016 ABC = 1.139							
Deduct 3 year average * 1.139							
Deduct 3 year adjusted average	-42	-37	-115	-88	-92	-49	-423
2018 ABC_{WC}	**1,988**	**1,464**	**1,544**	**5,158**	**1,672**	**3,131**	**14,957**
Change from 2017	15%	15%	14%	14%	14%	14%	14%

ABC summary

- LL survey up substantially from low in 2015
- Fishery CPUE index at time series low in 2016
- Trawl survey almost double from 2015
- 36% unfished spawning biomass
- ABC_w 2017: 13,083 t
- ABC 2018 (Max): 25,583 t (vs. 13,688 t projected)
  - 87 % **increase** from 2017 (versus 1% projected)
- Author recommended ABC_w 14,957 (+14%)

Apportionment

- CIE not concerned with static apportionment
- We believe it is best to stay put (and we have no new alternatives prepared)
- MSEs and spatial work continue
- Recent spatial operating model with sablefish-like model shows maximum yield can be achieved with a wide range of apportionments
- SSC agreed at October meeting (while noting the old apportionment has diverged quite a bit)

Recommending…

- Continuing with the fixed apportionment from 2017 fishery

Area	2017 ABC	Standard apportionment for 2018 ABC	**Recommended fixed apportionment for 2018 ABC***	**Difference from 2017**
Total	13,509	15,380	**15,380**	14%
Bering Sea	1,318	2,686	**1,501**	14%
Aleutians	1,783	2,225	**2,030**	14%
Gulf of Alaska (subtotal)	10,408	10,469	**11,849**	14%
Western	1,457	1,533	**1,659**	14%
Central	4,608	4,201	**5,246**	14%
W. Yakutat**	1,550	1,765	**1,765**	14%
E. Yak. / Southeast**	2,793	2,970	**3,179**	14%

Future

- Re-visiting selectivities
- Re-considering growth
- Modeled fishery CPUE index
- Continue spatial modeling
- Continue investigating recruitment processes (GOAIERP Synthesis April 2018 4th special issue)
- Refine Ecosystem and Socioeconomic Profile (ESP)

Questions?