Gulf of Alaska SAFE report

Report of the
Gulf of Alaska Groundfish
Plan Team meeting
Nov 13th-16th, 2018

GOA Plan Team Members

James Ianelli (co-chair)	AFSC/REFM
Chris Lunsford (co-chair)	AFSC/ABL
James Armstrong	NPFMC
Ben Williams	ADFG
Nate Nichols	ADFG
Jan Rumble	ADFG
Dan Lew	AFSC/REFM
Pete Hulson	AFSC/ABL
Sandra Lowe	AFSC/REFM
Paul Spencer	AFSC/REFM
Craig Faunce	AFSC/FMA
Kresimir Williams	AFSC/RACE
Obren Davis	AKRO

Overview

"off" year for GOA, NMFS bottom trawl survey slated for 2019

8 "full" assessments reviewed (5 in Tier 3)

8 "partial" assessments (5 also in Tier 3)

6 stock complex assessmentss scheduled for future years

none in tier 3

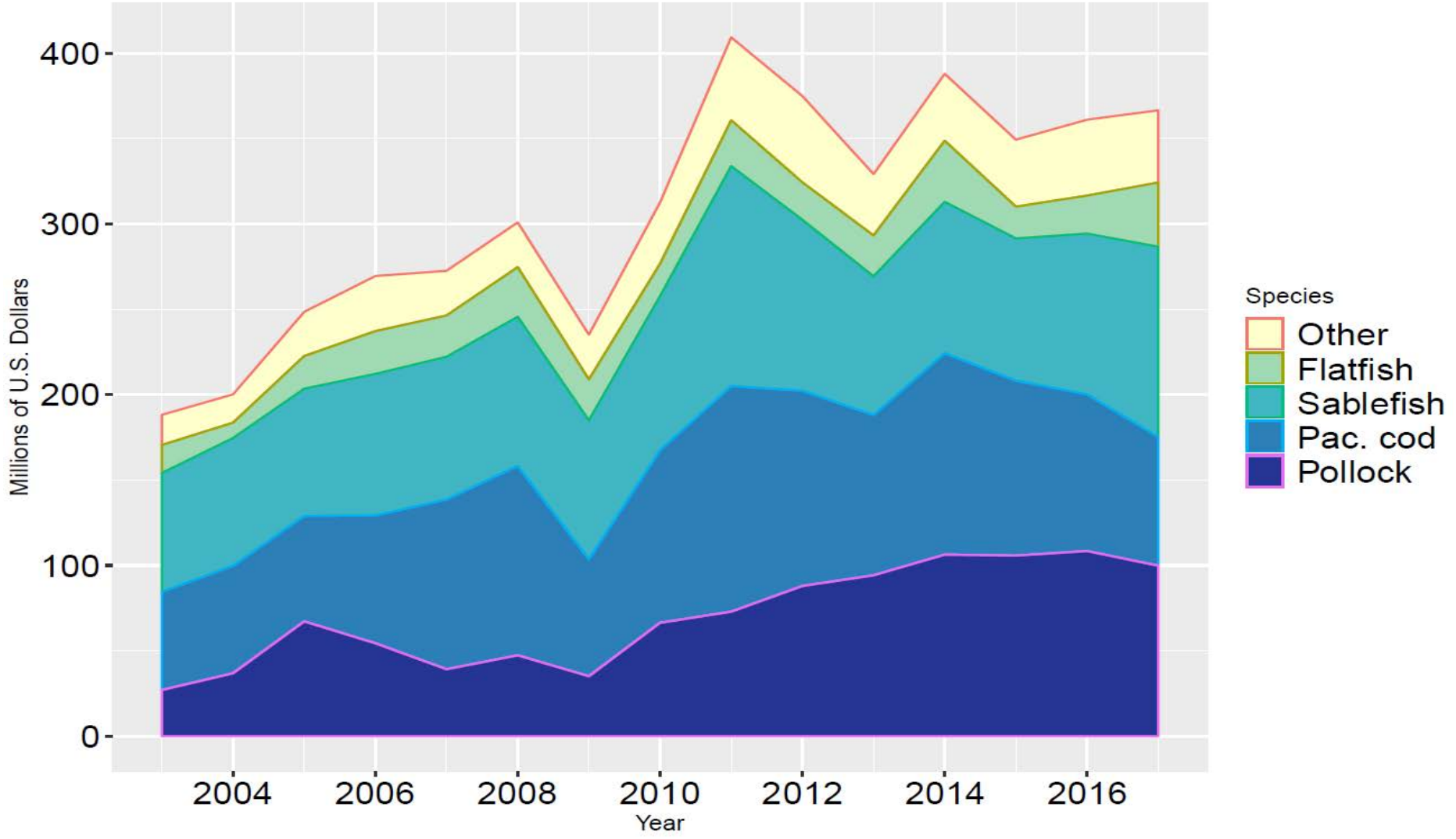
- Document layout and links…

Econ and Ecosystem summary in SAFE Introduction

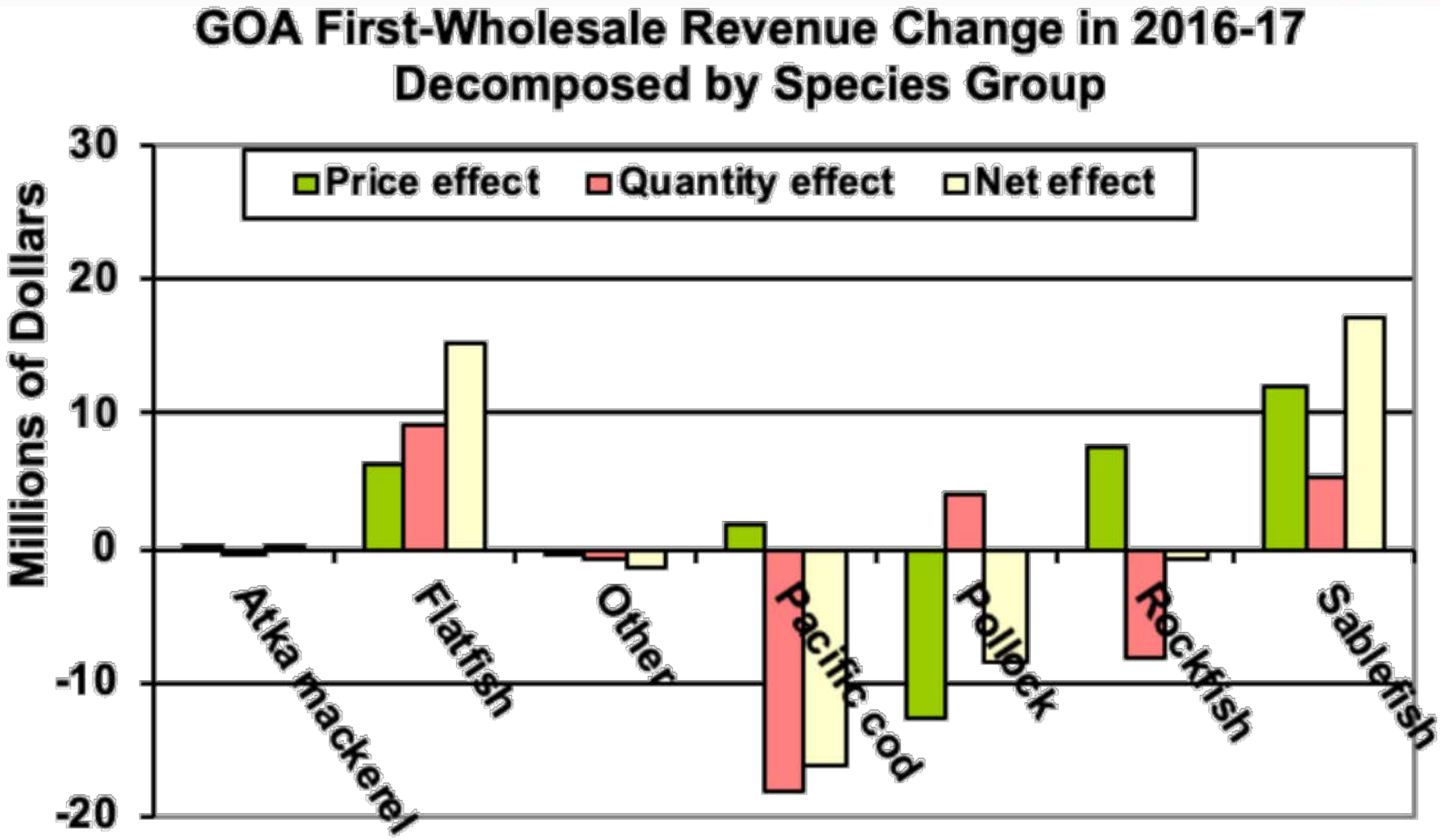
GOA Ecosystem SAFE…

- an executive summary with separate Eastern and Western GOA ecosystem report cards showing and physical, environmental, ecosystem, fishing, and fisheries trends,
- a recap of the 2017 Ecosystem state with updated data sources,
- a current (2018) Western and Eastern GOA ecosystem state summary, and
- a listing of the ecosystem indicators.

GOA Economic synopsis



Revenue changes (and source)

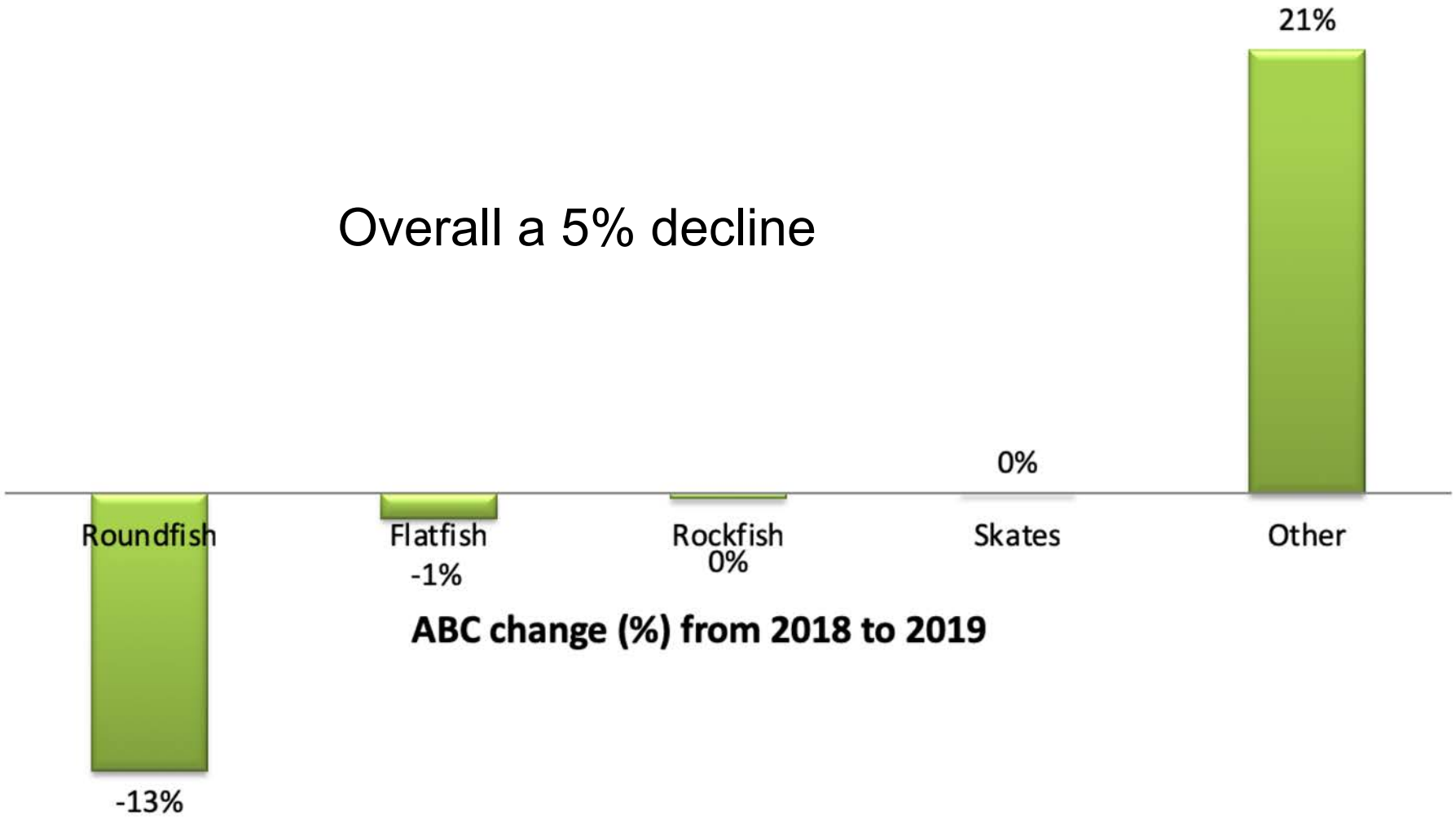


Ecosystem component

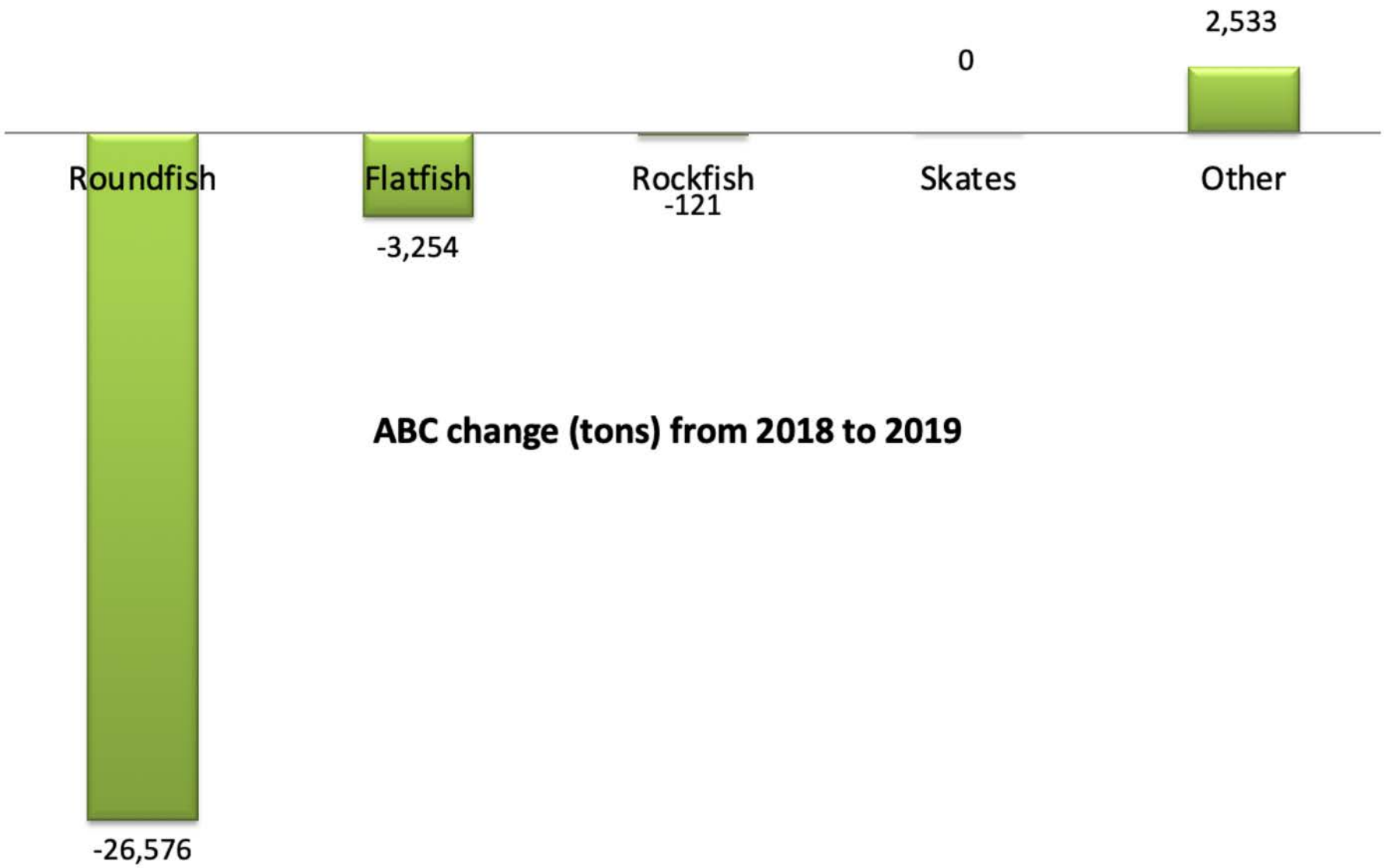
- **This year the Team received a report on GOA forage fish from Olav Ormseth that included information on squids**

2018-2019 ABC change

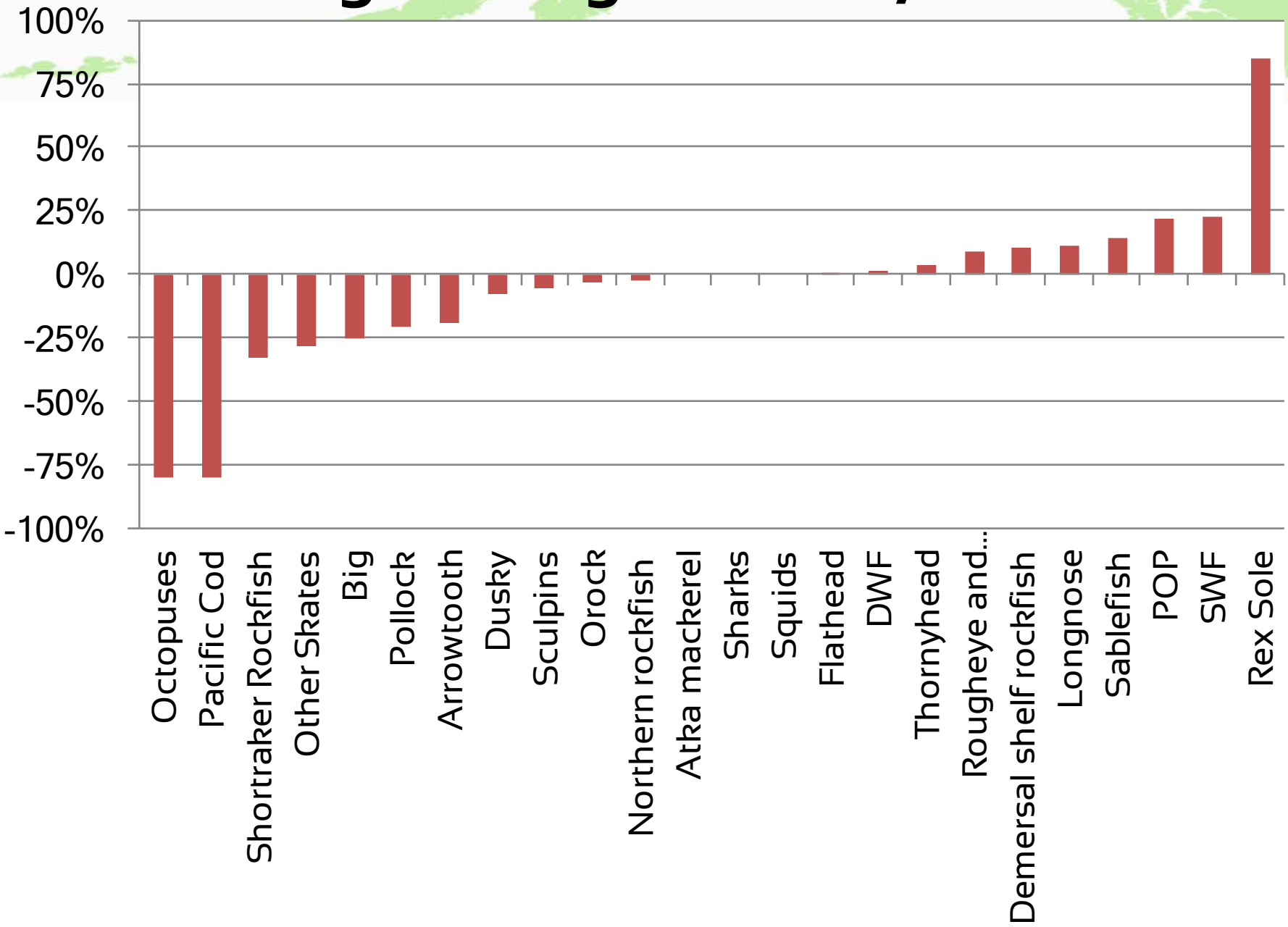
Overall a 5% decline



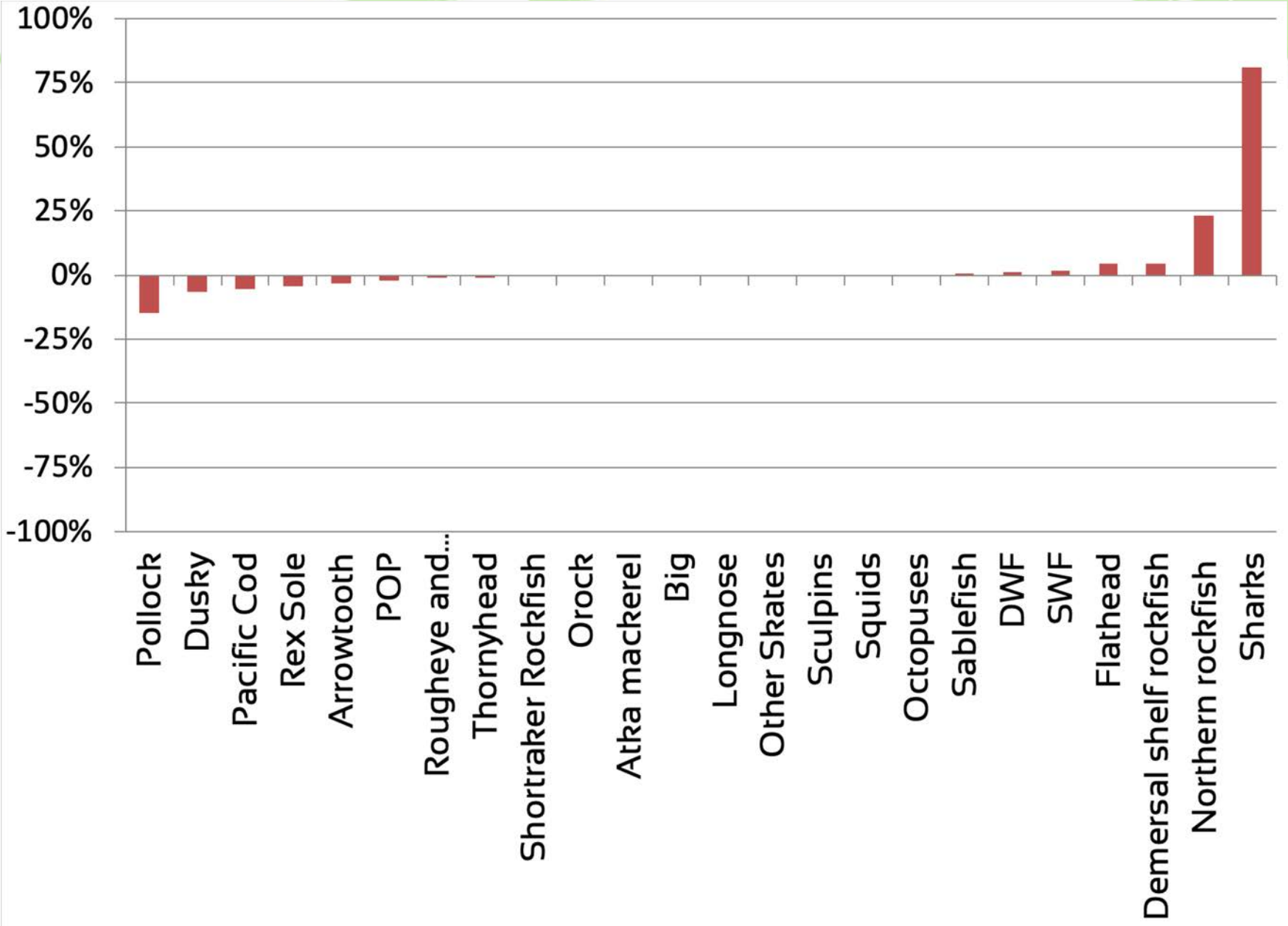
2018-2019 ABC change



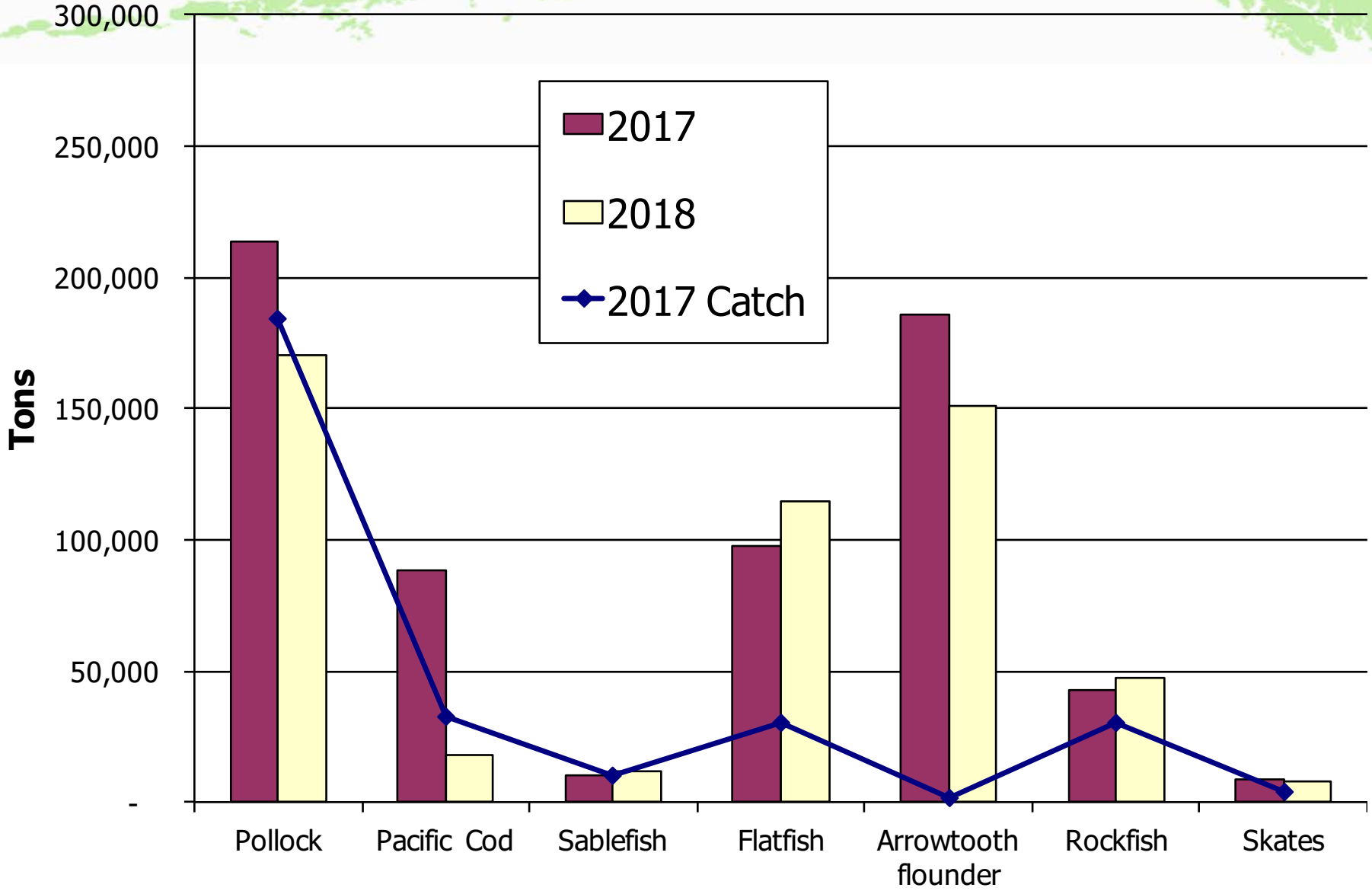
Percentage change in ABC, 2017-2018



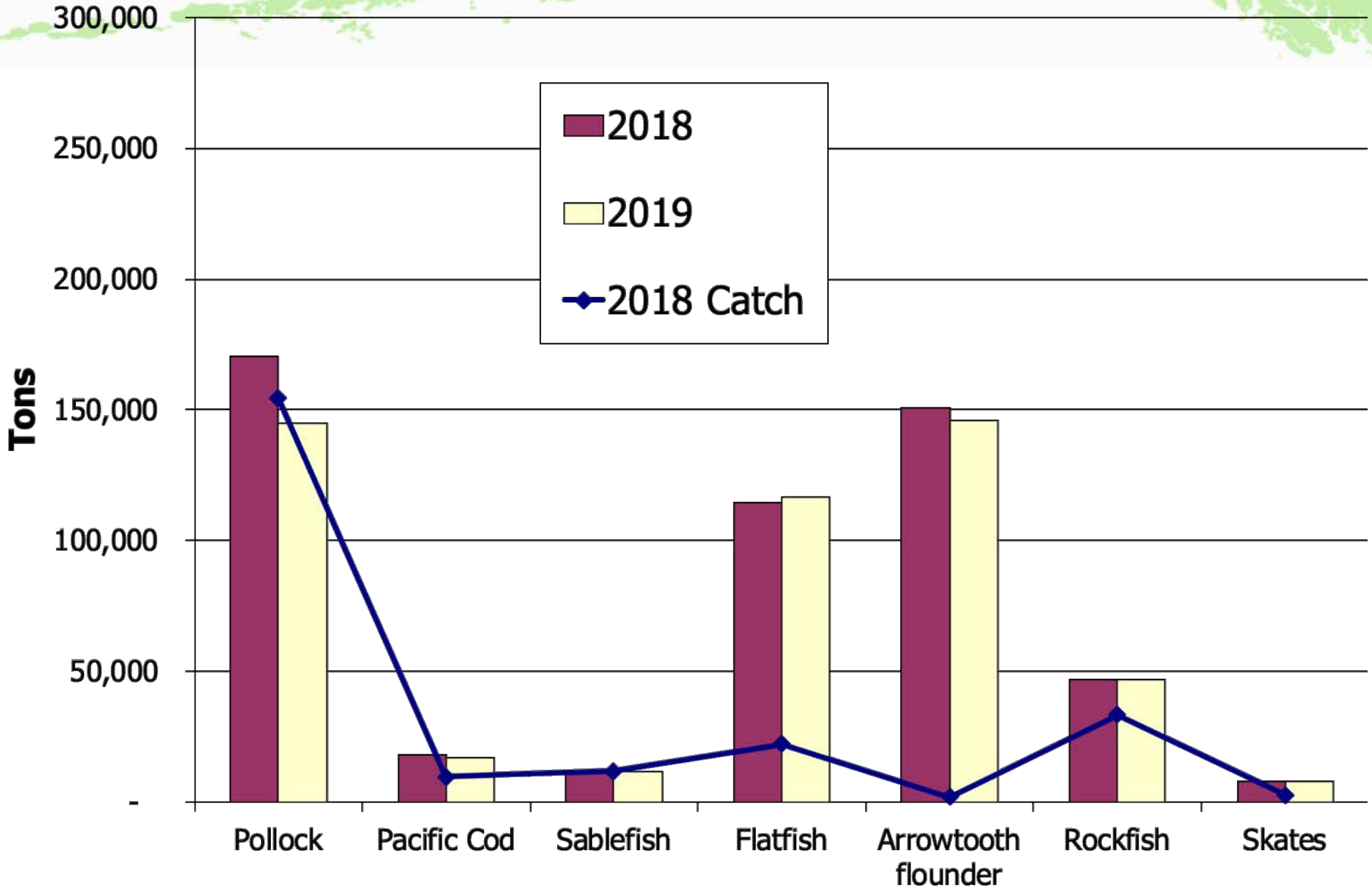
Percentage change in ABC, 2018-2019



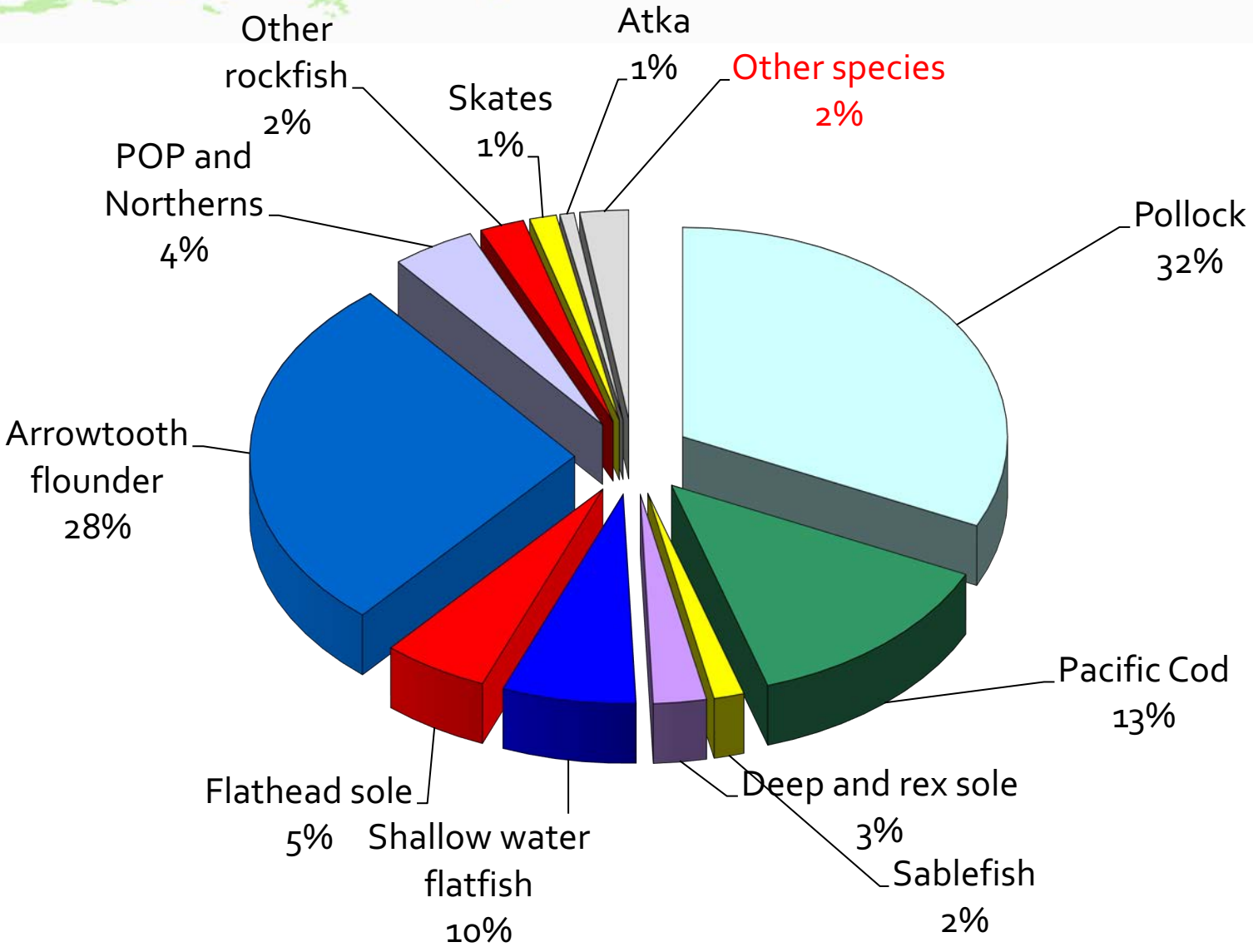
GOA Catch and ABC levels



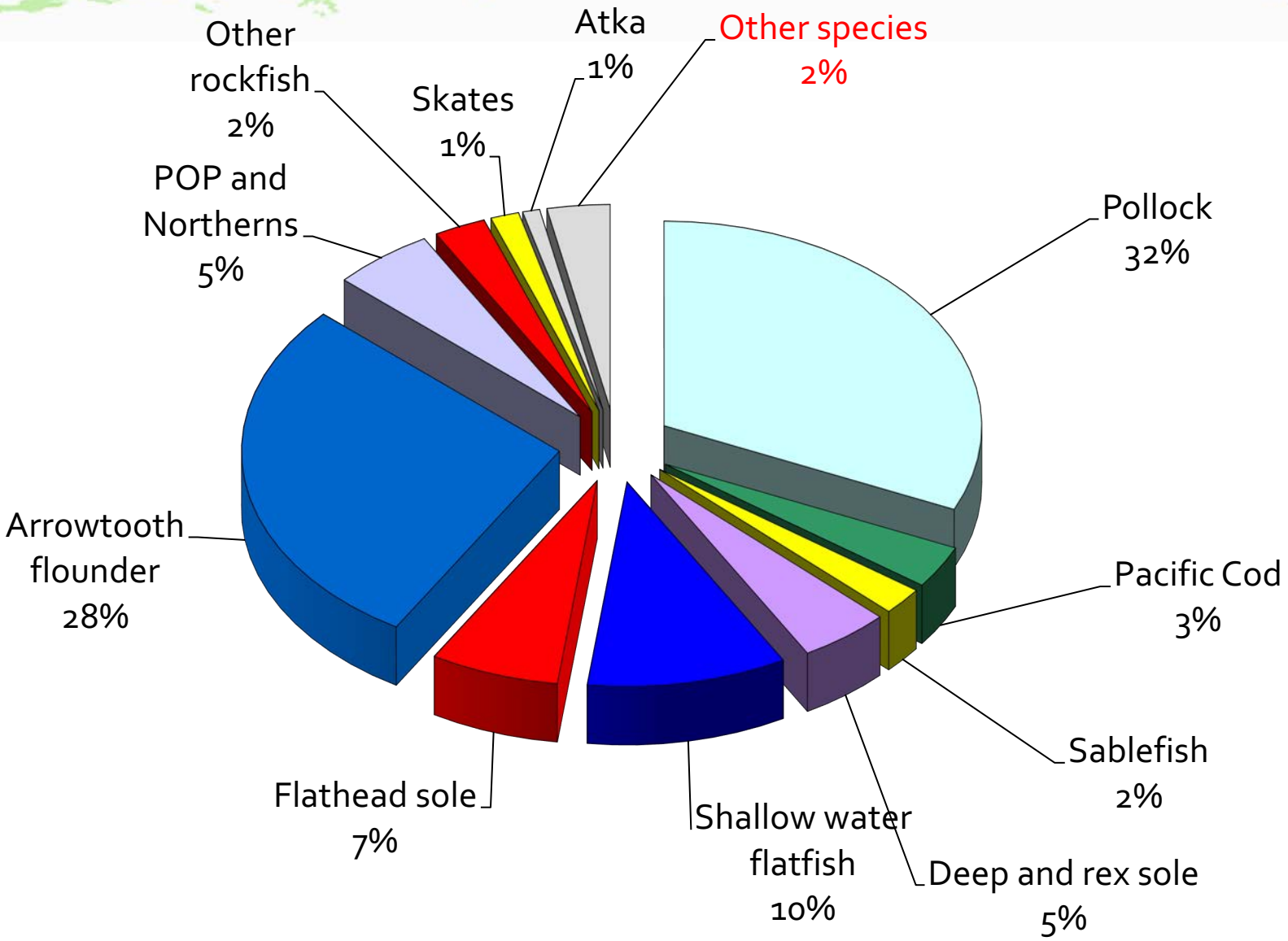
GOA Catch and ABC levels



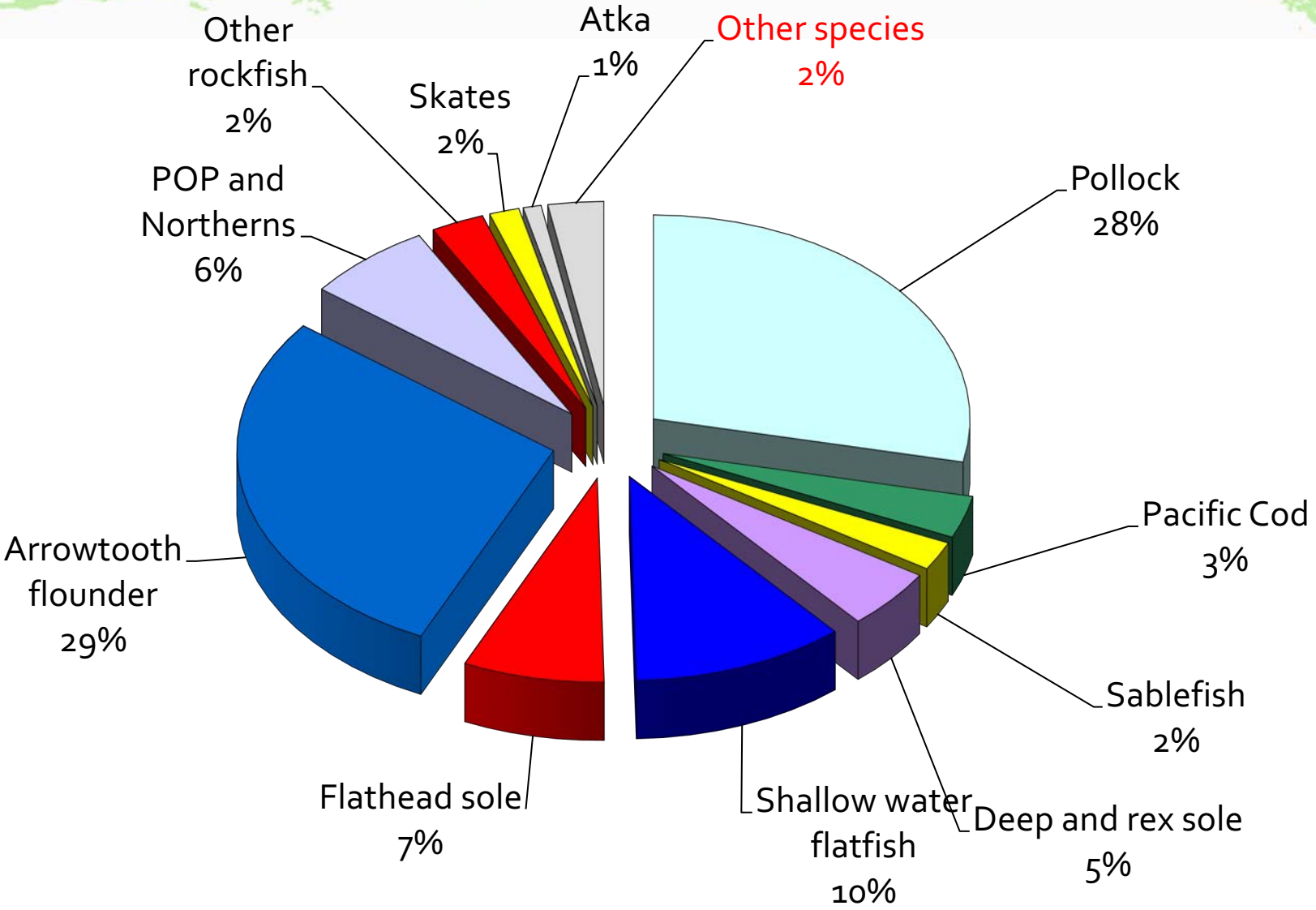
GOA 2017 ABC's: 667,877 t



GOA 2018 ABC's: 536,925 t



GOA 2019 ABC's: 509,507 t



Overall a 30% drop from 2016 aggregate ABC

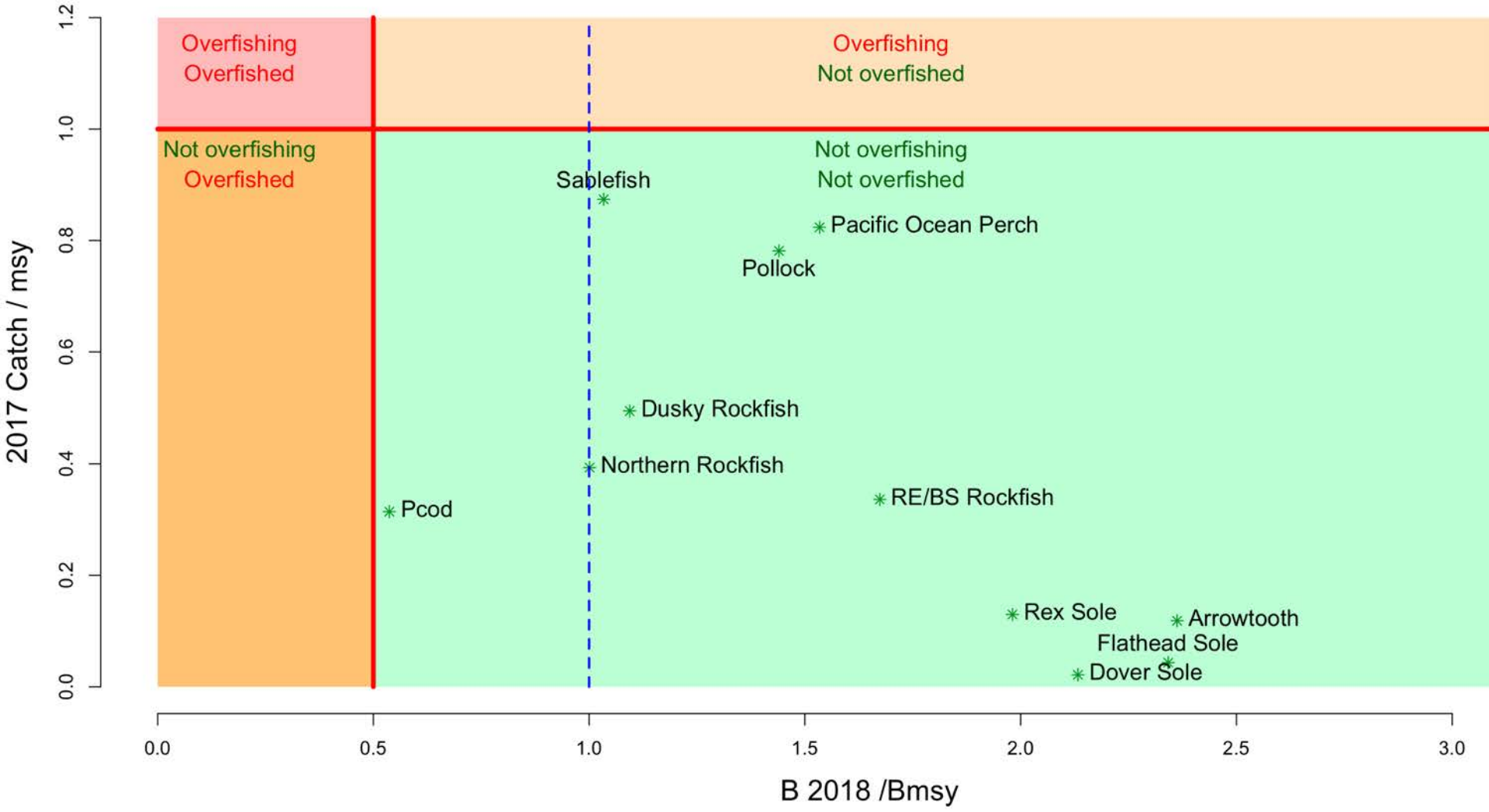
ABC / TAC

Team recommendations where ABC <maximum permissible:

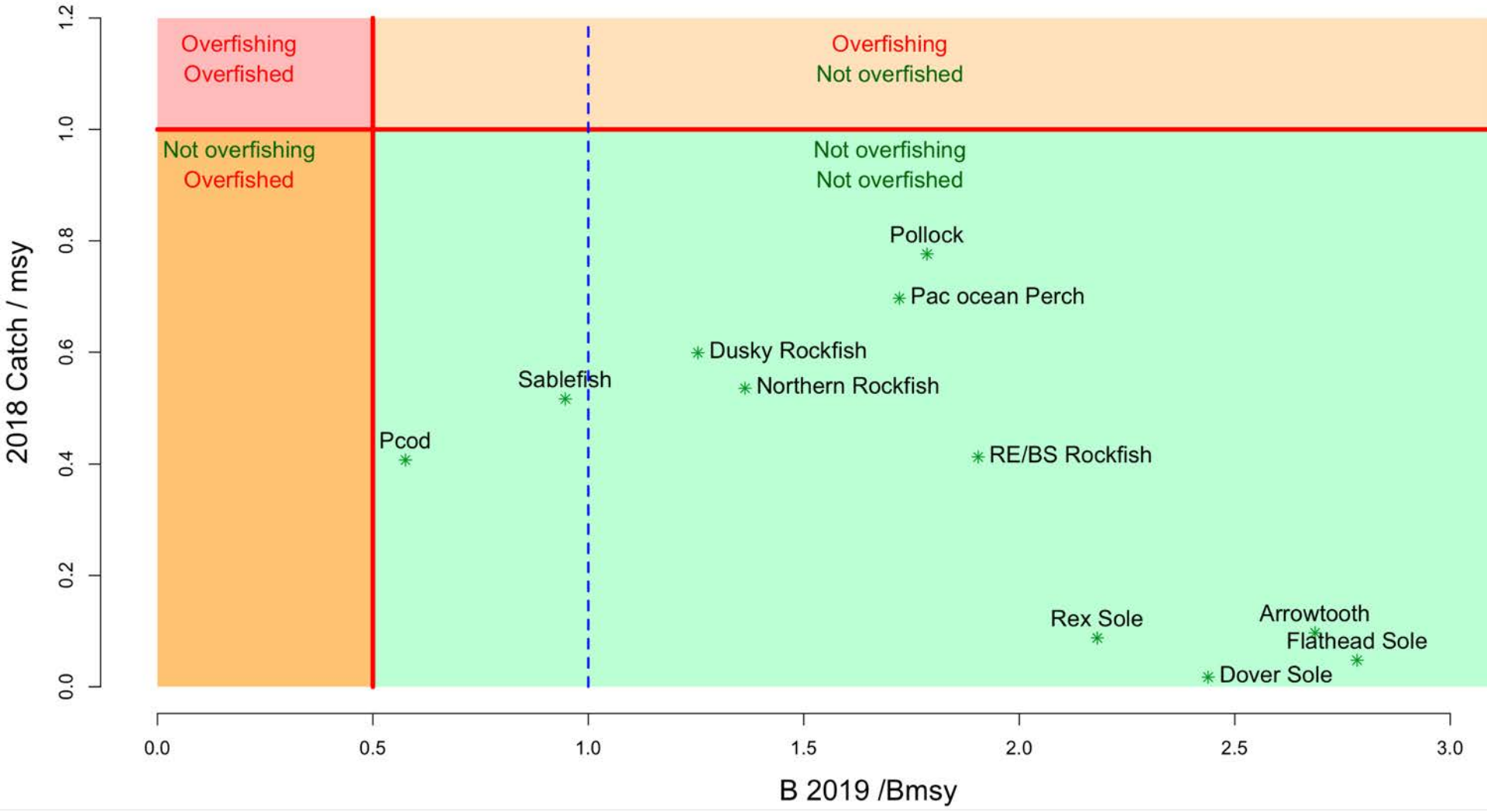
Table 3. Maximum permissible fishing mortality rates and ABCs as defined in Amendment 56 to the GOA and BSAI Groundfish FMPs, and the Plan Team's 2019 and 2020 recommended fishing mortality rates and ABCs, for those species whose recommendations were below the maximum permissible.

		2019			
Species	Tier	*Max* F_{ABC}	*Max* ABC	F_{ABC}	ABC
Pollock (W/C/WYK)	3a	0.27	158,518	0.22	135,850
Pacific cod	3b	0.29	19,655	0.25	17,000
Sablefish	3b	0.081	21,704	0.044	11,571
Demersal shelf rockfish	4, 6	0.026	333	0.02	261

Stock status summary last year

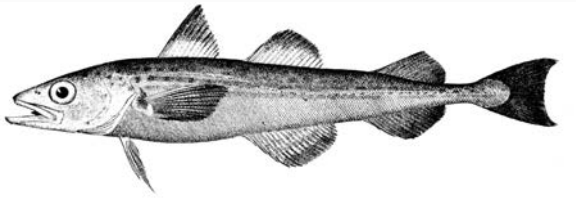


Stock status summary **this** year



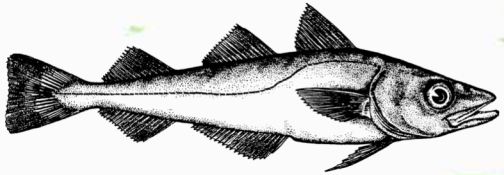
Species overviews

1. 2018 ABC/Catch and recommended changes
2. Highlights
   - New data
   - Analytic approach (changes)
3. Stock status and trend
4. ABC/OFL
   - Tier history and recommendations
   - 2019, 2020 maxABC; recommended ABC



ABC

Species	2018 Catch	2018	2019	Change
Pollock	154,286	170,265	144,623	down 25,642 (15%)
Pacific Cod	9,595	18,000	17,000	down 1,000 (6%)
Sablefish	11,716	11,505	11,571	up 66 (1%)
Flatfish	22,053	114,712	116,562	up 1,850 (2%)
Arrowtooth flounder	2,045	150,945	145,841	down 5,104 (3%)
Rockfish	33,425	47,067	46,946	down 121 (0%)
Atka mackerel	1,431	4,700	4,700	same (0%)
Skates	2,786	7,804	7,804	same (0%)
Other Species	3,616	11,927	14,460	up 2,533 (21%)
Total	240,953	536,925	509,507	down 27,418 (5%)



1. GOA pollock overview

Changes to the assessment model

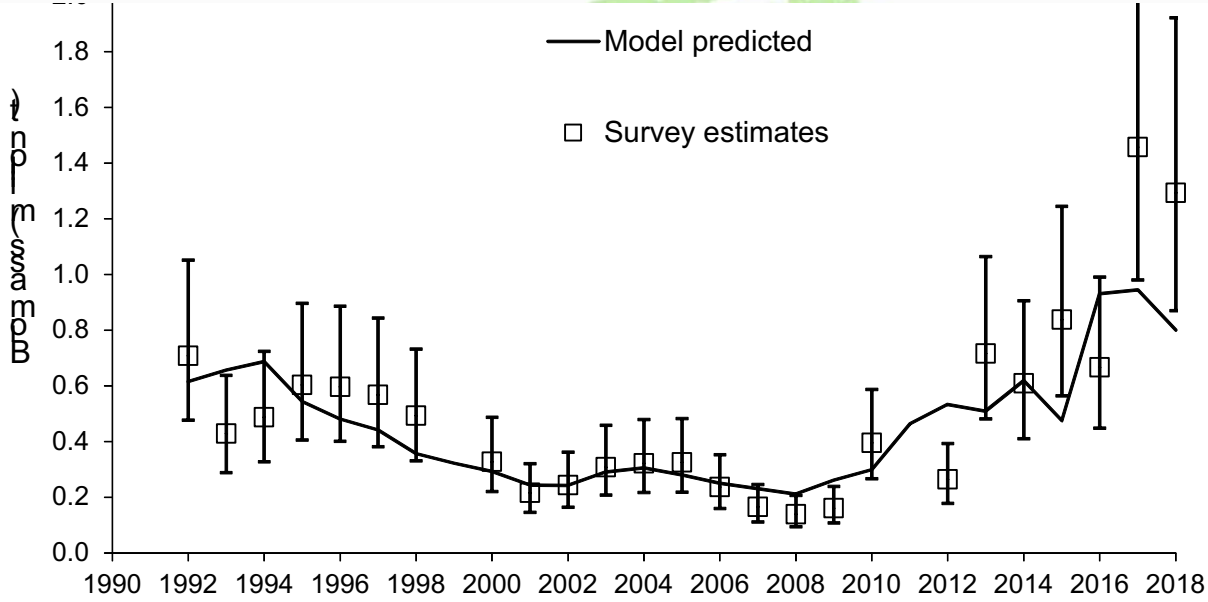
- Net-selectivity corrected acoustic estimates

- **Concerns:**
  - Poor model fit
  - Population dominated by single year class
  - Lack of recruitment
  - Unfavorable environmental conditions

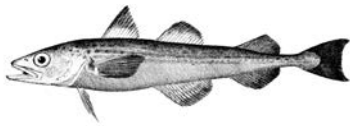
- **Positives**:
  - Minimal retrospective pattern
  - Evidence of 2017 year class (above average)
  - Full suite of surveys will occur next year

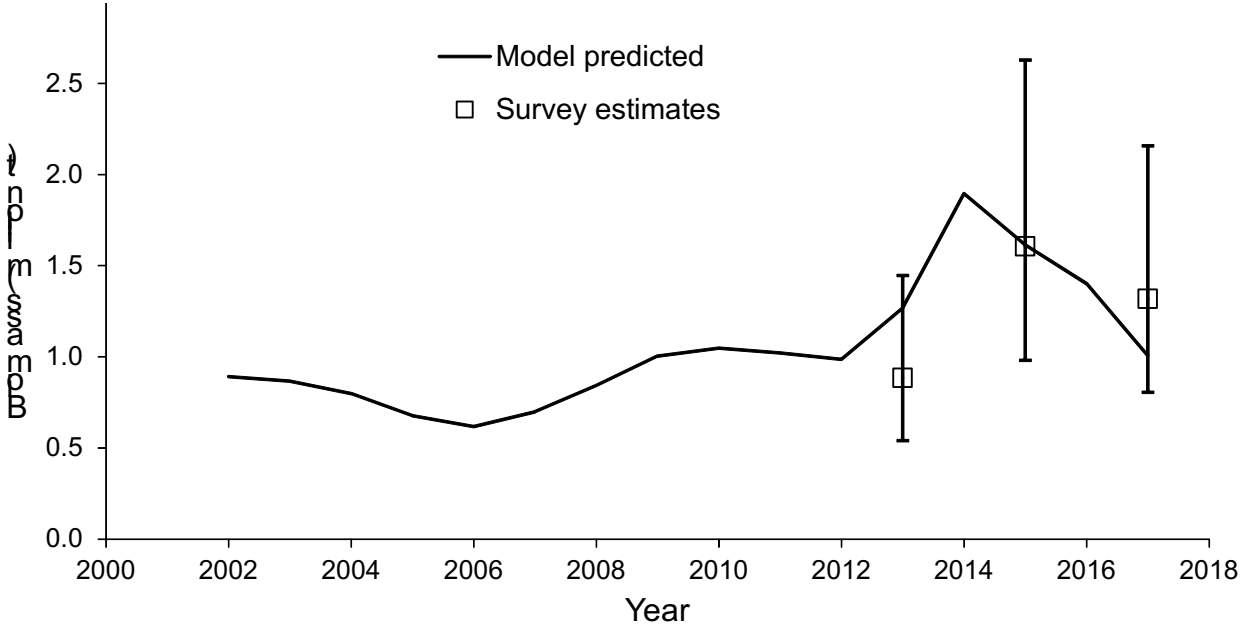
Shelikof Strait EIT survey, 1992-2018

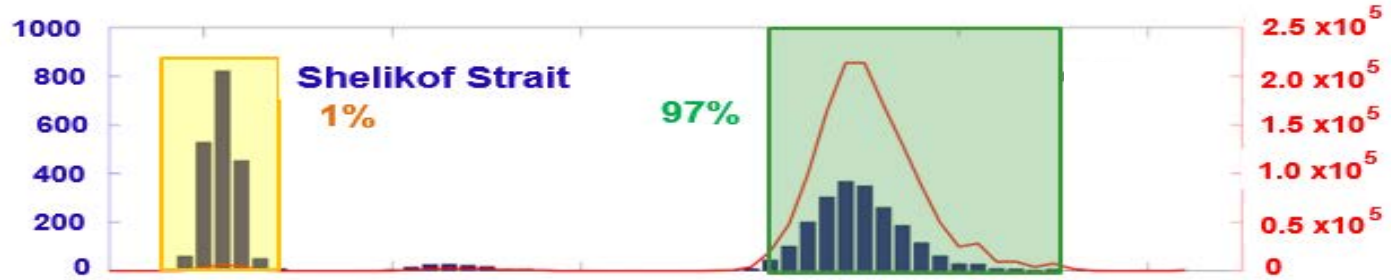
GOA pollock



Summer EIT survey
2013, 2015, 2017



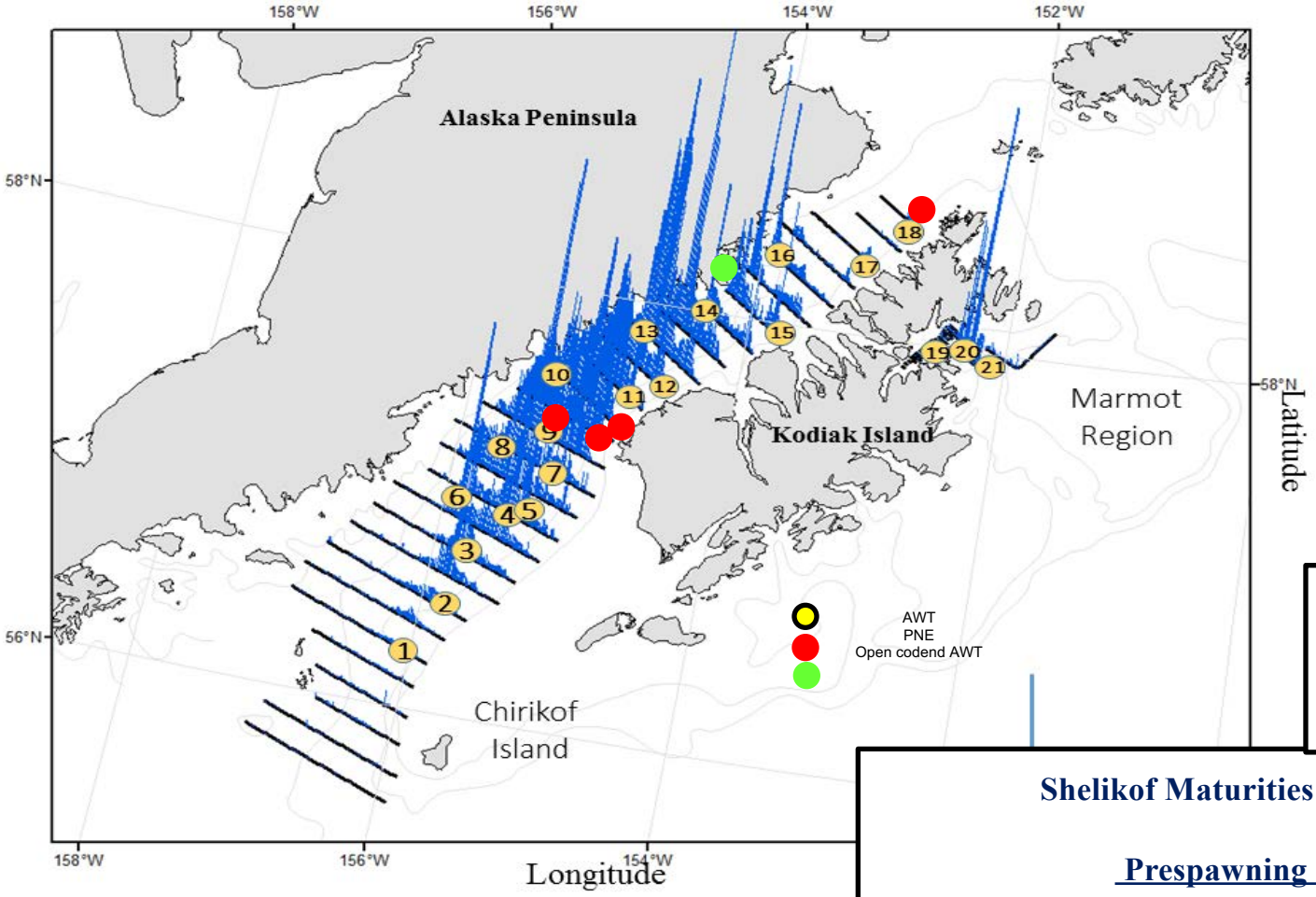




Shelikof Strait

March 15-21

1,320,867 t

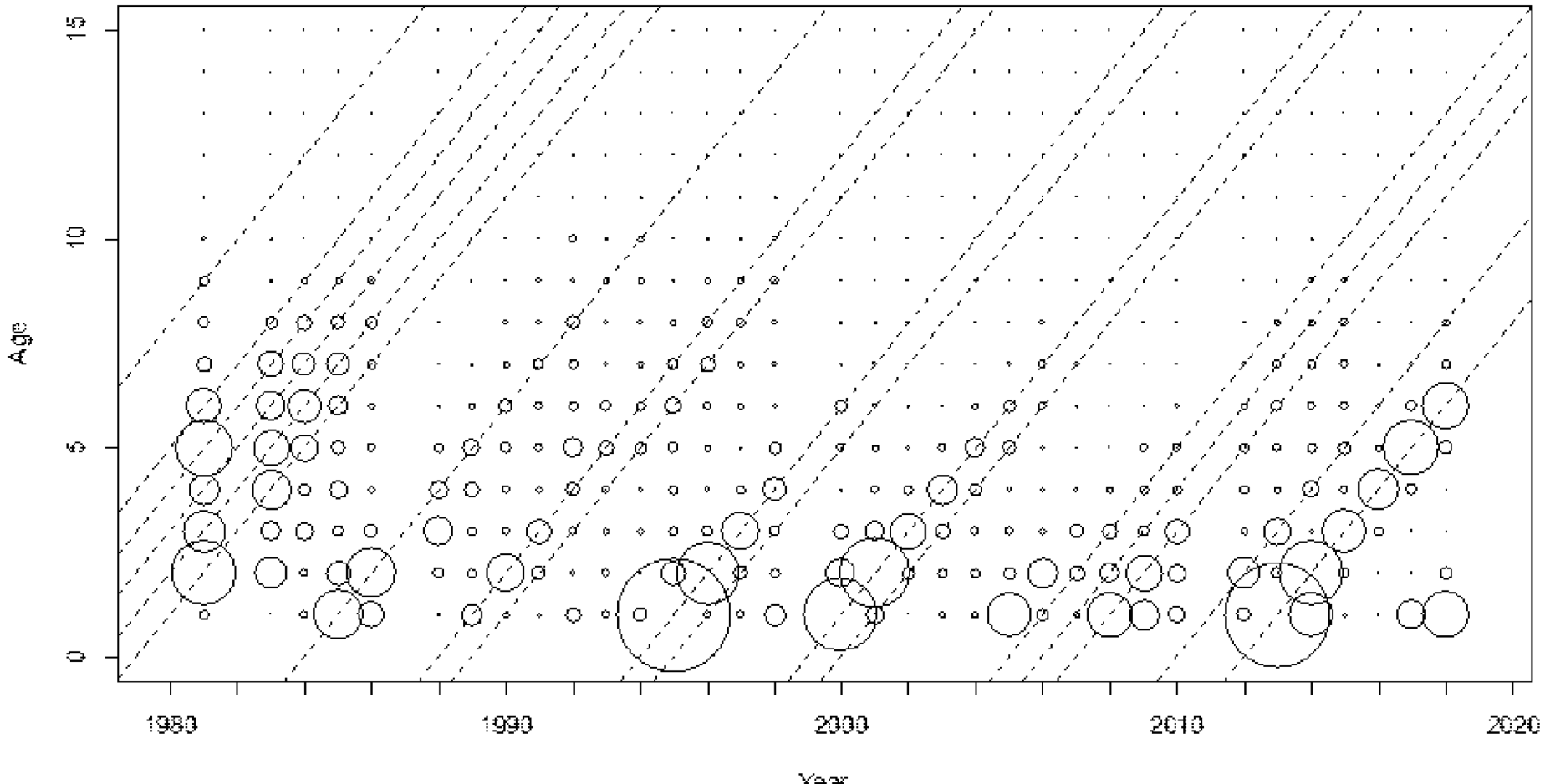


18 tows
871 nmi of trackline

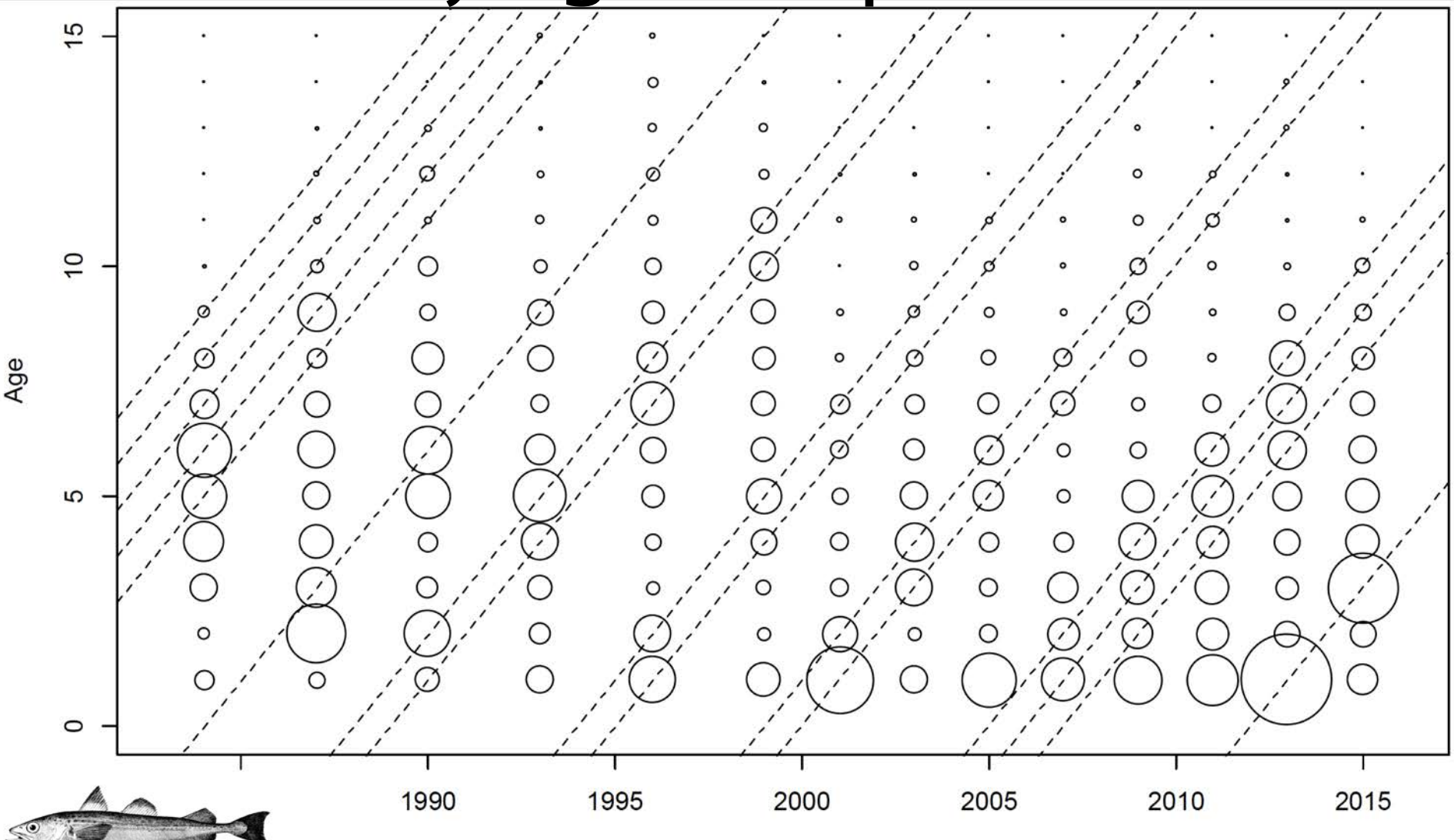
Shelikof Maturities (females > 40cm)

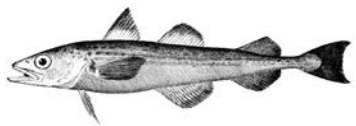
	Prespawning	Spawning	Spent	n
Shelikof	30%	24%	44%	383

Shelikof Strait survey age compositions, 1981-2018; GOA Pollock

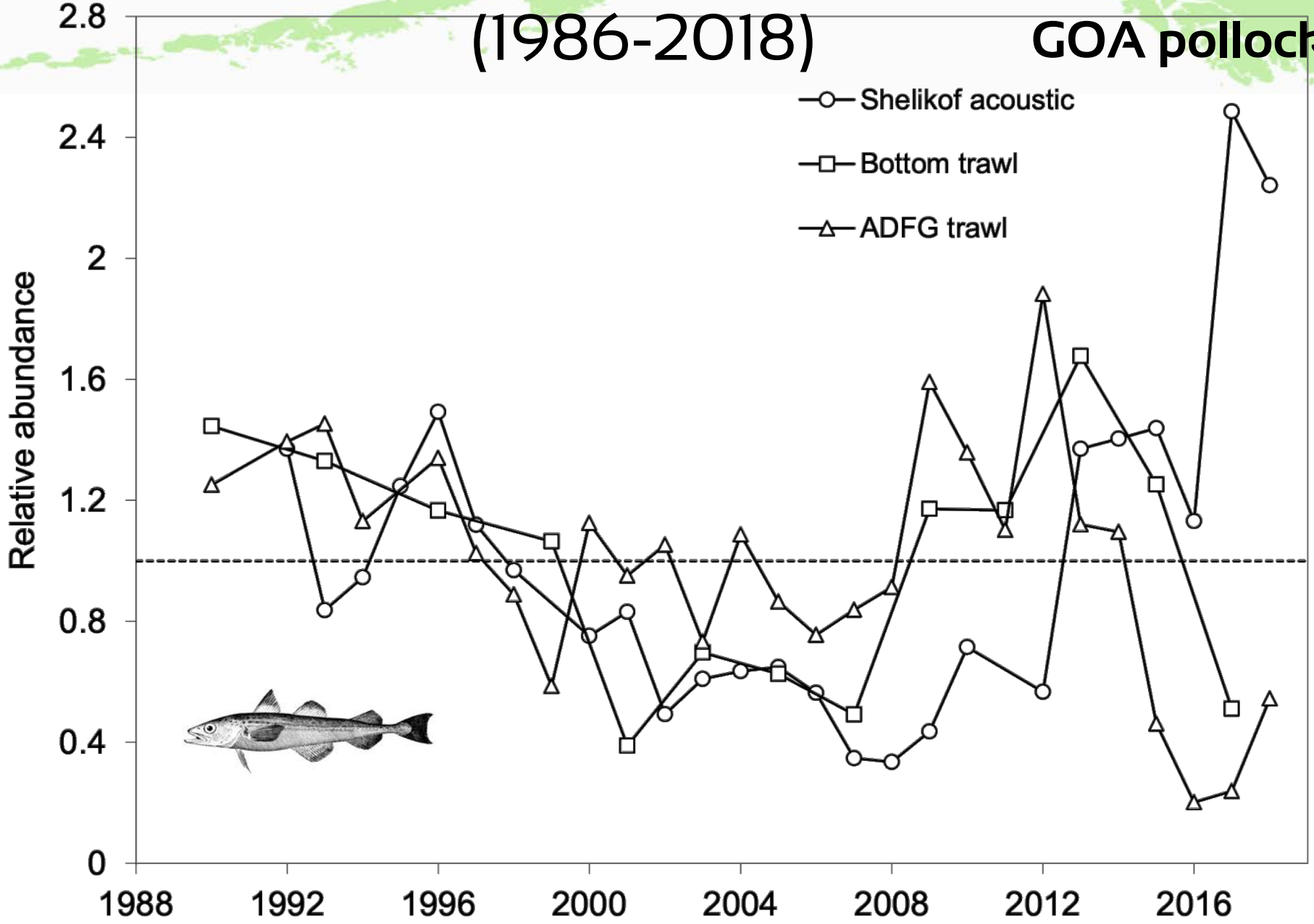


GOA pollock bottom-trawl survey age compositions



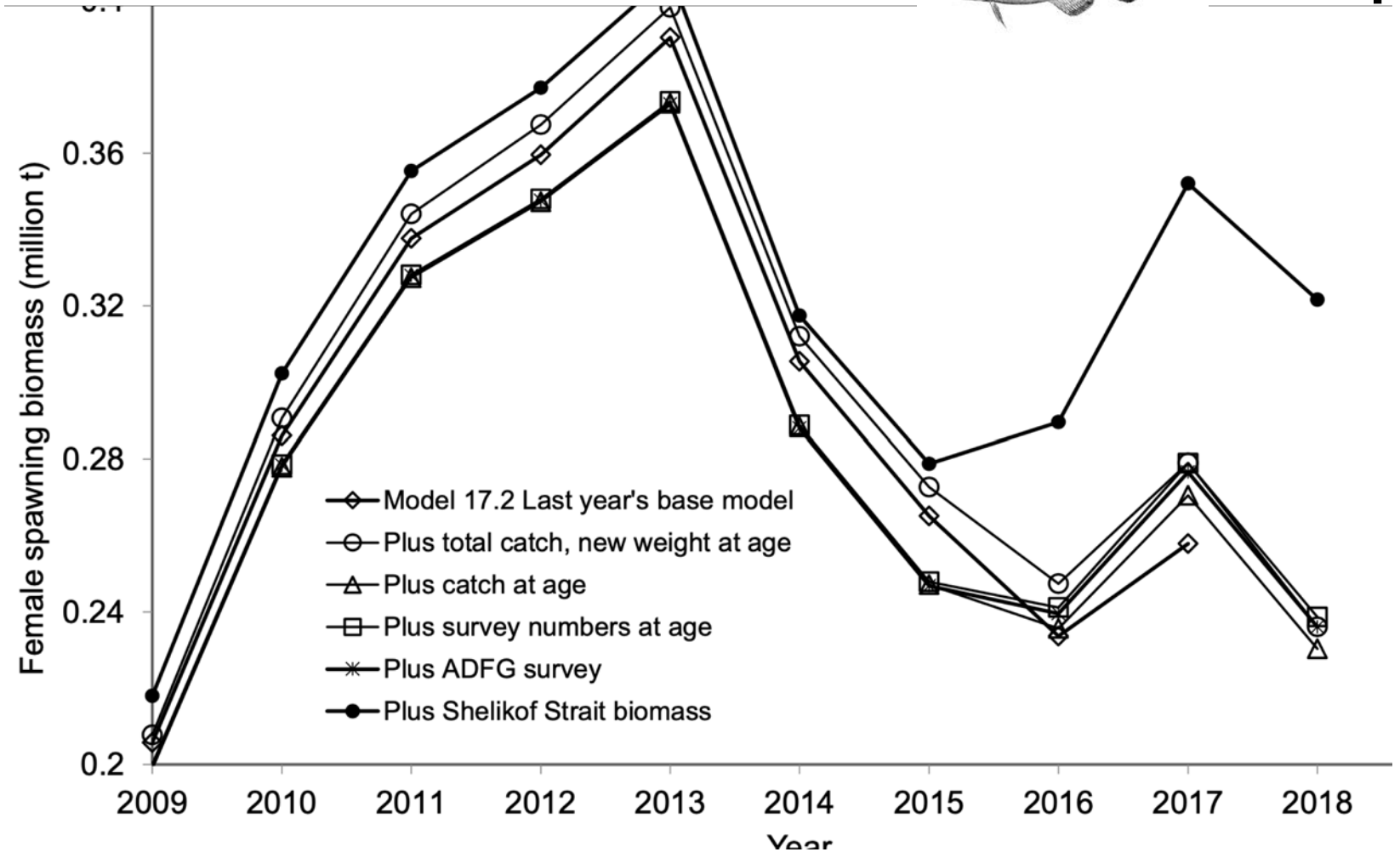


Relative trends in abundance indices (1986-2018)

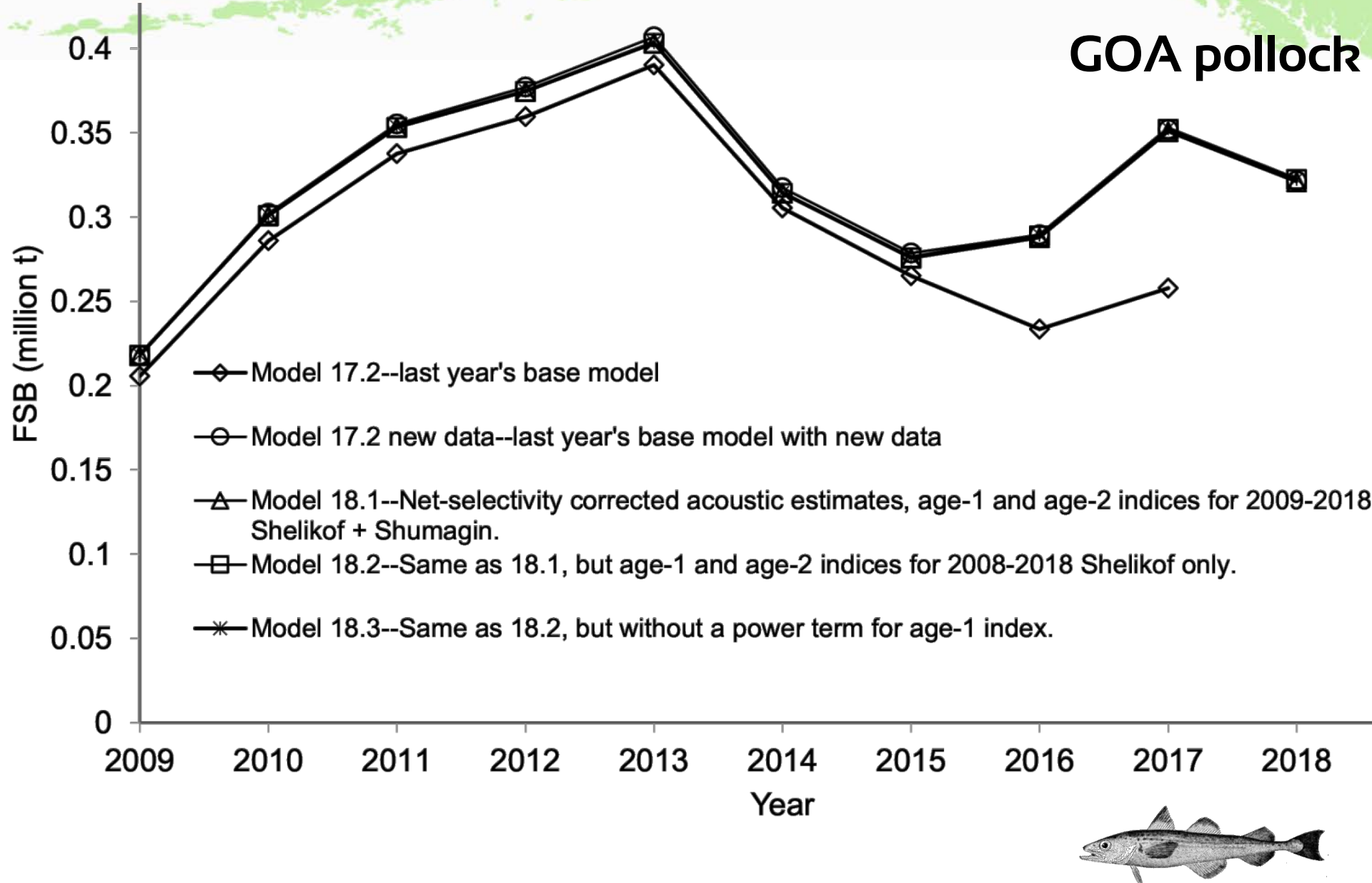


Sensitivity to new survey data…

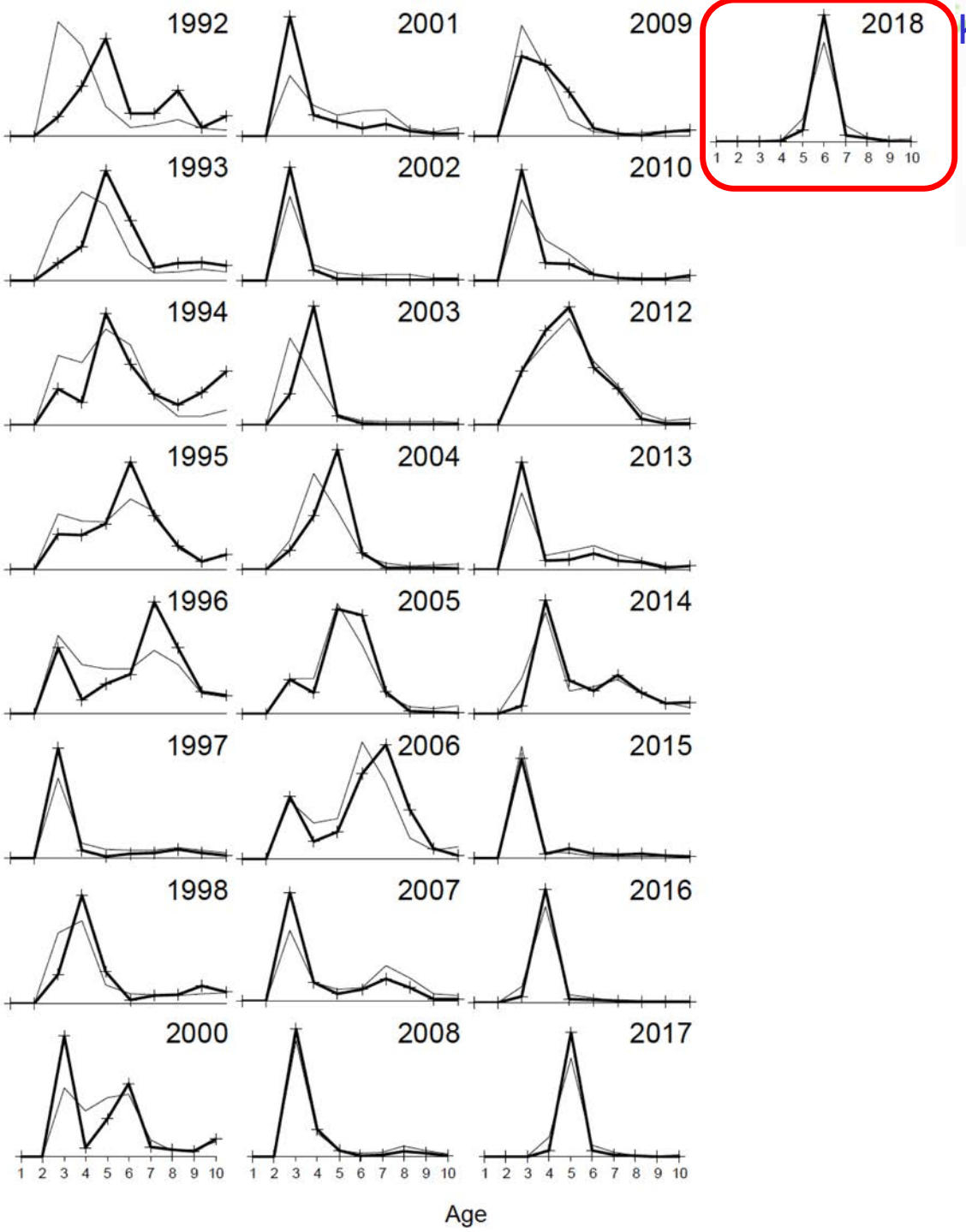
GOA pollock



GOA pollock model evaluations

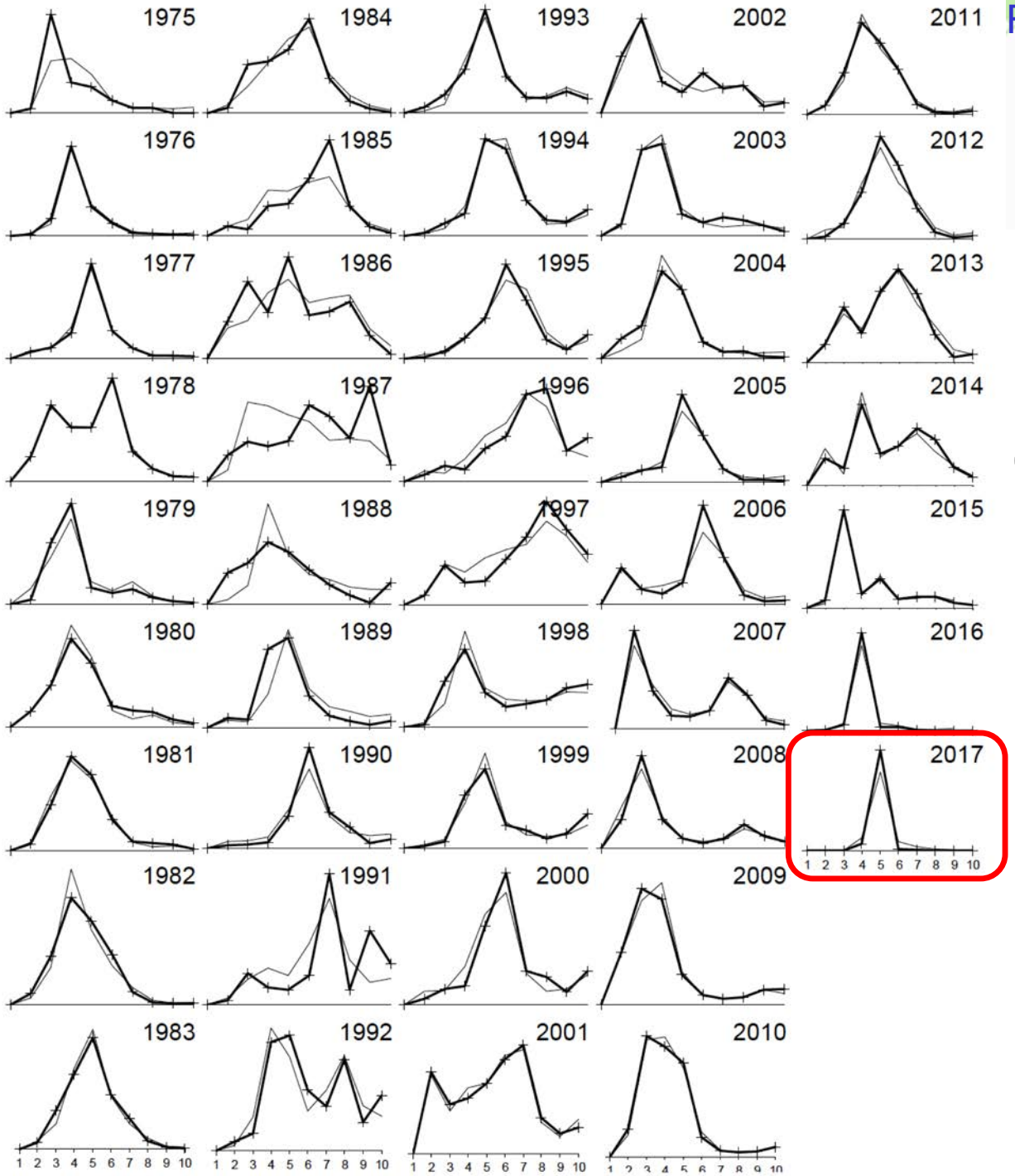


GOA pollock

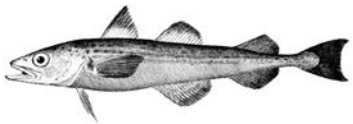


Shelikof Strait survey age composition (predicted vs observed)

GOA pollock



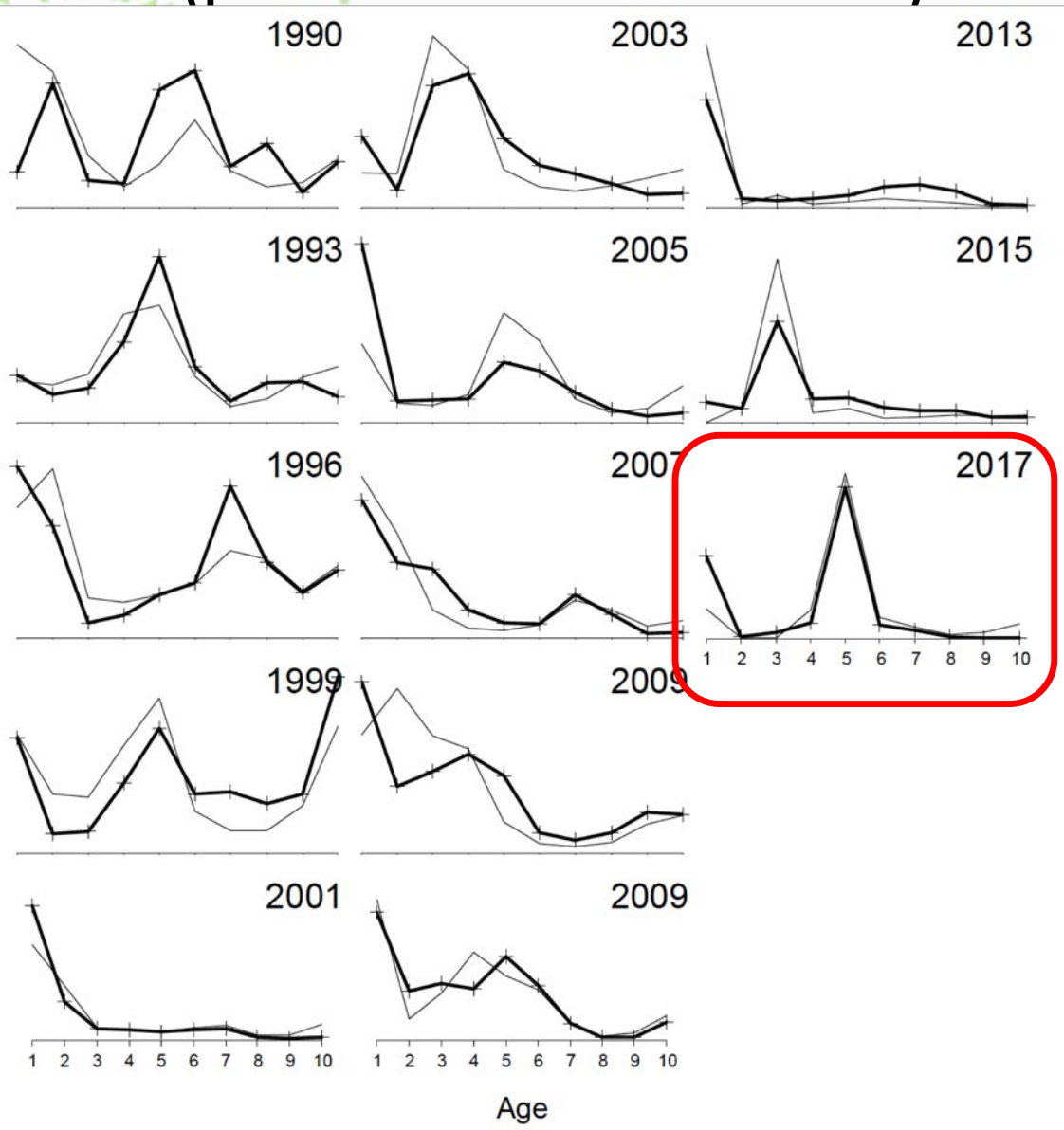
GOA pollock age composition (predicted vs observed)

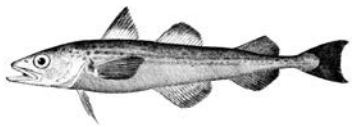


NMFS bottom trawl age composition

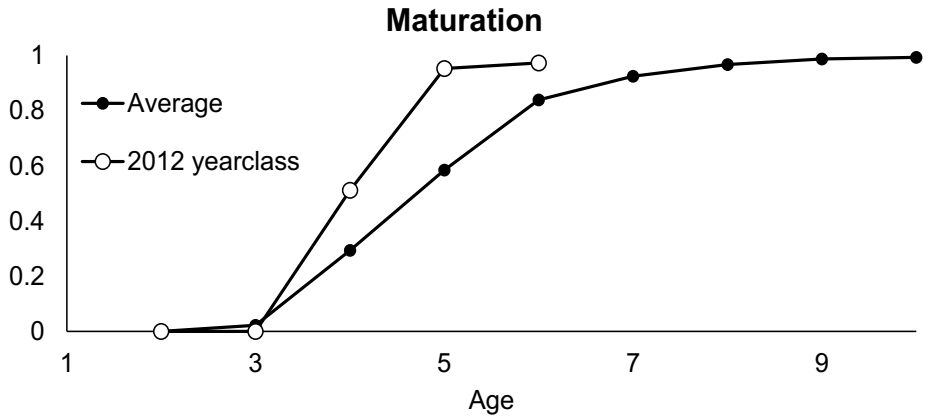
(predicted vs observed)

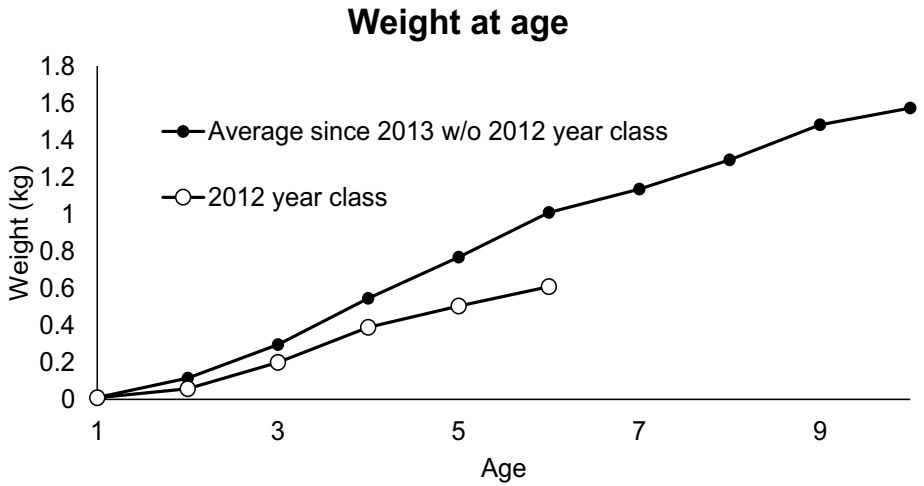
GOA pollock



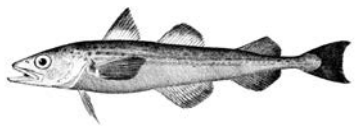


GOA pollock

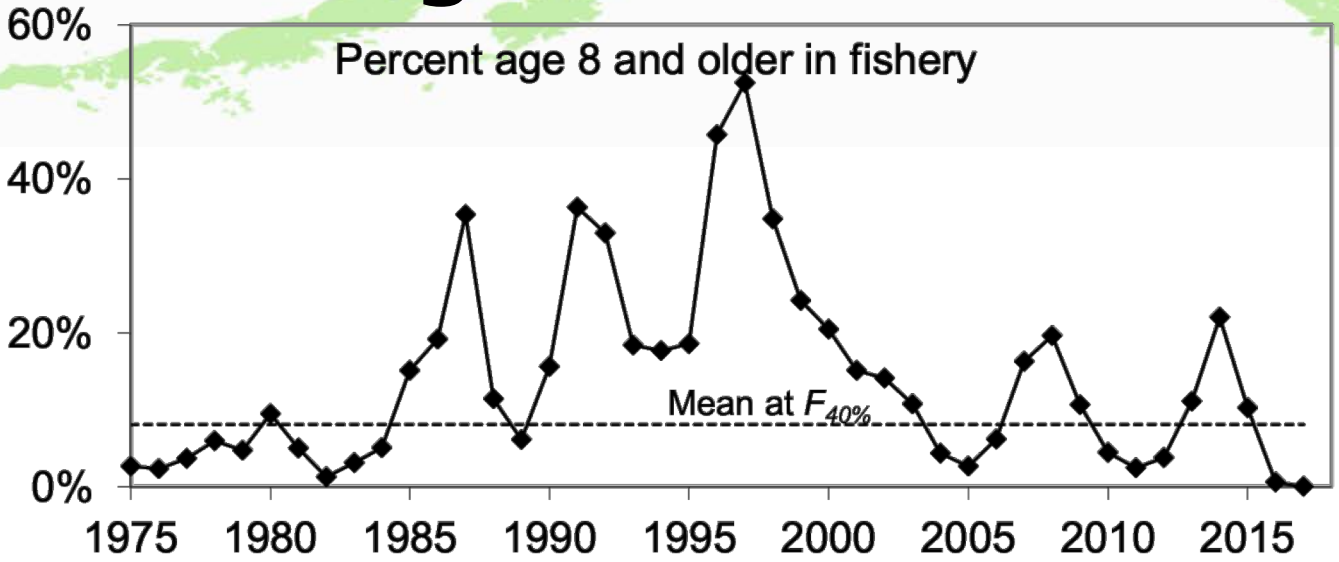


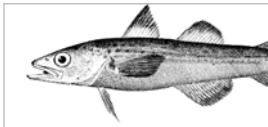


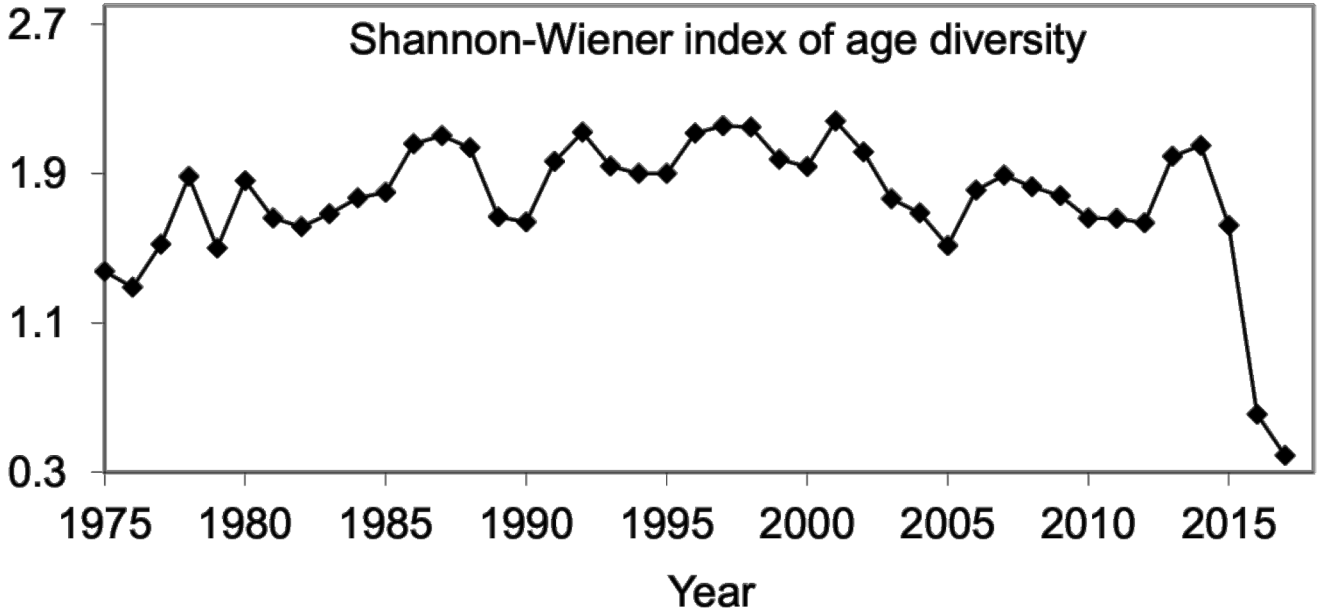
2012 Year class characteristics

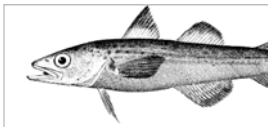


GOA Pollock age structure issues



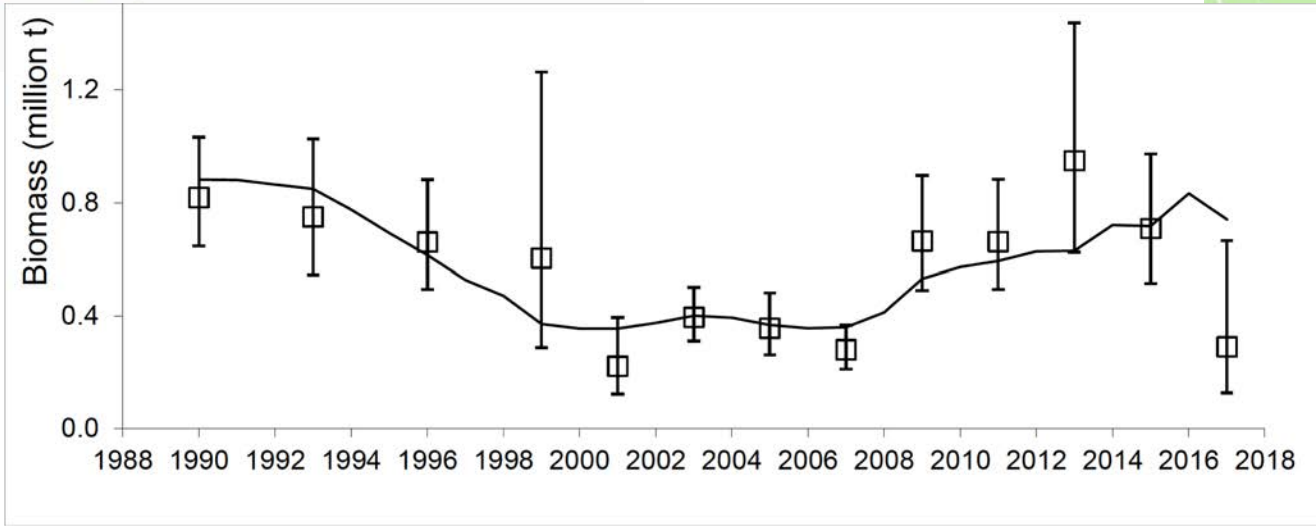




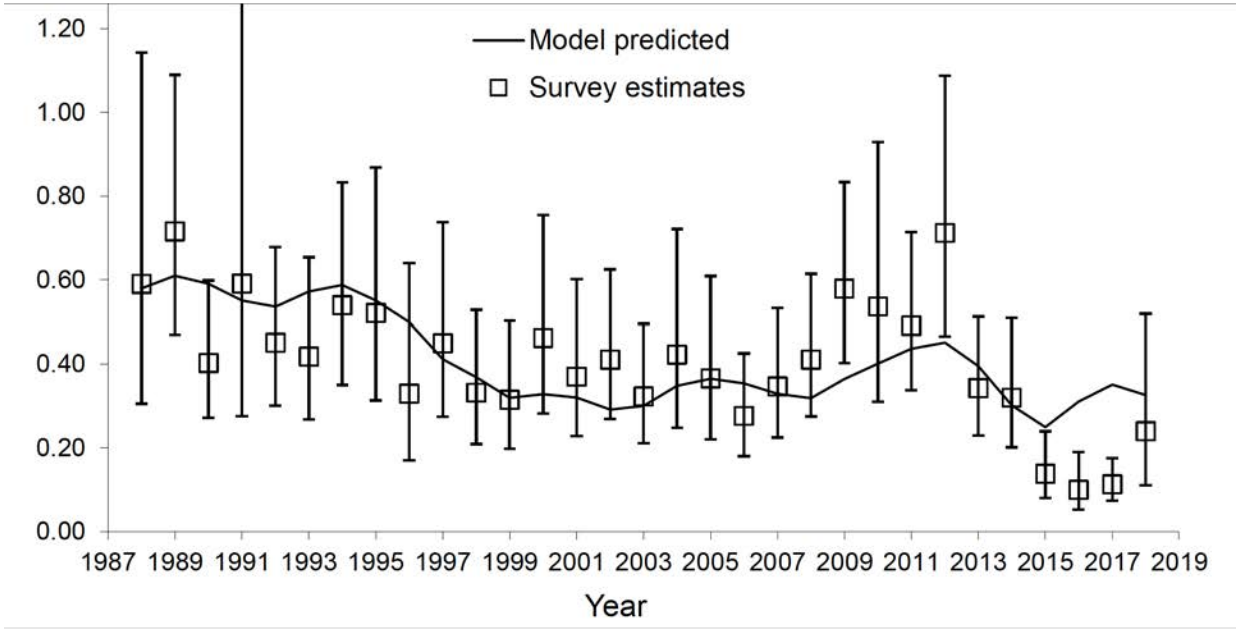


GOA pollock

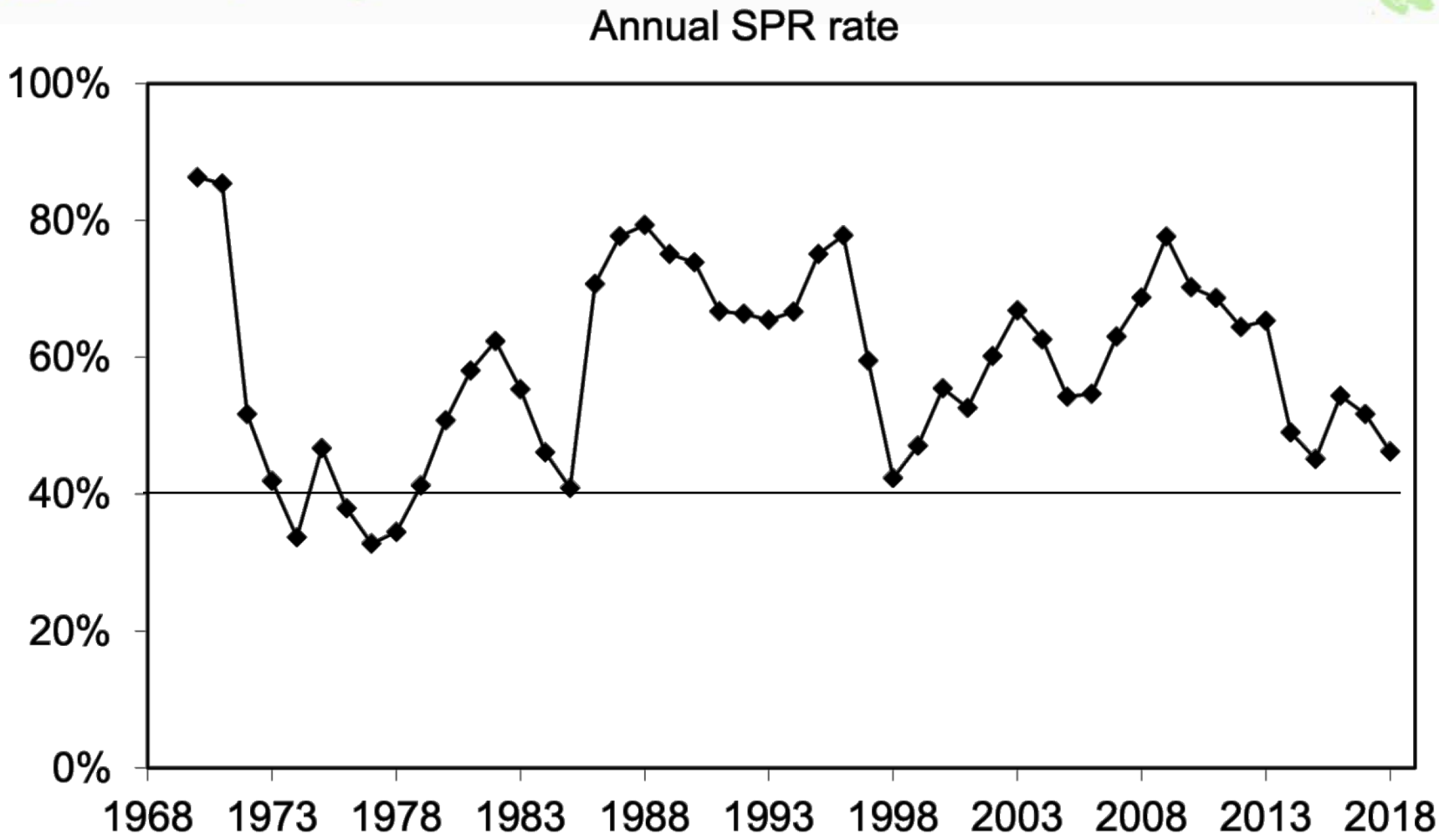
Fit to NMFS bottom trawl survey

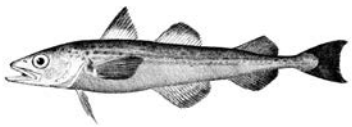


Fit to ADFG survey

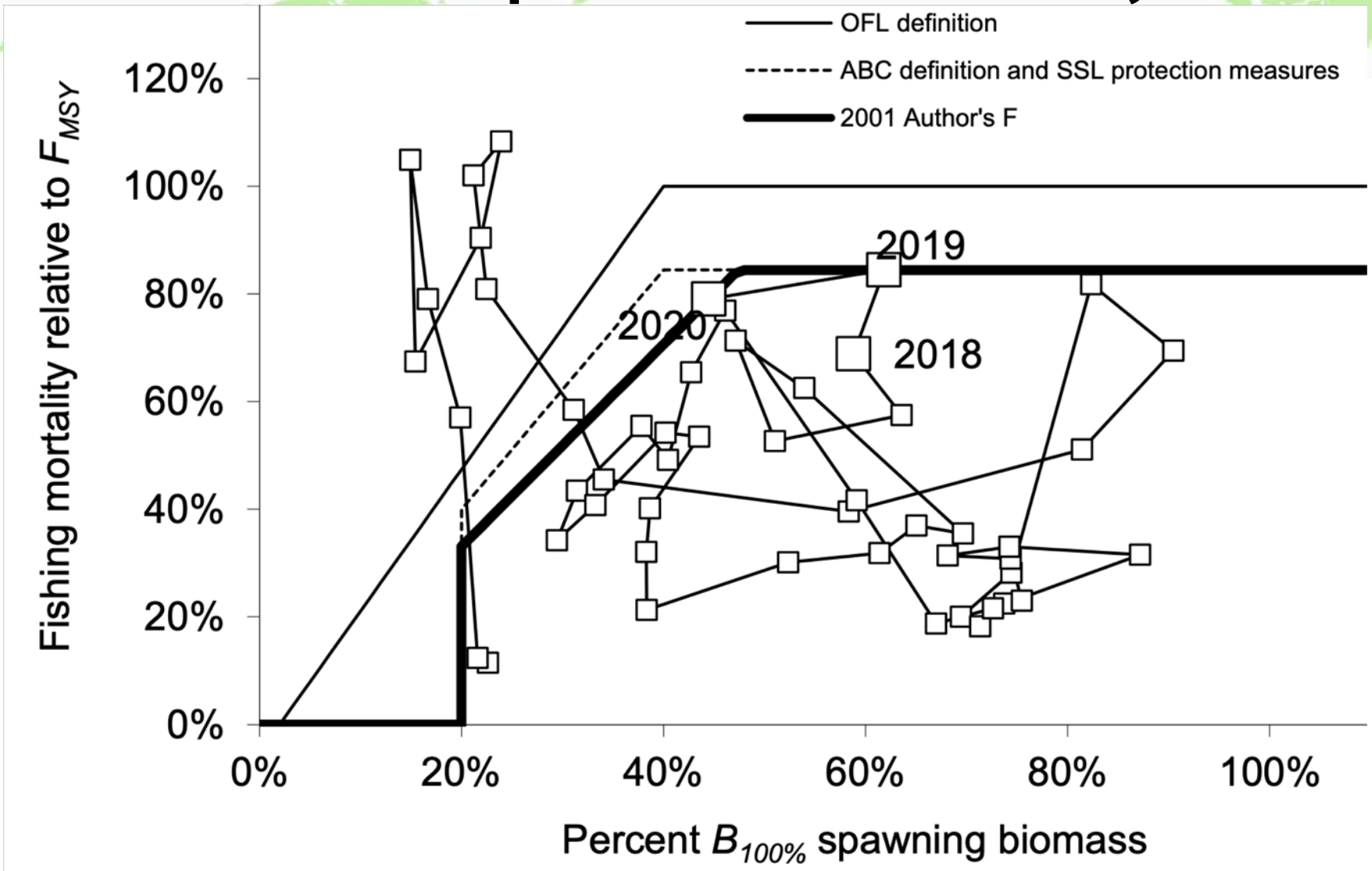


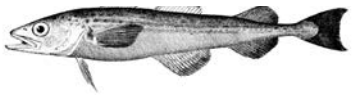
GOA pollock SPR history



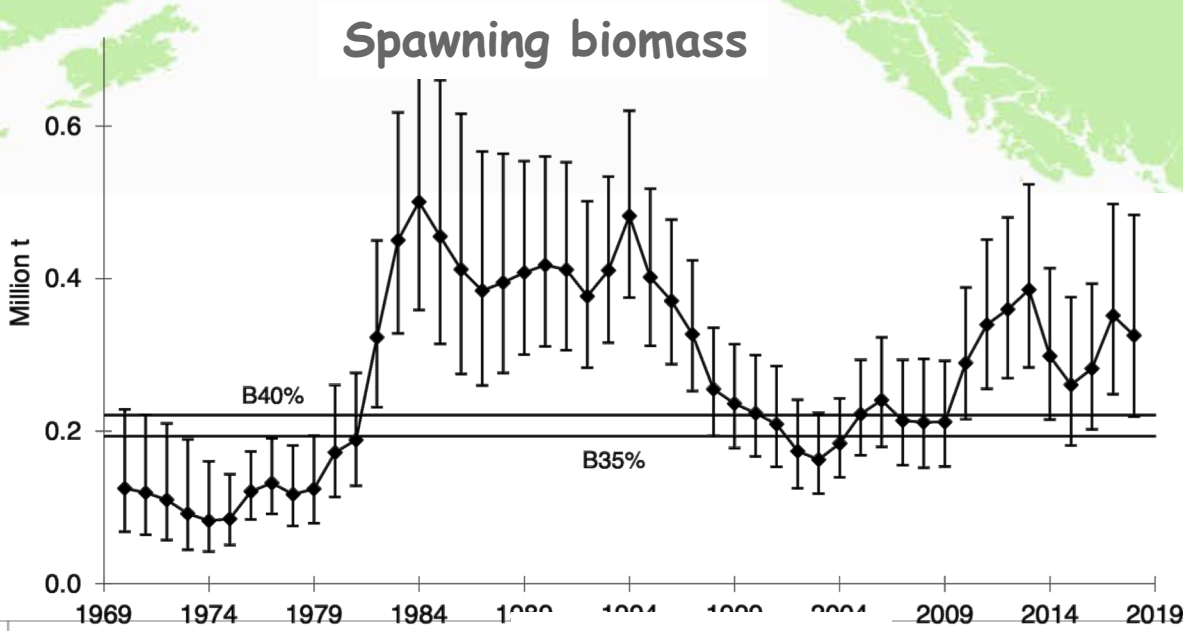


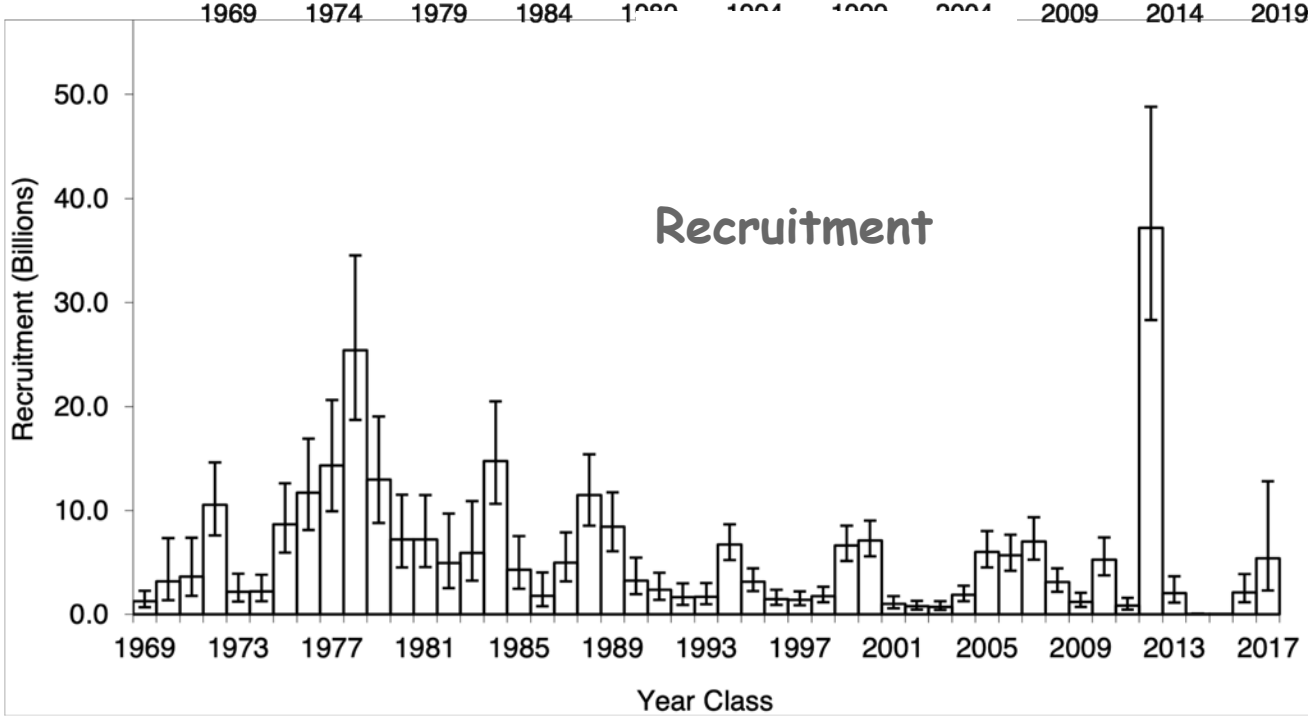
GOA pollock history

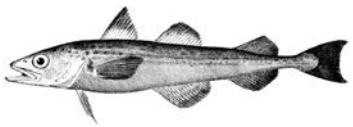




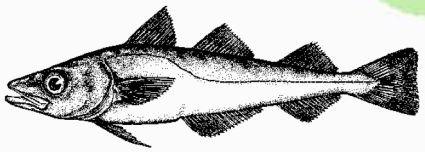
GOA pollock model results





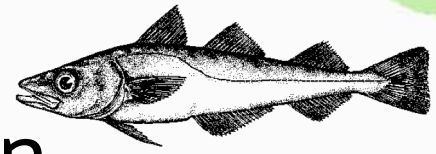


Gulf of Alaska pollock
Risk table Criteria



	Assessment-related	Population dynamics	Environmental / ecosystem
Level 1: Normal	Typical to moderately increased uncertainty / minor unresolved issues in assessment	Stock trends are typical for the stock; recent recruitment is within normal range.	No apparent environmental/ecosystem concerns
Level 2: Substantially increased concerns	Substantially increased assessment uncertainty/ unresolved issues.	Stock trends are unusual; abundance increasing or decreasing faster than has been seen recently, or recruitment pattern is atypical.	Some indicators showing an adverse signals but the pattern is not consistent across all indicators.
Level 3: Major Concern	Major problems with the stock assessment, very poor fits to data, high level of uncertainty, strong retrospective bias.	Stock trends are highly unusual; very rapid changes in stock abundance, or highly atypical recruitment patterns.	Multiple indicators showing consistent adverse signals a) across the same trophic level, and/or b) up or down trophic levels (i.e., predators and prey of stock)
Level 4: Extreme concern	Severe problems with the stock assessment, severe retrospective bias. Assessment considered unreliable.	Stock trends are unprecedented. More rapid changes in stock abundance than have ever been seen previously, or a very long stretch of poor recruitment compared to previous patterns.	Extreme anomalies in multiple ecosystem indicators that are highly likely to impact the stock. Potential for cascading effects on other ecosystem components

Gulf of Alaska pollock
Authors' risk table evaluation



Assessment	Population dynamics	Environmental / ecosystem
Contradictory data, very poor model fits to recent survey indices. But model seems robust, no retrospective pattern.	Stock dominated by a single year class, Four years of very weak recruitment. There have been similar patterns in the past, but never this extreme.	Onset of a marine heatwave and projections of a weak El Niño are not conducive for winter survival for age-0 pollock. Zooplankton prey for adult pollock has increased, but planktivorous parakeet auklets in the central GOA had poor reproductive success in 2018
Conclusion: Level 2	**Conclusion: Level 2**	**Conclusion: Level 2**

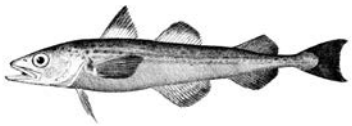
Overall score is Level 2: Substantially increased concerns.
Author's recommended ABC = 85% of maximum permissible (15% buffer)

- based on mode of historical buffers.

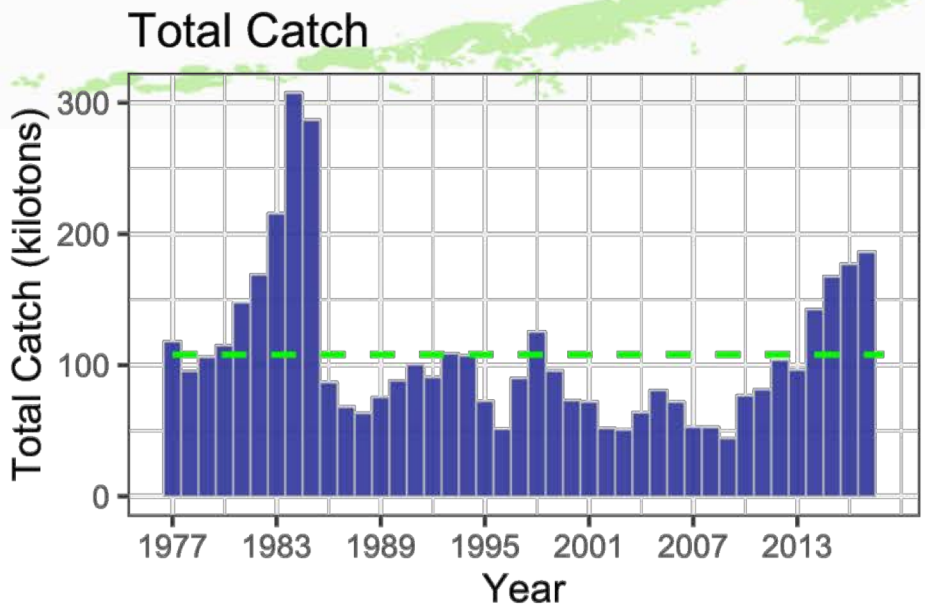
GOA Pollock Team discussions

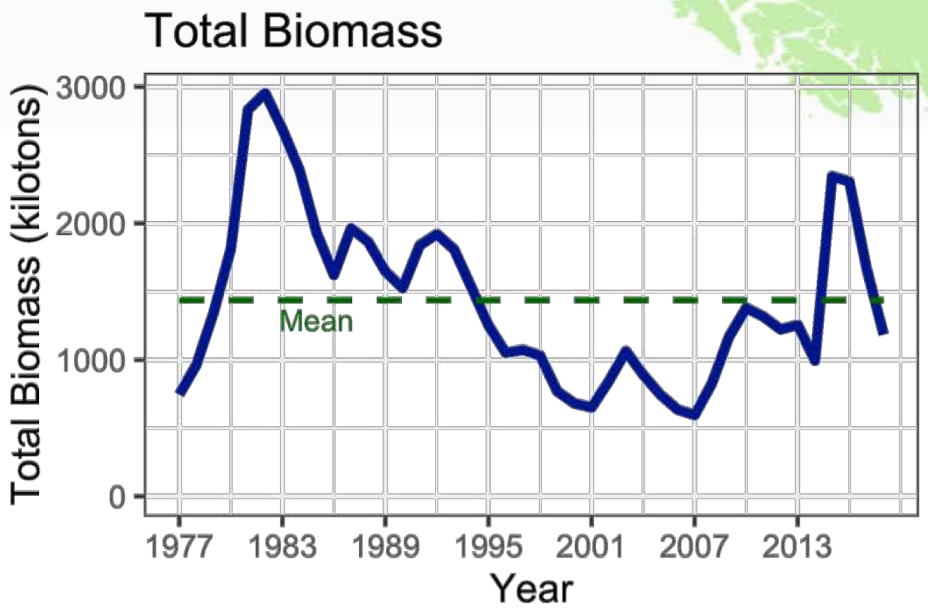
- Relative to reductions from maximum permissible:

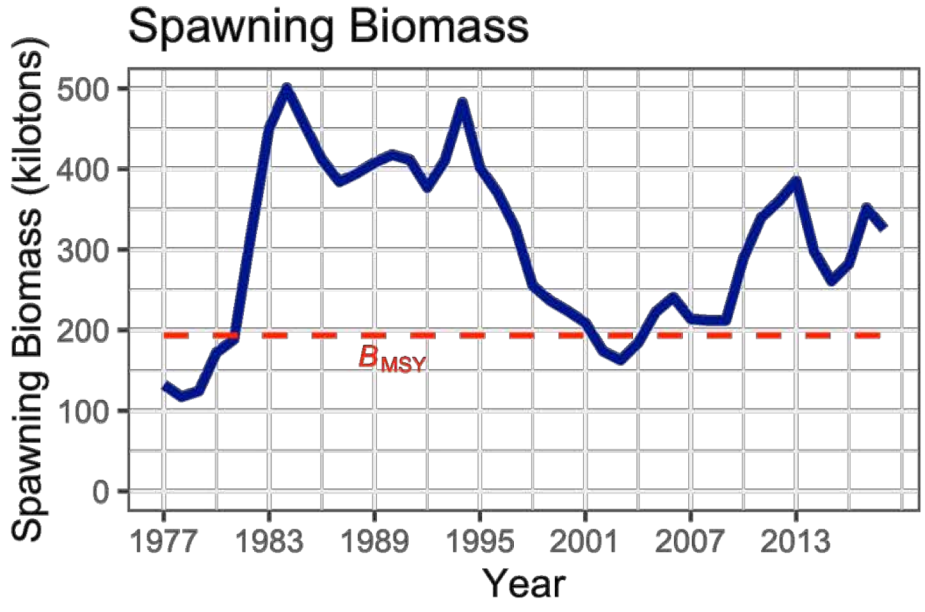
  The Team recommends using the incremental method (14.3%) but would appreciate guidance from the SSC on appropriate level(s) of reduction in response to substantial concerns of how to implement the risk matrix

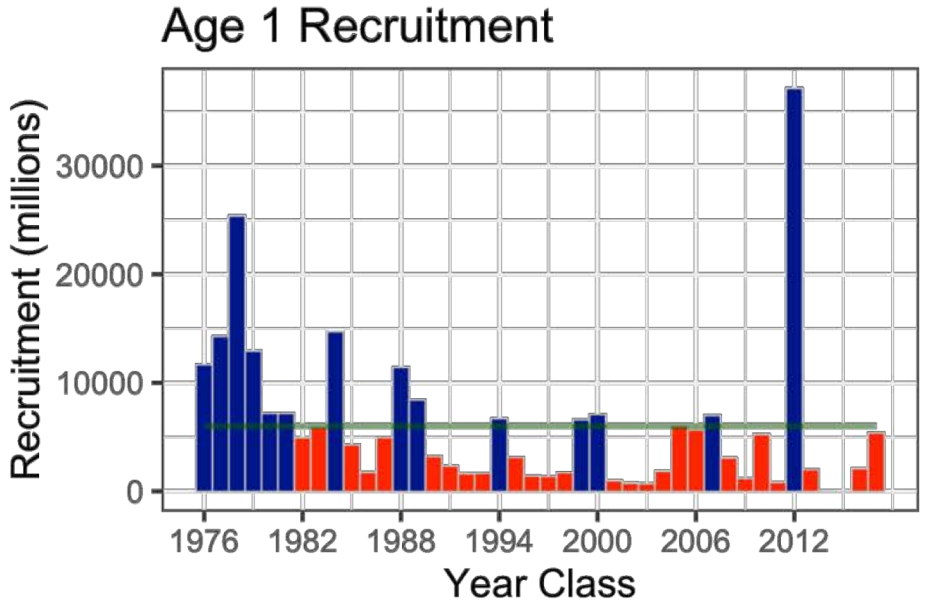


GULF OF ALASKA GROUNDFISH ASSESSMENTS

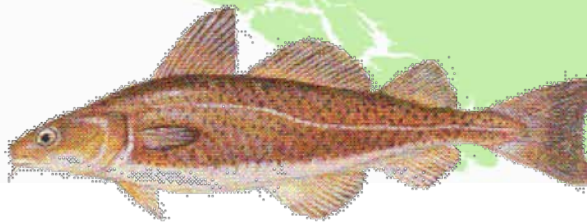








2. GOA Pacific cod



Species	2018 Catch	2018	2019	Change
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Flatfish	22,053	114,712	116,562	up 1,850 (2%)
Arrowtooth flounder	2,045	150,945	145,841	down 5,104 (3%)
Rockfish	33,425	47,067	46,946	down 121 (0%)
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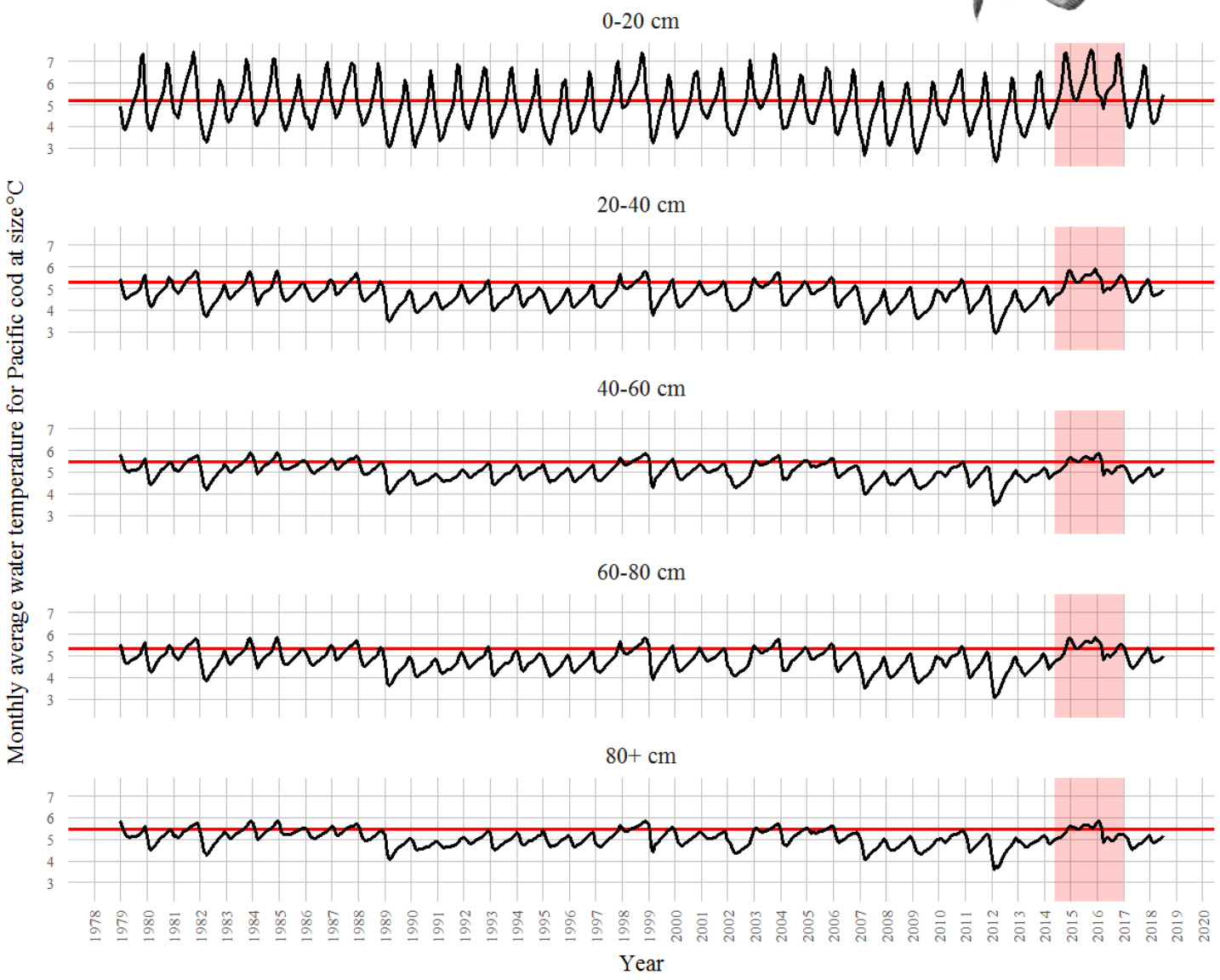
Skates	2,786	7,804	7,804	same (0%)
Other Species	3,616	11,927	14,460	up 2,533 (21%)
Total	240,953	536,925	509,507	down 27,418 (5%)

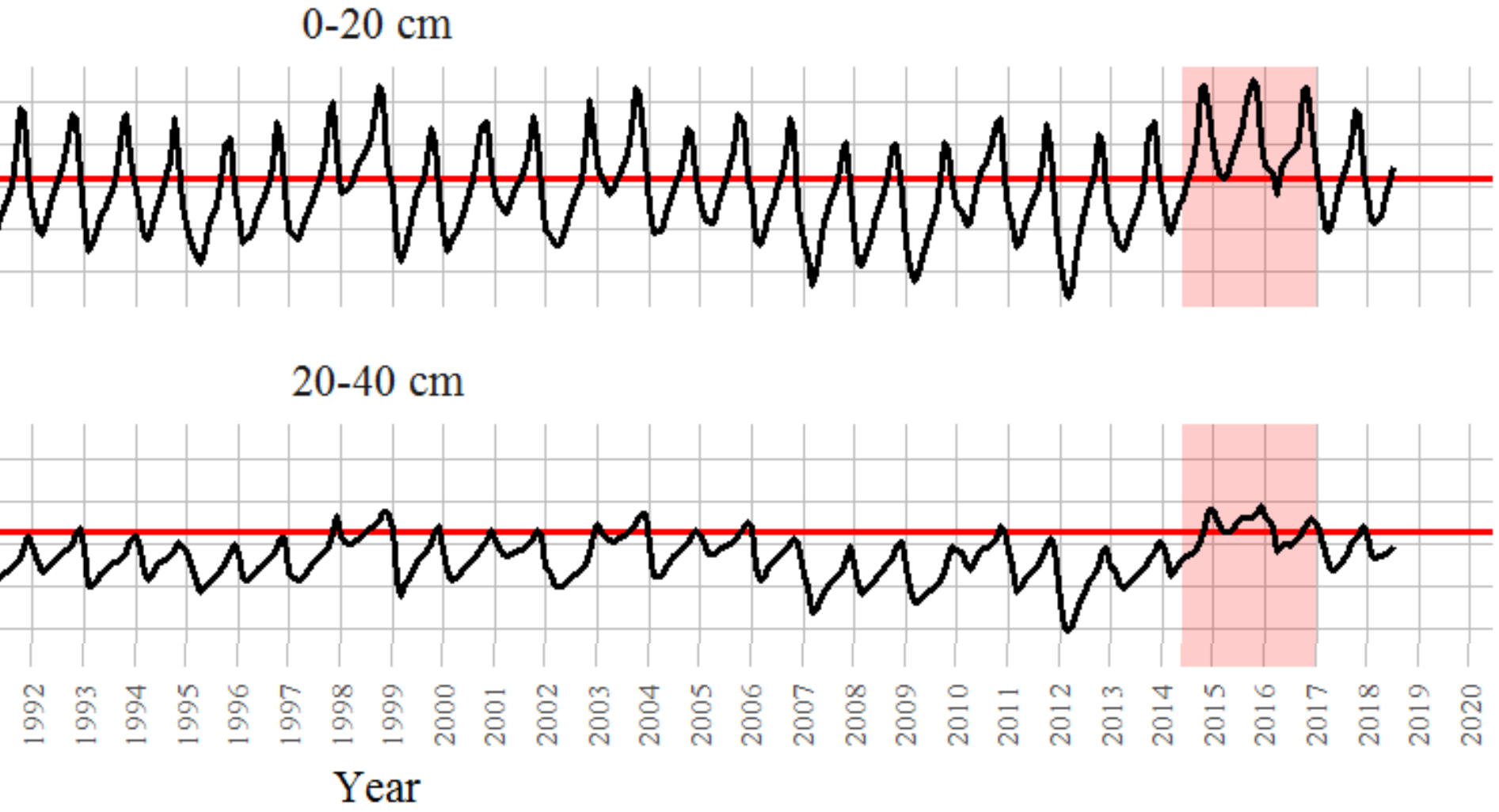
Anomalously warm waters 2014-2016

Cooler in 2017 and first half of 2018

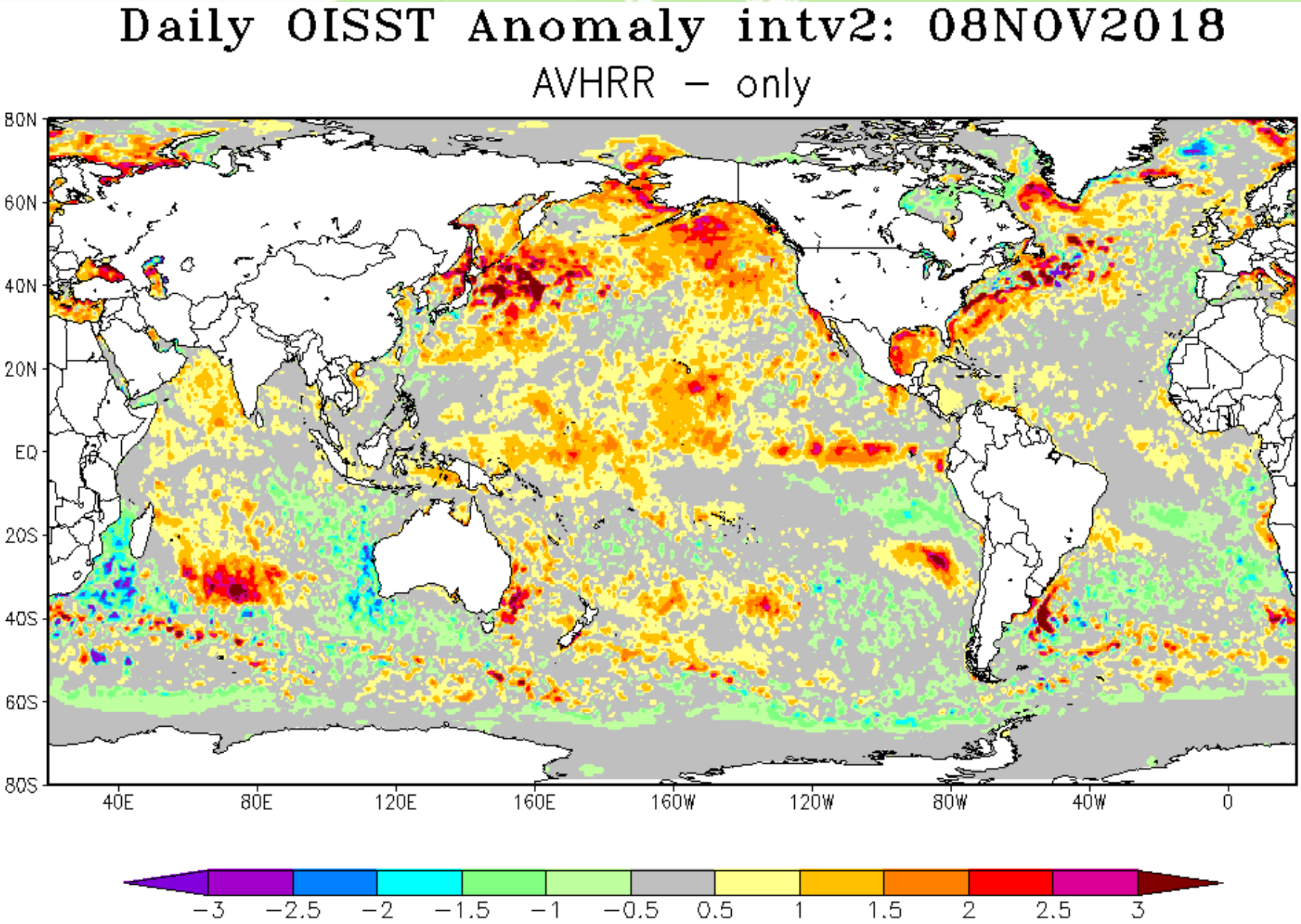


CFSR analysis by Qiong Yang, NPRB project 1509

Anomalously warm waters 2014-2016



CFSR analysis by Qiong Yang, NPRB project 1509



- **Heatwave in central GOA since September 10, 2018**
- **70-75% chance of El Niño in winter 2018-2019**

New data

2018 AFSC longline survey

- RPN Index 1990-2018
- Length composition

2012-2017 Fishery age and length data

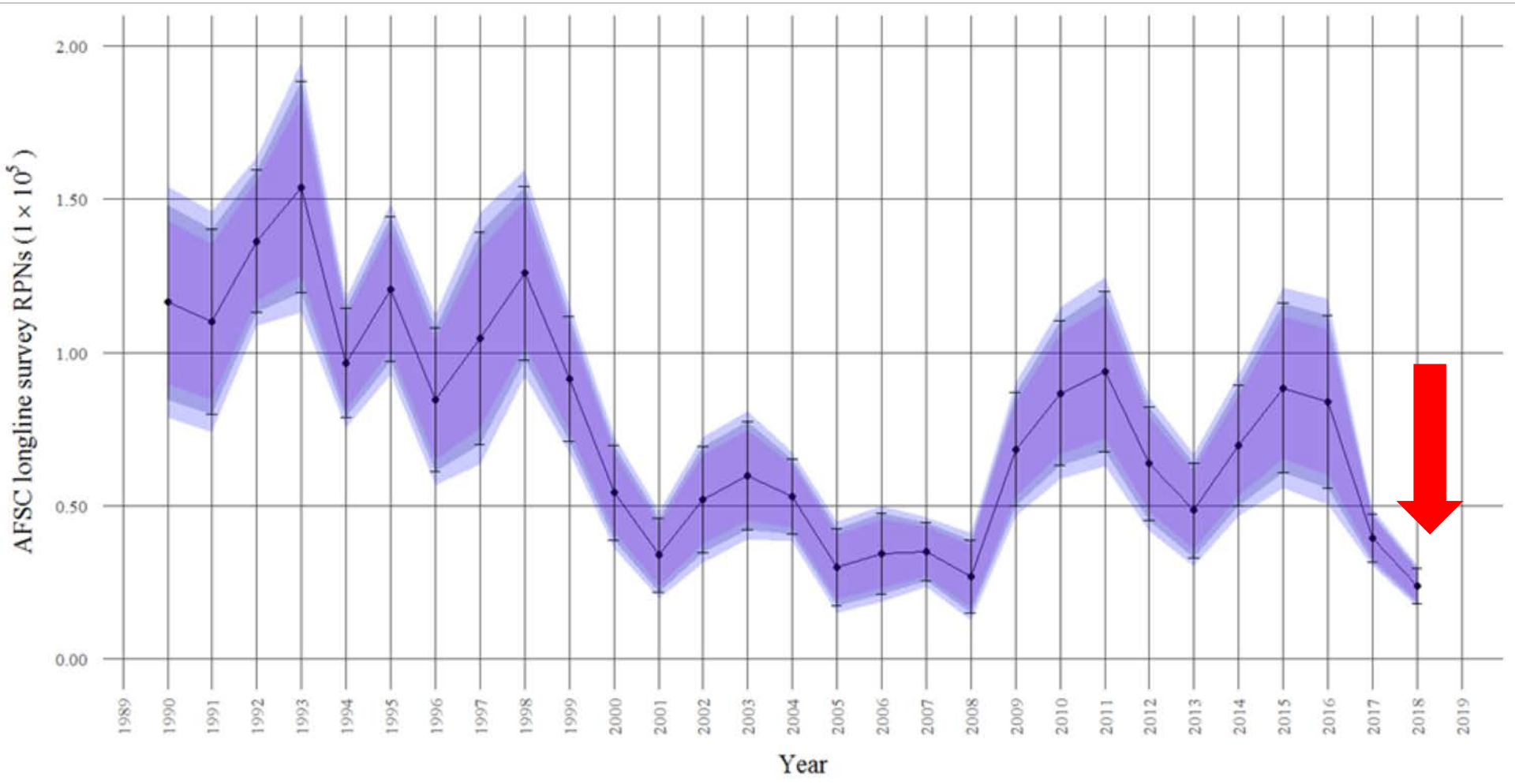
2017-2018 Fishery catch

2017 AFSC bottom trawl survey age

GOA Pcod
AFSC longline survey

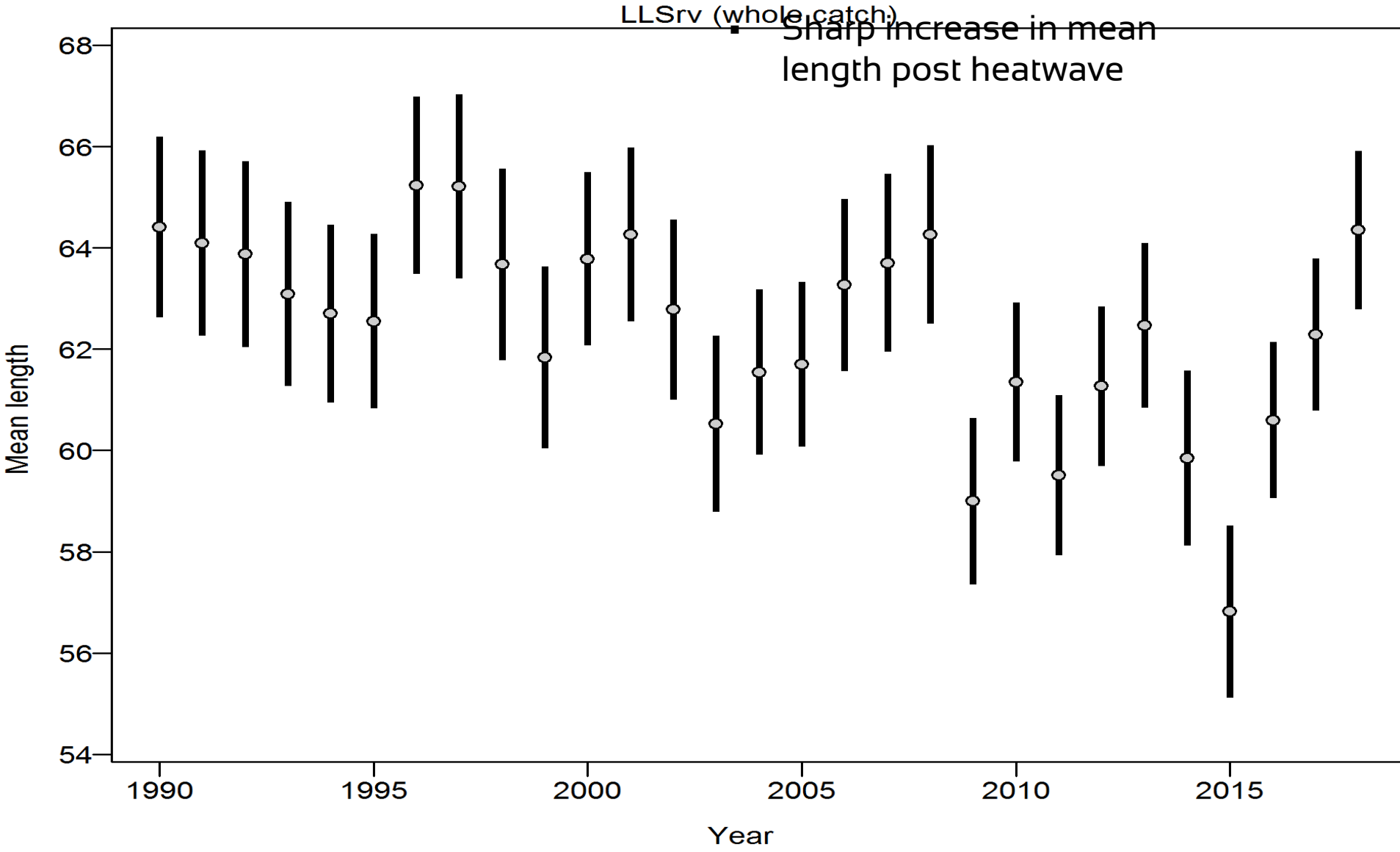
2018 lowest on record

- Down 40% from 2017

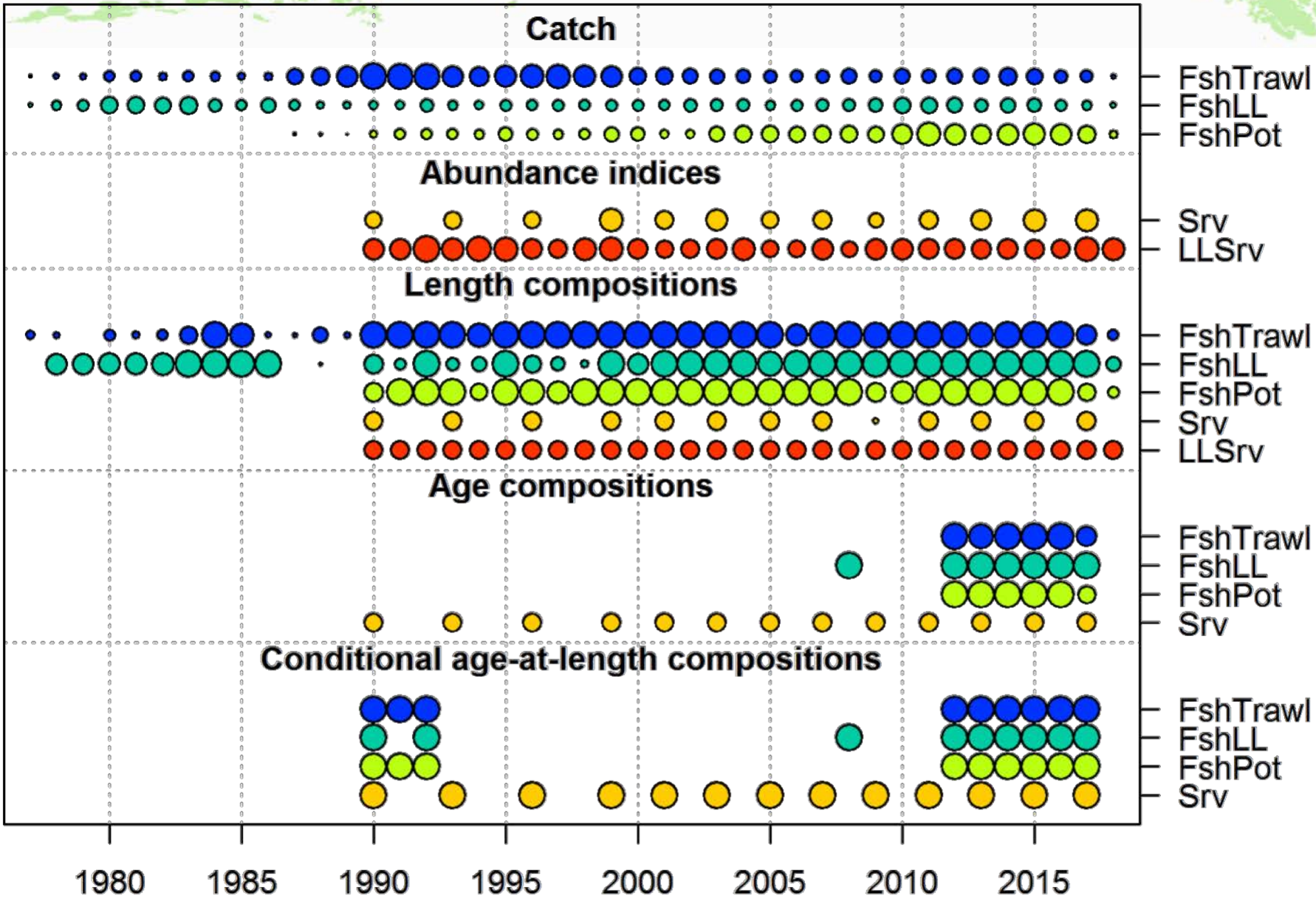


GOA Pcod

AFSC longline survey mean size



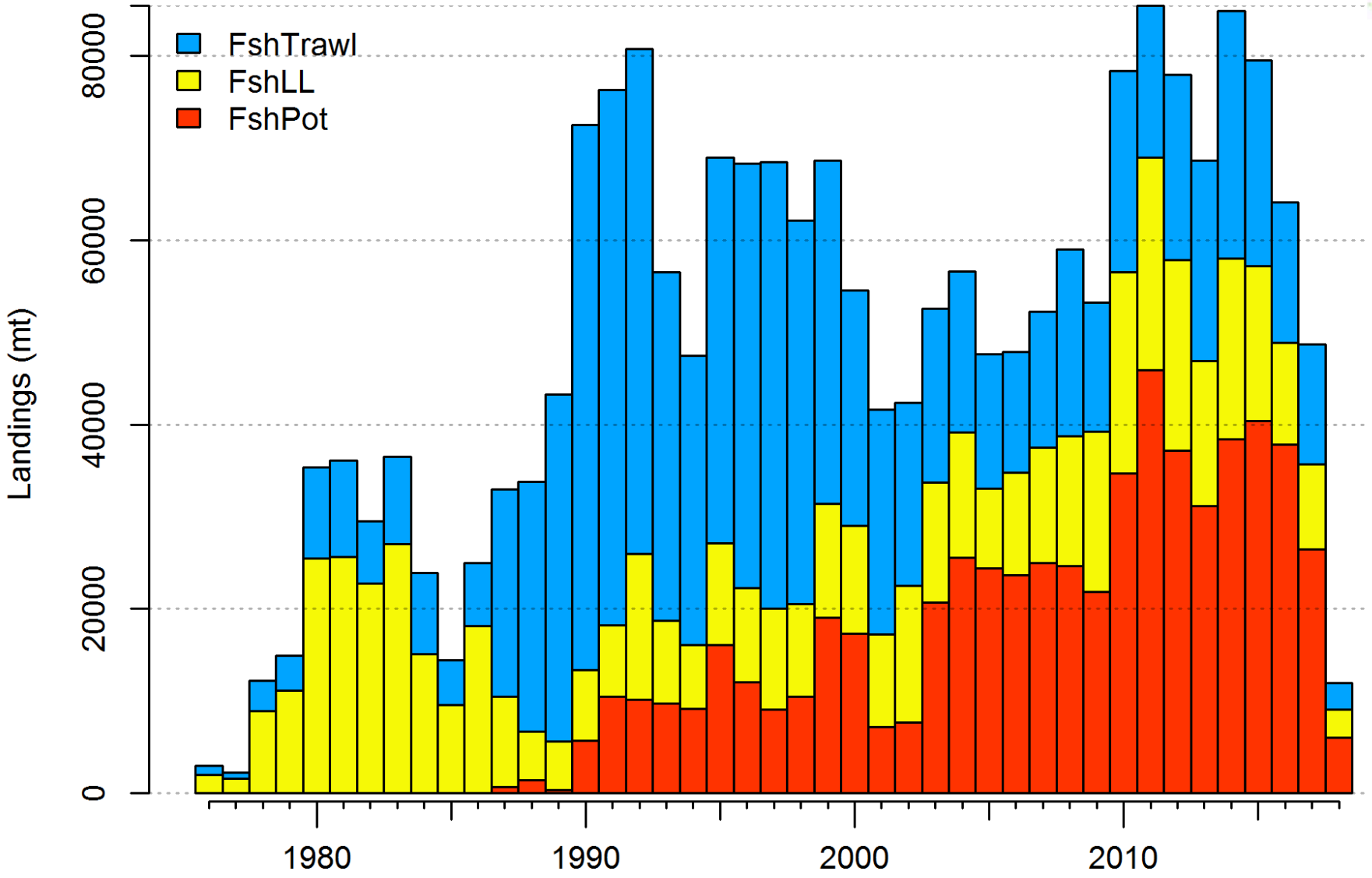
Data extent


Catch
FshTrawl
FshLL
FshPot
Abundance indices
Srv
LLSrv
Length compositions
FshTrawl
FshLL
FshPot
Srv
LLSrv
Age compositions
FshTrawl
FshLL
FshPot
Srv
Conditional age-at-length compositions
FshTrawl
FshLL
FshPot
Srv
1980
1985
1990
1995
2000
2005
2010
2015

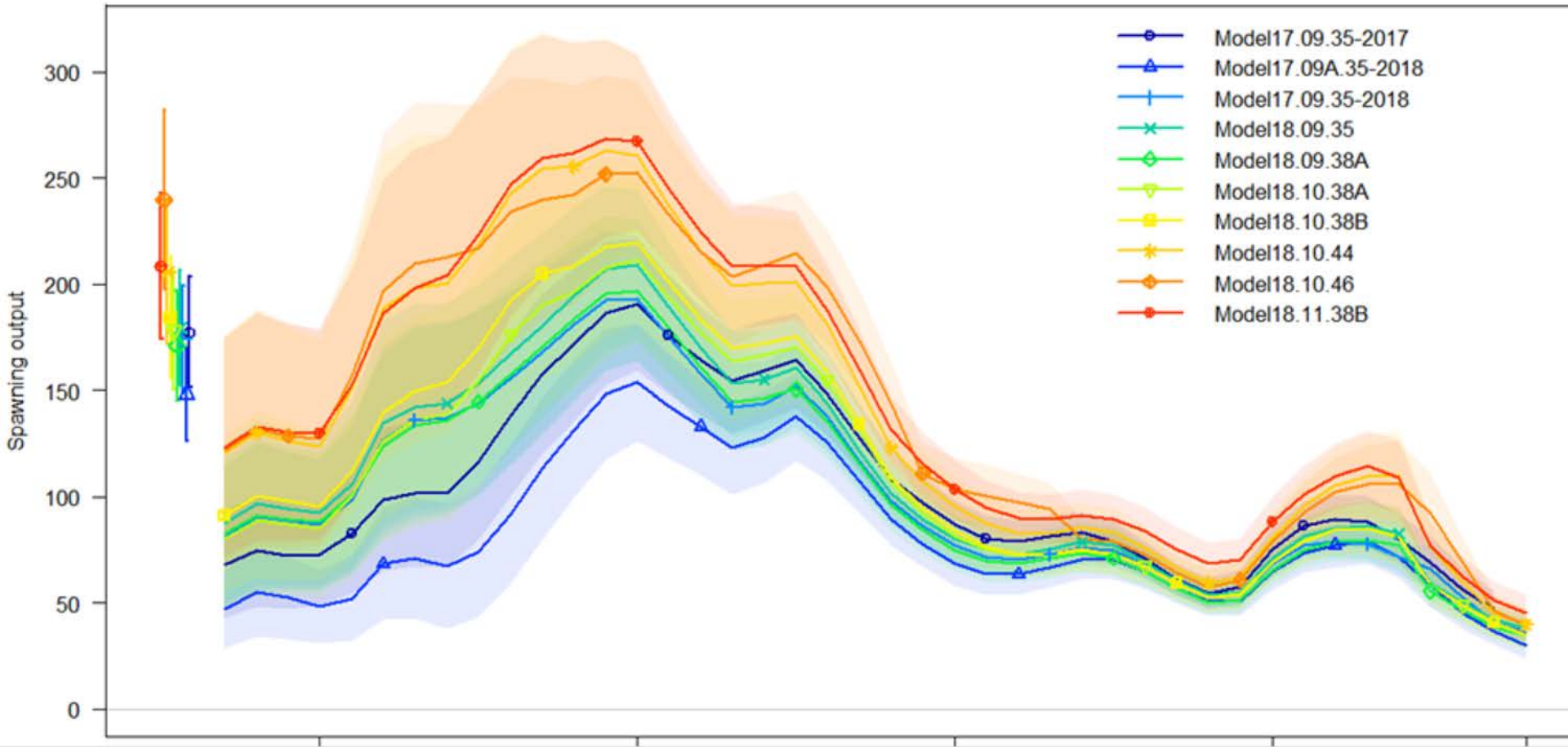
GOA Pcod

GULF OF ALASKA GROUNDFISH ASSESSMENTS

Catch

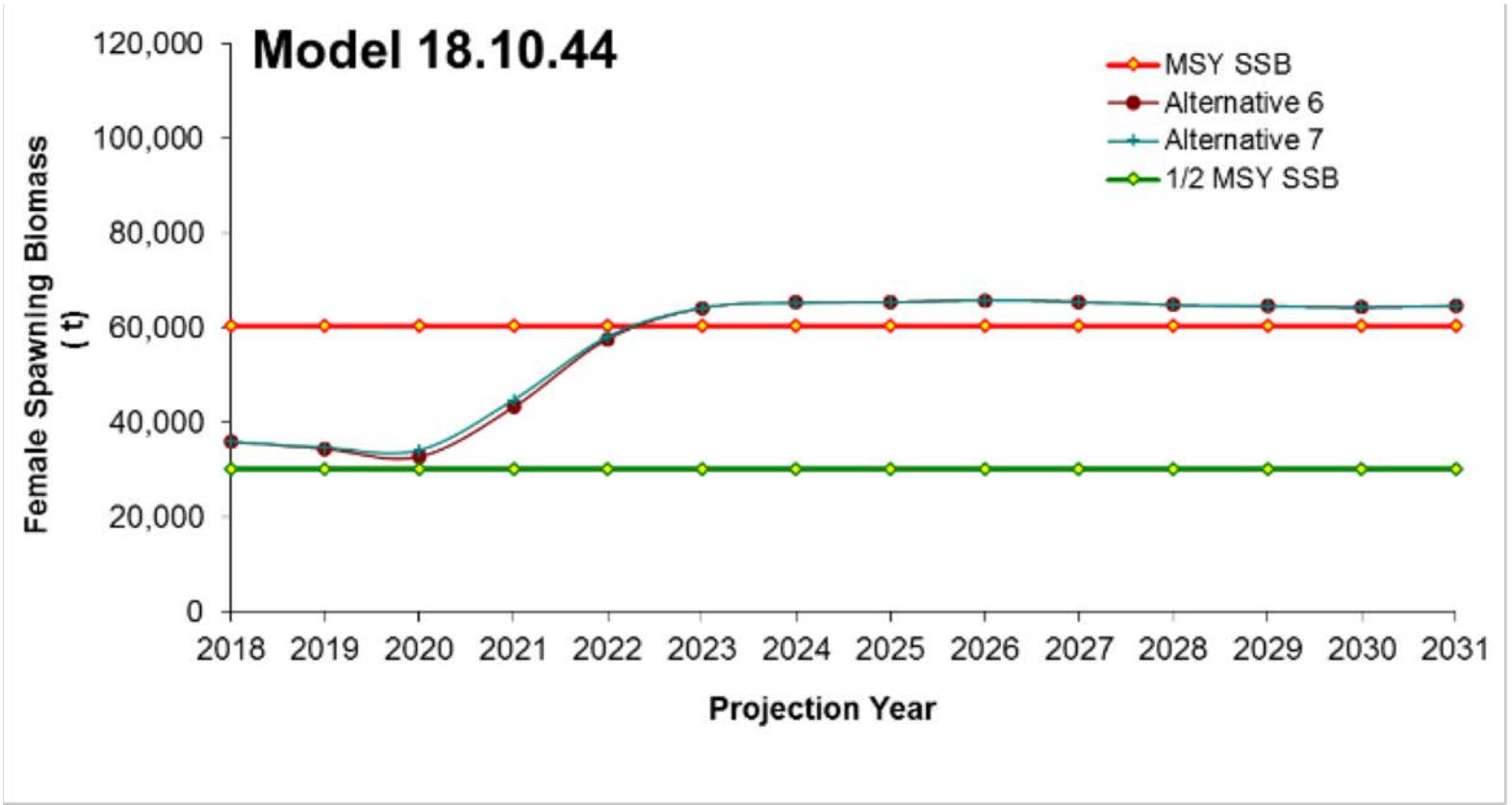


Spawning biomass



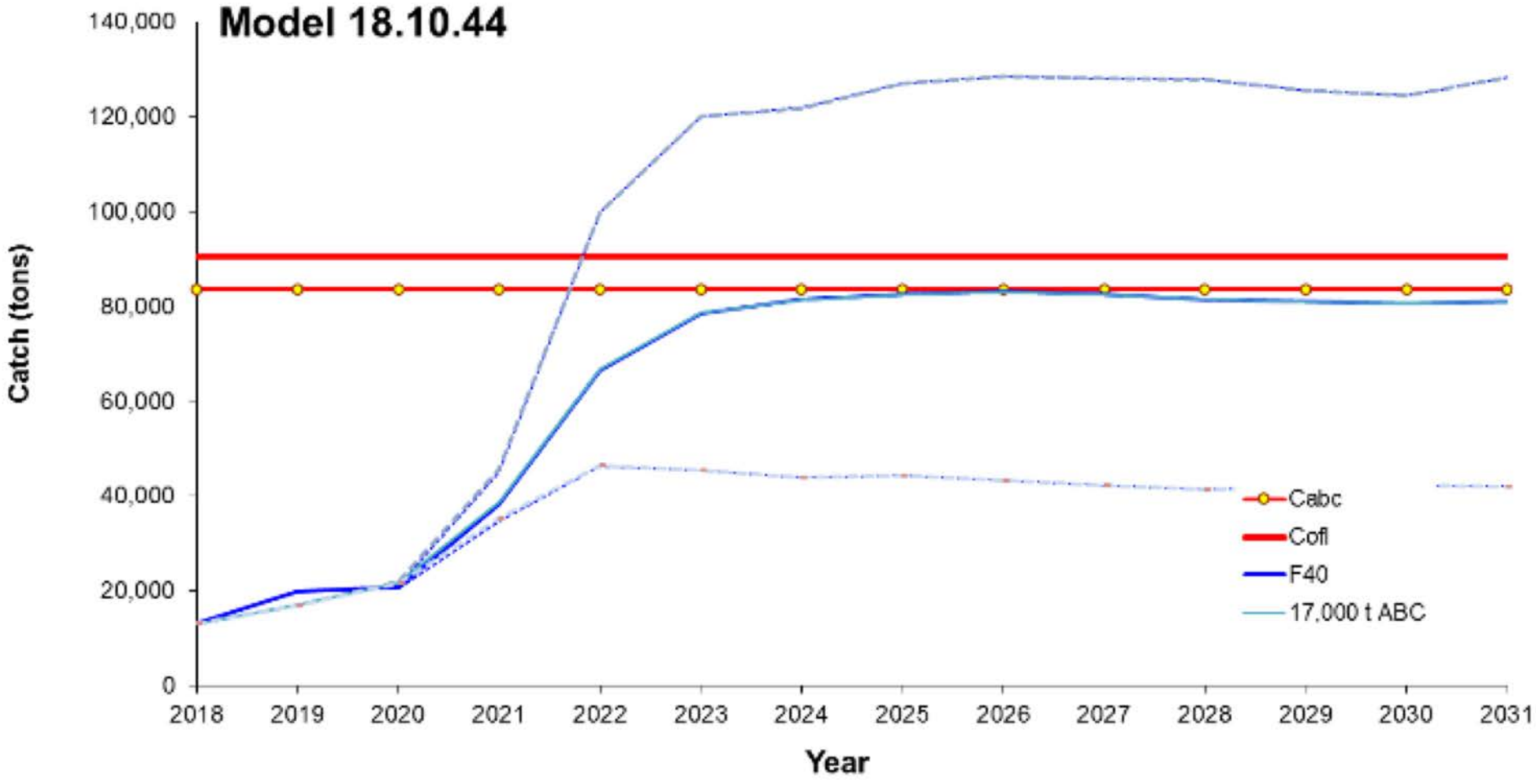
Projections

- Above $B_{17.5\%}$ in 2018 and 2020
- Above $B_{35\%}$ by 2028 and 2030
- Not overfished, not overfishing…



GOA Pcod Projections

Adjustment of 2019 catch from 19,665 t to 17,000 t to stabilize biomass



GOA Pacific cod risk table

Assessment-related considerations	Population dynamics considerations	Environmental/ecosystem considerations	Overall score (highest of the individual scores)
Level 2: Substantially increased	Level 4: Extreme concern	Level 2: Substantially increased	Level 4: Extreme concern

Assessment - Level 2:

- Modeling uncertainty in the early recruitment estimates

Population dynamics – Level 4:

- Female spawning biomass lowest point in period
- Poor recruitment 2014-2016 and increased natural mortality (heat wave)

Environment – Level 2:

- Conditions in 2017 and early 2018 appear to be improved
- New heatwave (10 Sept 2018 – present)
- Probability of el Niño for winter 2018-19

GOA Pacific cod

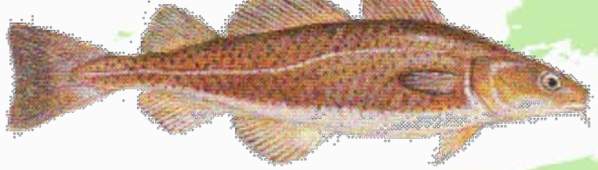
Team discussions

Further ABC reductions?

- Consistent with last year's recommendation as adopted by the SSC
- Assurance that spawning biomass stabilizes

The Team recommended that the author investigate the role that fishery catch has had on the decline in abundance. That is, project estimated historical recruits forward without fishing mortality.

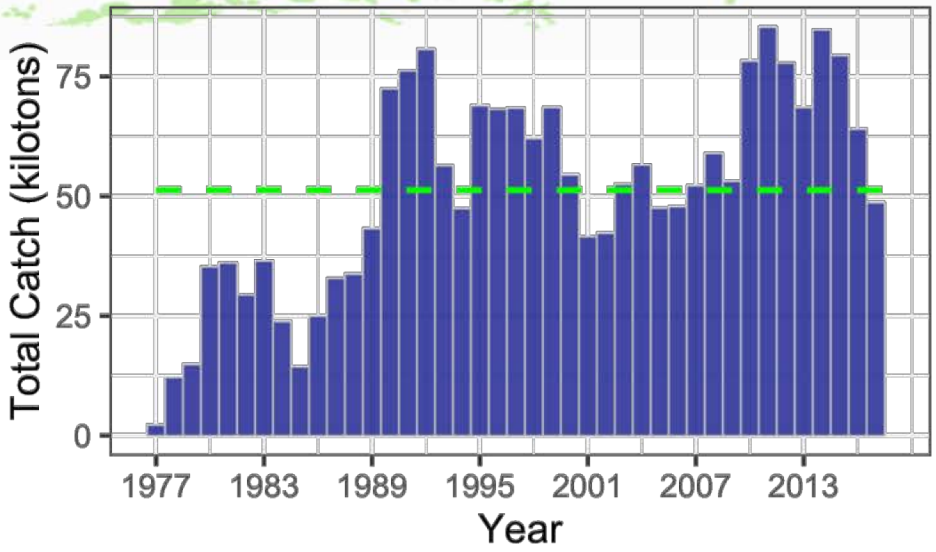
- This should help discern the extent that the stock declines are the result of environmental conditions versus the impact of fishing.



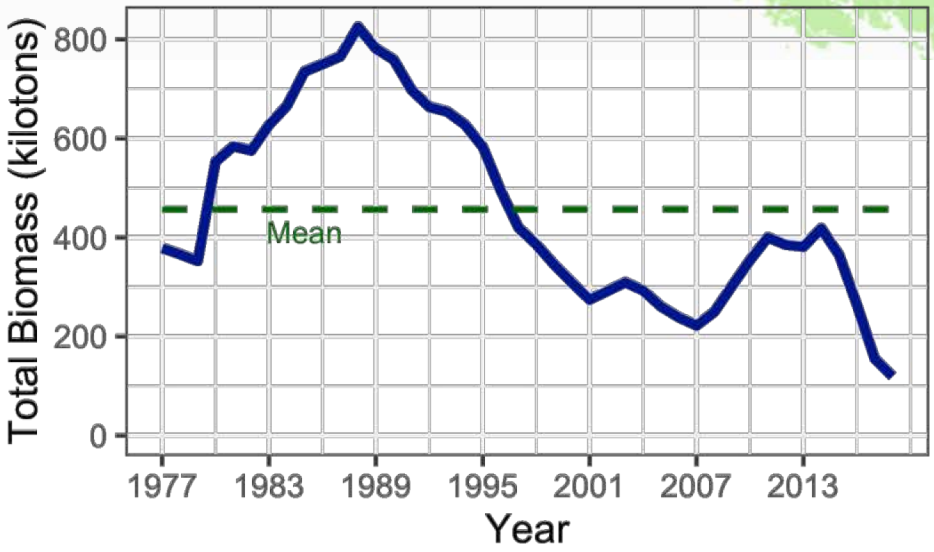
GULF OF ALASKA GROUNDFISH ASSESSMENTS

GOA Pacific cod

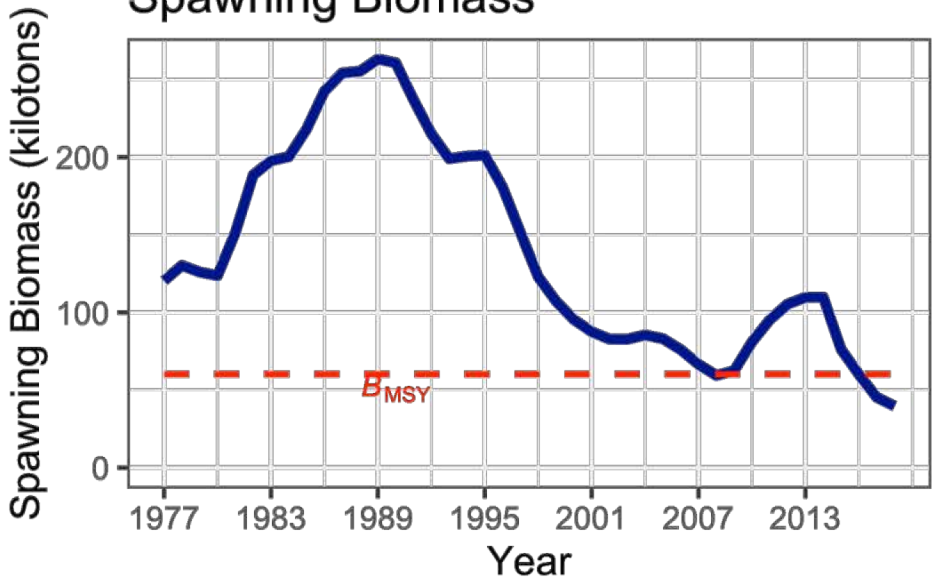
Total Catch



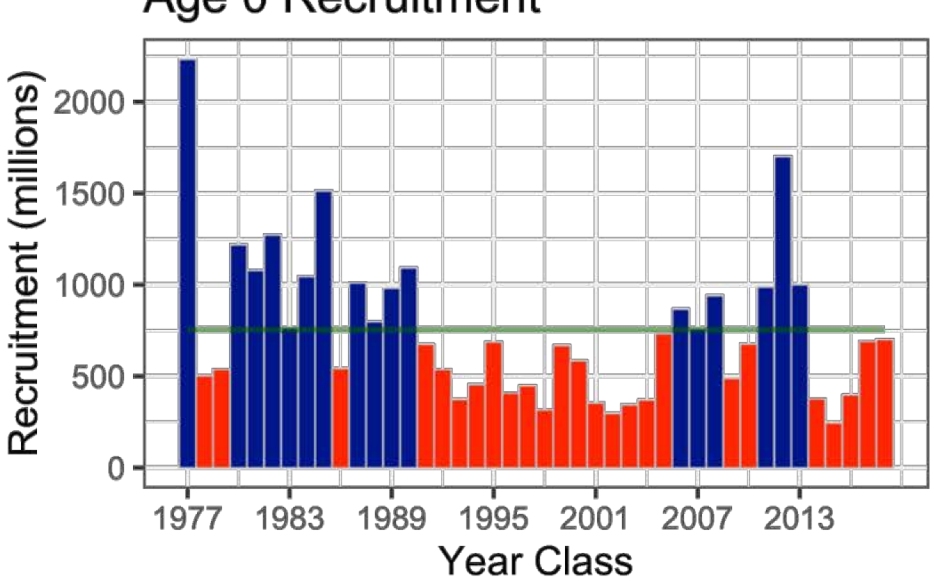
Total Biomass



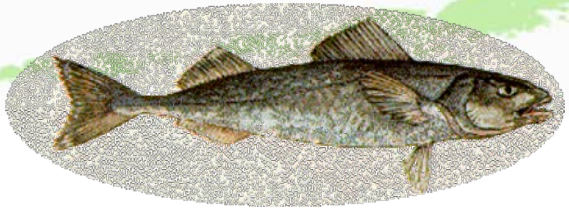
Spawning Biomass



Age 0 Recruitment



3. Sablefish



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Total	240,953	536,925	509,507	down 27,418 (5%)

2018 sablefish assessment overview

- Maximum permissible ABC way up
- Author's ABC 2019 = ABC 2018 (-45%)
  - Provides 12 reasons to rationalize

- Risk-table applied (after the fact)
- Also Ecosystem and Socioeconomic Profile (ESP)

New data

Catch:

- Updated catch for 2017
- New 2018-2020 estimates

Relative abundance:

- 2018 Longline **survey**
- 2017 Longline **fishery**

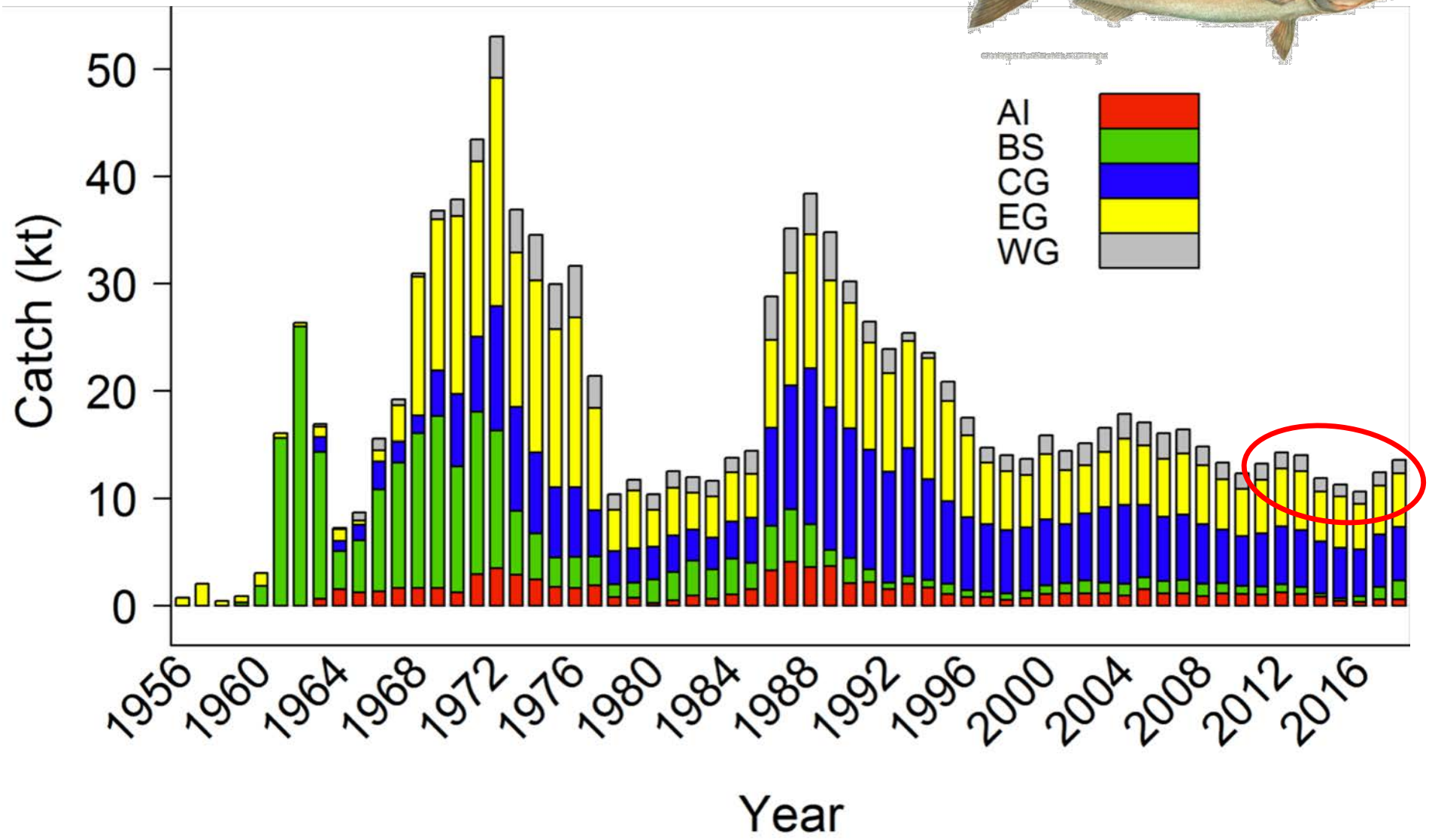
Ages:

- 2017 longline survey, 2017 fixed gear fishery

Lengths:

- 2018 longline survey,
- 2017 fixed gear fishery, and
- 2017 trawl fishery

Sablefish Catch by Area



Sablefish

Sablefish Trawl catch increase

Total
Trawl Gear
Fixed Gear

Catch (mt)

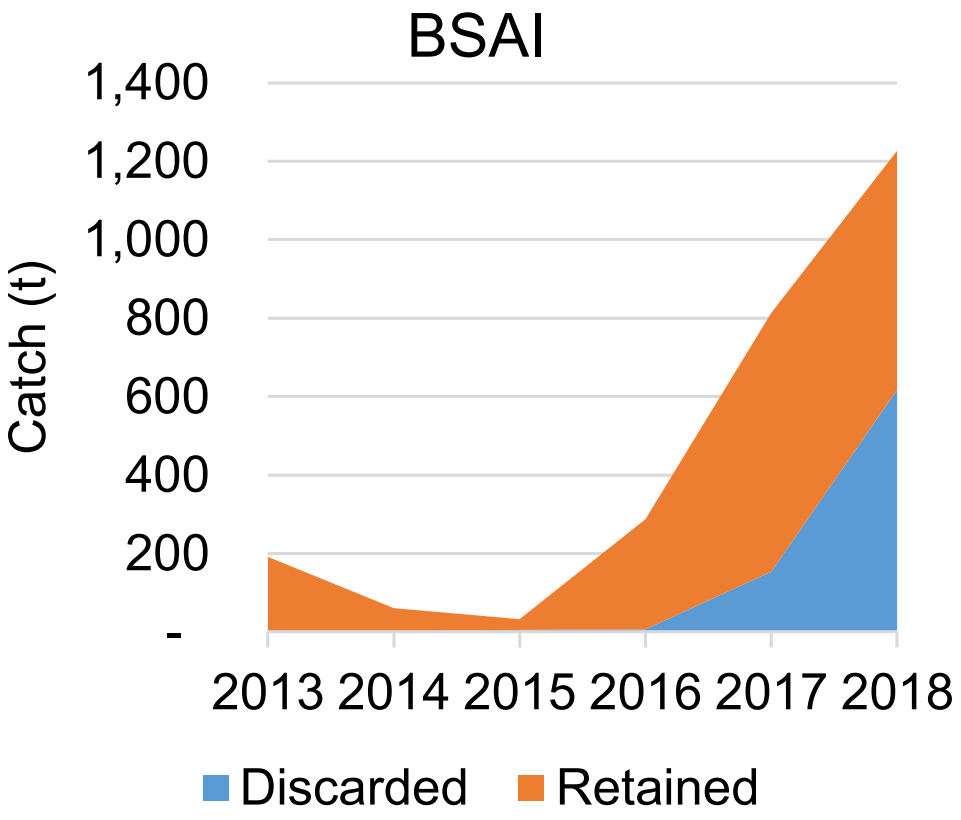
0
10
20
30

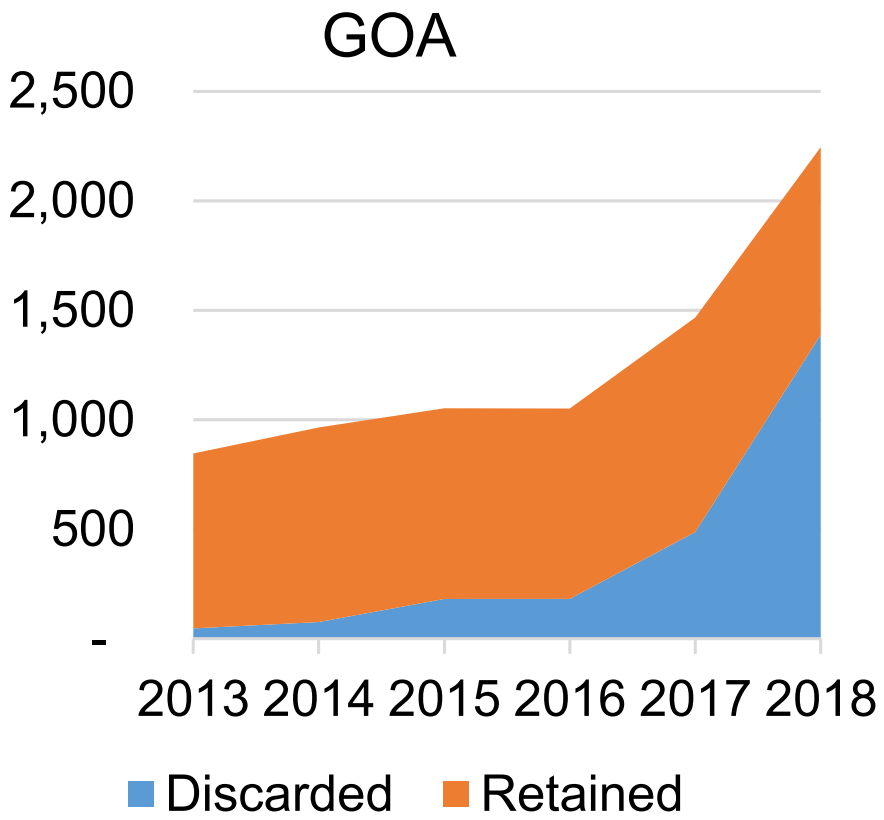
1990
1995
2000
2005
2010
2015

Year

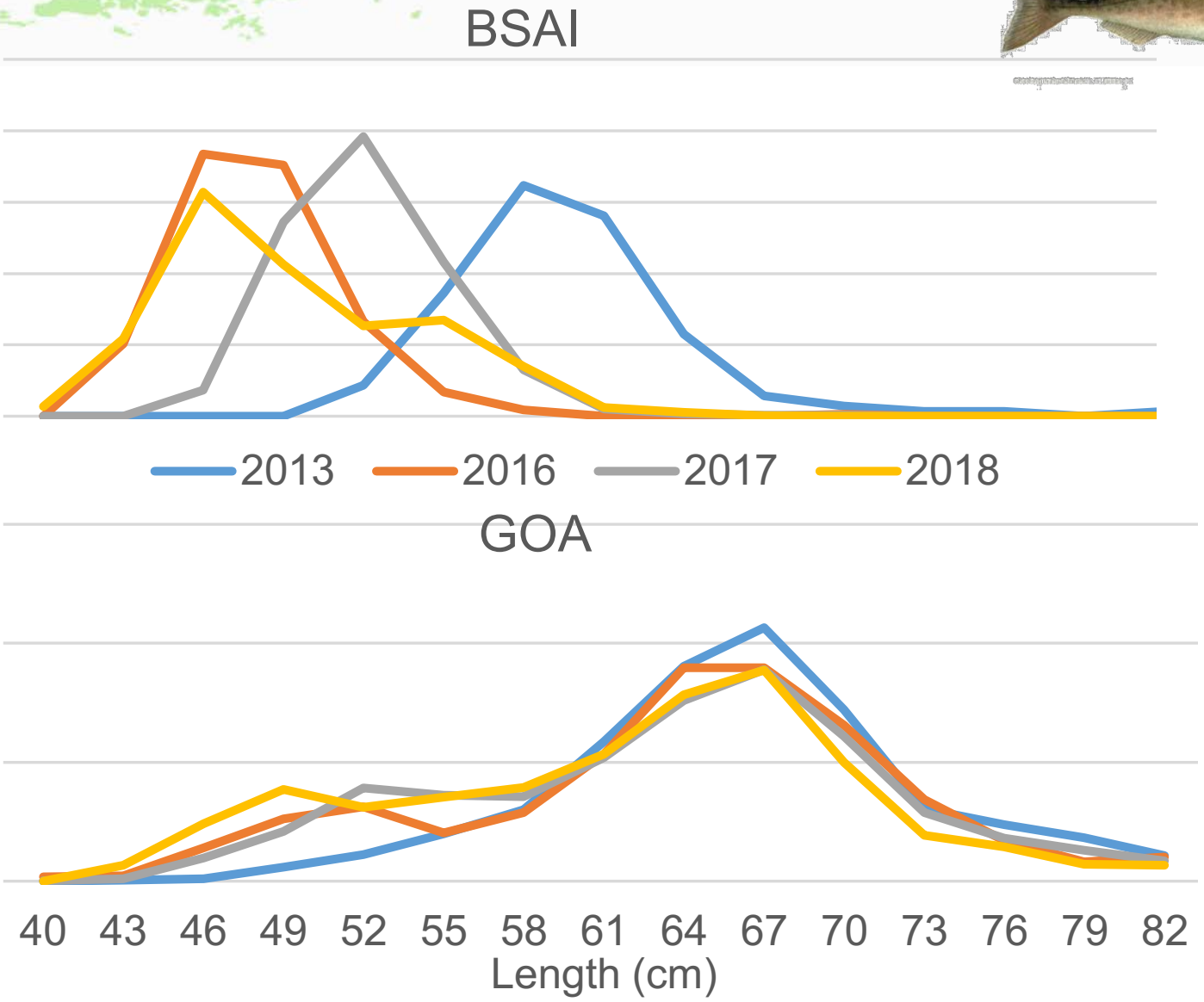
Sablefish

Bycatch in trawl fishery



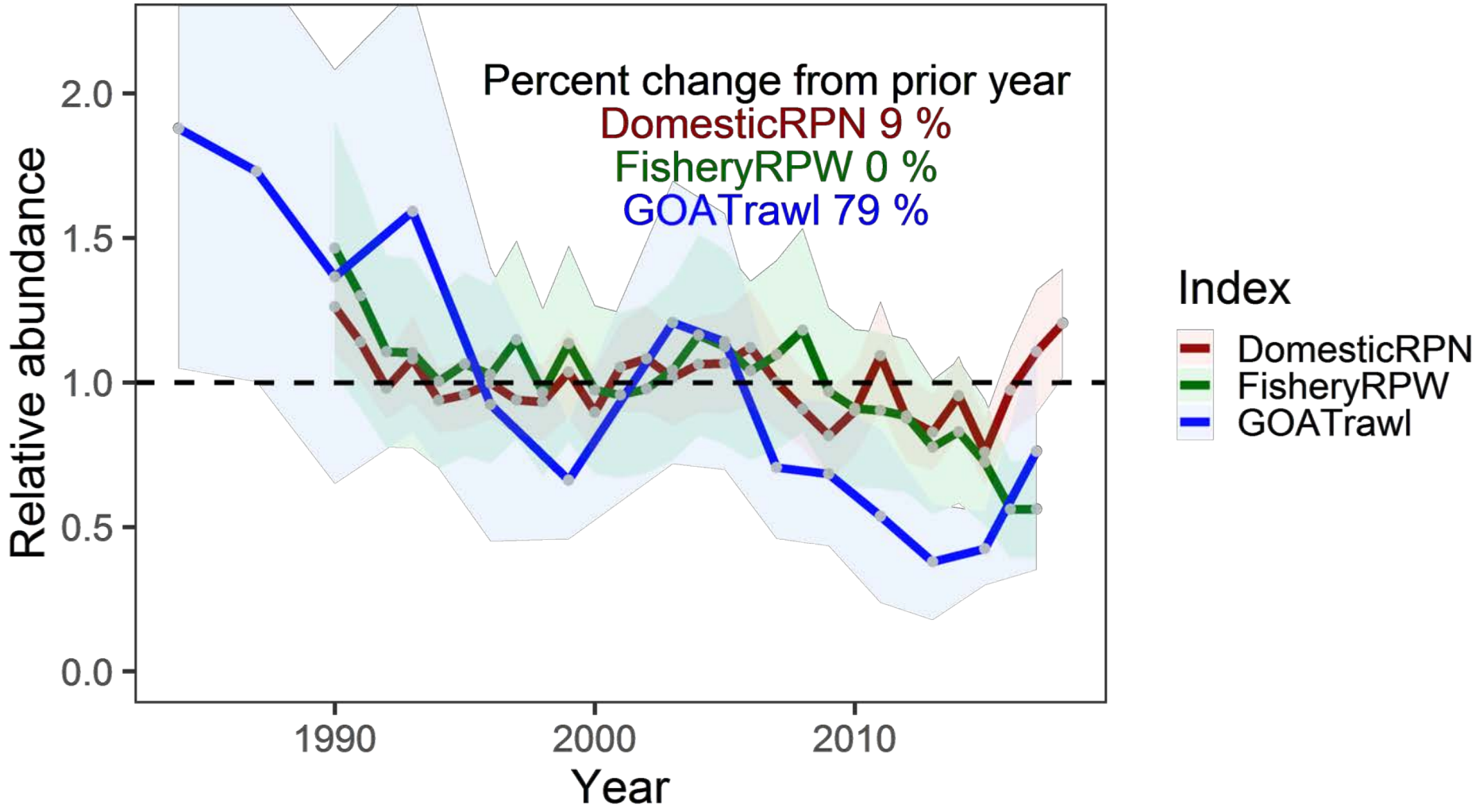


Bycatch in trawl fishery



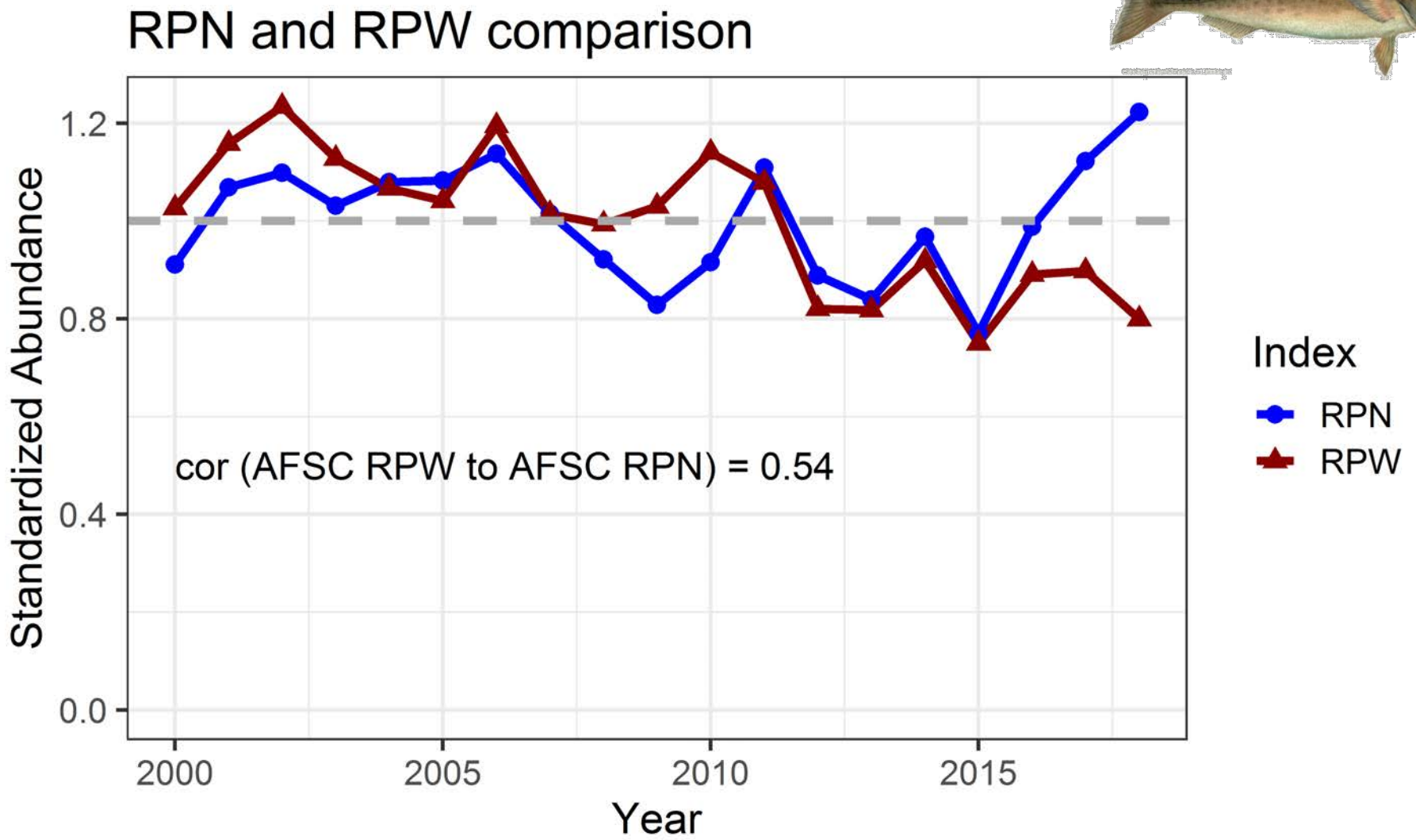
Sablefish

Sablefish abundance indices



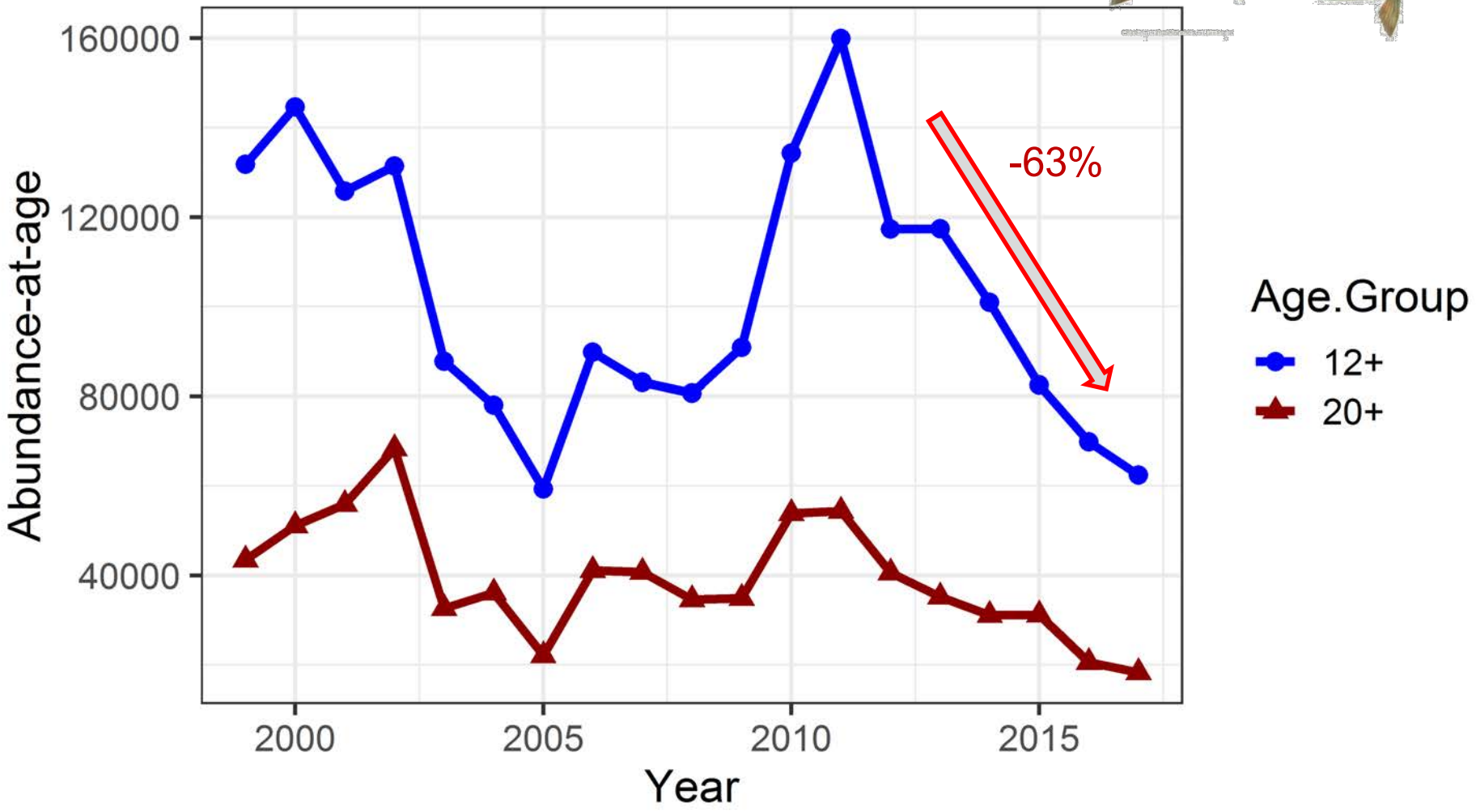
Sablefish survey CPUE (wt vs number)

Sablefish



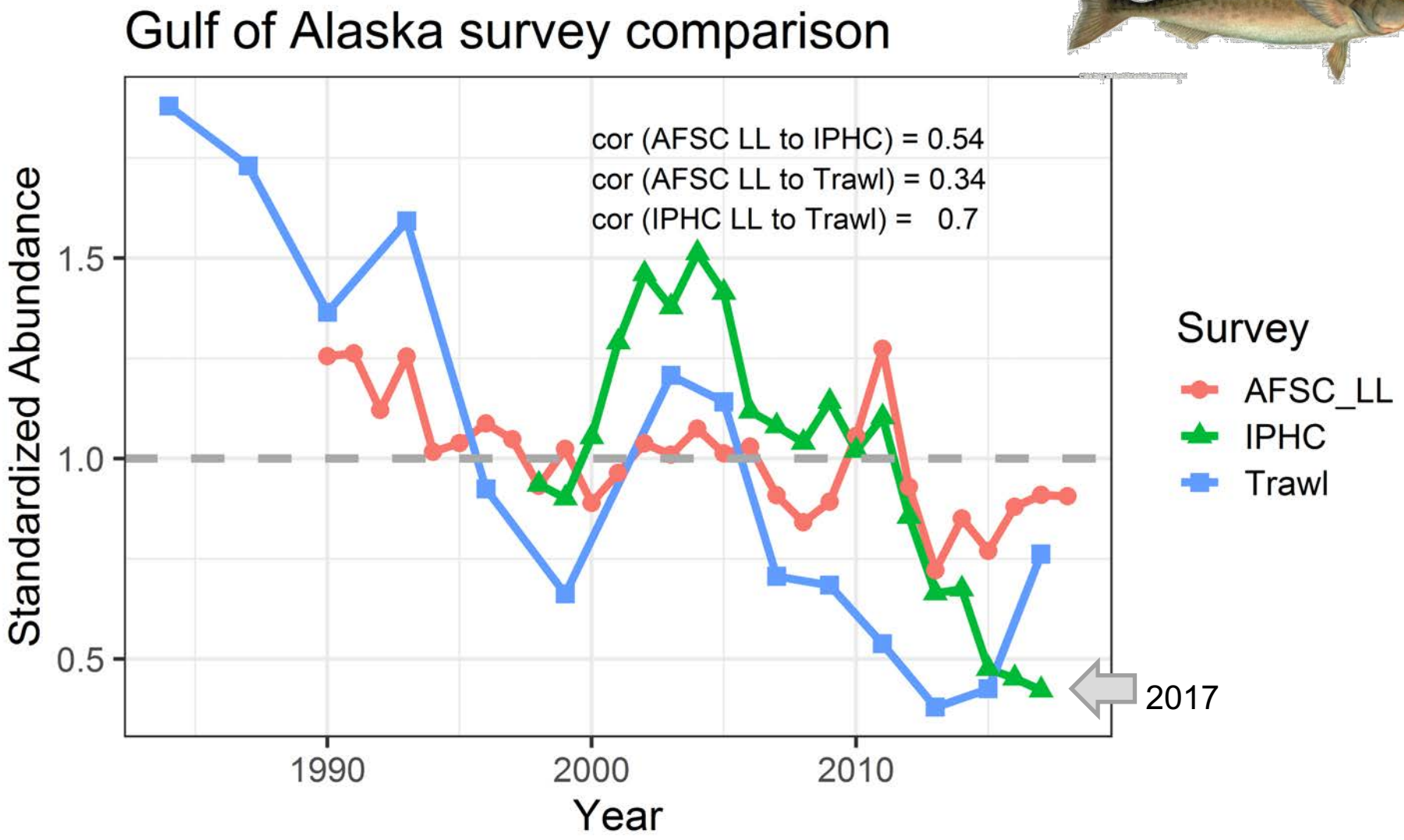
Apparent abundance of older fish

Sablefish



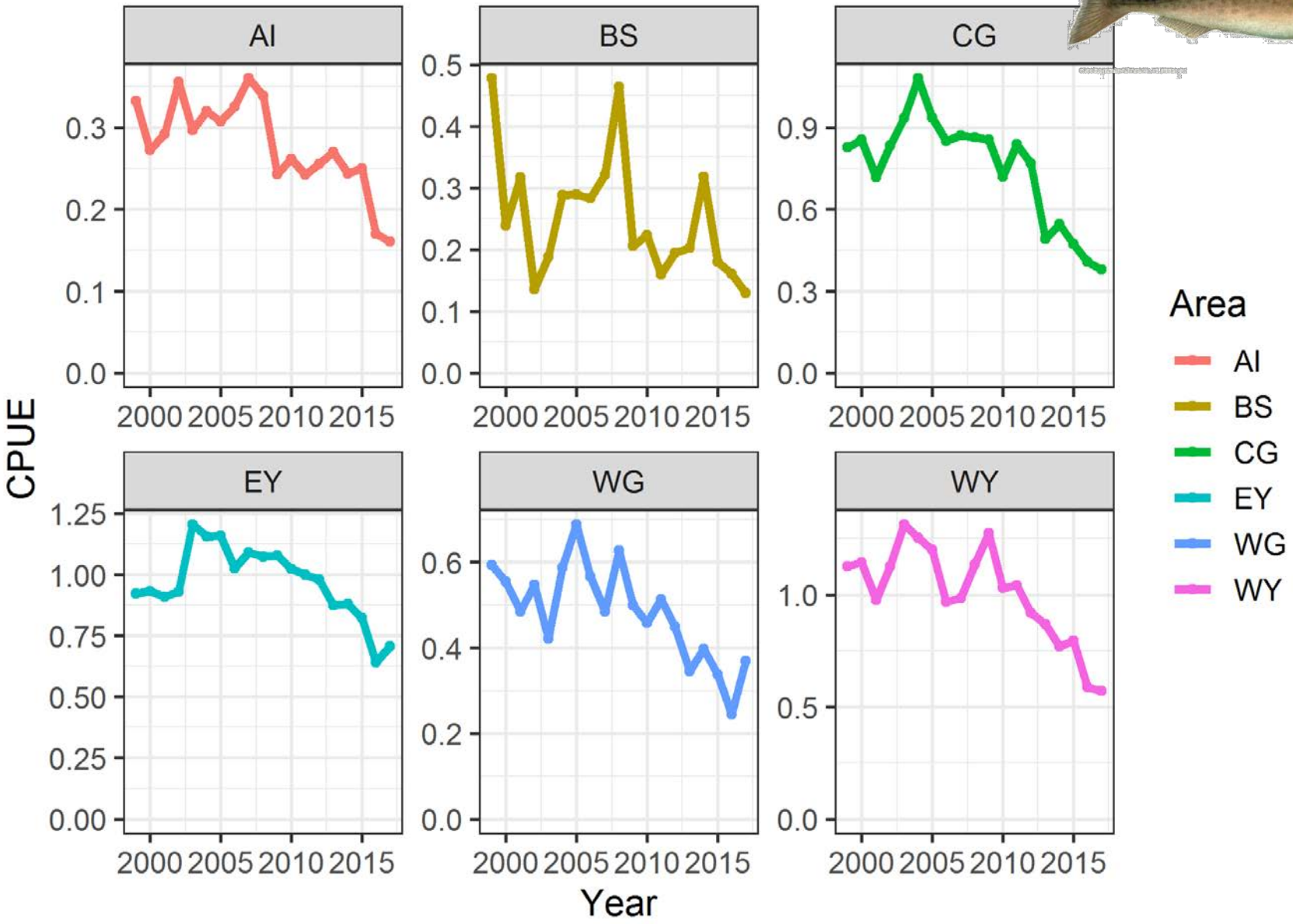
Halibut commission setline-survey compared to AFSC data

Sablefish



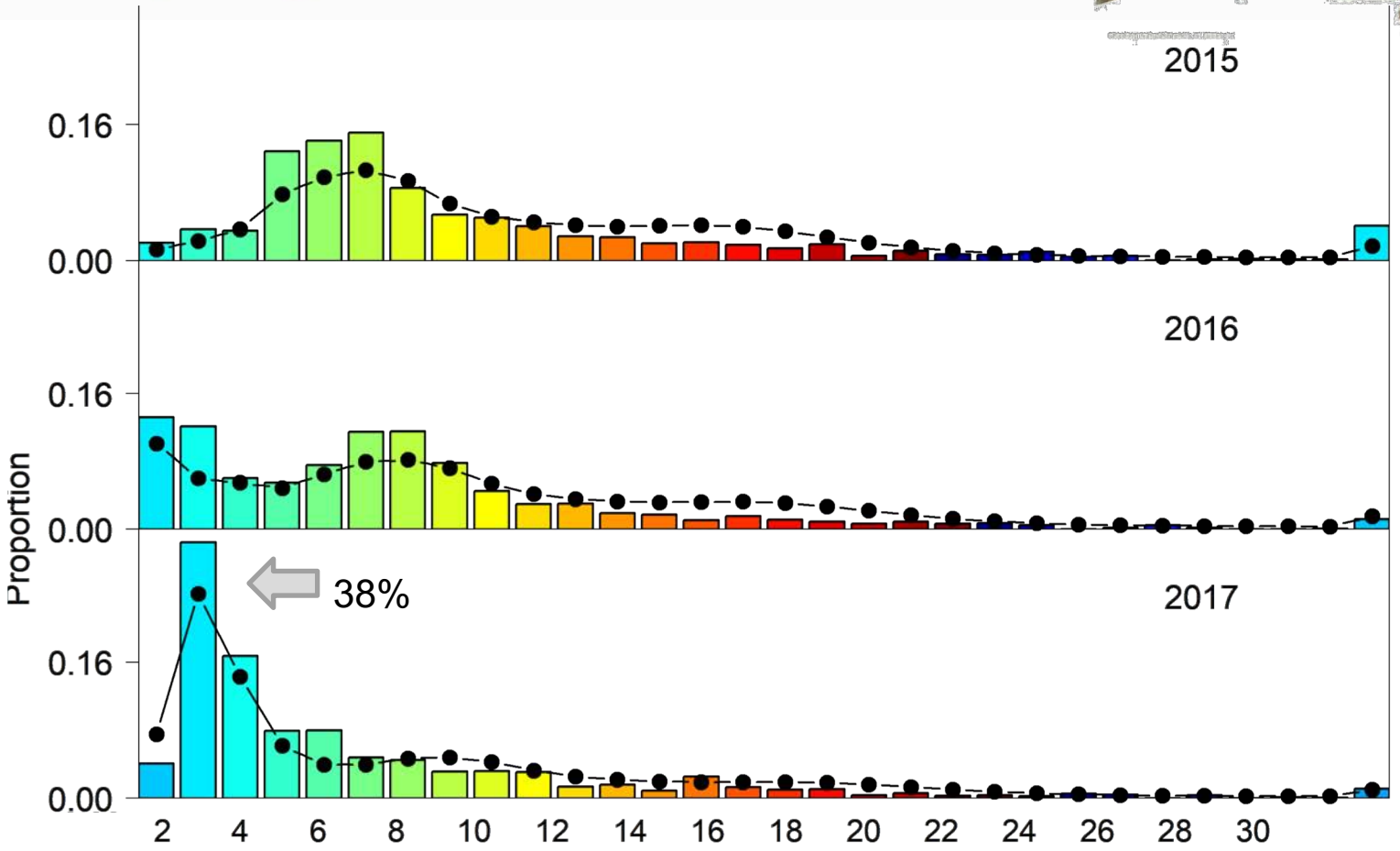
Fishery CPUE by area

Sablefish



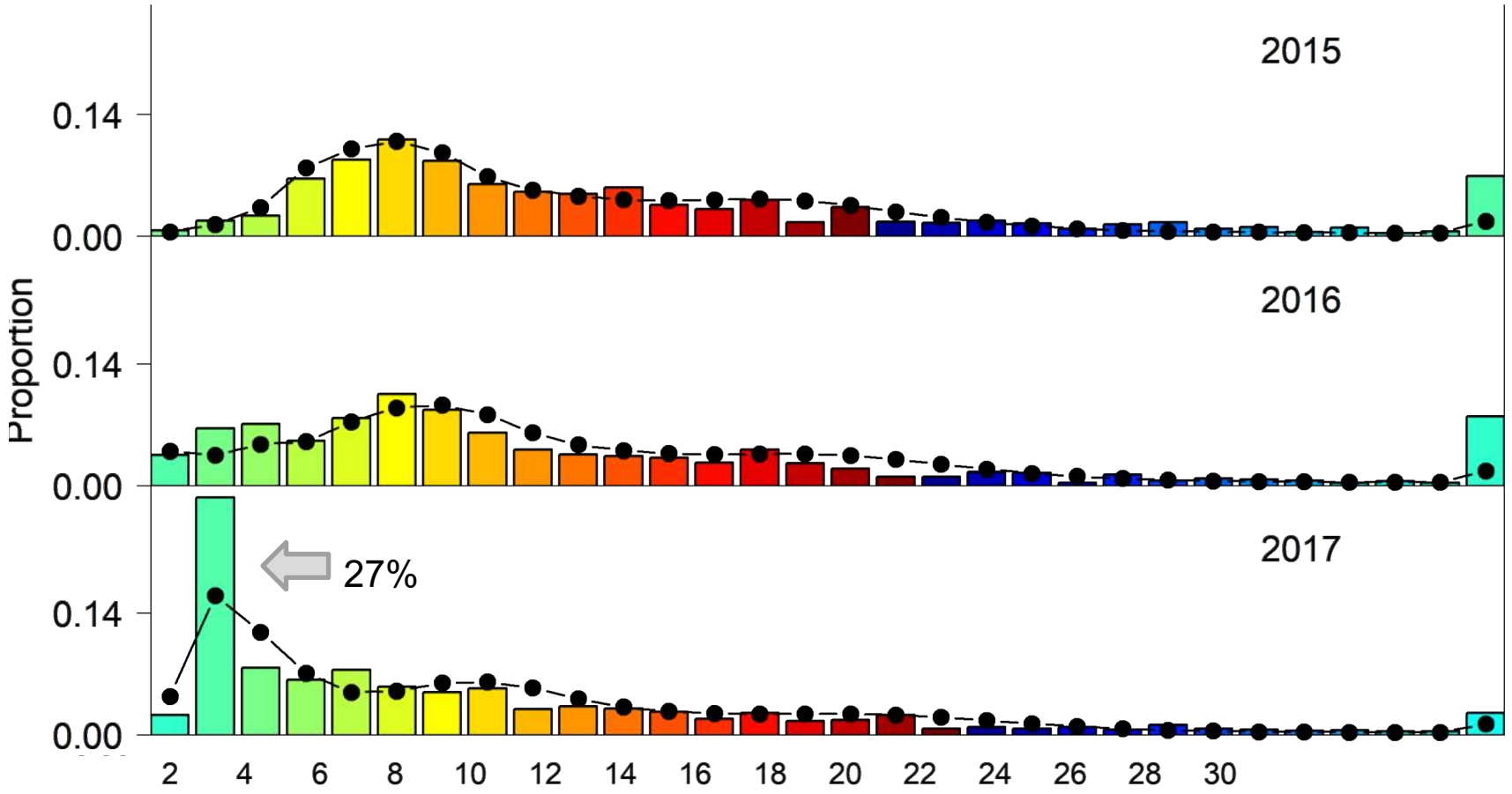
Longline survey ages

Sablefish

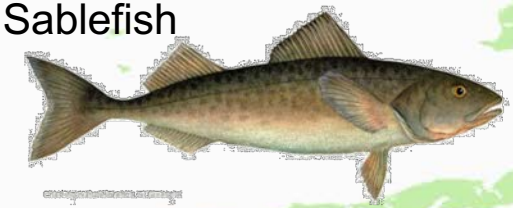


Fixed gear fishery ages

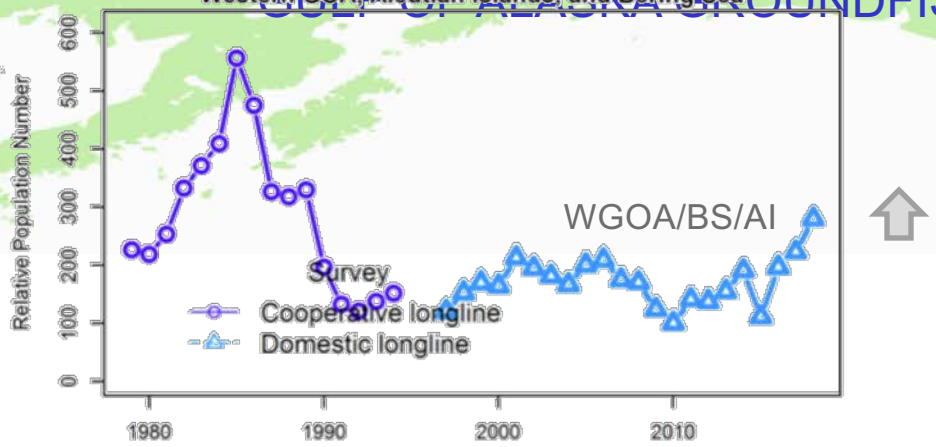
Sablefish

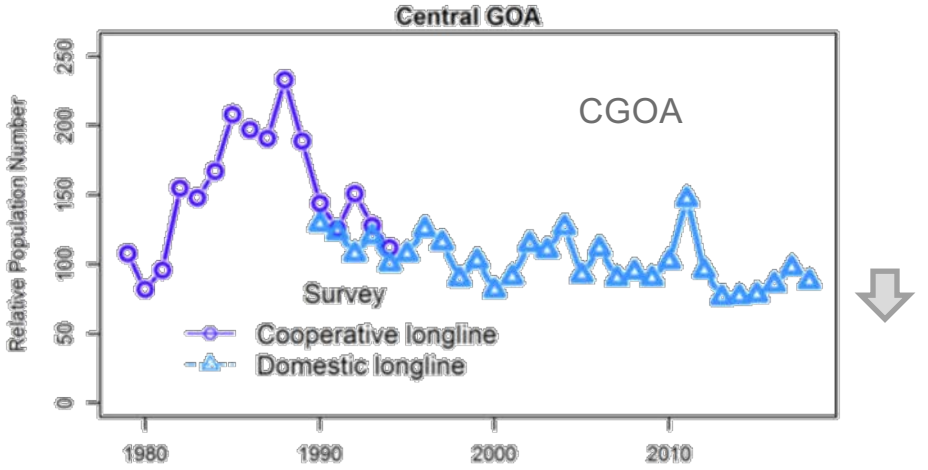


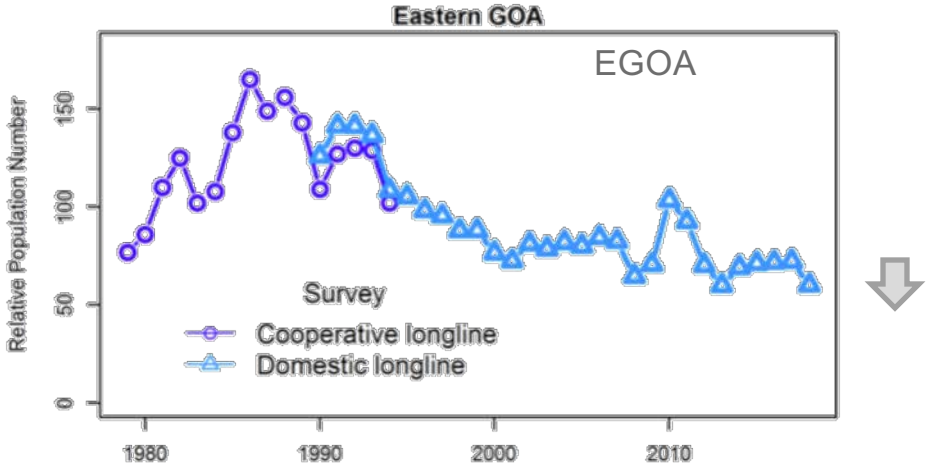
Sablefish



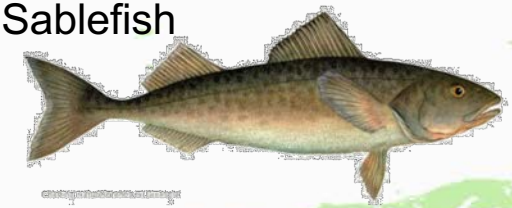
LL Survey RPNs





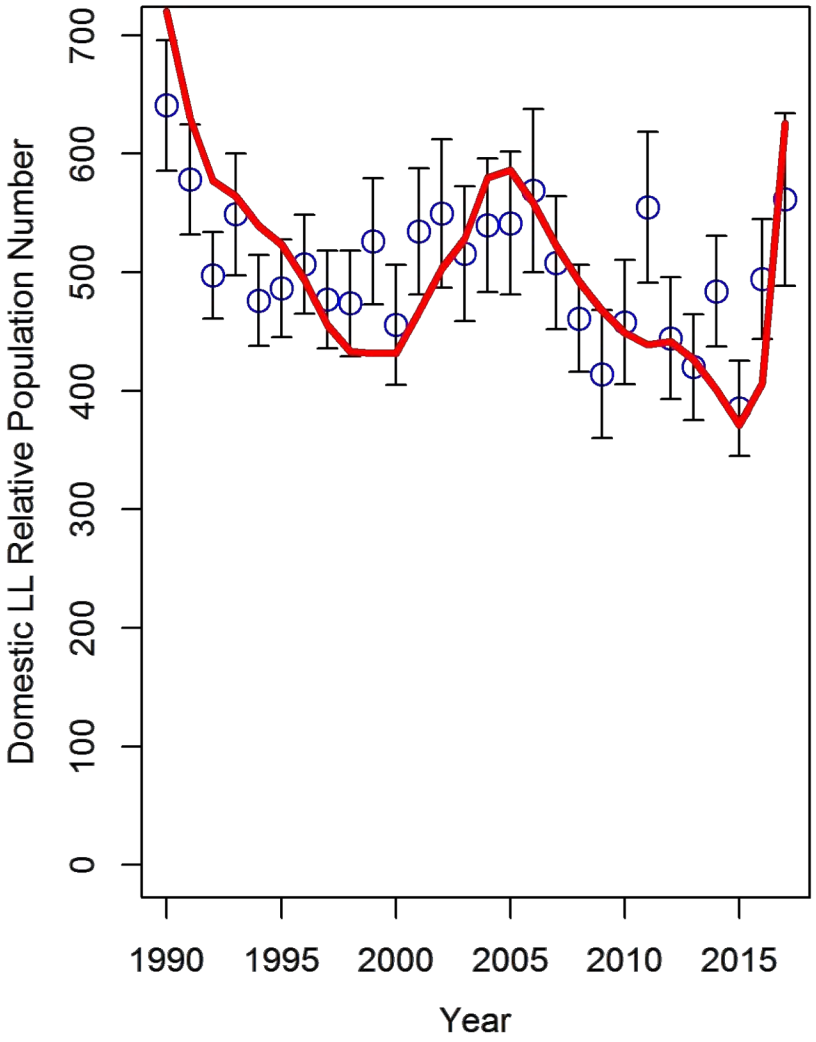


Sablefish

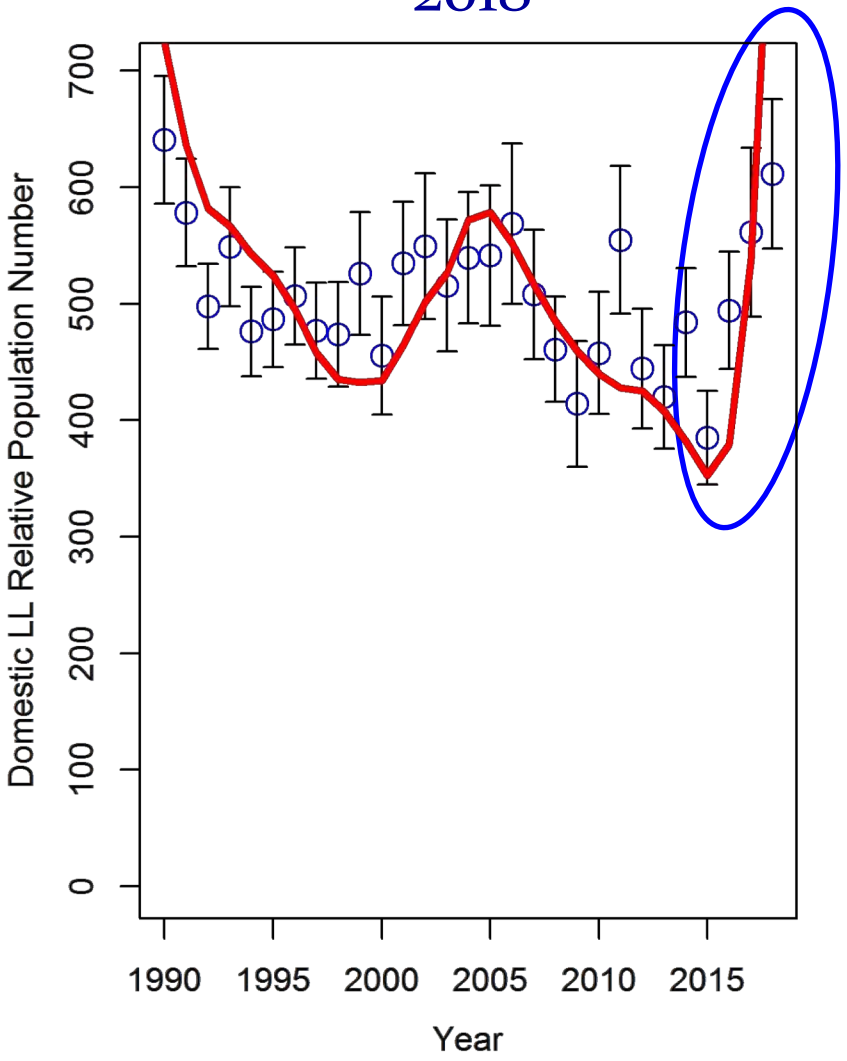


Sablefish survey fit, last yr vs this yr

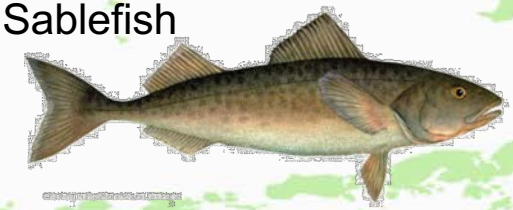
2017



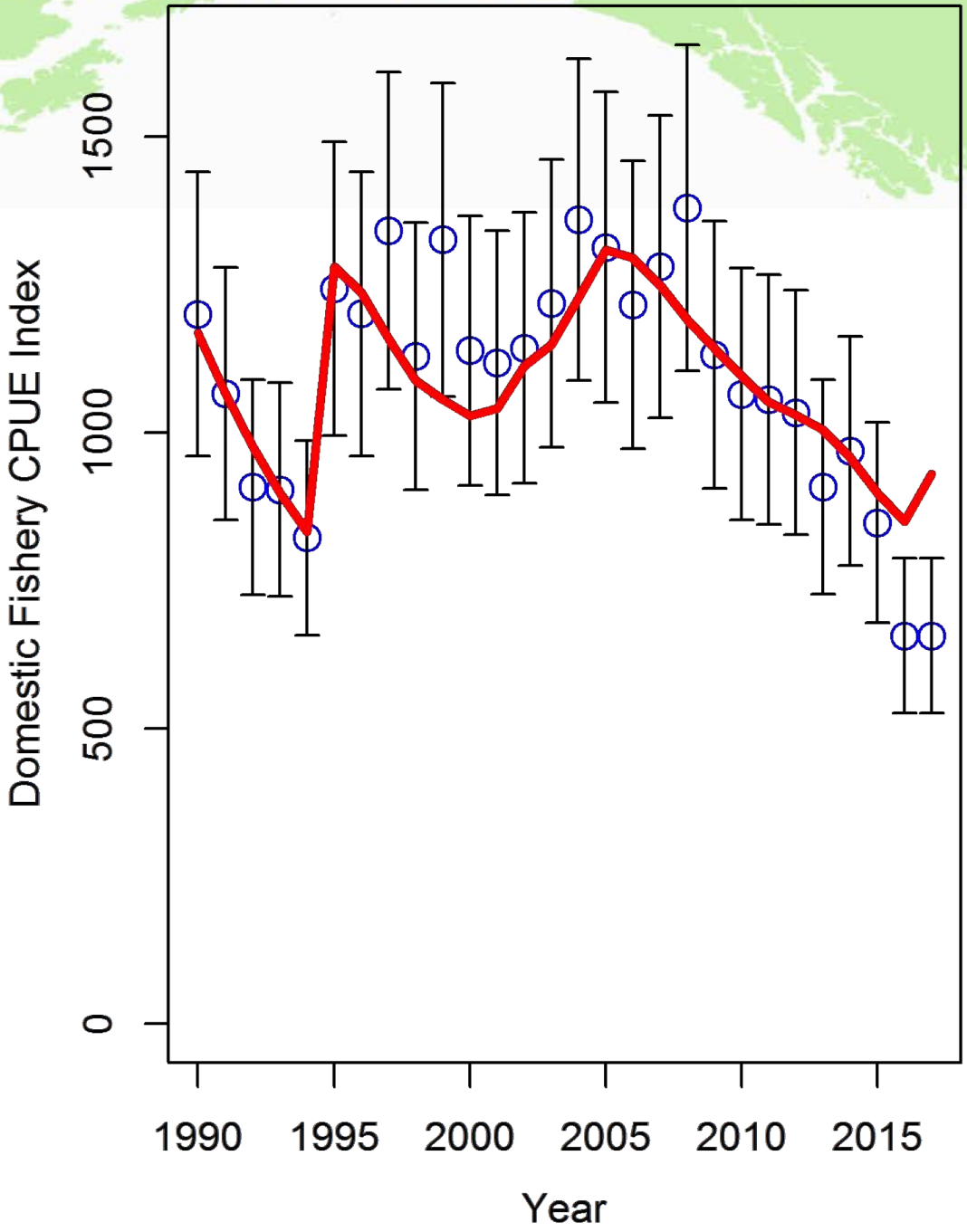
2018



Sablefish

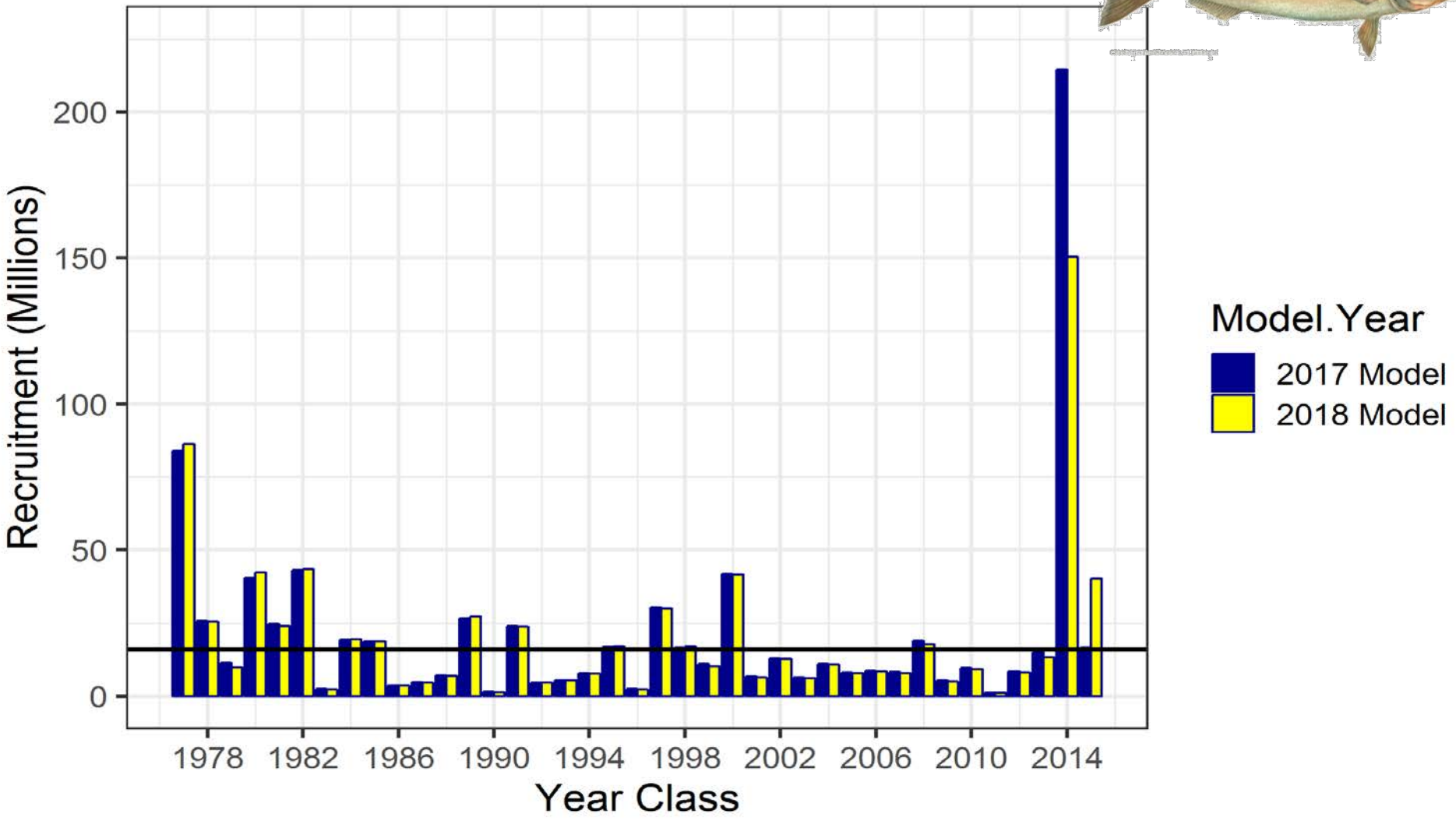


Fit to fishery CPUE



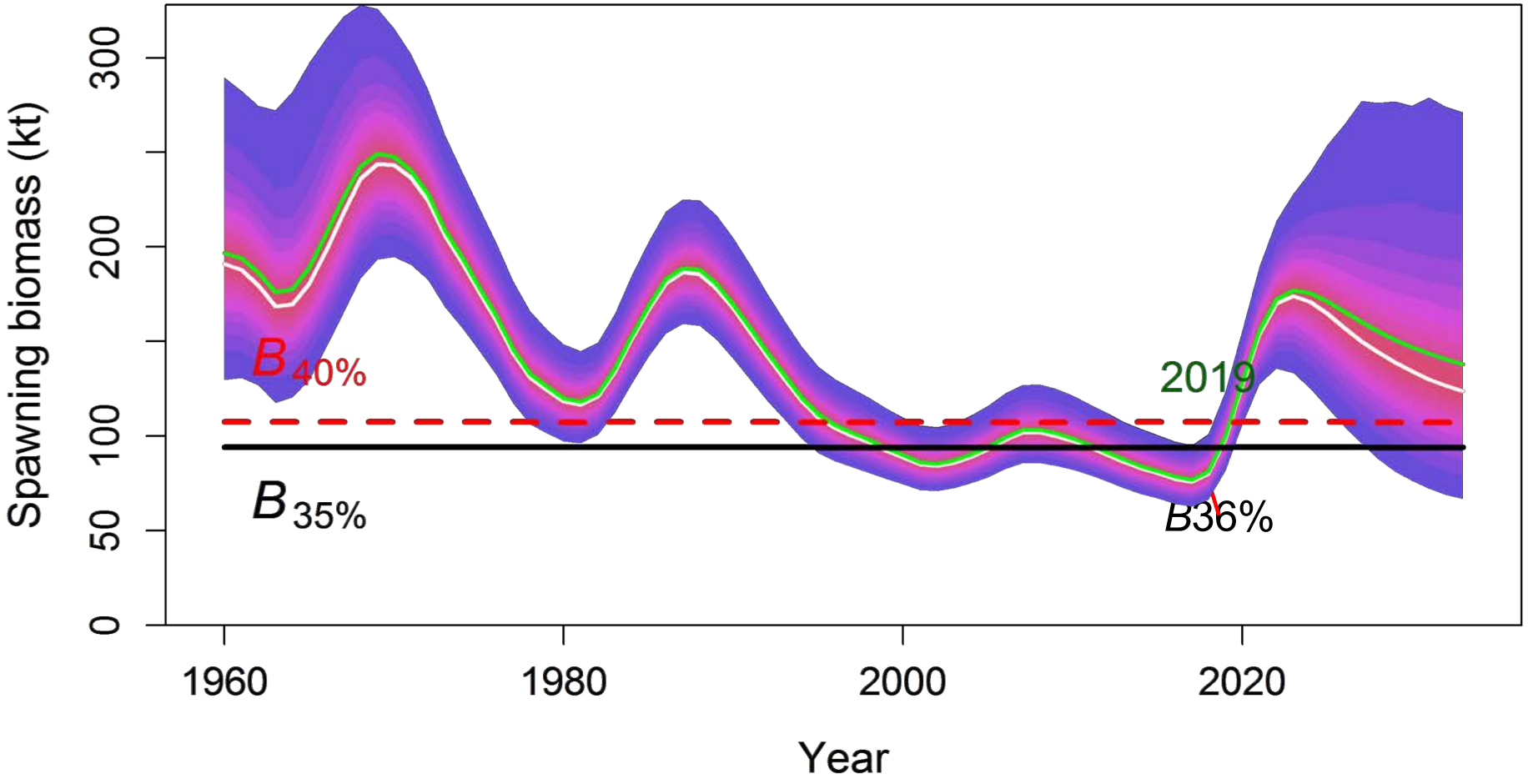
Model recruitment estimates

Sablefish



Sablefish

2018 Projection



Sablefish

Risk-table framework 4

- Reducing ABC from maximum
- Assessment model: 2 (increased concern)
- Population dynamics: 4 (extreme concern)
- Ecosystem: 2 (increased concern)

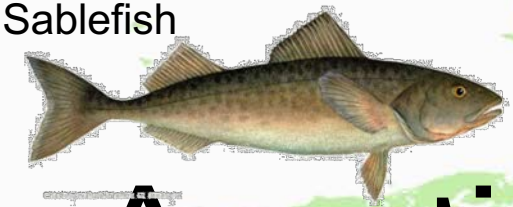
ABC summary

LL survey RPN up substantially from low in 2015

Fishery CPUE index at time series low in 2016/2017

33% unfished spawning biomass (lower than in 2017)

- Author's ABC 2019 = ABC 2018
- Rebuilding spawning biomass above target is primary goal



Apportionment recommendation

- Continuing with the fixed apportionment

Apportionment Table (before whale depredation adjustments)

Area	2018 ABC	Standard apportionment for 2019 ABC	Recommended fixed apportionment for 2019 ABC*	Difference from 2018
Total	15,380	15,380	**15,380**	0%
Bering Sea	1,501	3,085	**1,501**	0%
Aleutians	2,030	2,064	**2,030**	0%
Gulf of Alaska (subtotal)	11,849	10,231	**11,849**	0%
Western	1,659	1,877	**1,659**	0%
Central	5,246	3,978	**5,246**	0%
W. Yakutat**	1,765	1,506	**1,765**	0%
E. Yak. / Southeast**	3,179	2,870	**3,179**	0%

* Fixed at the 2013 assessment apportionment proportions (Hanselman et al. 2012b). ** Before 95:5 hook and line: trawl split shown below.

Discussion in Joint minutes (p. 3)

Teams agreed with the authors' recommendation

- **Keep ABC constant at the 2018 level.**
- **Apply updated depredation adjustment**
- **Stock appears to remain in Tier 3b in 2018**

The Teams recommend exploring model fit to the survey RPN and the alternative survey index, RPW,

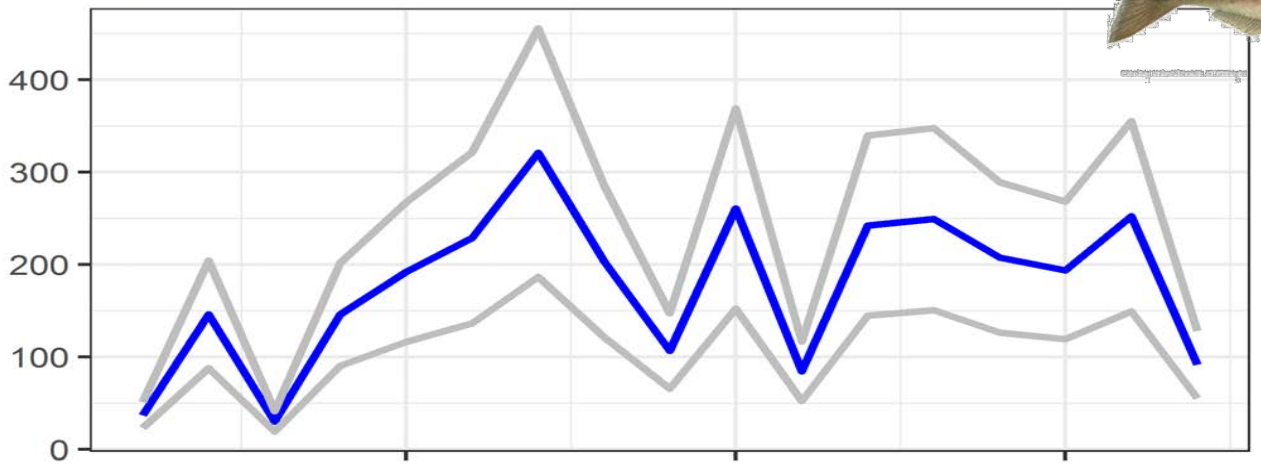
- **Specifically related to changes in size-at-age or length-weight relationships**

The Teams look forward to seeing the spatial apportionment analysis next year

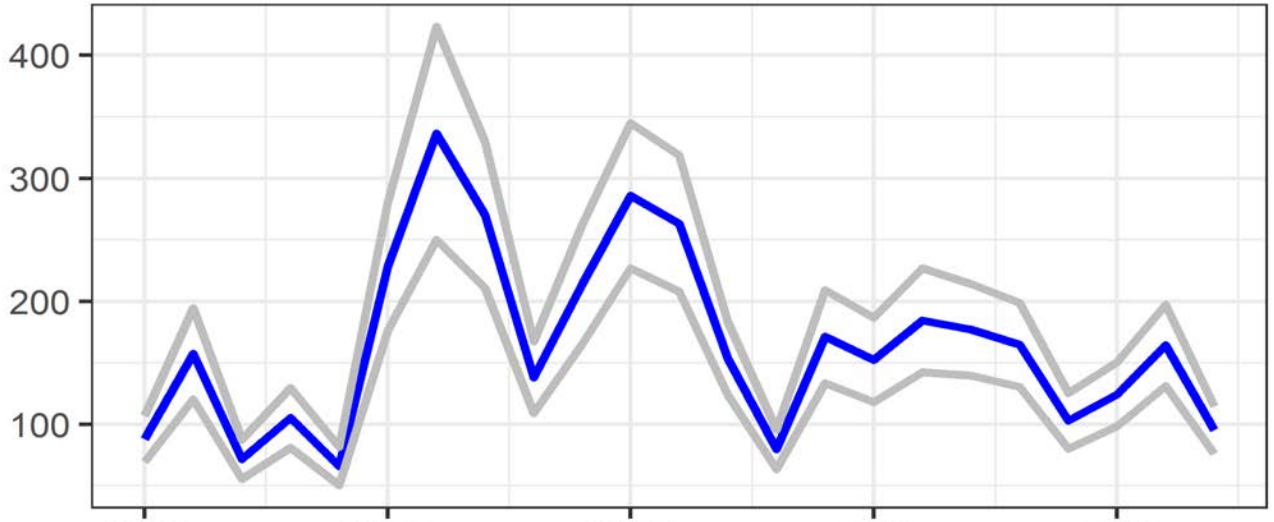
Depredation by whales in fishery

Sablefish

Sperm whale



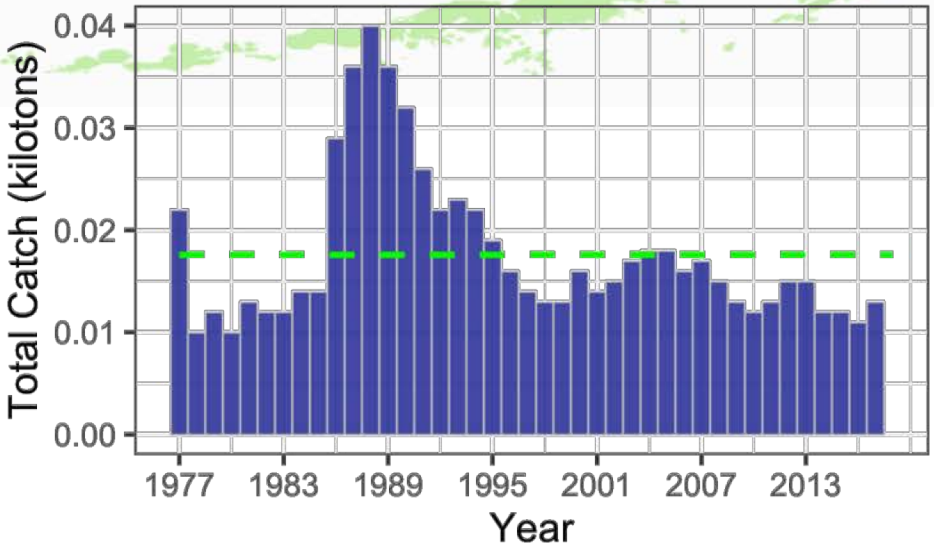
Orca



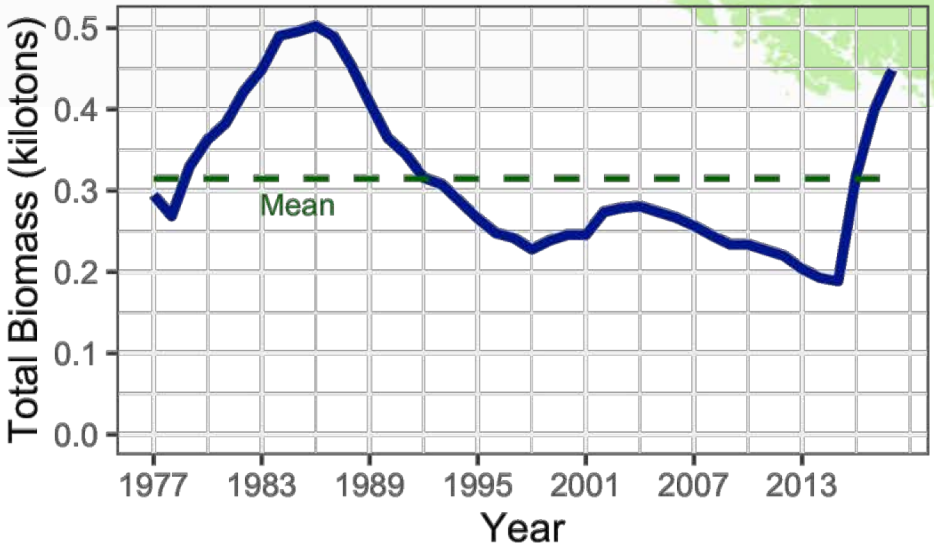
2018

GULF OF ALASKA GROUNDFISH ASSESSMENTS

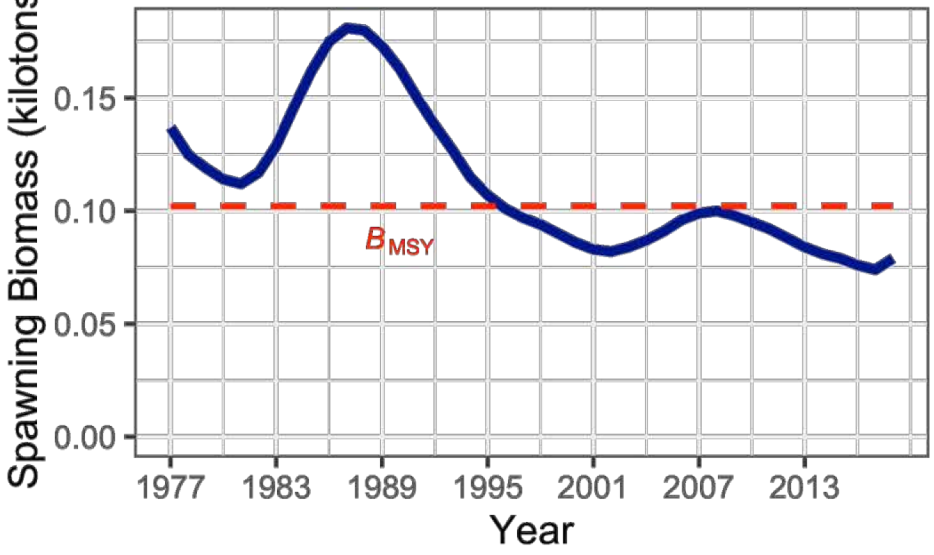
Total Catch



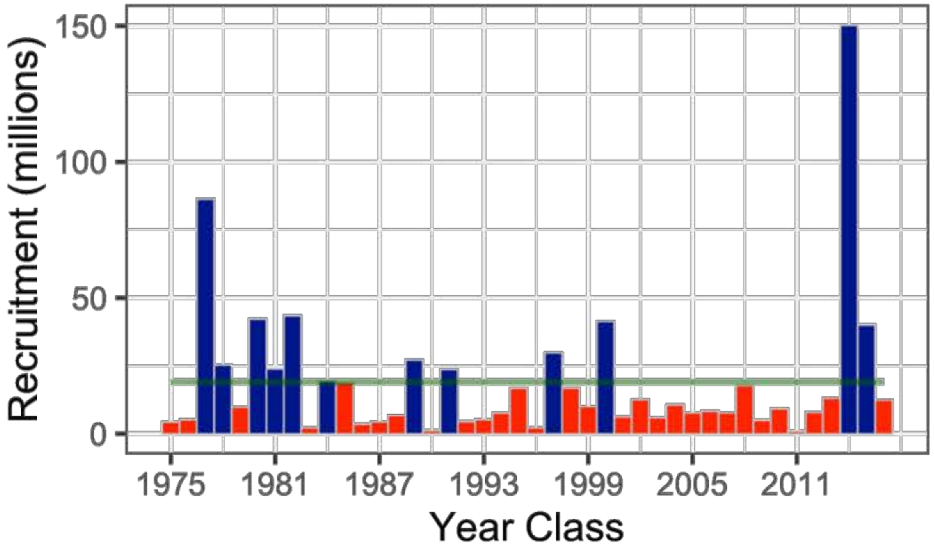
Total Biomass



Spawning Biomass



Age 2 Recruitment



Flatfish ABC Summary

Species	2018 Catch	2018	2019	Change
Pollock	154,286	170,265	144,623	down 25,642 (15%)
Pacific Cod	9,595	18,000	17,000	down 1,000 (6%)
Sablefish	11,716	11,505	11,571	up 66 (1%)
Flatfish	22,053	114,712	116,562	up 1,850 (2%)
Arrowtooth flounder	2,045	150,945	145,841	down 5,104 (3%)
Rockfish	33,425	47,067	46,946	down 121 (0%)
Atka mackerel	1,431	4,700	4,700	same (0%)
Skates	2,786	7,804	7,804	same (0%)
Other Species	3,616	11,927	14,460	up 2,533 (21%)
Total	240,953	536,925	509,507	down 27,418 (5%)

Flatfish ABC's

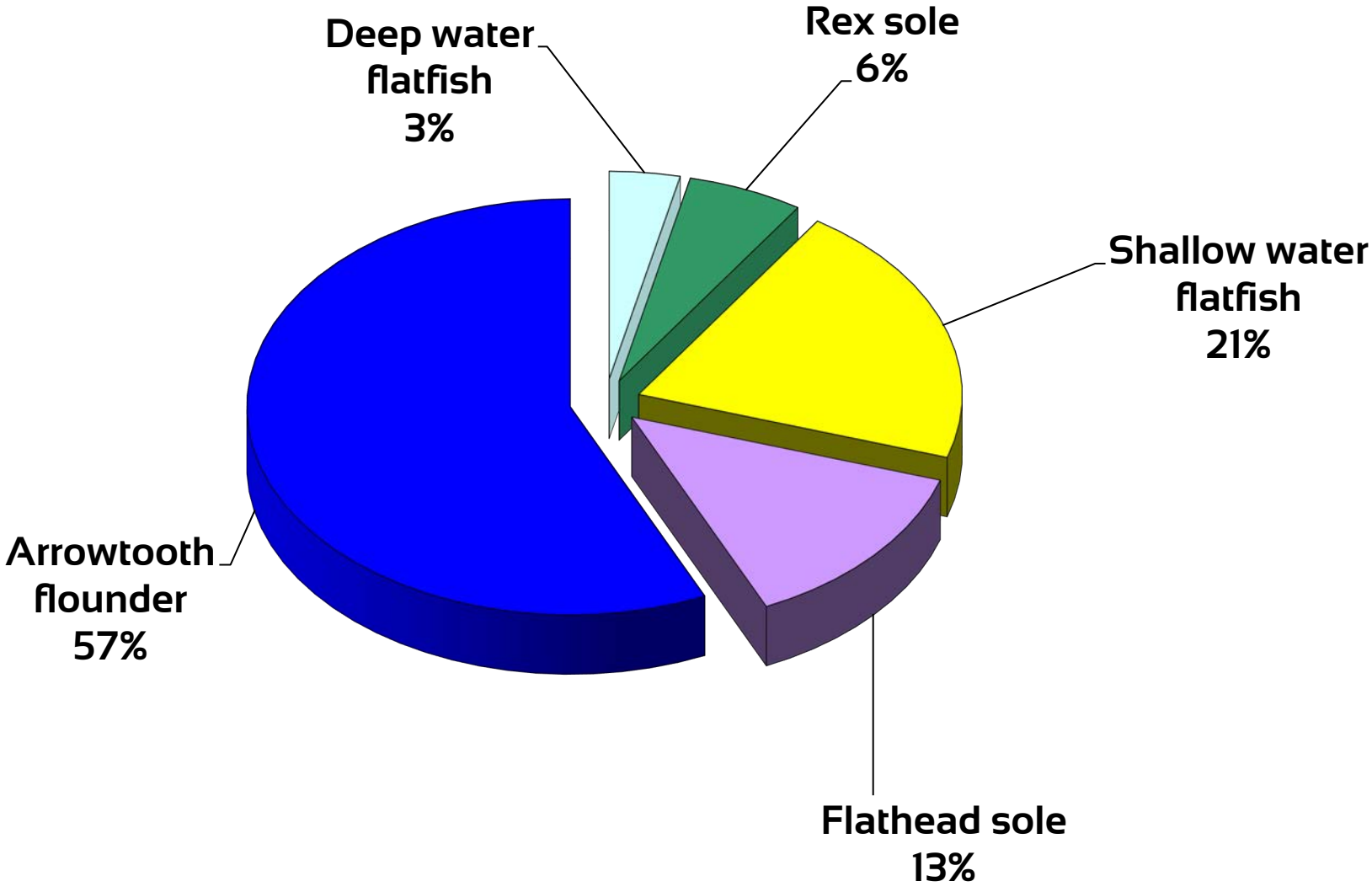
Species	2018 ABC	2019 ABC	Change
Shallow water flatfish	54,688	55,587	up 899 (2%)
Rex sole	15,373	14,692	down 681 (4%)
Deep water flatfish	9,385	9,501	up 116 (1%)
Flathead sole	35,266	36,782	up 1,516 (4%)
Arrowtooth flounder	150,945	145,841	down 5,104 (3%)
Subtotal	265,657	262,403	down 3,254 (1%)
Subtotal (without ATF)	114,712	116,562	up 1,850 (2%)

Deep-water ABC from Dover assessment Tier 3 + others Tier 6

Shallow water flats: N and S rock sole Tier 3, others Tier 5

Flatfish 2018 ABC's

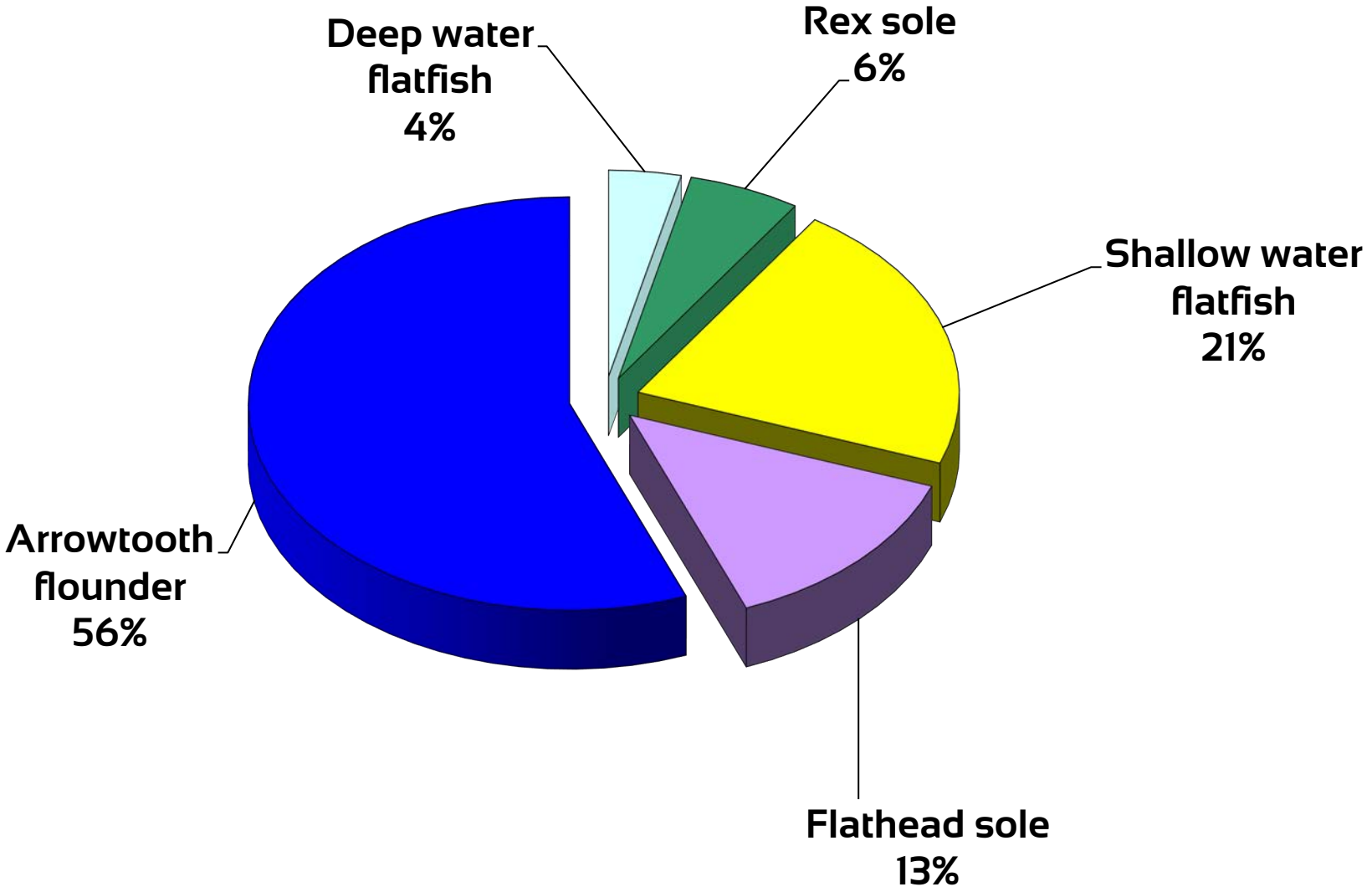
265,657 t combined



260,887

Flatfish 2019 ABC's

260,887 t combined



General comments on flatfish assessments

- Lightly exploited
- Analytical developments:
  - N & S rock sole models
  - Dover and flathead sole models full in 2015
    - Stock Synthesis modeling platform (SS3) application
    - Models accepted from 2014
    - Rex sole assessment conversion completed to SS3
      - Full assessment this year

Flatfish ABC's

Species	2018 ABC	2019 ABC	Change
Shallow water flatfish	54,688	55,587	up 899 (2%)
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Shallow water flats: N and S rock sole Tier 3, others Tier 5

4. Shallow-water flatfish

Tier 5 (except rock soles)

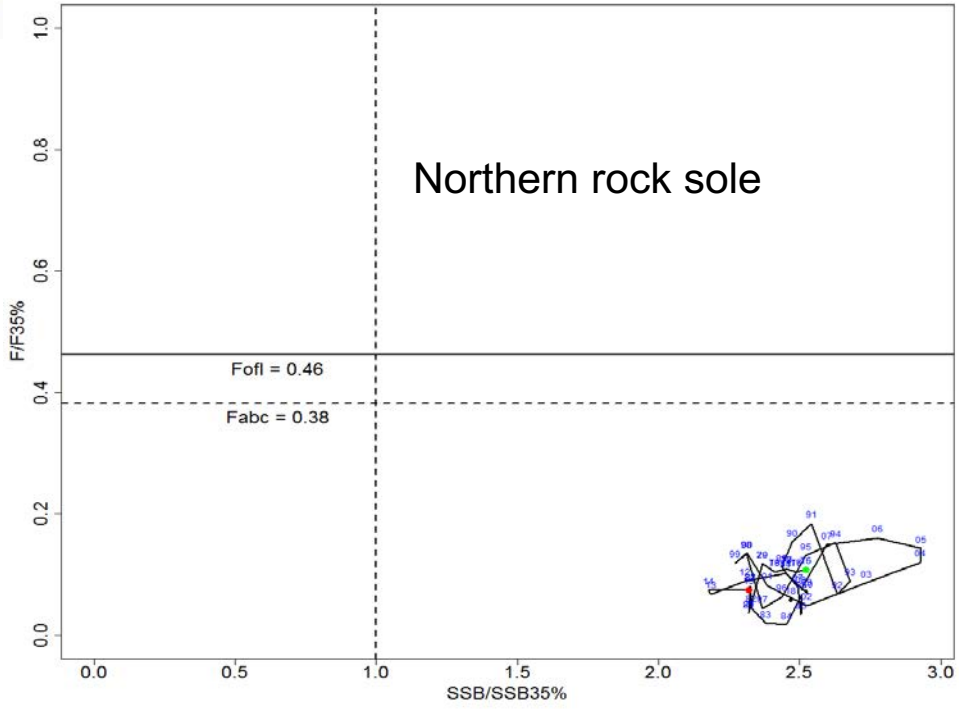
Random effects model:

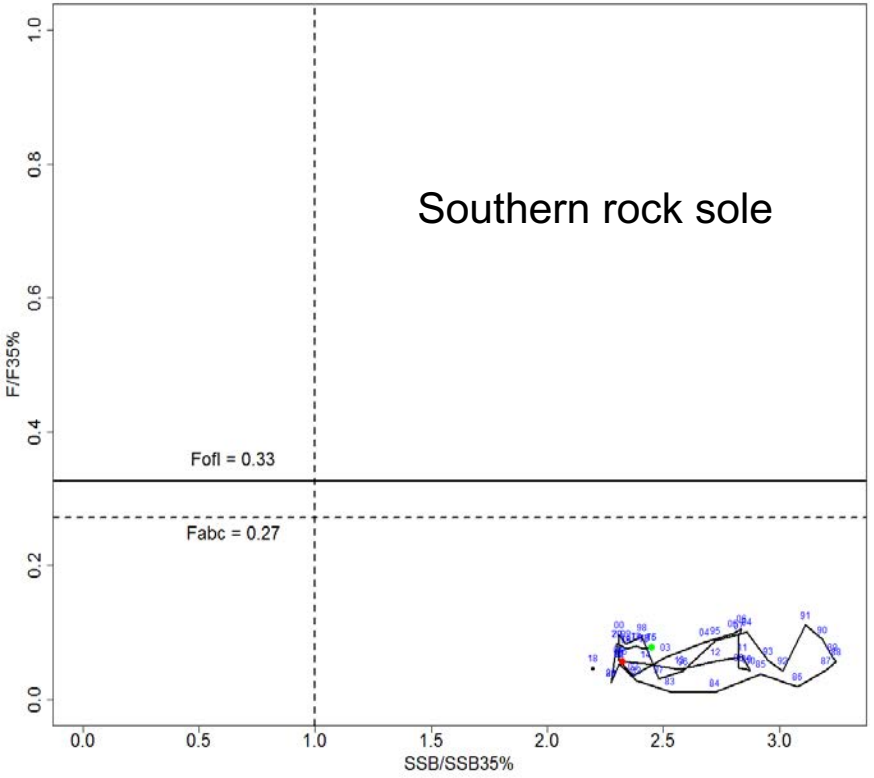
- Applied to sum of survey biomass over species (excluding rock sole)
- Also by area (including rock soles)
- Also by species separately (excluding rock sole)

Shallow-water flatfish	Tier
Northern rock sole	3a
Southern rock sole	3a
Yellowfin sole	5
Butter sole	5
Starry flounder	5
English sole	5
Sand sole	5
Alaska plaice	5
Total	

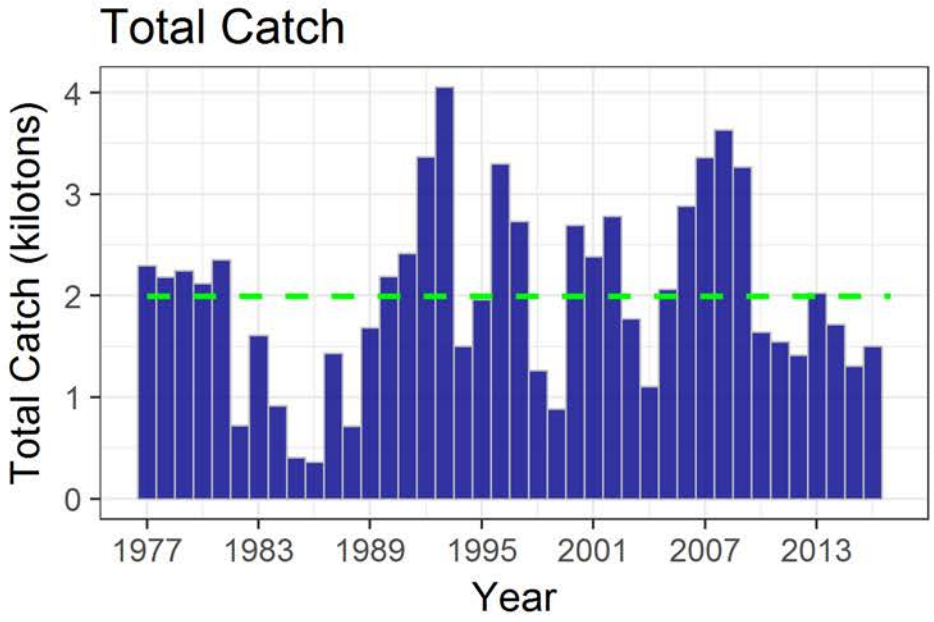
4. Shallow-water flatfish

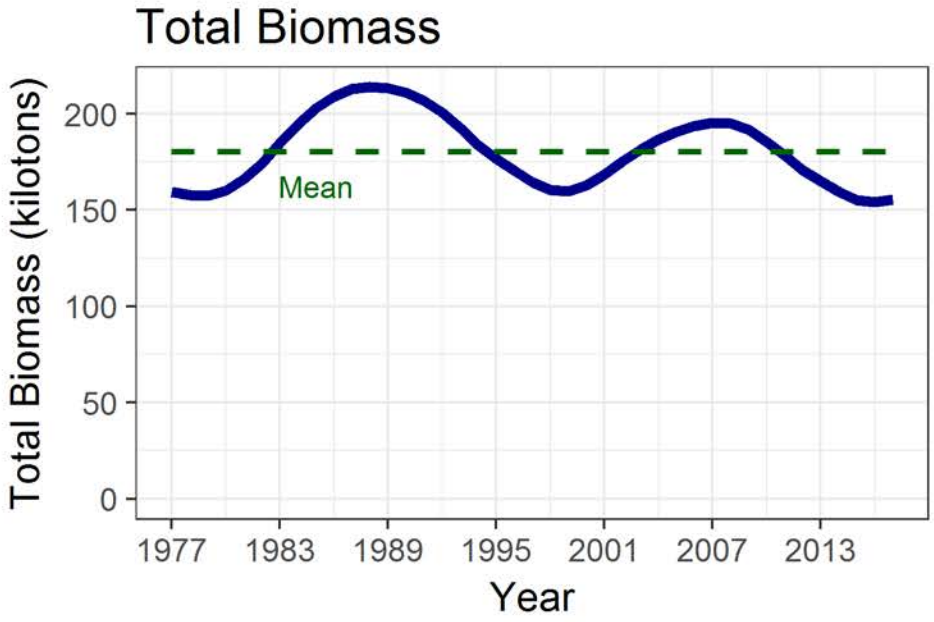
Rock soles phase plots

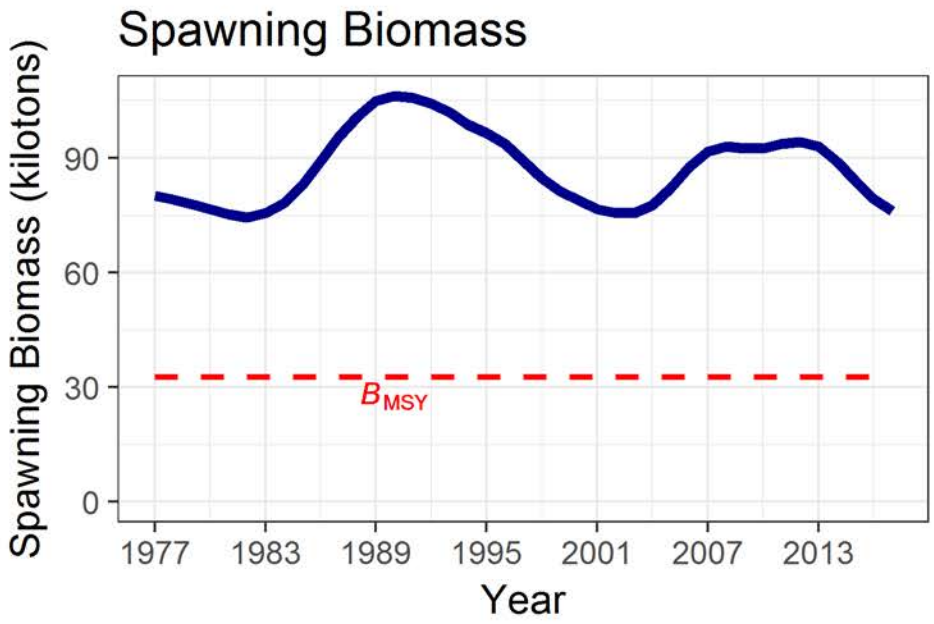


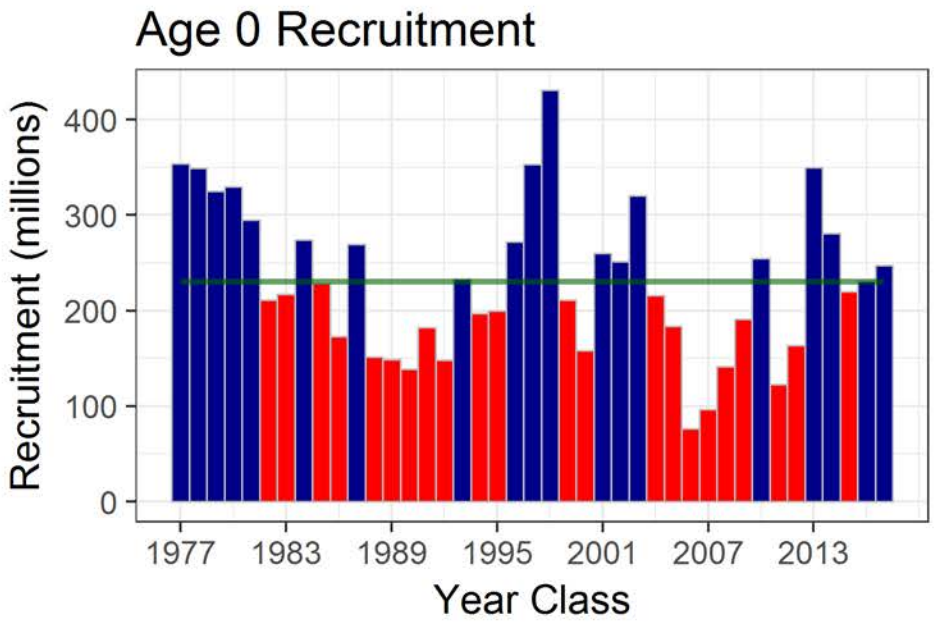


GOA Southern Rock Sole

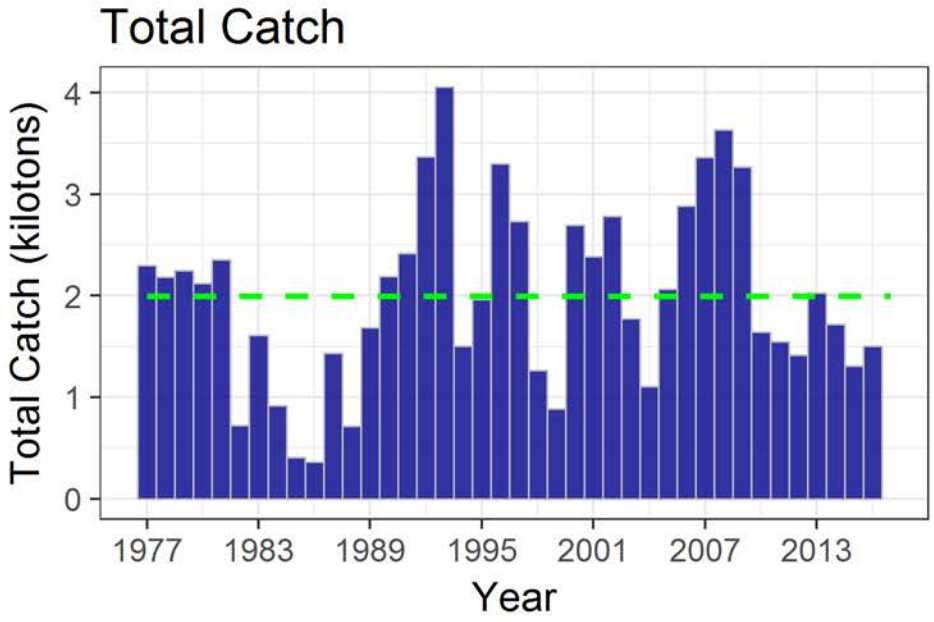


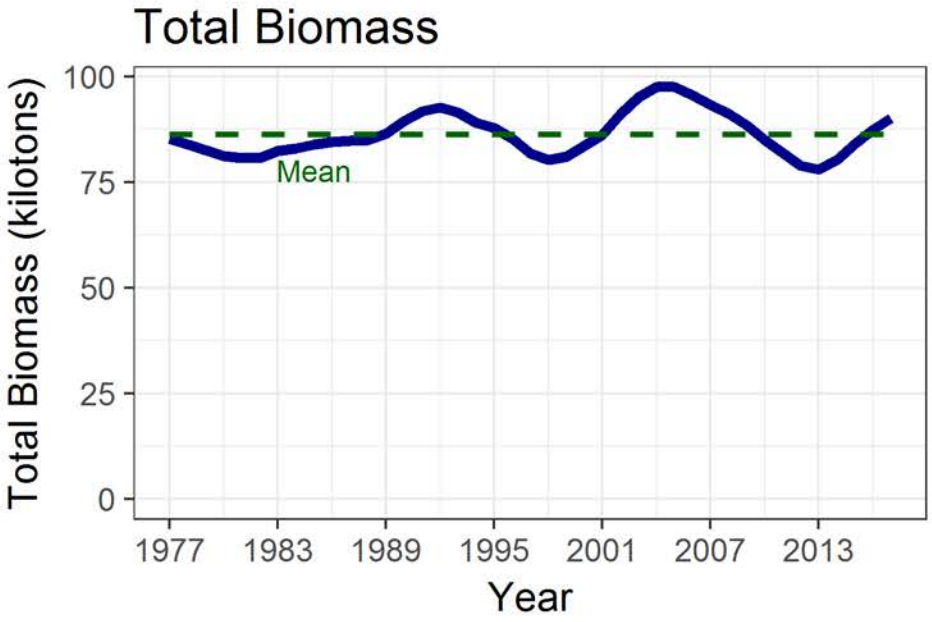


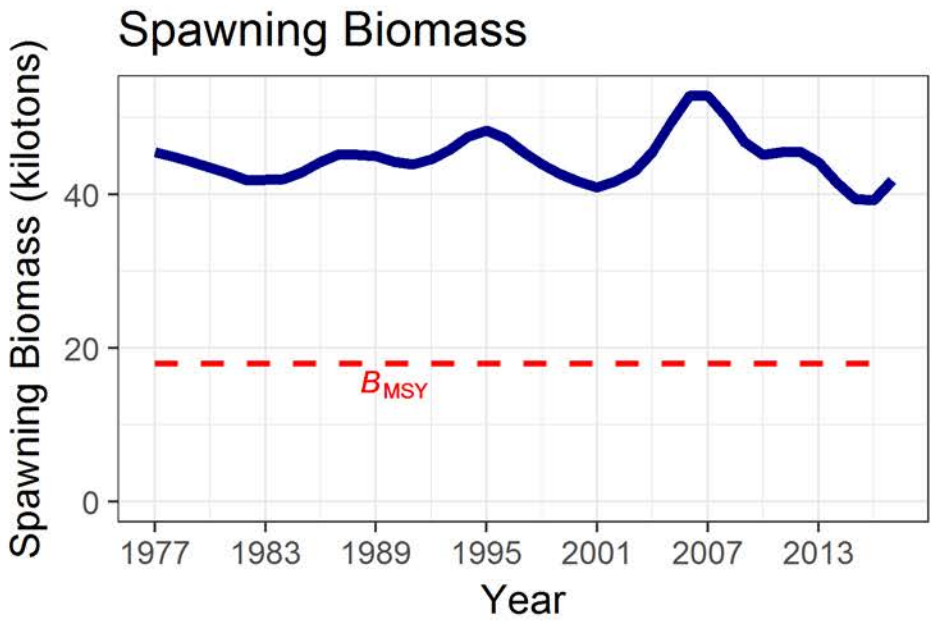


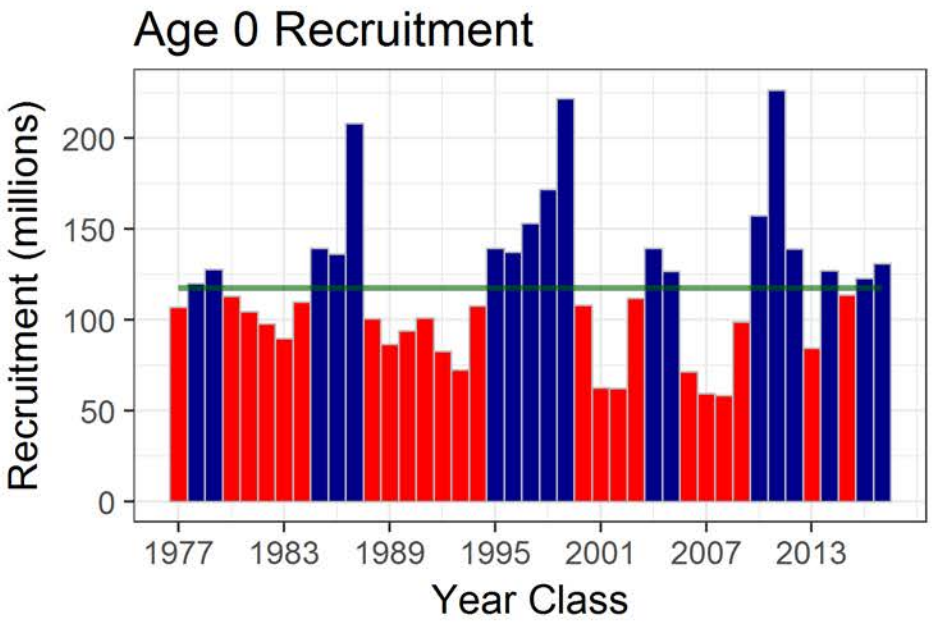


GOA Northern Rock Sole









5. Deepwater flatfish

Species	2018 ABC	2019 ABC	Change
Shallow water flatfish	54,688	55,587	up 899 (2%)
Rex sole	15,373	14,692	down 681 (4%)
Deep water flatfish	9,385	9,501	up 116 (1%)
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Arrowtooth flounder	150,945	145,841	down 5,104 (3%)
Subtotal	265,657	262,403	down 3,254 (1%)
Subtotal (without ATF)	114,712	116,562	up 1,850 (2%)

Partial assessment

Updated 2017 and estimated 2018 catch

- **2019 and 2020 catch projected from 2013-2017 average**
- **Species estimated from observer data**

6. Rex sole

Species	2018 ABC	2019 ABC	Change
Shallow water flatfish	54,688	55,587	up 899 (2%)
Rex sole	15,373	14,692	down 681 (4%)
Deep water flatfish	9,385	9,501	up 116 (1%)
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Subtotal (without ATF)	114,712	116,562	up 1,850 (2%)

Partial assessment,

- Updated catch through 2018
  - Apportionment via random effects model
    - stock areas separately

Flatfish ABC's

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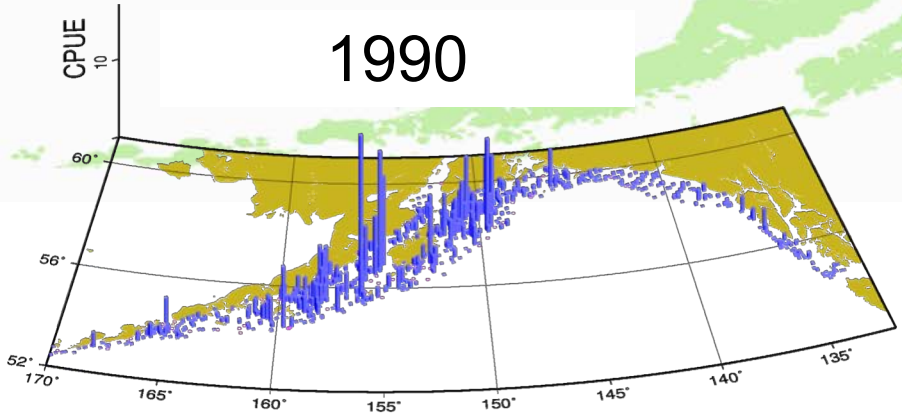
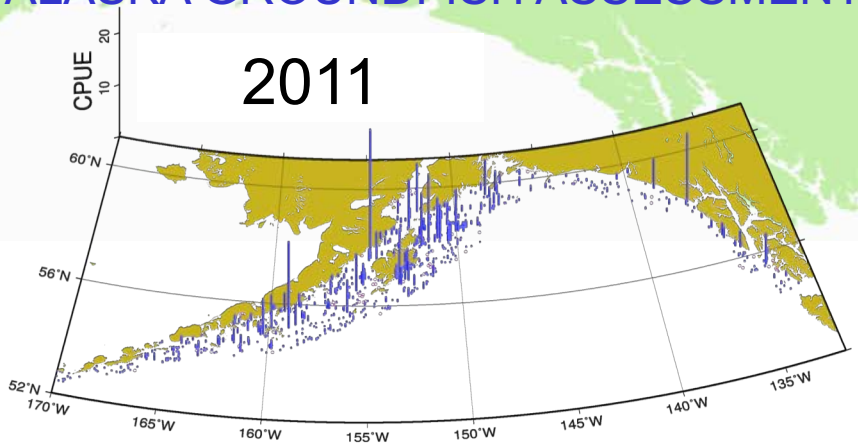
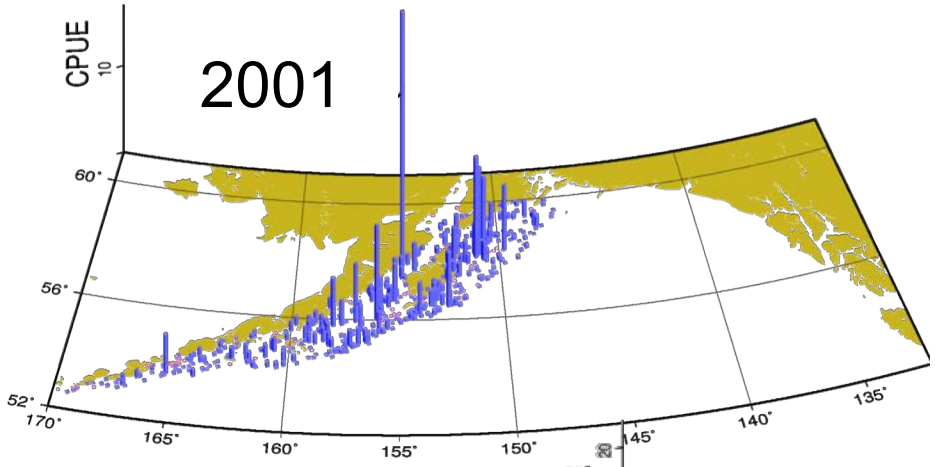
Deep-water ABC from Dover assessment Tier 3 + others Tier 6

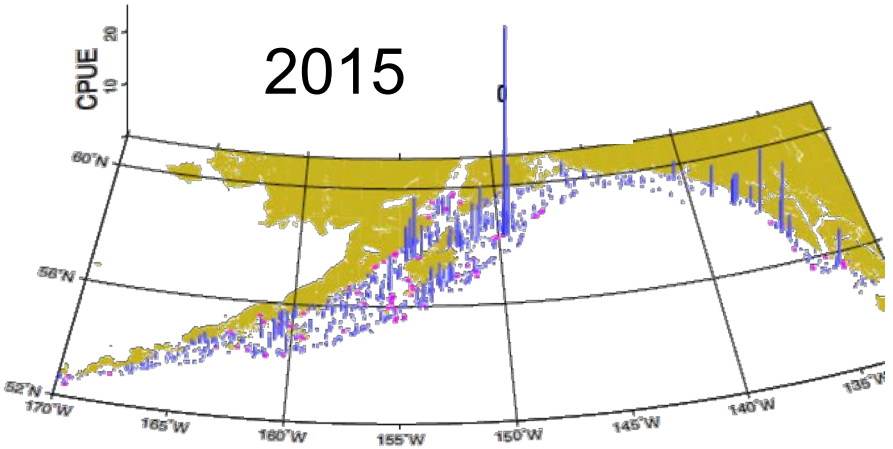
Shallow water flats: N and S rock sole Tier 3, others Tier 5

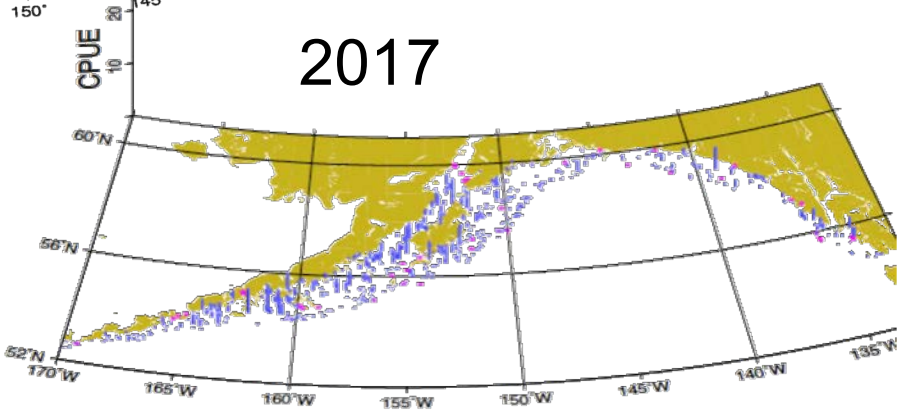
7. Arrowtooth flounder



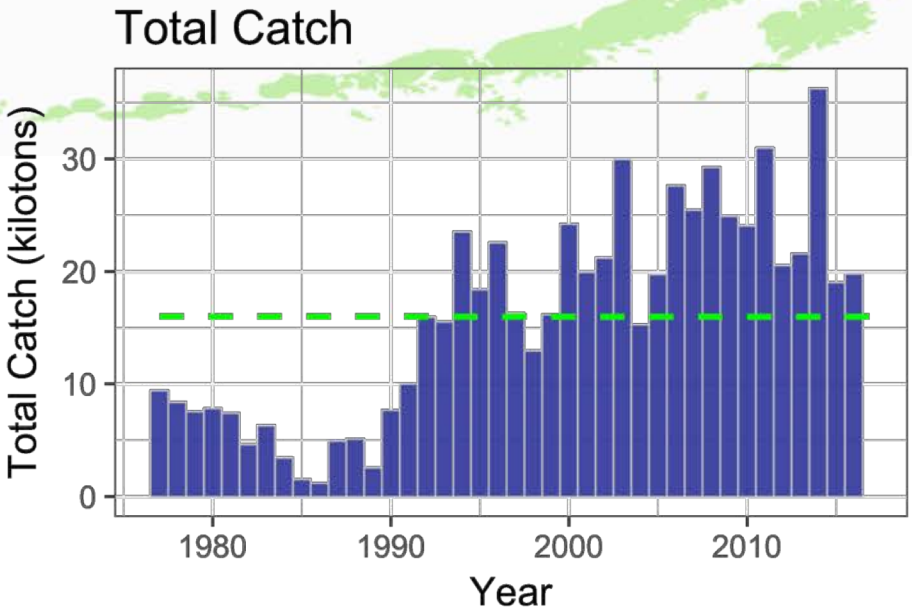


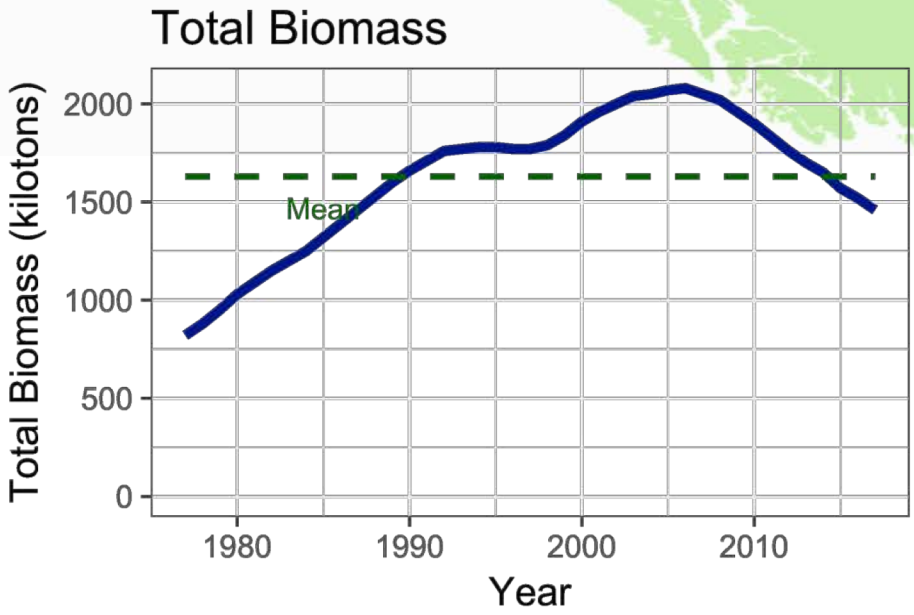


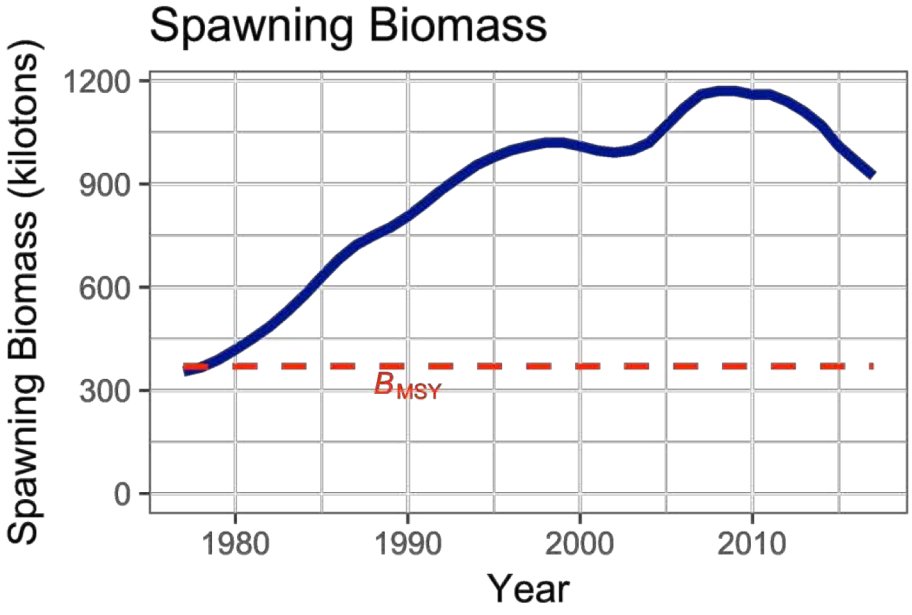


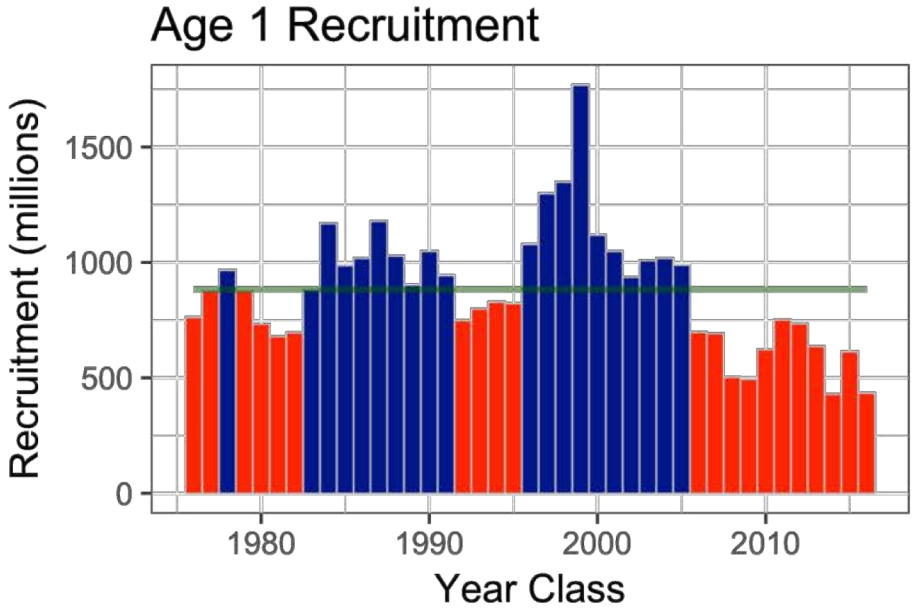


GOA Arrowtooth Flounder









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8. Flathead sole

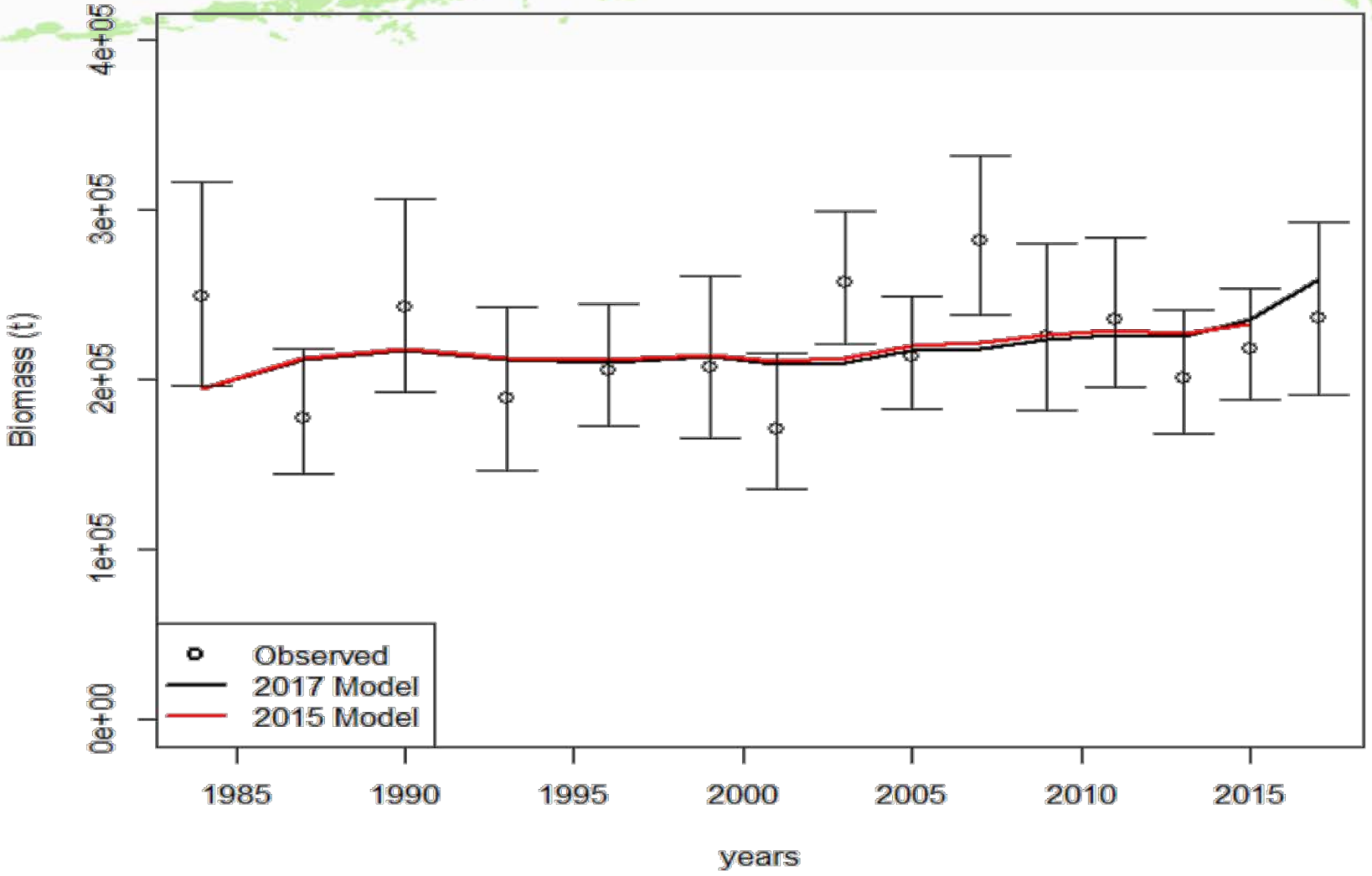
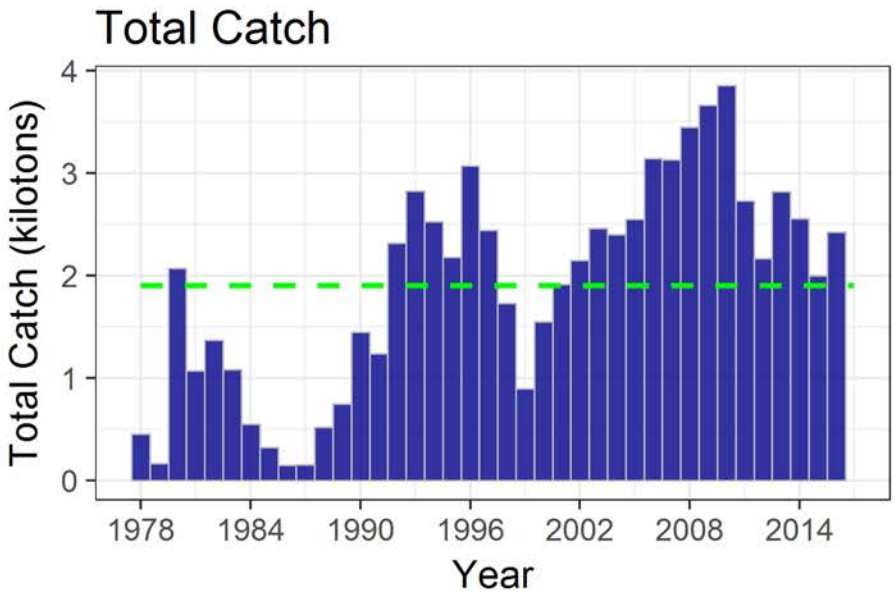
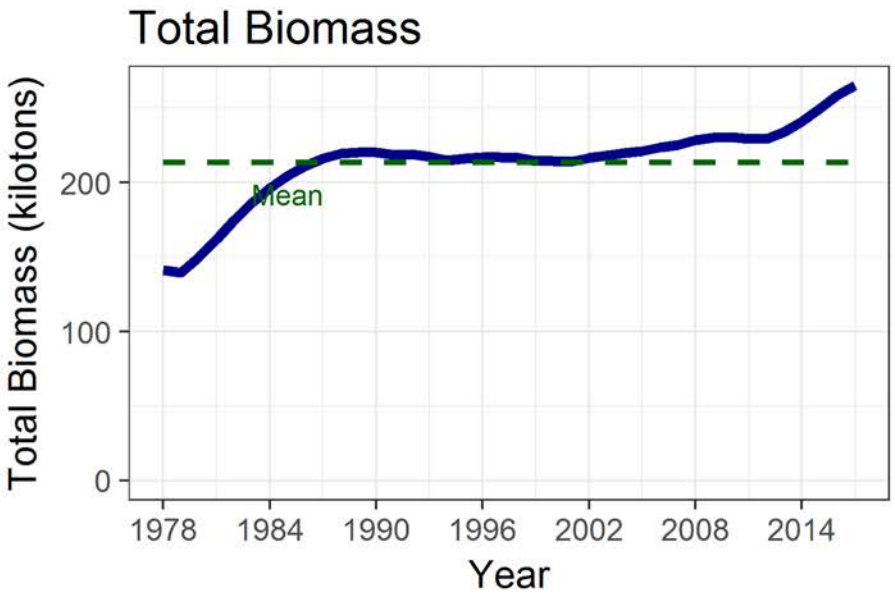


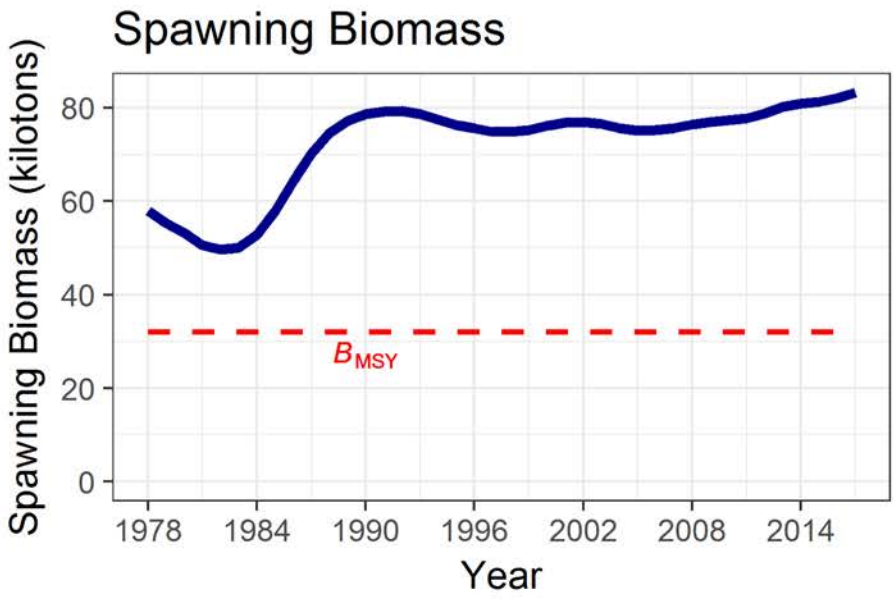
Figure 1. Survey biomass index (circles), asymptotic 95% confidence intervals (vertical black lines), and estimated survey biomass for the proposed 2017 model and the accepted 2015 model (the same as the 2017 Model without 2016-2017 data).

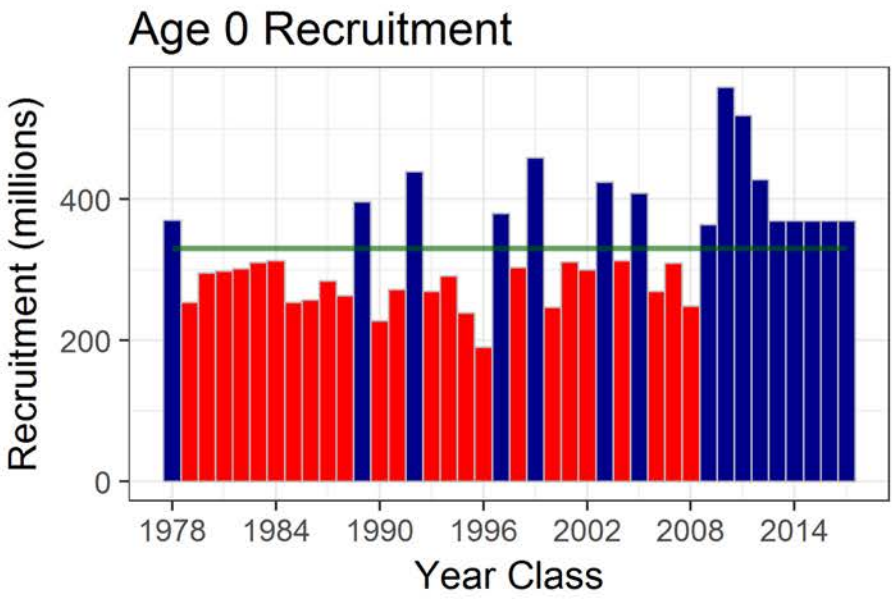
8. Flathead sole

GOA Flathead Sole









GOA Rockfish

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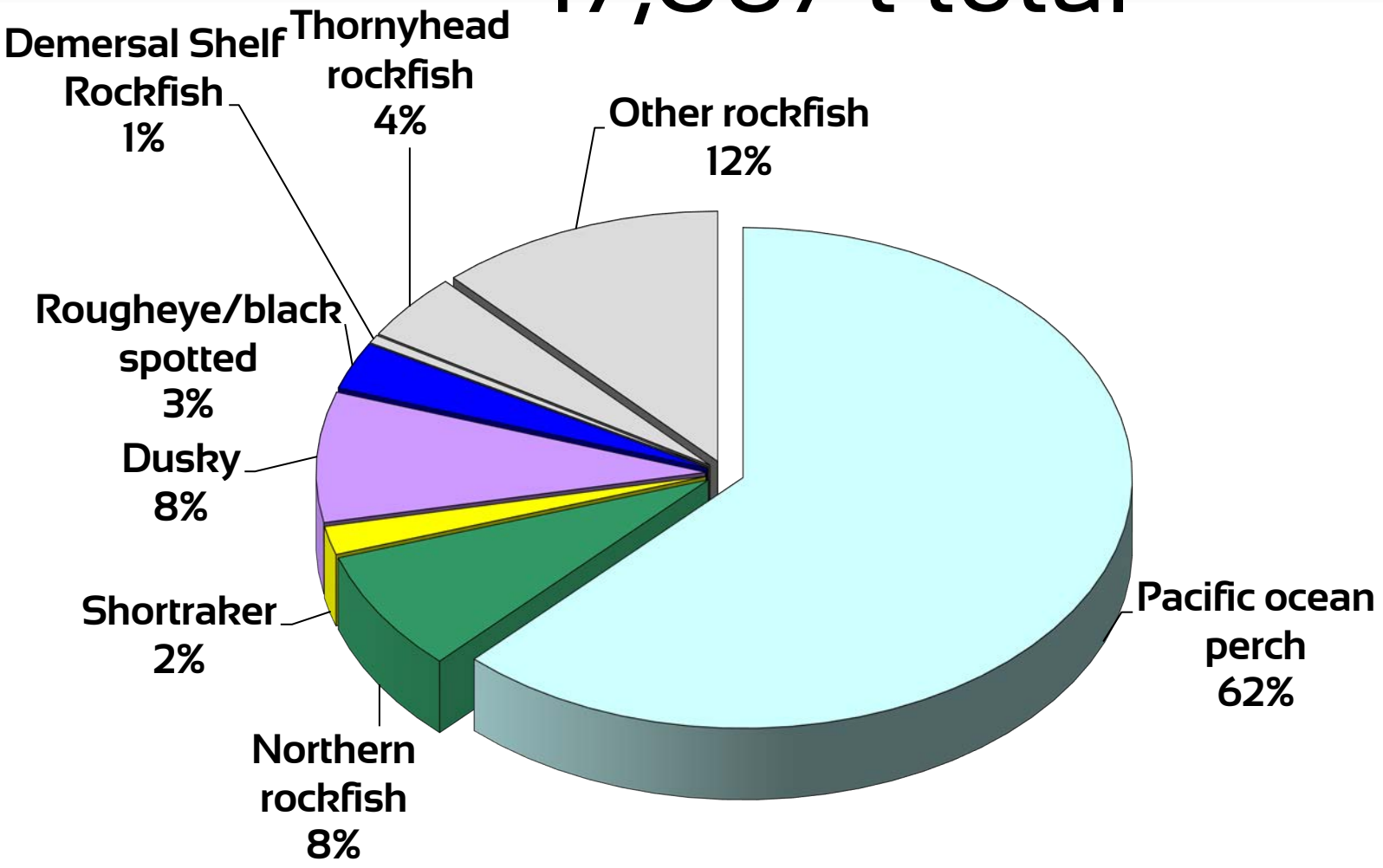
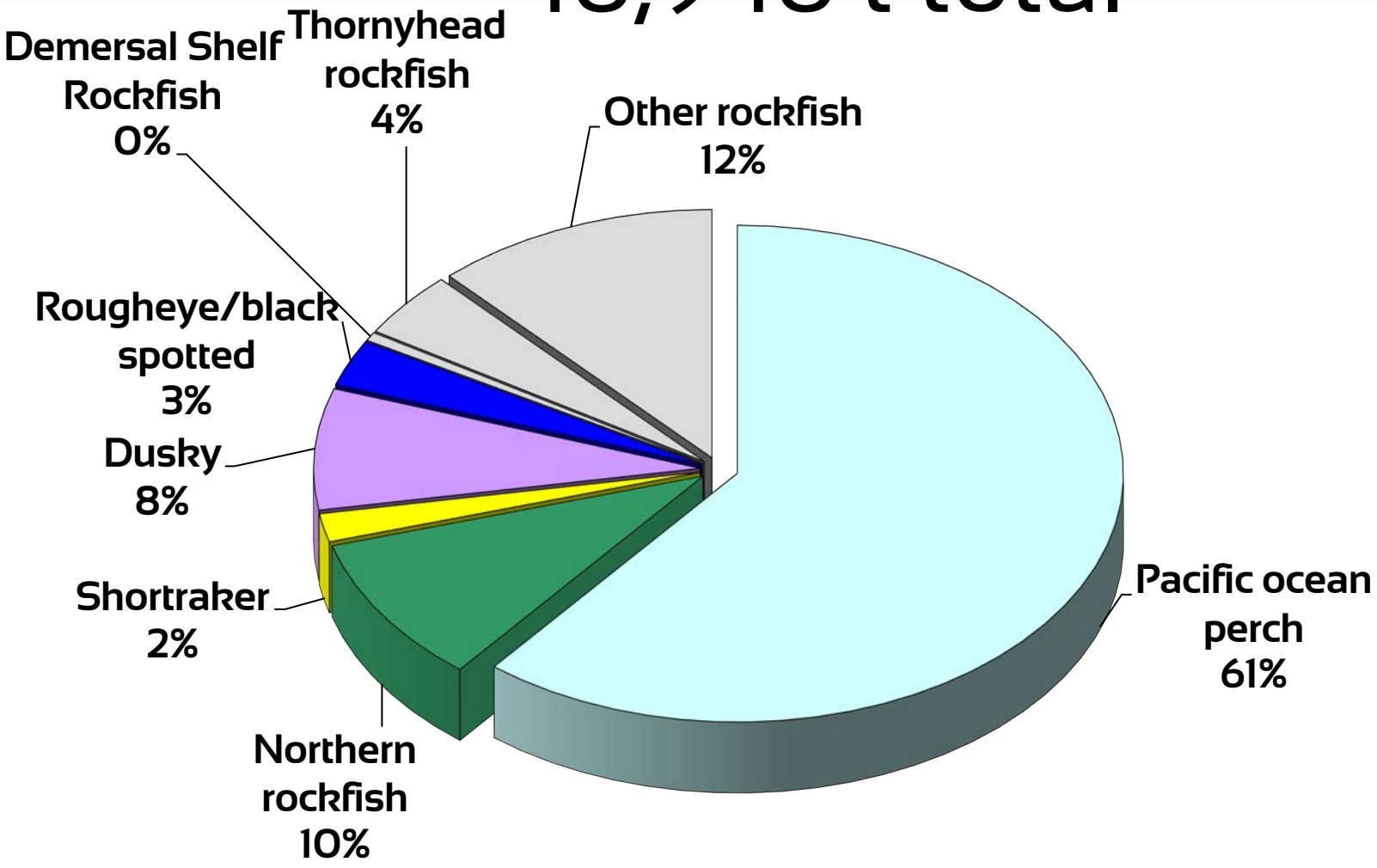
Total	240,953	536,925	509,507	down 27,418 (5%)

Rockfish 2018 ABC's 47,067 t total



Rockfish 2019 ABC's 46,946 t total



Rockfish ABC Summary

Species	2018	2019	Change
POP	29,236	28,555	down 681 (2%)
northern rockfish	3,685	4,529	up 844 (23%)
Shortraker Rockfish	863	863	same (0%)
Dusky	3,957	3,700	down 257 (6%)
Rougheye and Blackspotted Rockfish	1,444	1,428	down 16 (1%)
Demersal shelf rockfish	250	261	up 11 (4%)
Thornyhead	2,038	2,016	down 22 (1%)
Other rock	5,594	5,594	same (0%)
Sub Total	47,067	46,946	down 121 (0%)

9. Pacific ocean perch

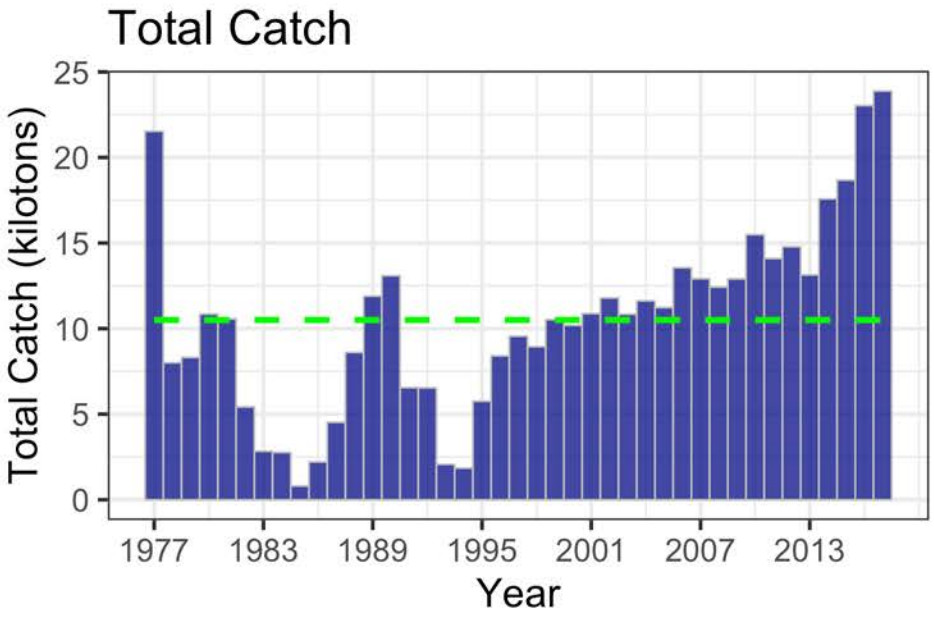
Partial assessment

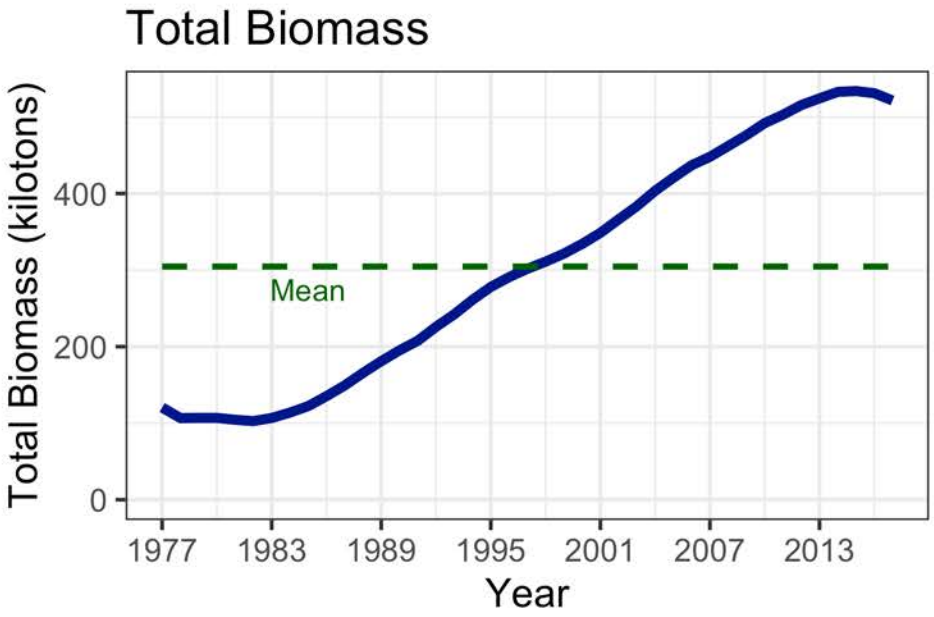
CIE review for GOA rockfish scheduled for spring 2019

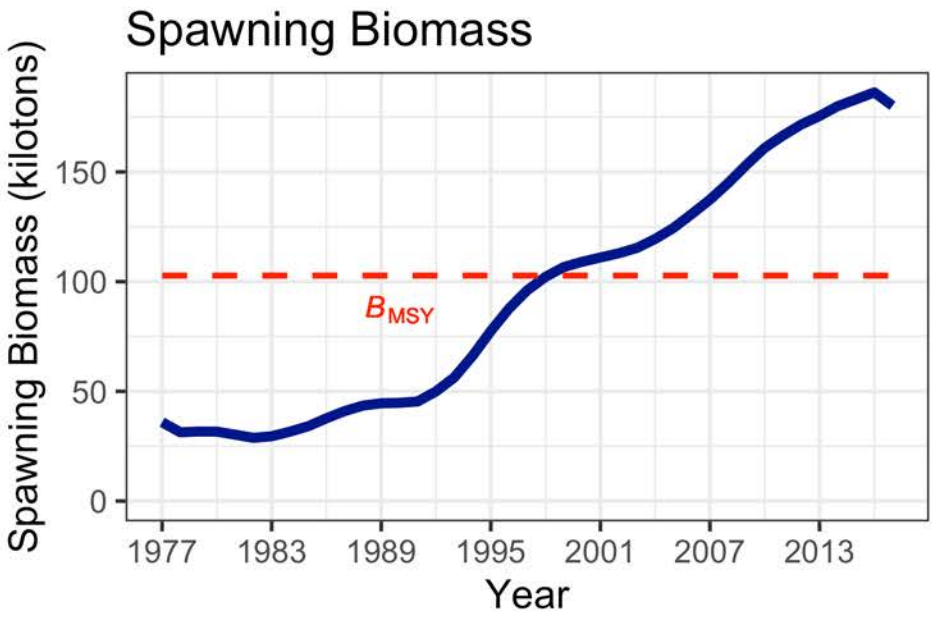
1. Use hydroacoustic info
2. Examine fishery-dependent info, e.g., age sampling
3. Catchability manuscript is in prep to inform priors…

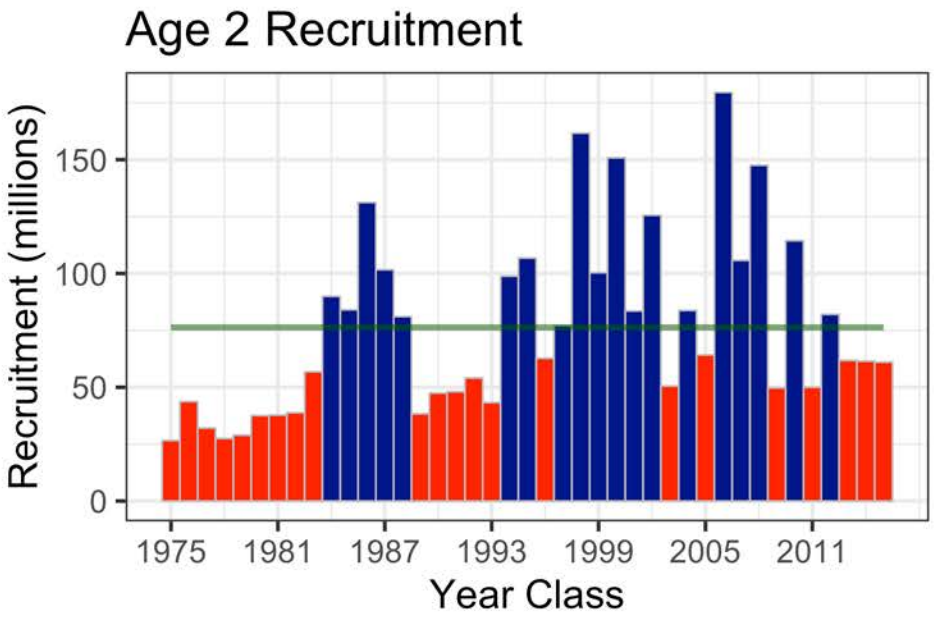
The Plan Team supports the review CIE review topics, and additionally recommends the assessment authors incorporate an examination of the VAST model during the CIE review.

GOA Pacific Ocean Perch









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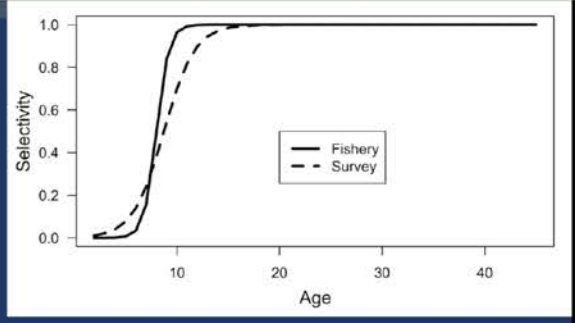
10. Northern rockfish

New Data for 2018 Assessment

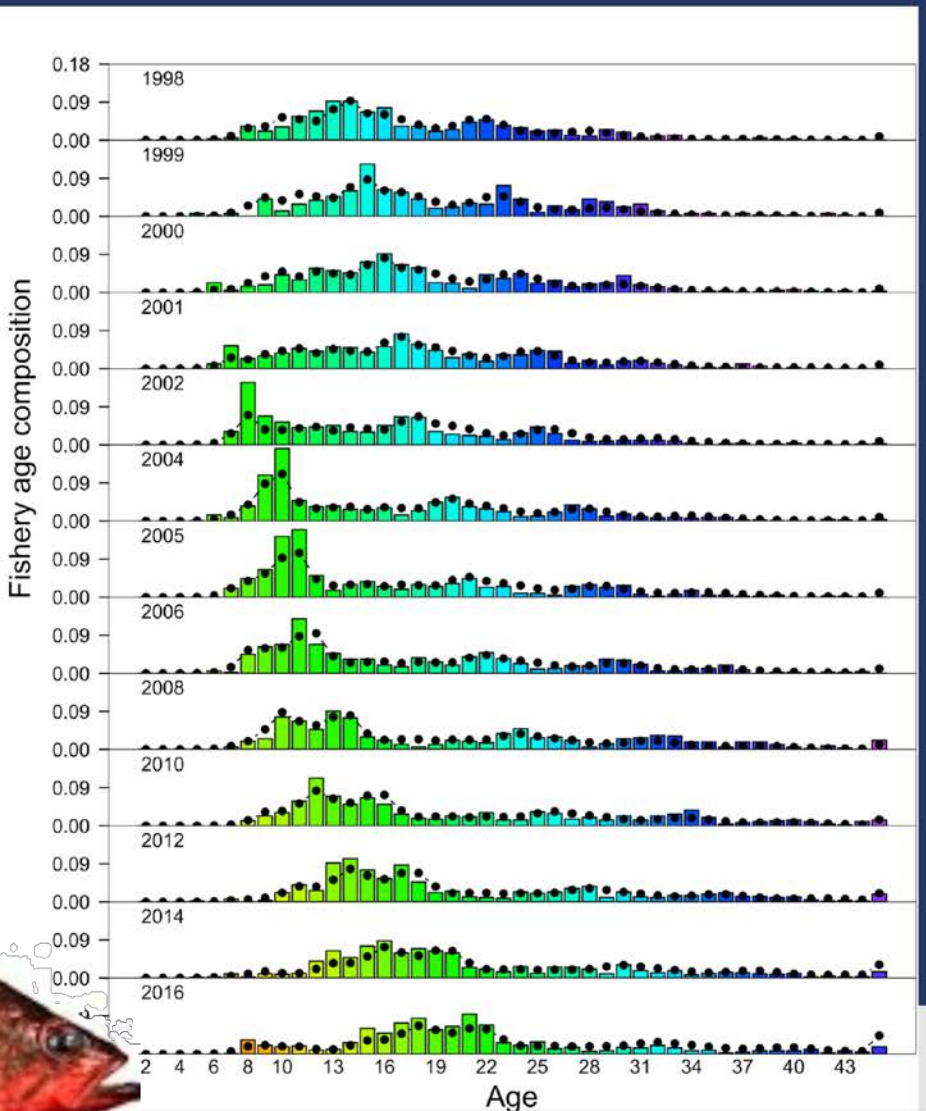
Source	Data	Years
Fisheries	Catch	1961-**2018** (2015, 2016, 2017, prelim 2018)
NMFS bottom trawl surveys	Biomass index	1984, 1987, 1990, 1993, 1996, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013, 2015, **2017**
NMFS bottom trawl surveys	Age	1984, 1987, 1990, 1993, 1996, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013, **2015**, **2017**
U.S. trawl fisheries	Age	1998, 1999, 2000, 2001, 2002, 2004, 2005, 2006, 2008, 2010, 2012, **2014**, **2016**
U.S. trawl fisheries	Length	1990,1991,1992, 1993, 1994, 1995, 1996, 1997, 2003, 2007, 2009, 2011, 2013, **2015**, **2017**

GOA Northern rockfish

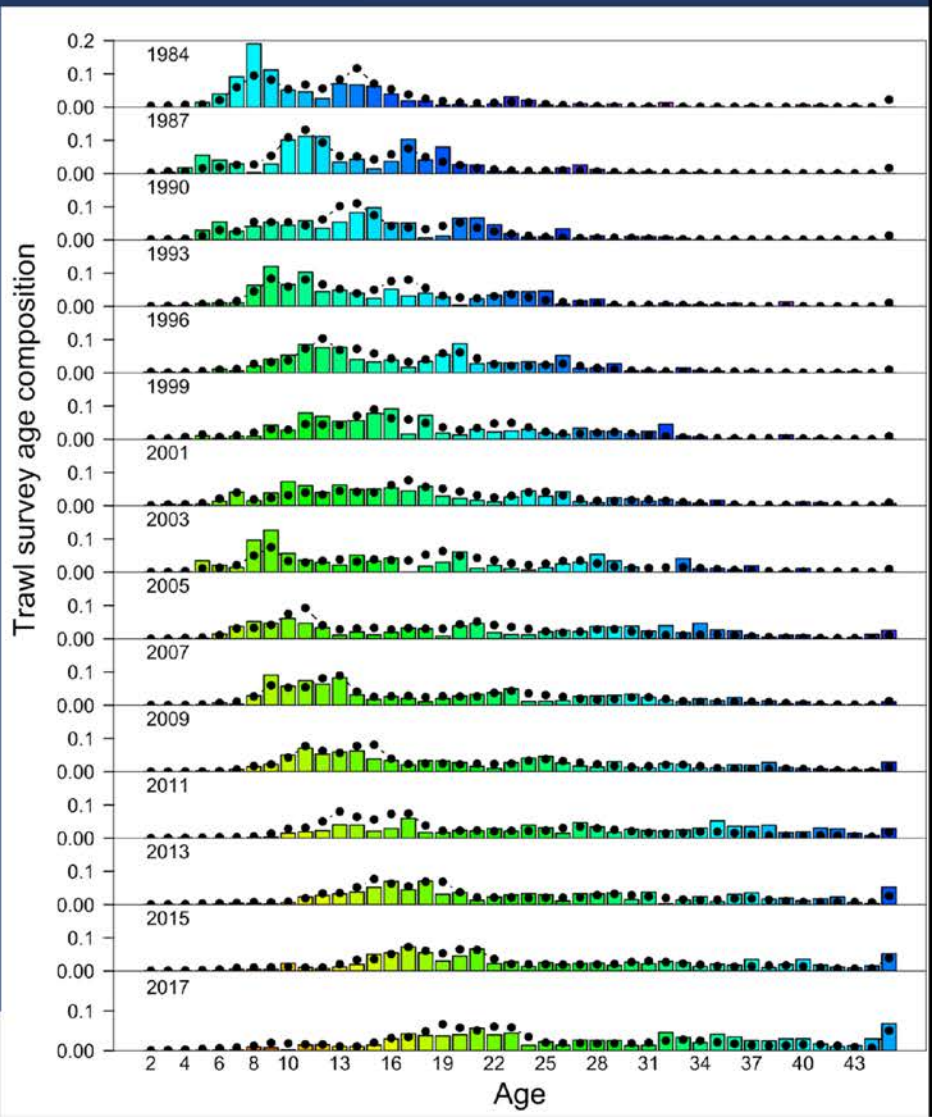
Age Compositions



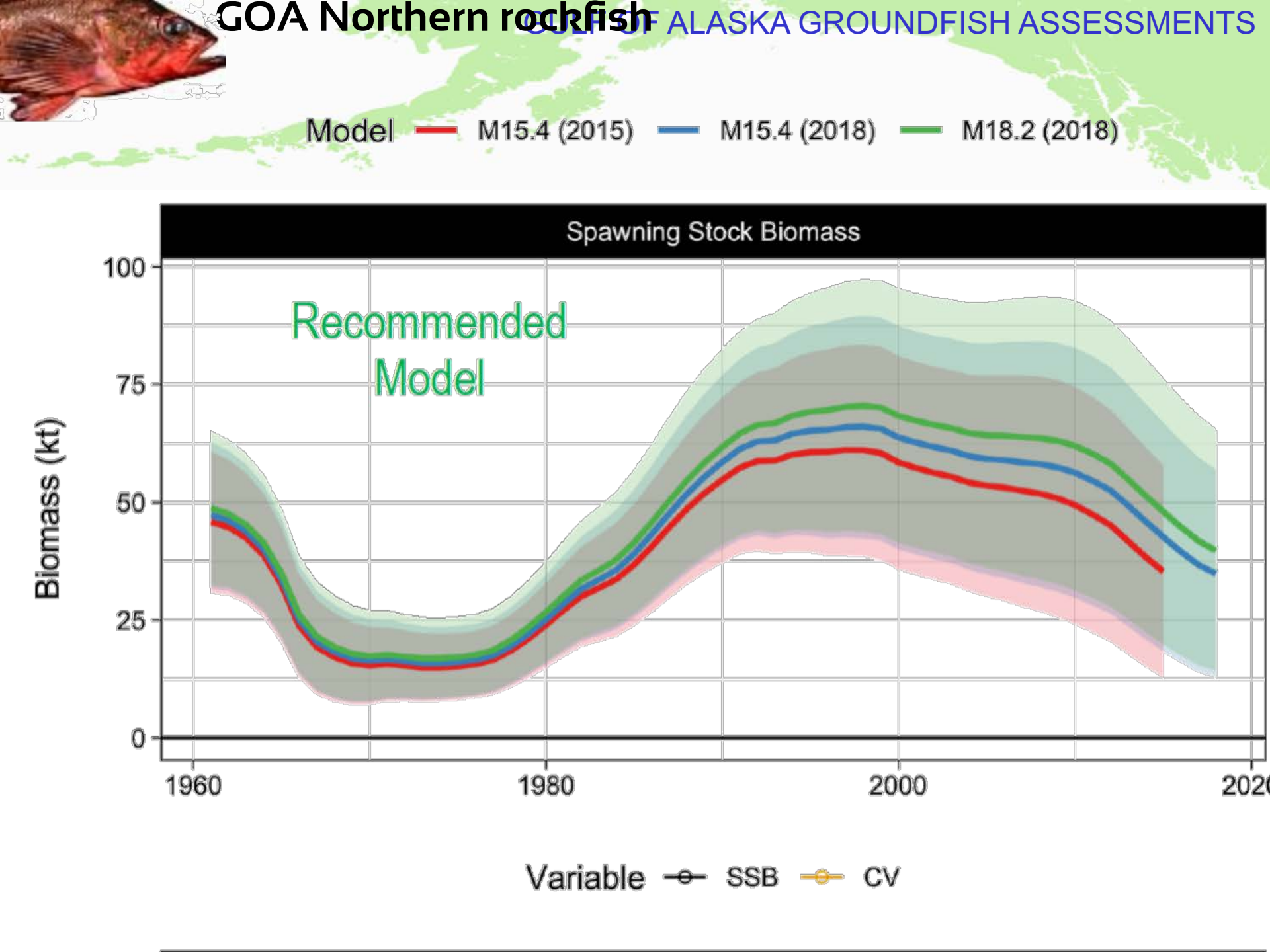
Fishery



Survey



GOA Northern rockfish

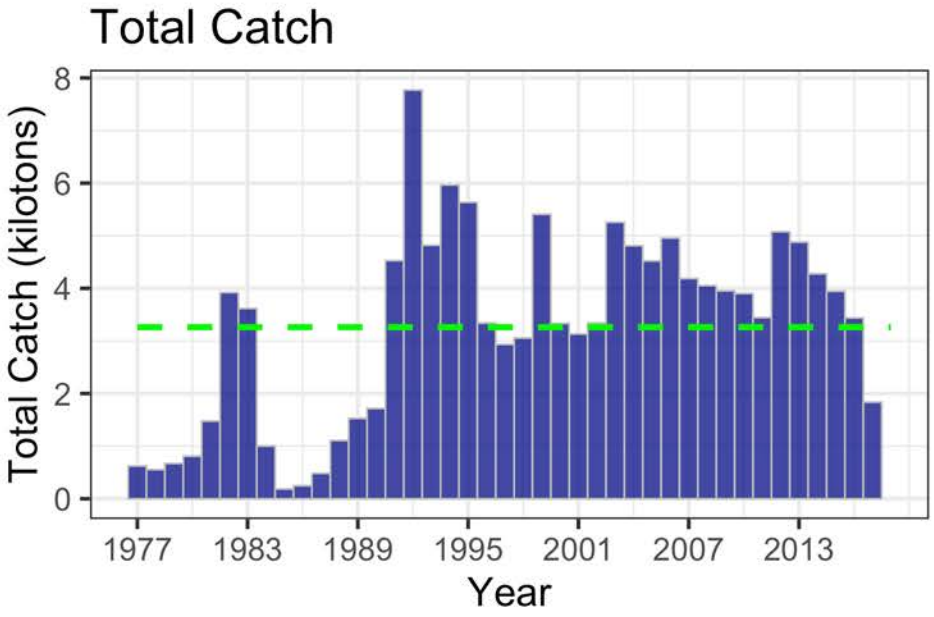


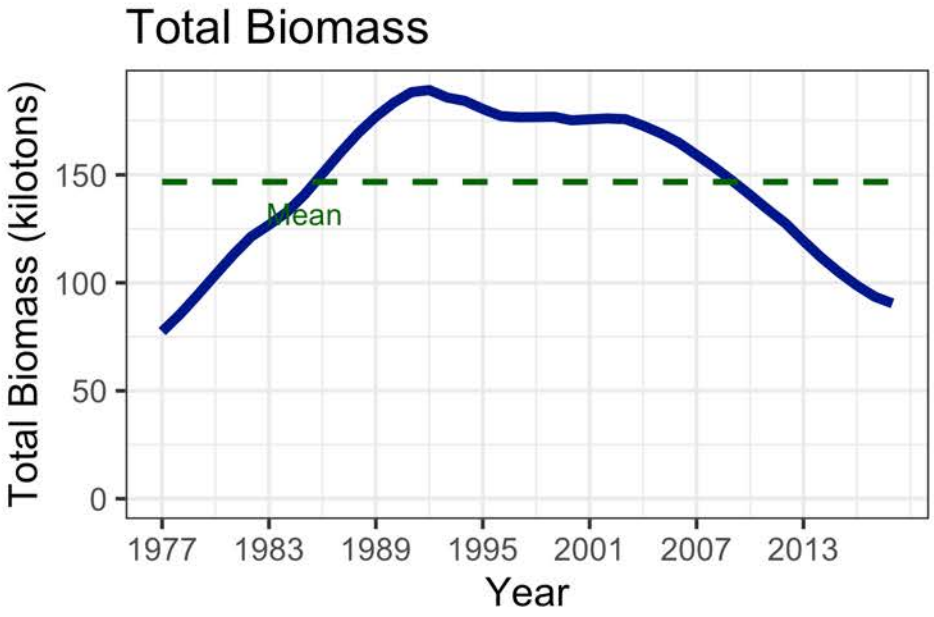
Northern rockfish: Team discussions

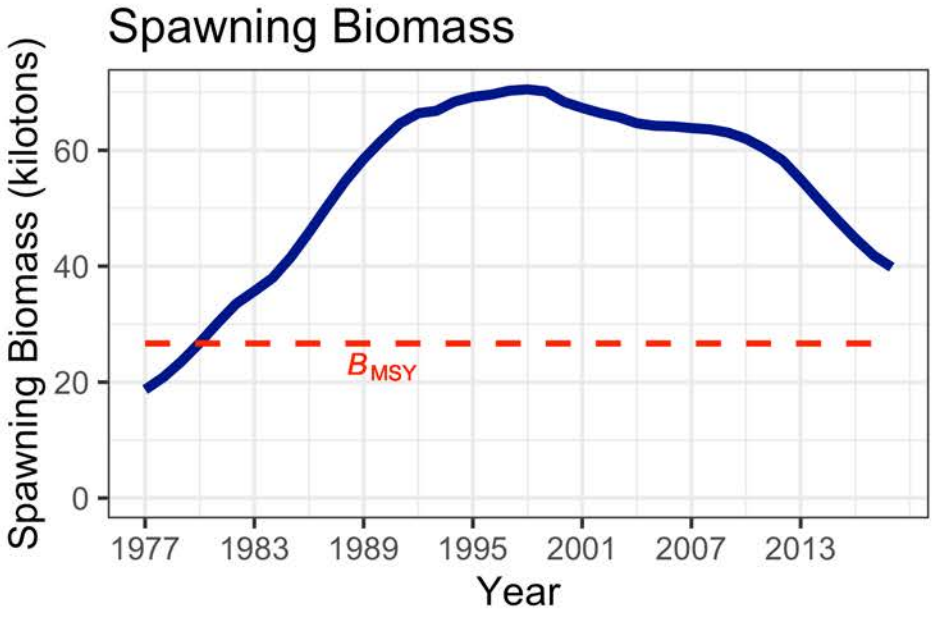
The Team recommended

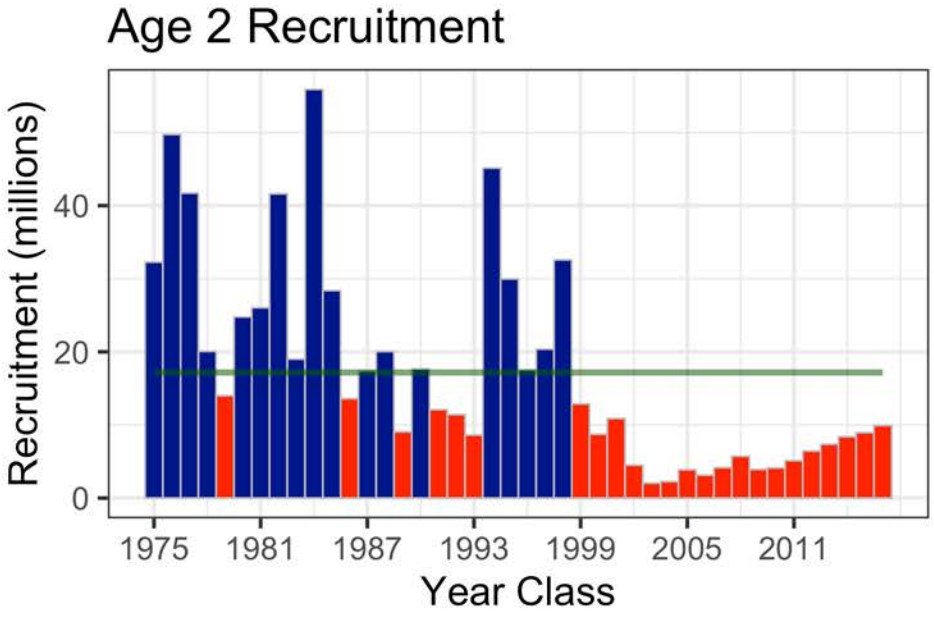
- **Examining the delta-GLM approach by survey strata to see if the stratum-specific estimates are affecting the differences in approaches (compared to the results from a GOA-wide model).**
- **Exploring using the covariance matrix from VAST in the stock assessment likelihood (i.e., to avoid using some variance inflation outside of the assessment).**

GOA Northern Rockfish









Rockfish ABC Summary

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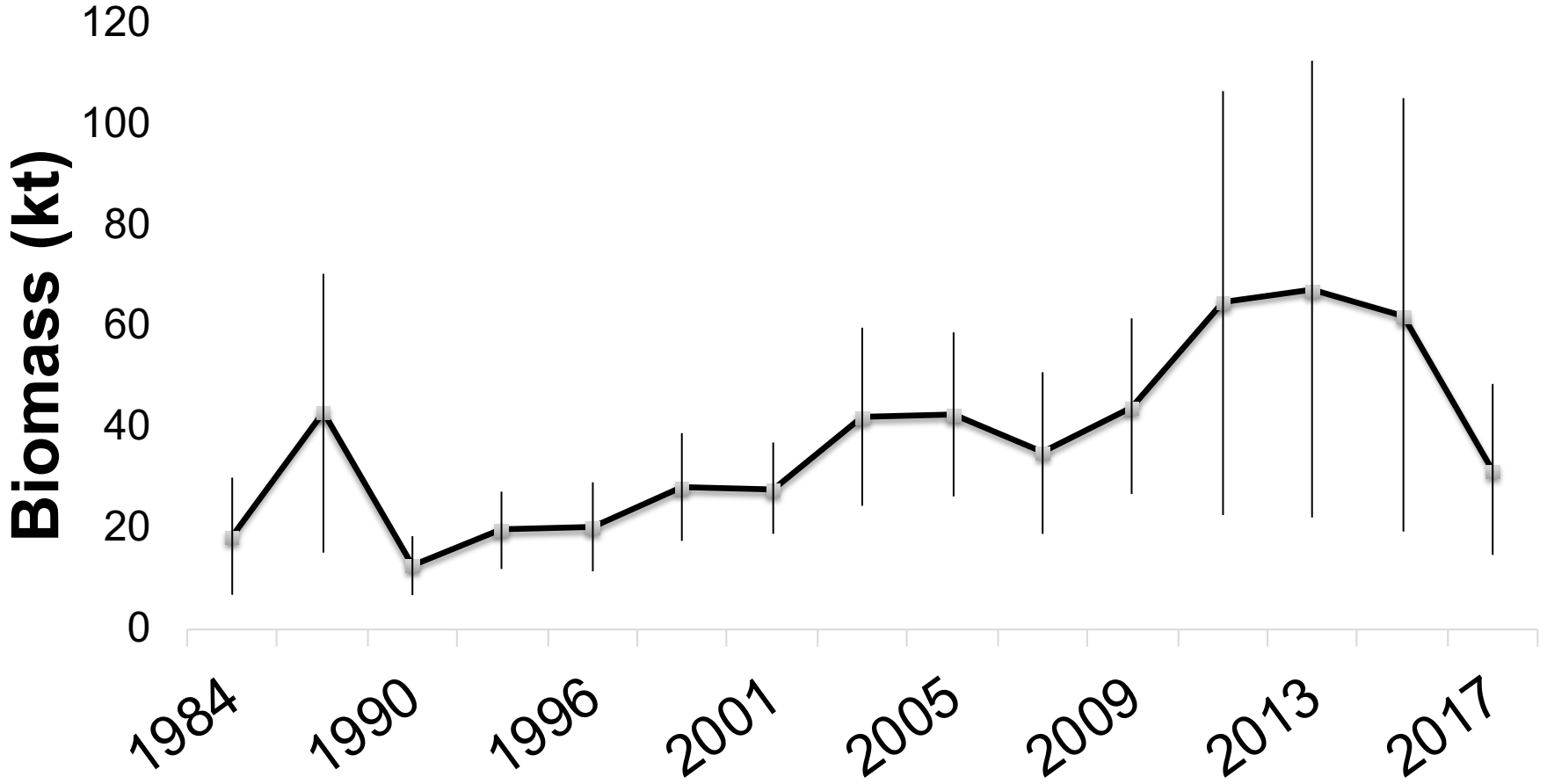
Thornyhead	2,038	2,016	down 22 (1%)
Other rock	5,594	5,594	same (0%)
Sub Total	47,067	46,946	down 121 (0%)

11. GOA Shortraker

Next assessment due in 2019



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Sub Total	47,067	46,946	down 121 (0%)

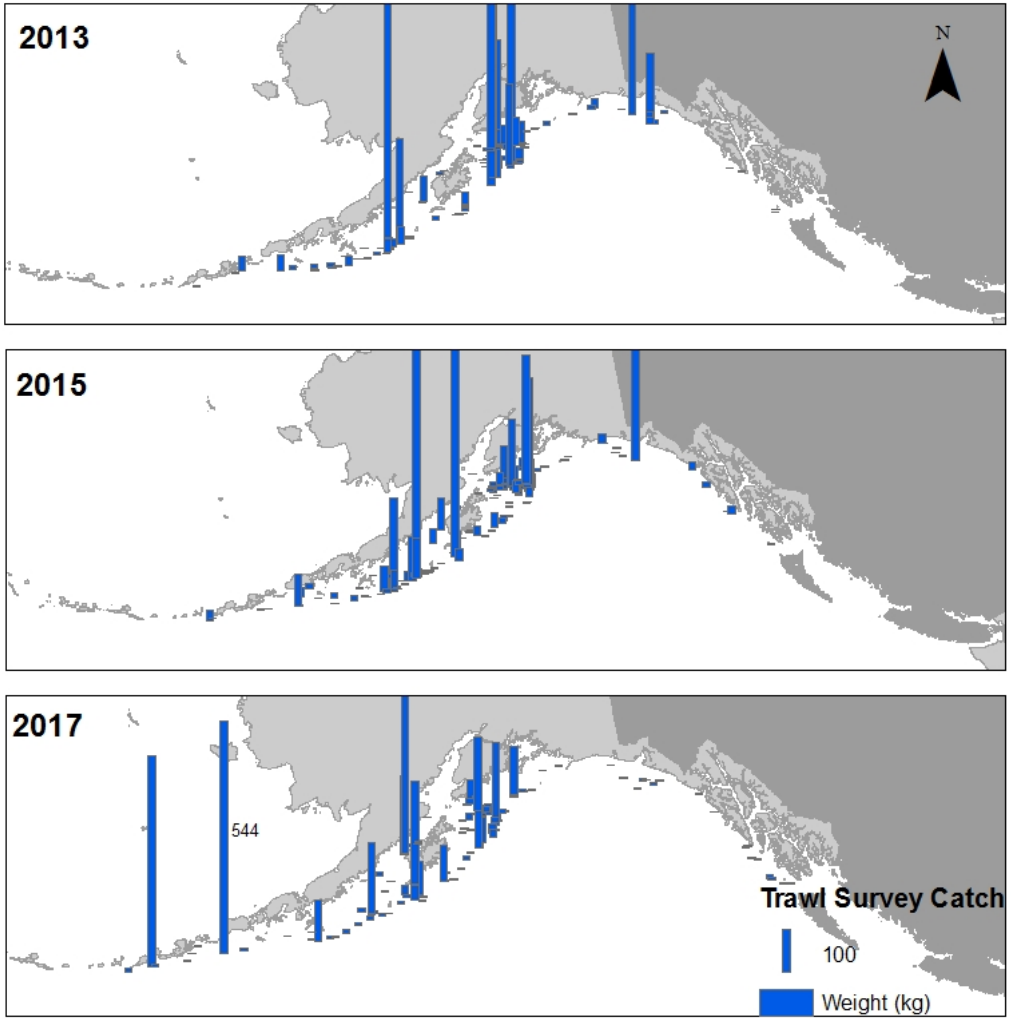
12. GOA Dusky rockfish

- New data
  - 2016, 2017, 2018* catch (*projected)
  - 2017 trawl survey biomass
  - 2015, 2017 survey age comps
  - 2014, 2016 fishery age comps
  - 2015, 2017 fishery length comps

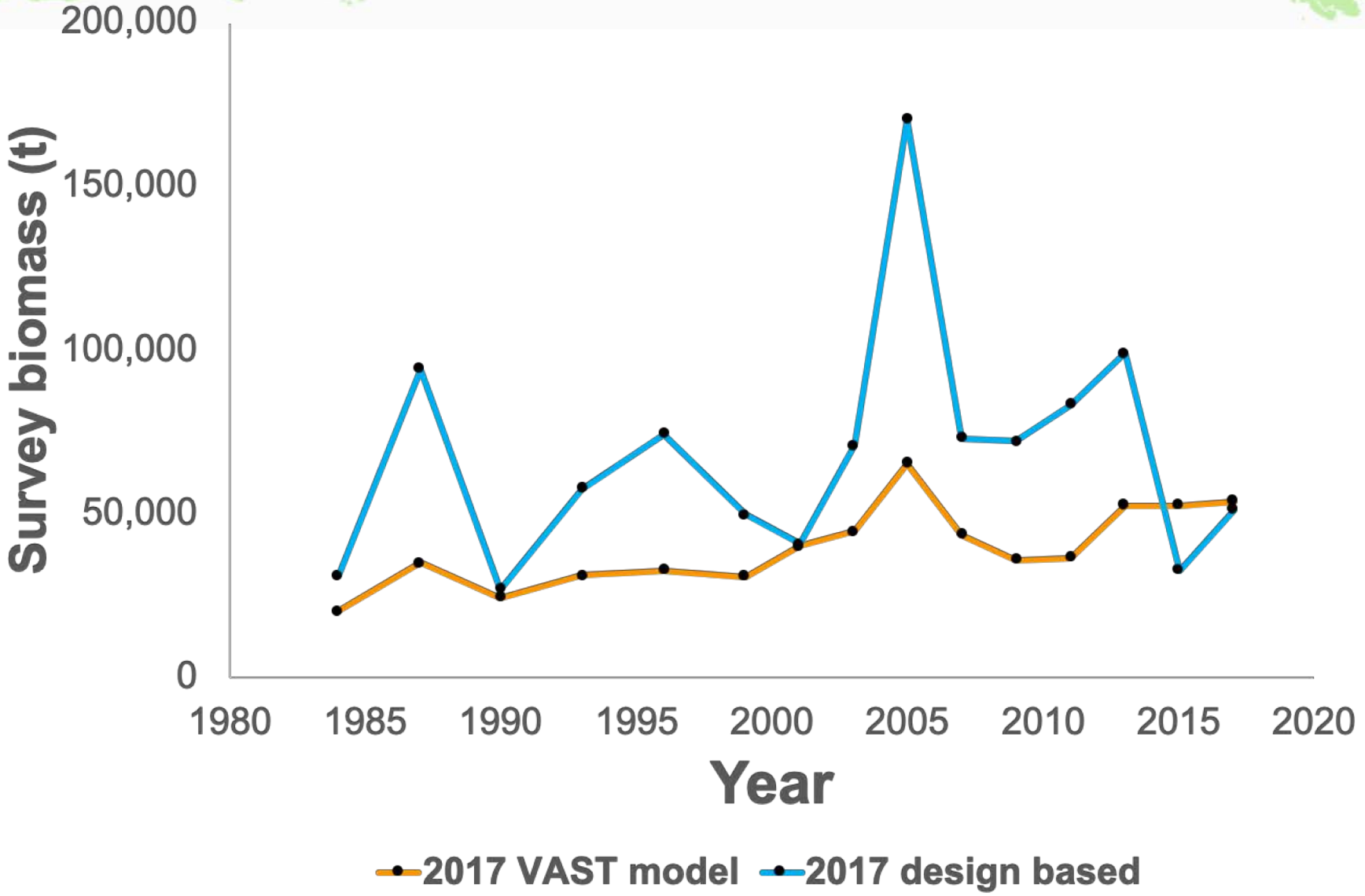
GOA Dusky rockfish
Recent trawl survey

2017 trawl survey

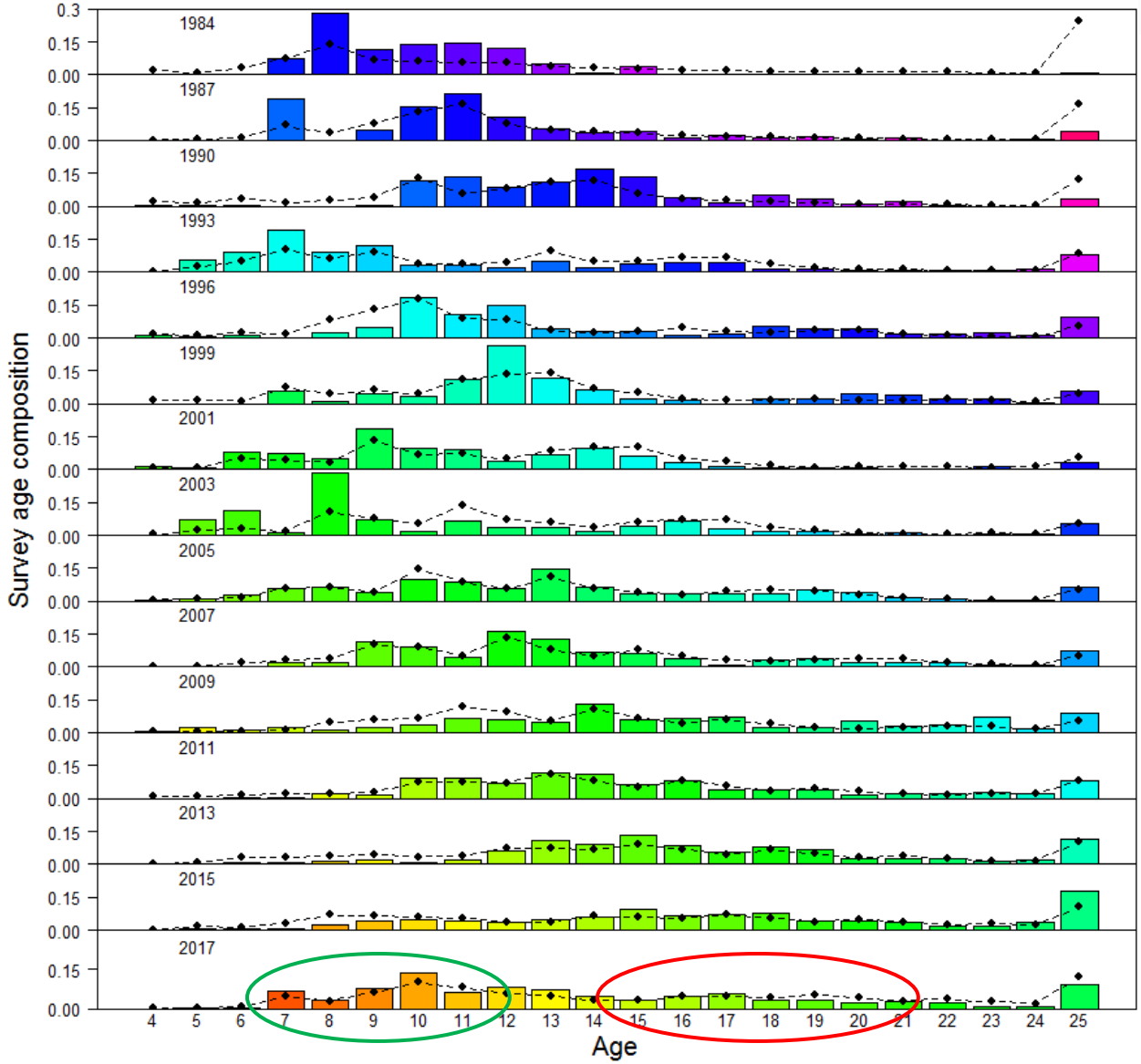
- sampled to 700m
- still covers dusky depth range well



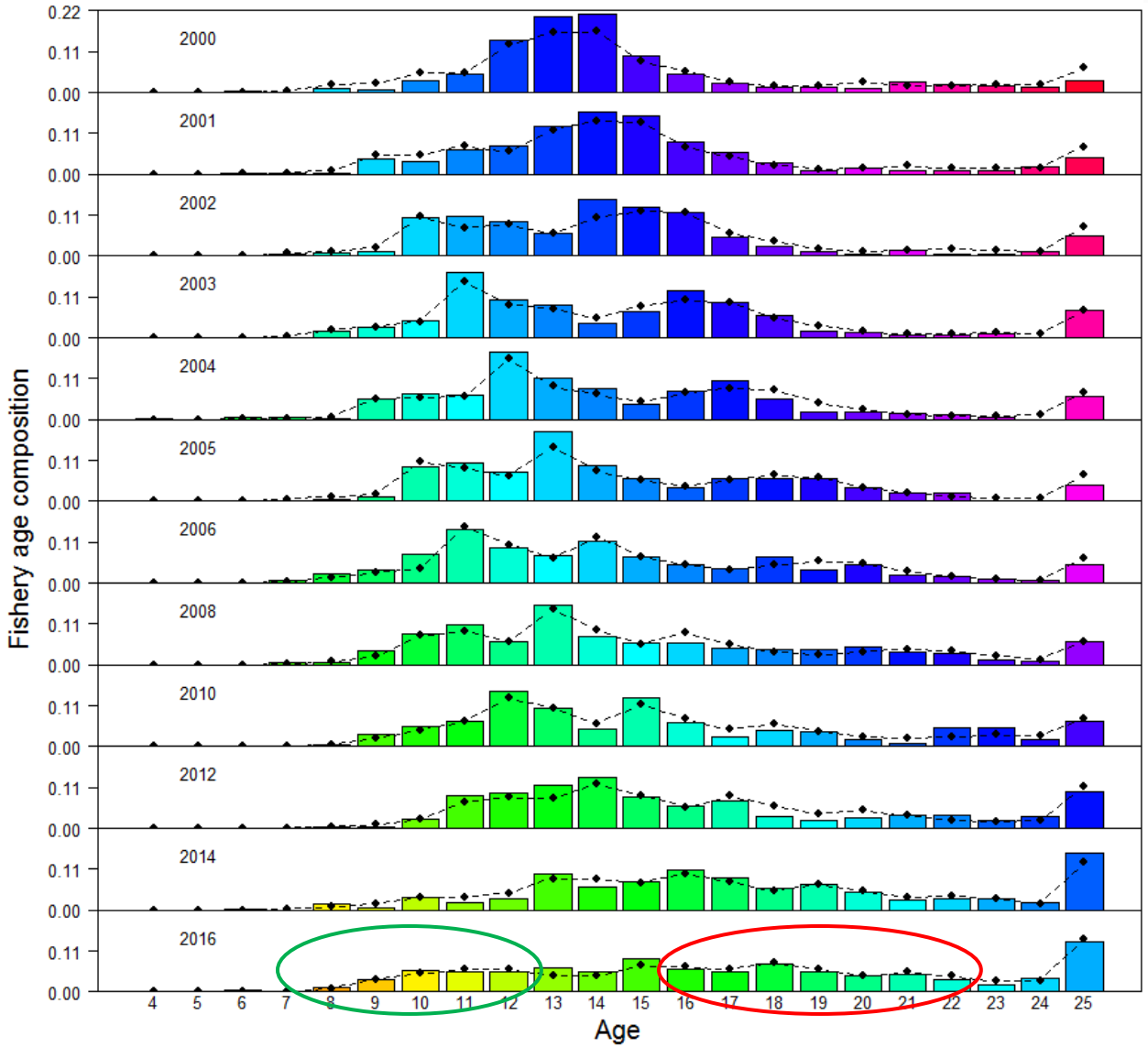
Dusky rockfish trawl survey data treatment



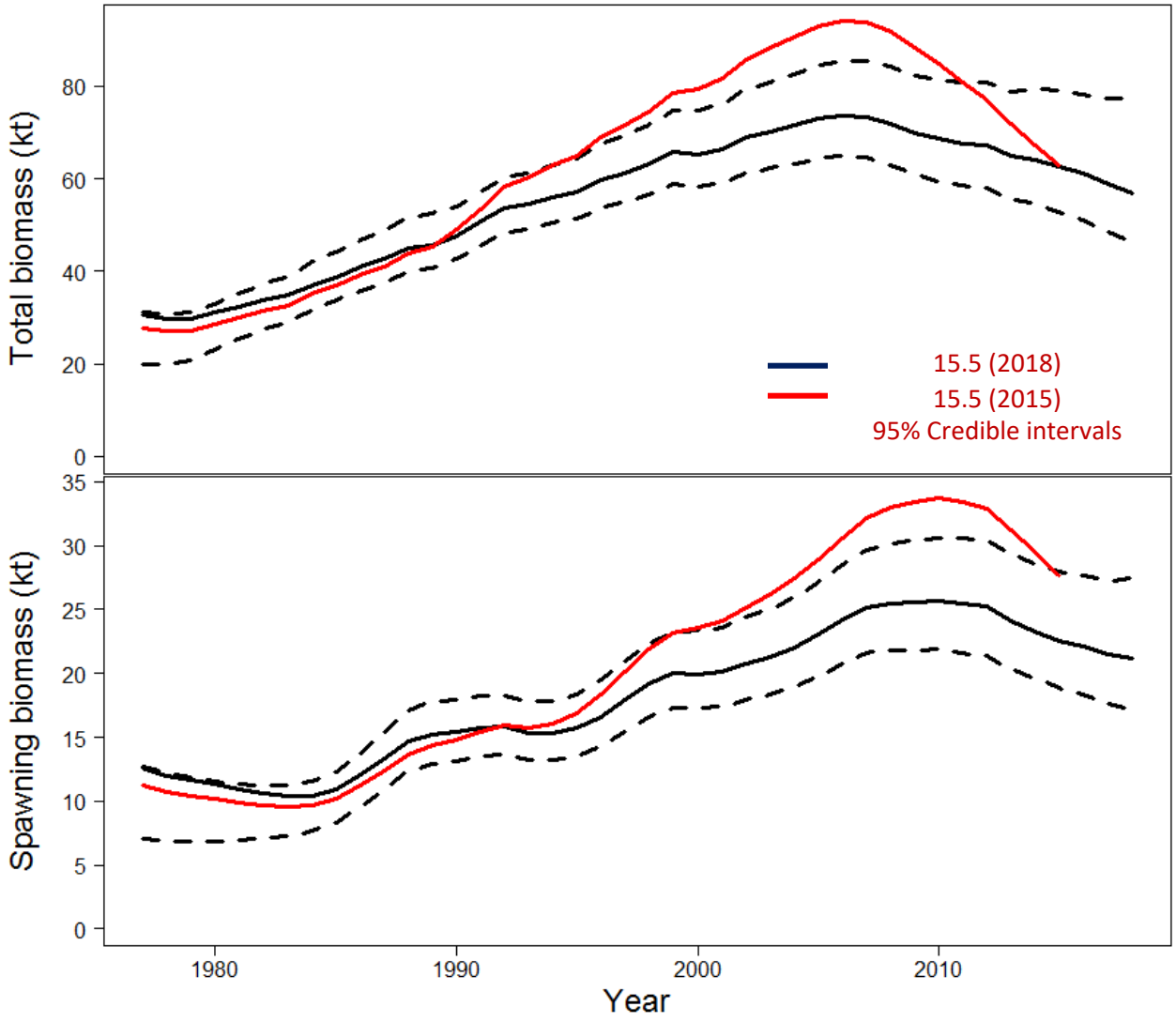
Dusky rockfish survey age comps



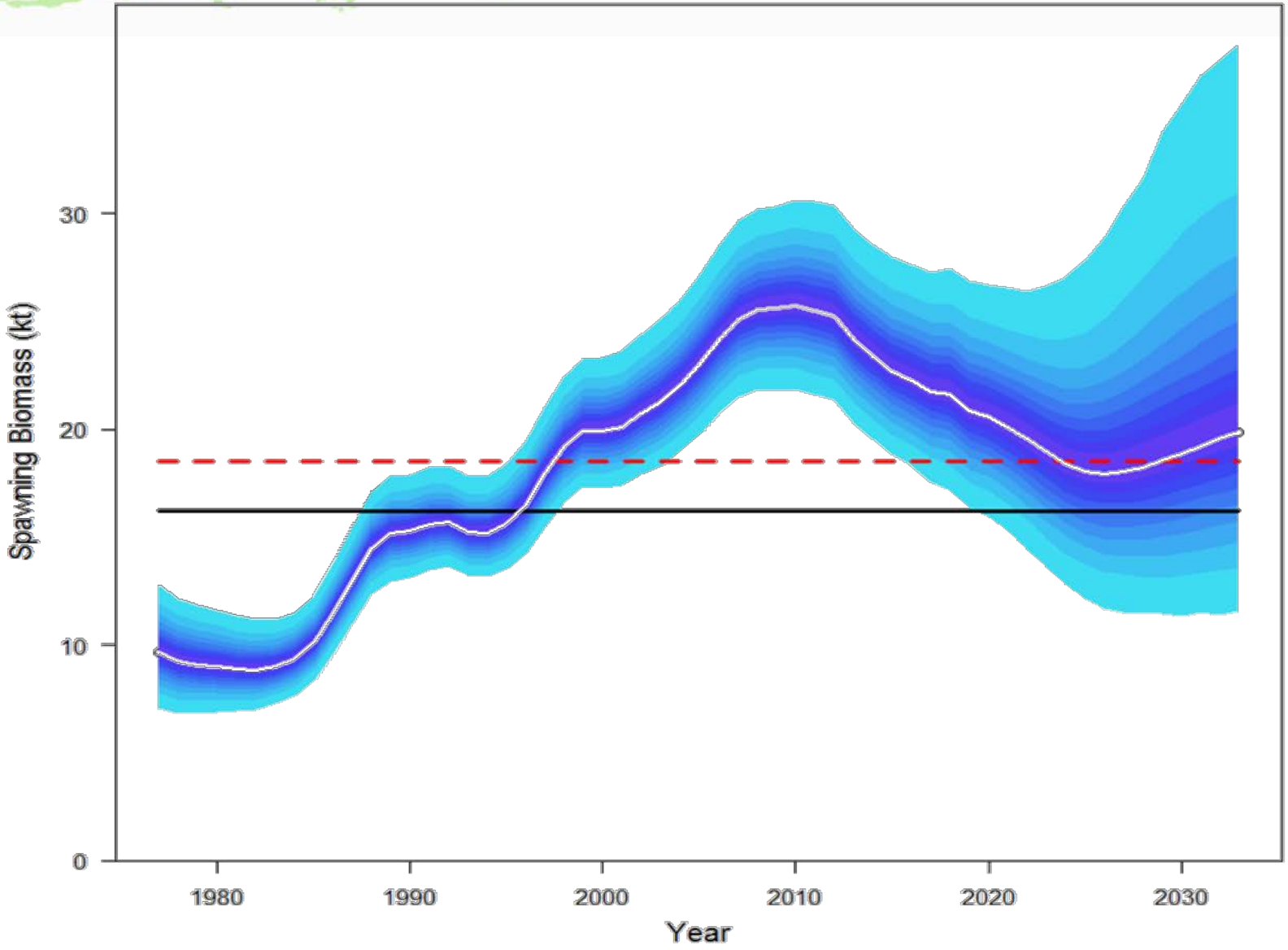
Dusky rockfish fishery age comps



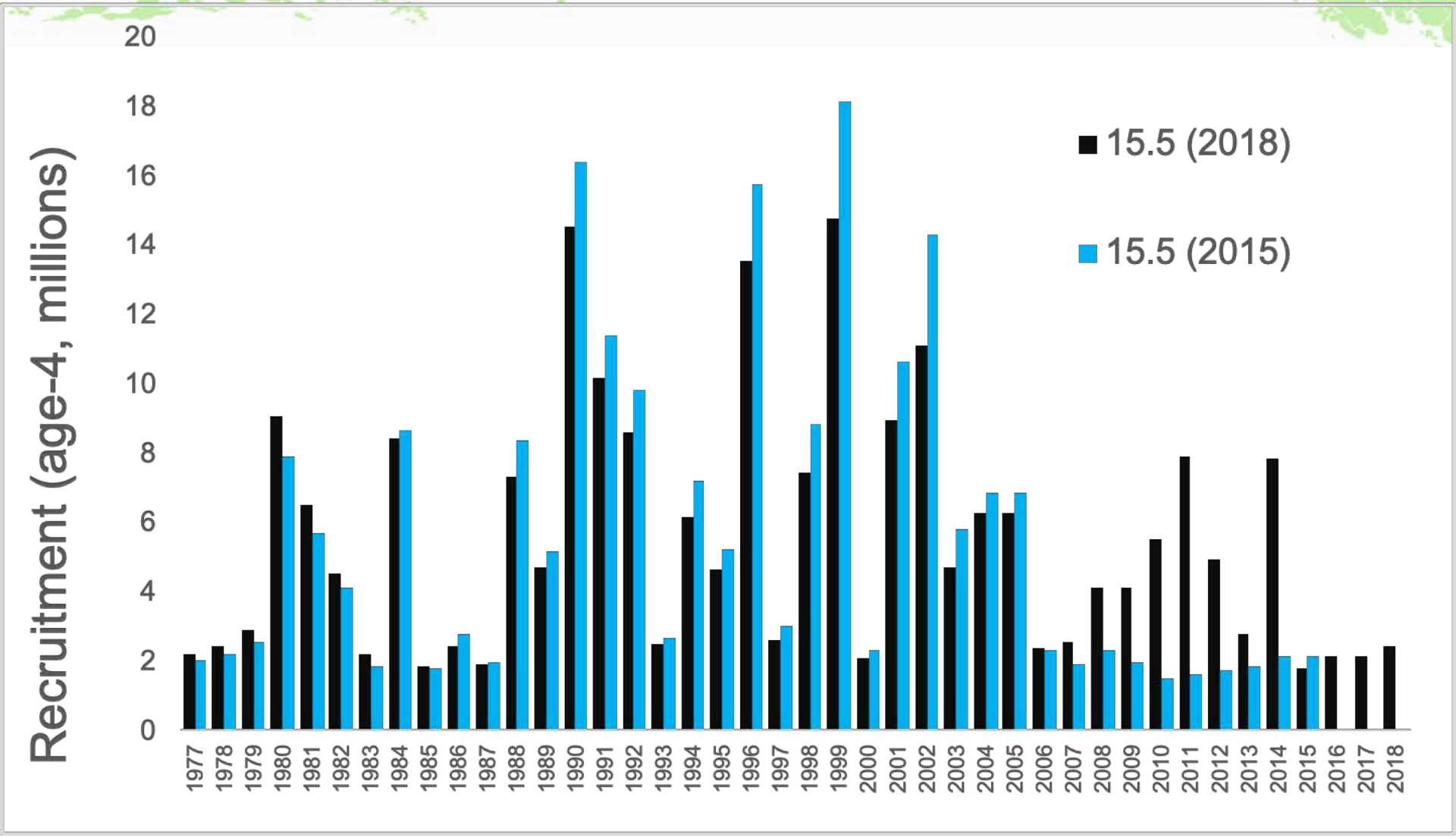
Dusky rockfish biomass



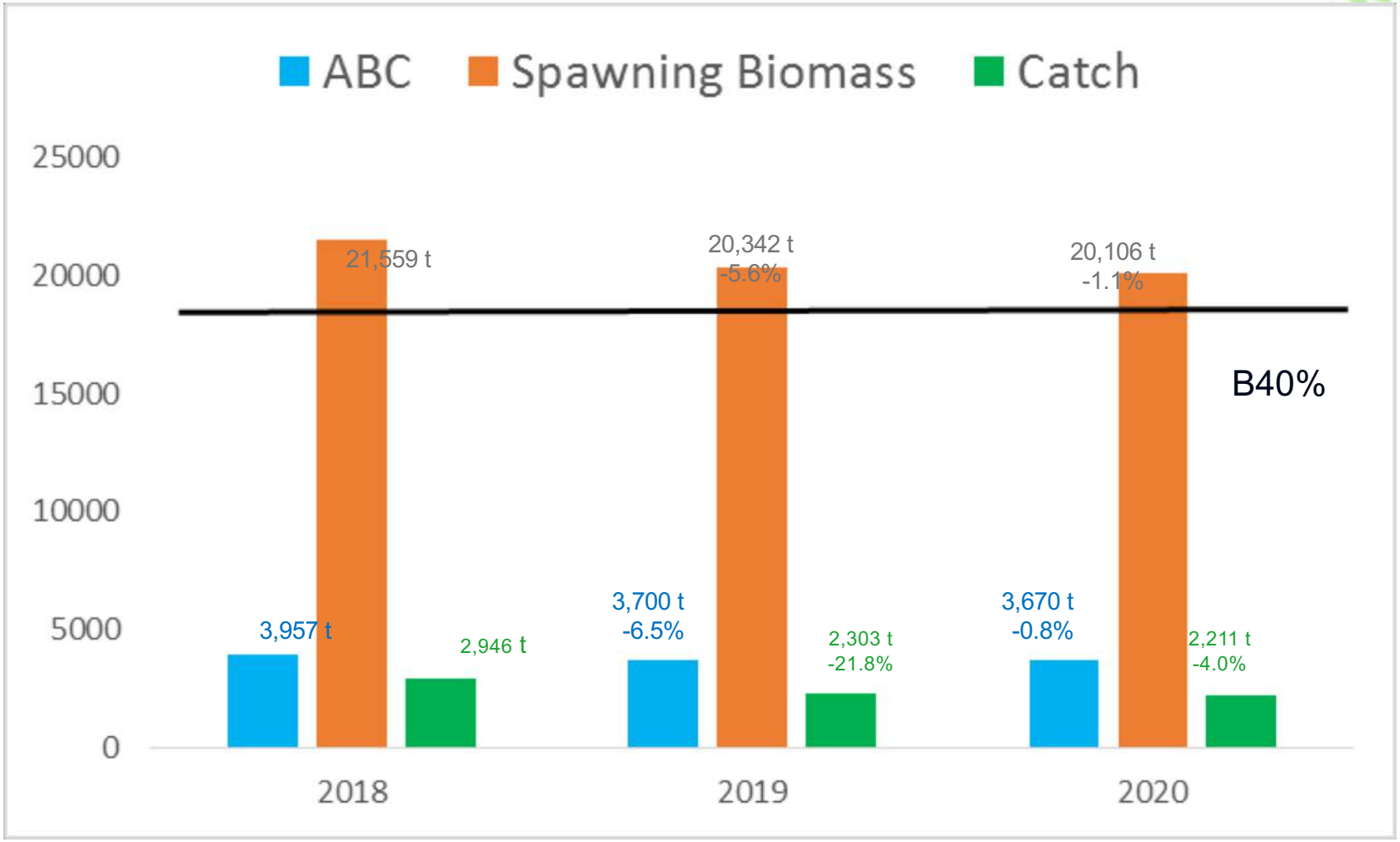
Dusky rockfish spawning biomass projections



Dusky rockfish recruitment

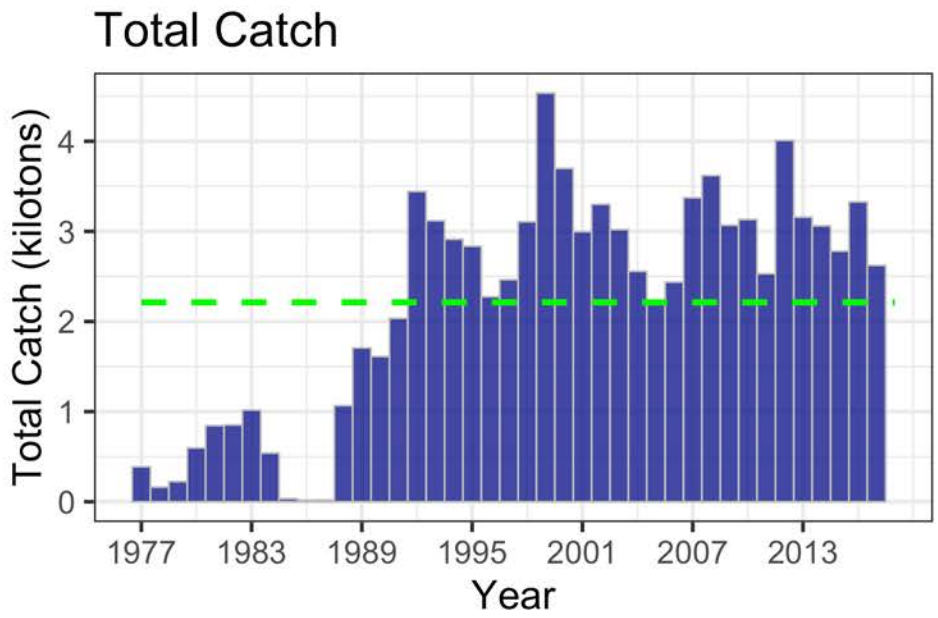


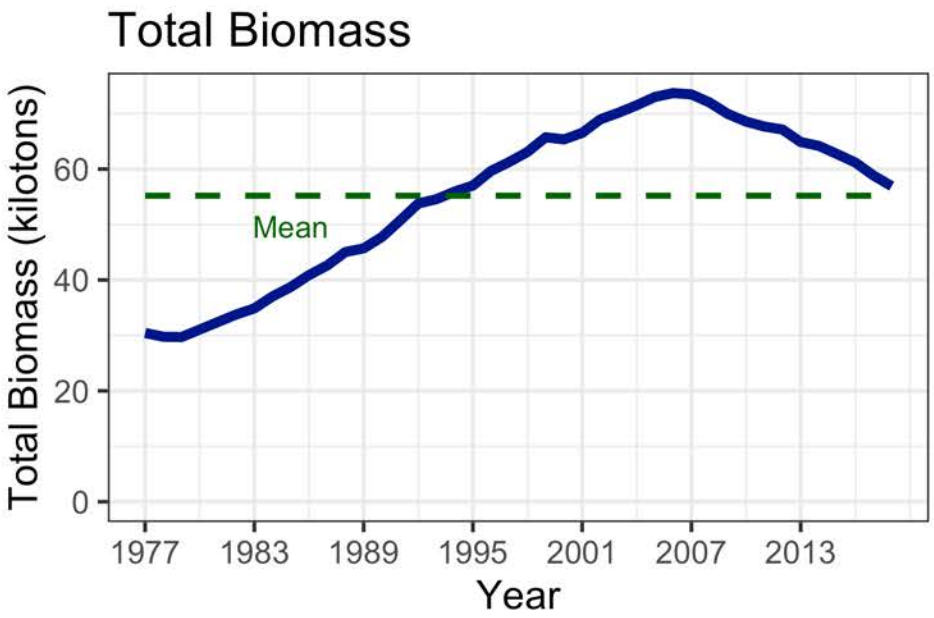
Dusky rockfish 3 year summary

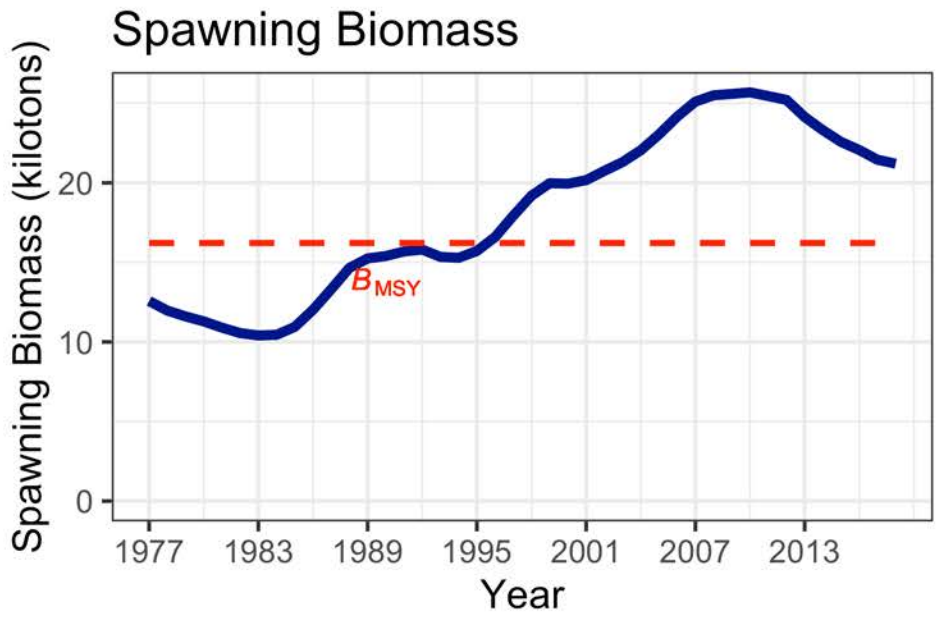


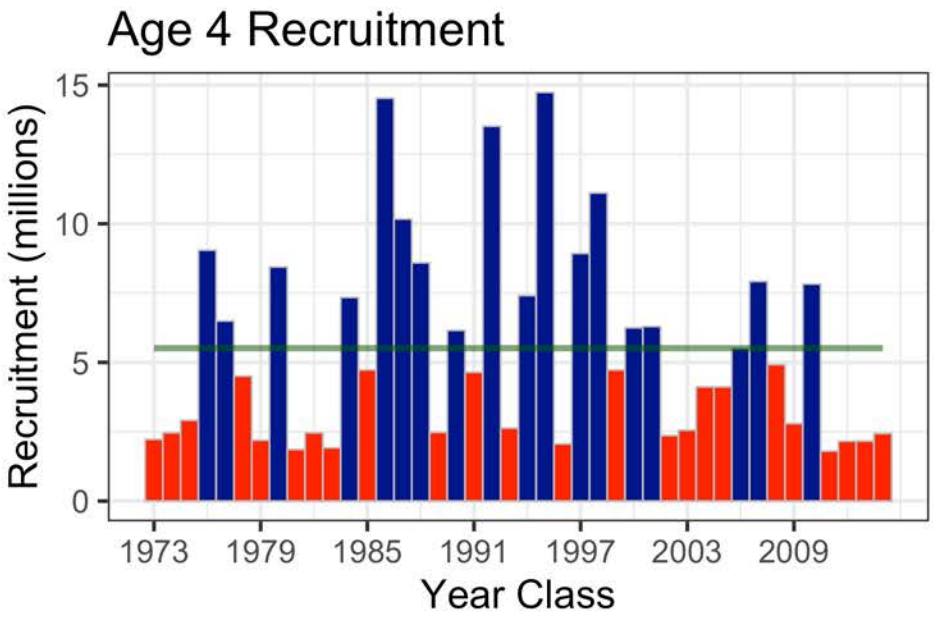
*Estimated catch of 2,946 t for 2018, and estimates of 2,303 t and 2,211 t used in place of maximum permissible ABC for 2019 and 2020

GOA Dusky Rockfish









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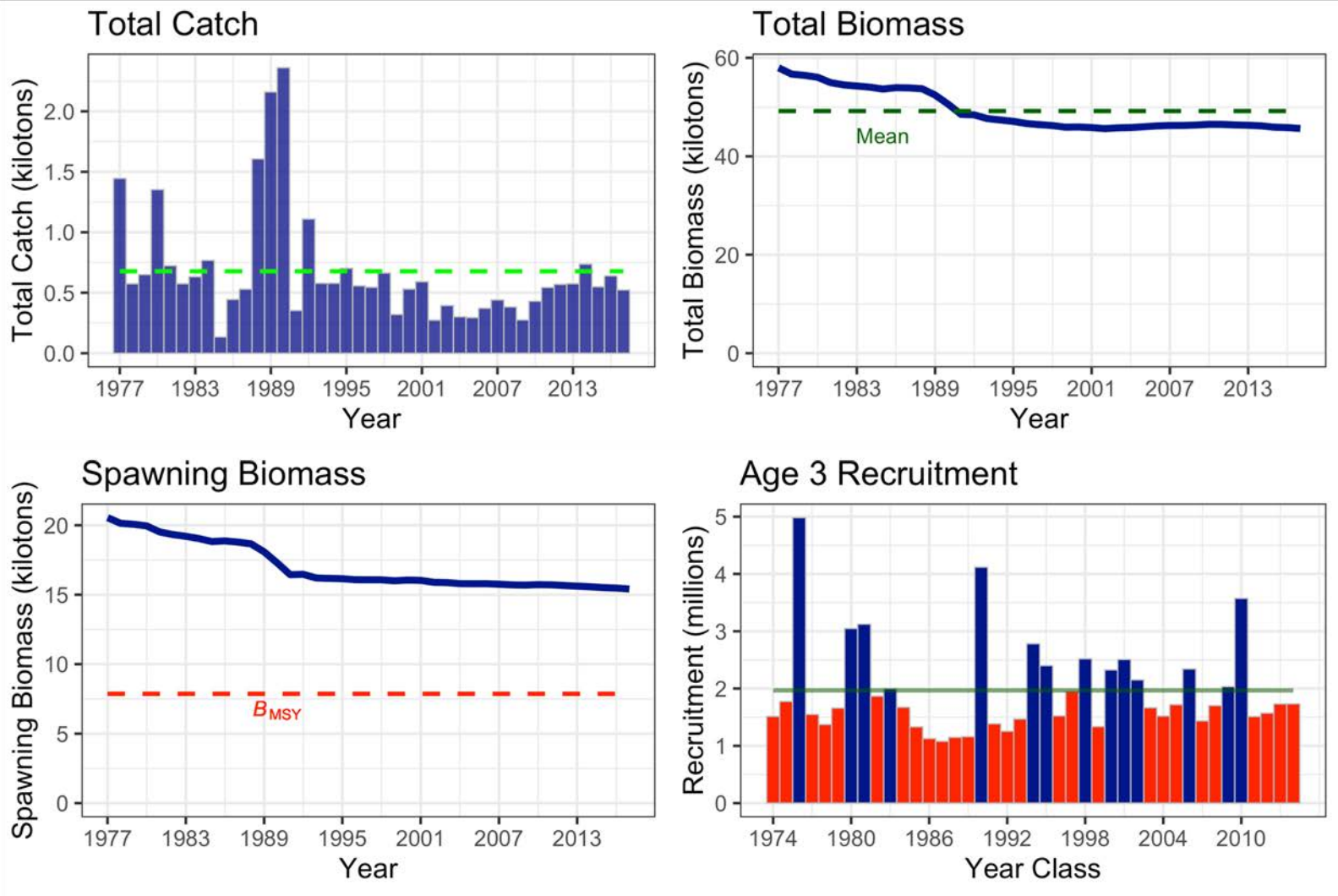
Other rock	5,594	5,594	same (0%)
Sub Total	47,067	46,946	down 121 (0%)

13. GOA Blackspotted/Rougheye Rockfish

Partial assessment

Catches low relative to total biomass



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Sub Total	47,067	46,946	down 121 (0%)

14. Demersal shelf rockfish

Stock Assessment

DSR Complex:

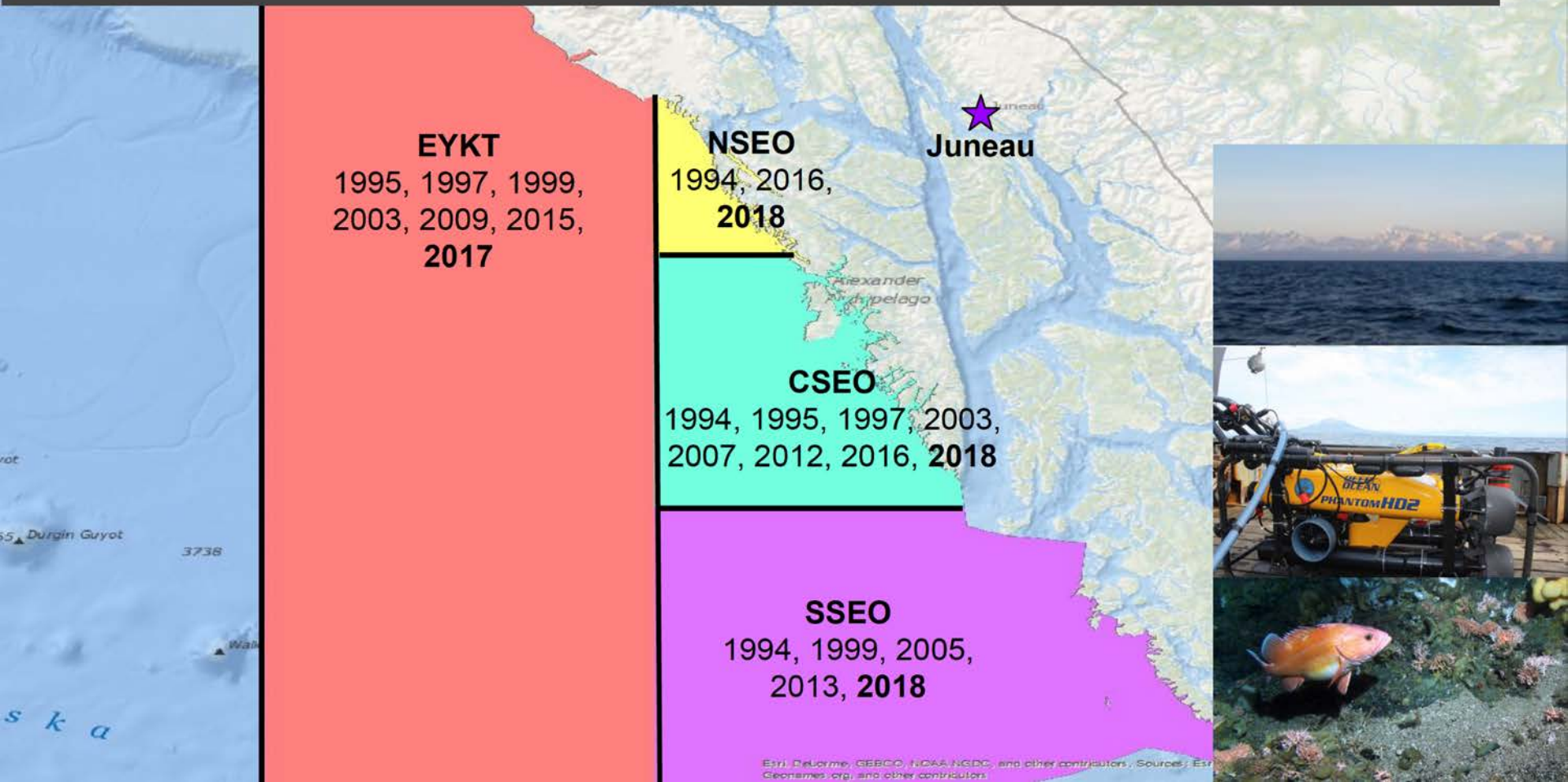
Yelloweye (*S. ruberrimus*) | Quillback (*S. maliger*) | Tiger (*S. nigrocinctus*) | China (*S. nebulosus*)

Canary (*S. pinniger*) | Copper (*S. caurinus*) | Rosethorn (*S. helvomaculatus*)

Images: Google Images

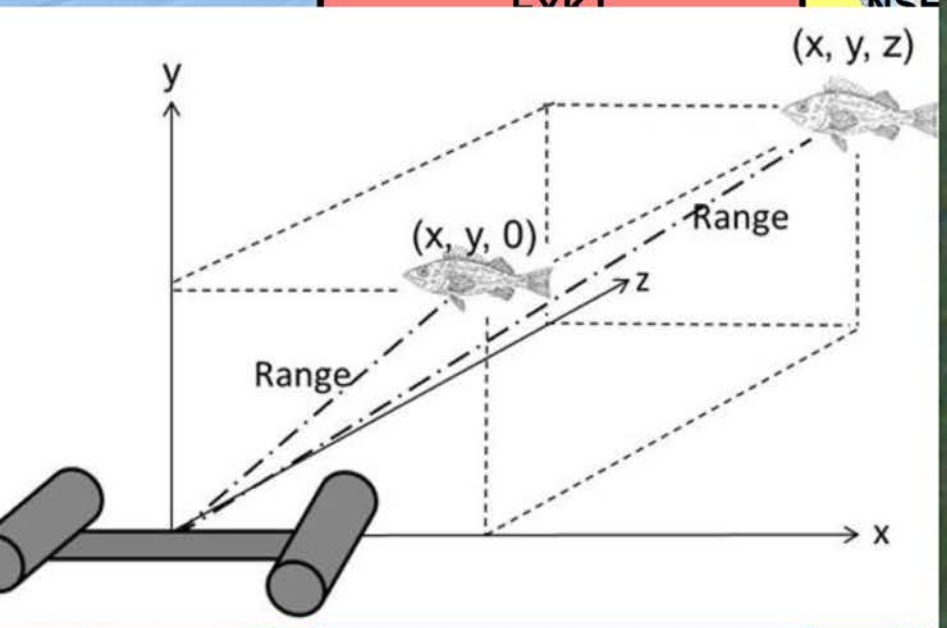
14. Demersal shelf rockfish

Stock Assessment



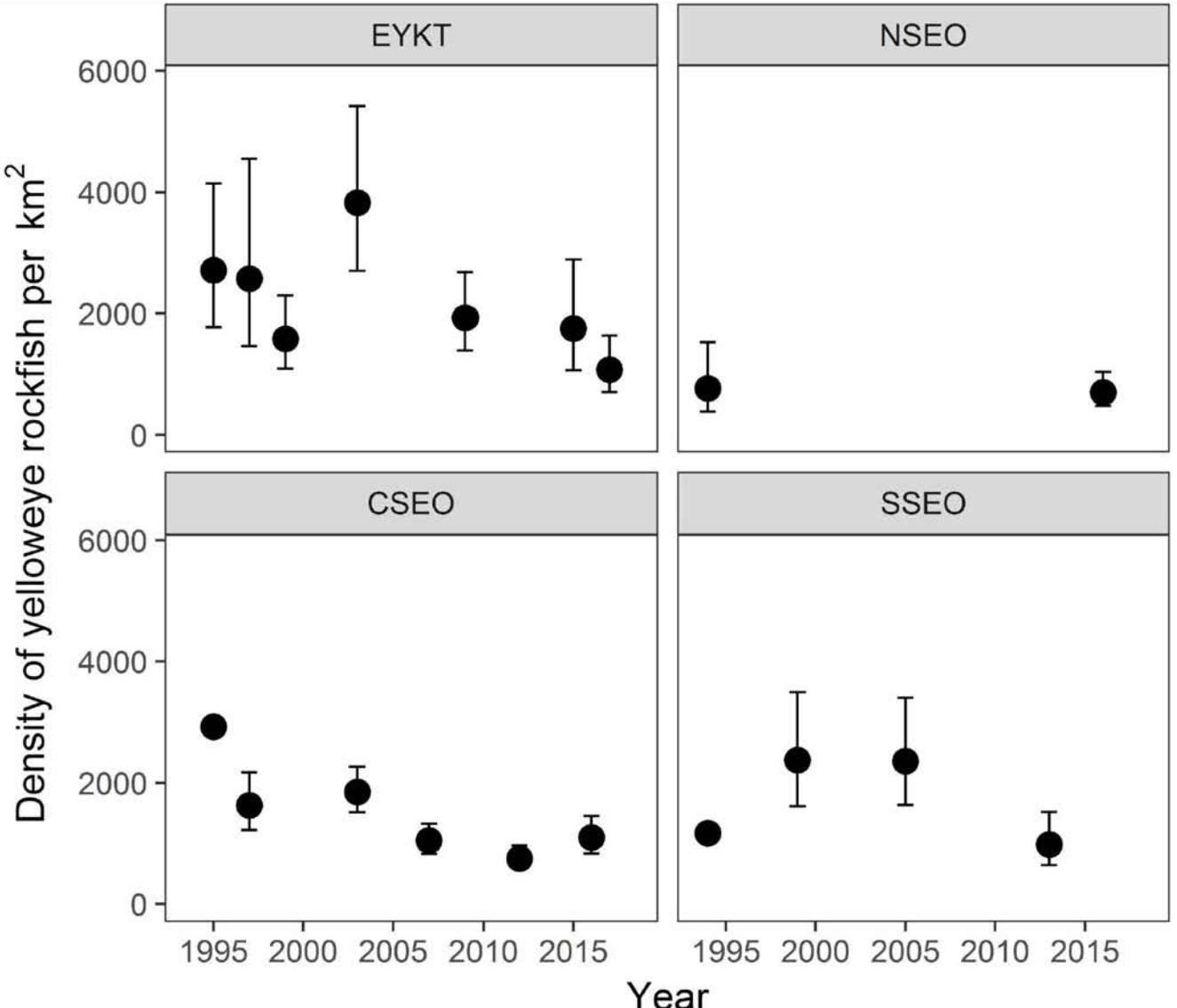
14. Demersal shelf rockfish

Stock Assessment



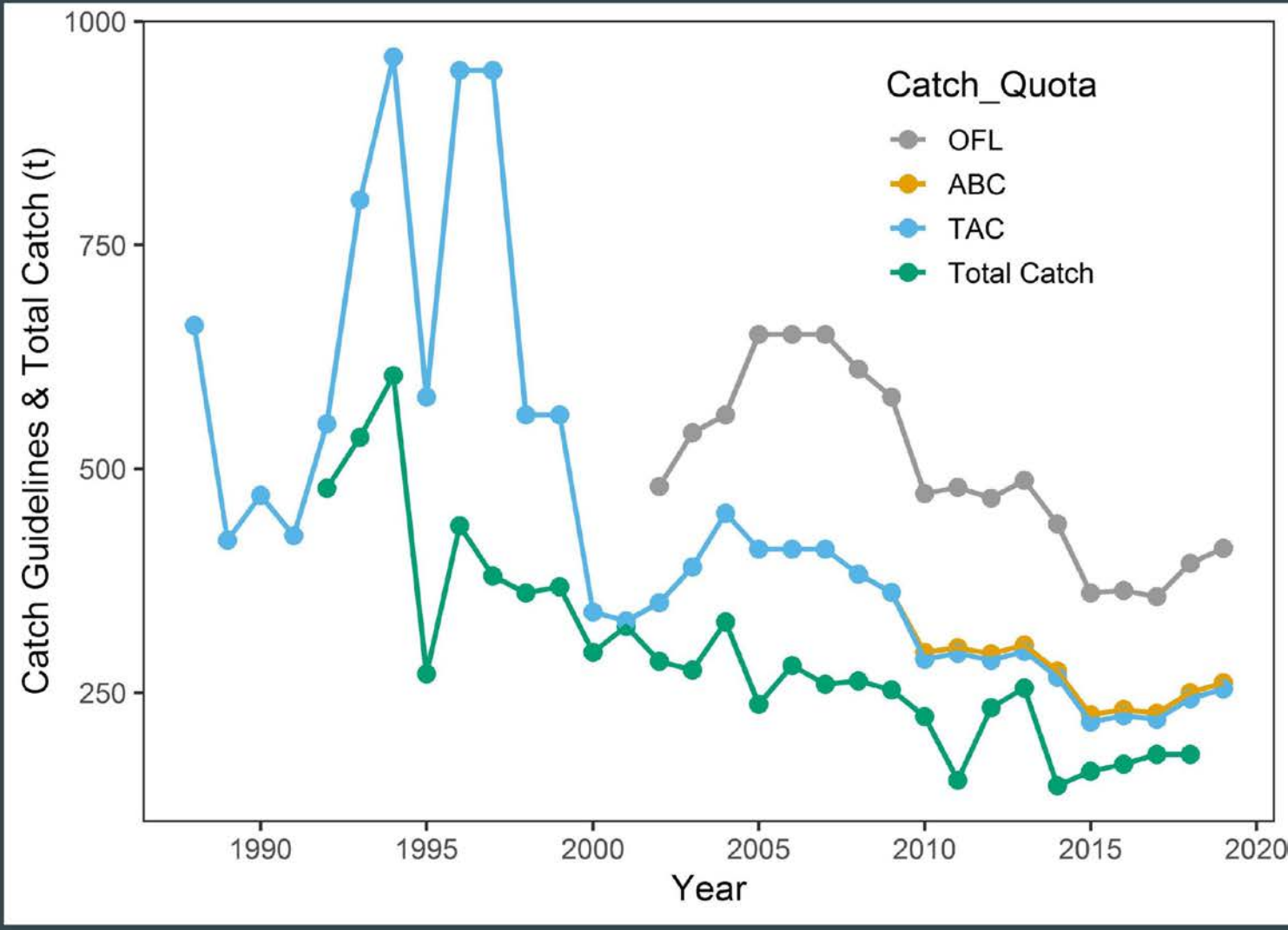
14. Demersal shelf rockfish

Sub & ROV Density Estimates (95% CI)



14. Demersal shelf rockfish

Catch Guidelines vs Total Catch



GOA Demersal shelf rockfish

The GOA Plan Team recommends

- **...examine the risk table for the next assessment**
- **...provide rationale in the assessment of why *M* is being used instead of $F_{40\%}$ and why the lower 90% CI for biomass is used rather than the point estimate.**

Image: tanakulodge.com

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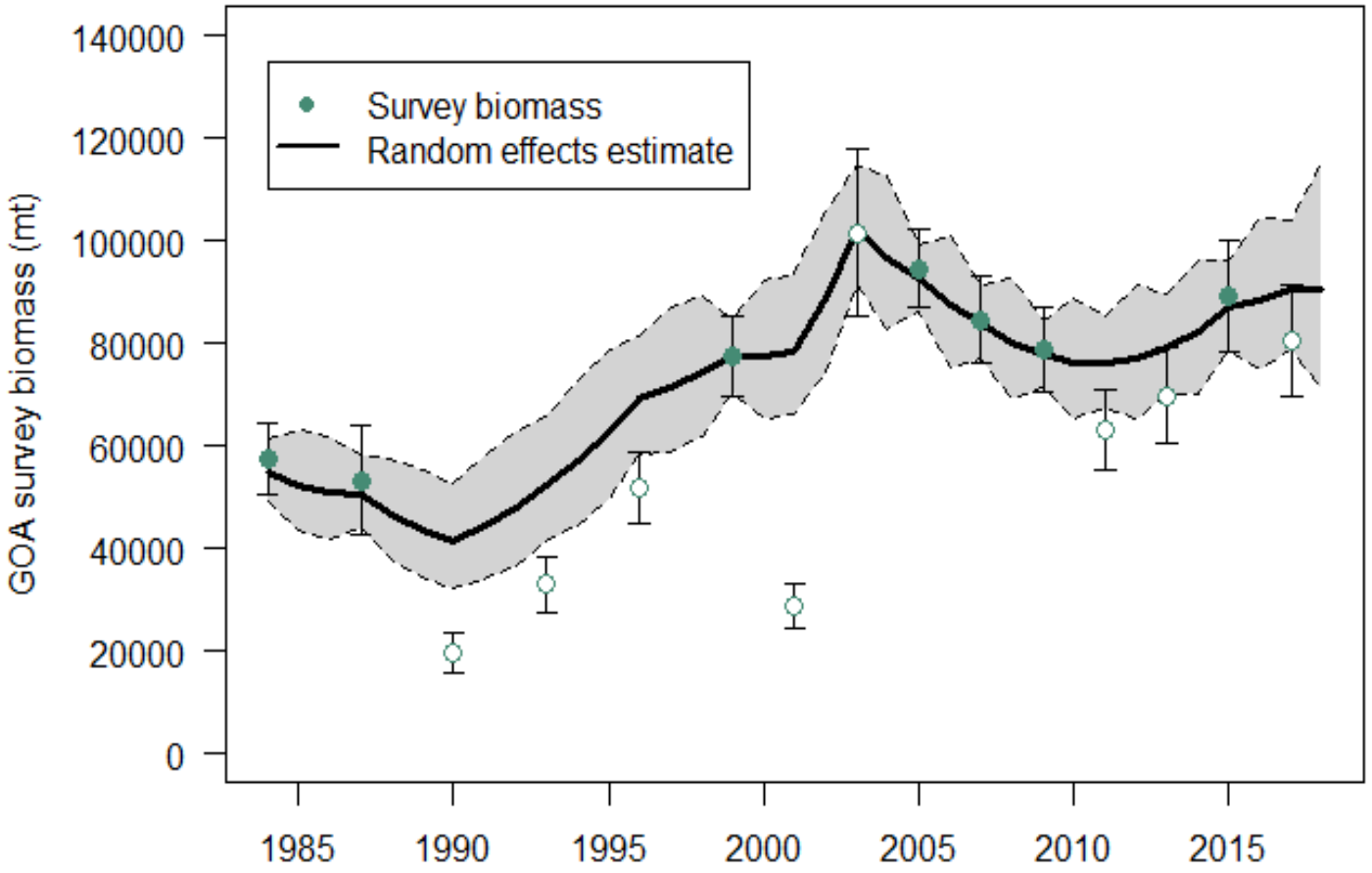
15. Shortspine thornyheads

Tier 5



GOA Thornyhead Rockfish

New data

- 2017 trawl survey biomass
- 1992 – 2018 longline survey RPWs

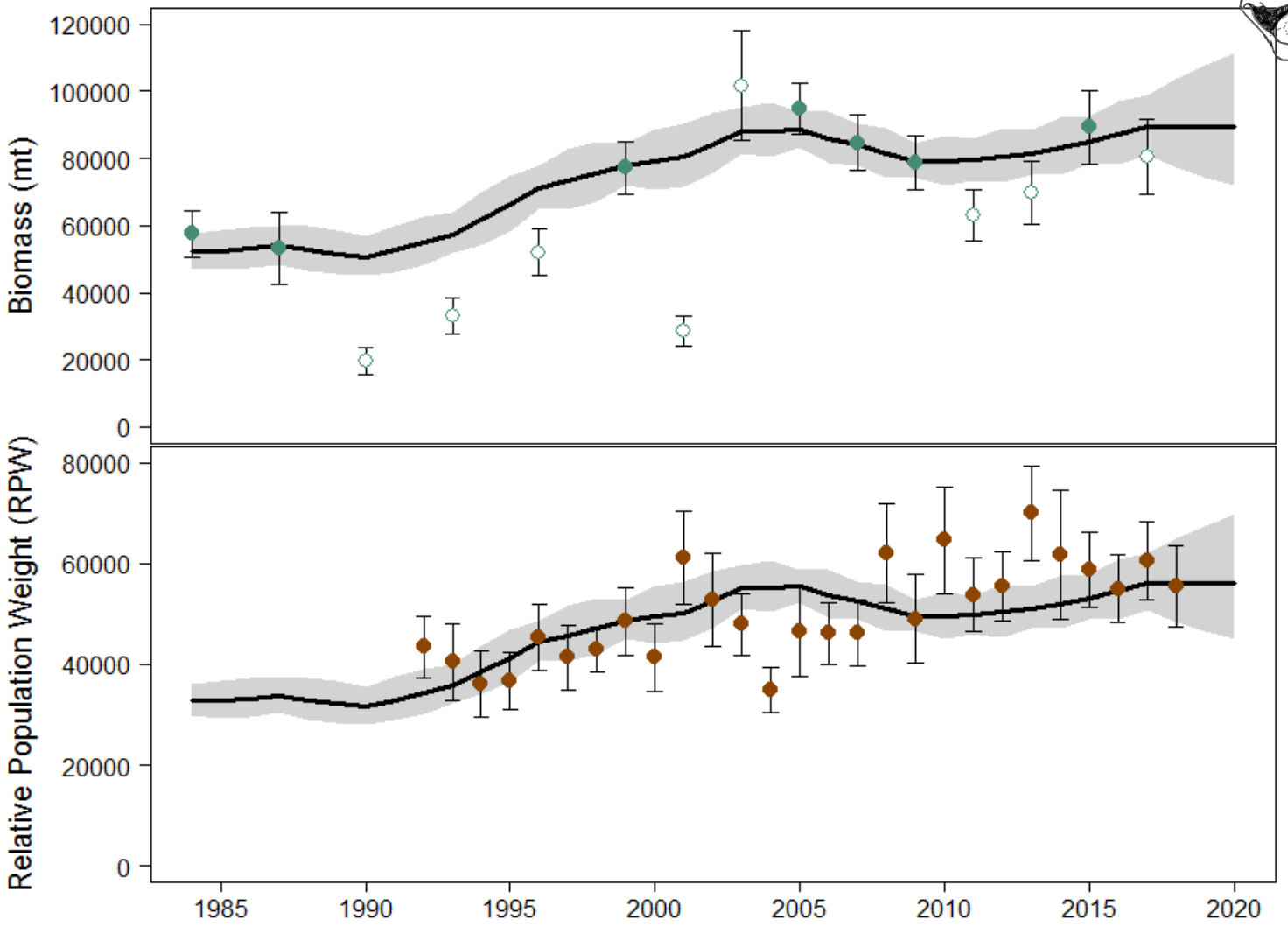
Exploitable biomass

- 1% decrease from 2017

Changes in Methodology: Model fit to both

- AFSC Longline survey index (1992-2018)
- **AND**
- AFSC bottom trawl survey biomass index (1984-2017)

Estimated Exploitable Biomass via Random Effects Model



Trawl survey biomass 10%

LL Survey RPW 13%

ABCs for remaining GOA species

Species	2018 Catch	2018	2019	Change
Pollock	154,286	170,265	144,623	down 25,642 (15%)
Pacific Cod	9,595	18,000	17,000	down 1,000 (6%)
Sablefish	11,716	11,505	11,571	up 66 (1%)
Flatfish	22,053	114,712	116,562	up 1,850 (2%)
Arrowtooth flounder	2,045	150,945	145,841	down 5,104 (3%)
Rockfish	33,425	47,067	46,946	down 121 (0%)
Atka mackerel	1,431	4,700	4,700	same (0%)
Skates	2,786	7,804	7,804	same (0%)
Other Species	3,616	11,927	14,460	up 2,533 (21%)
Total	240,953	536,925	509,507	down 27,418 (5%)

Other species…

Species	2018 Catch	2018	2019	Change
Atka mackerel	1,431	4,700	4,700	same (0%)
Big skate	1,262	2,848	2,848	same (0%)
Longnose skate	843	3,572	3,572	same (0%)
Other skates	681	1,384	1,384	same (0%)
Sculpins	550	5,301	5,301	same (0%)
Sharks	2,886	4,514	8,184	up 3,670 (81%)
Squid	41	1,137	-	down 1,137 (100%)
Octopus	139	975	975	same (0%)

20. GOA Sharks

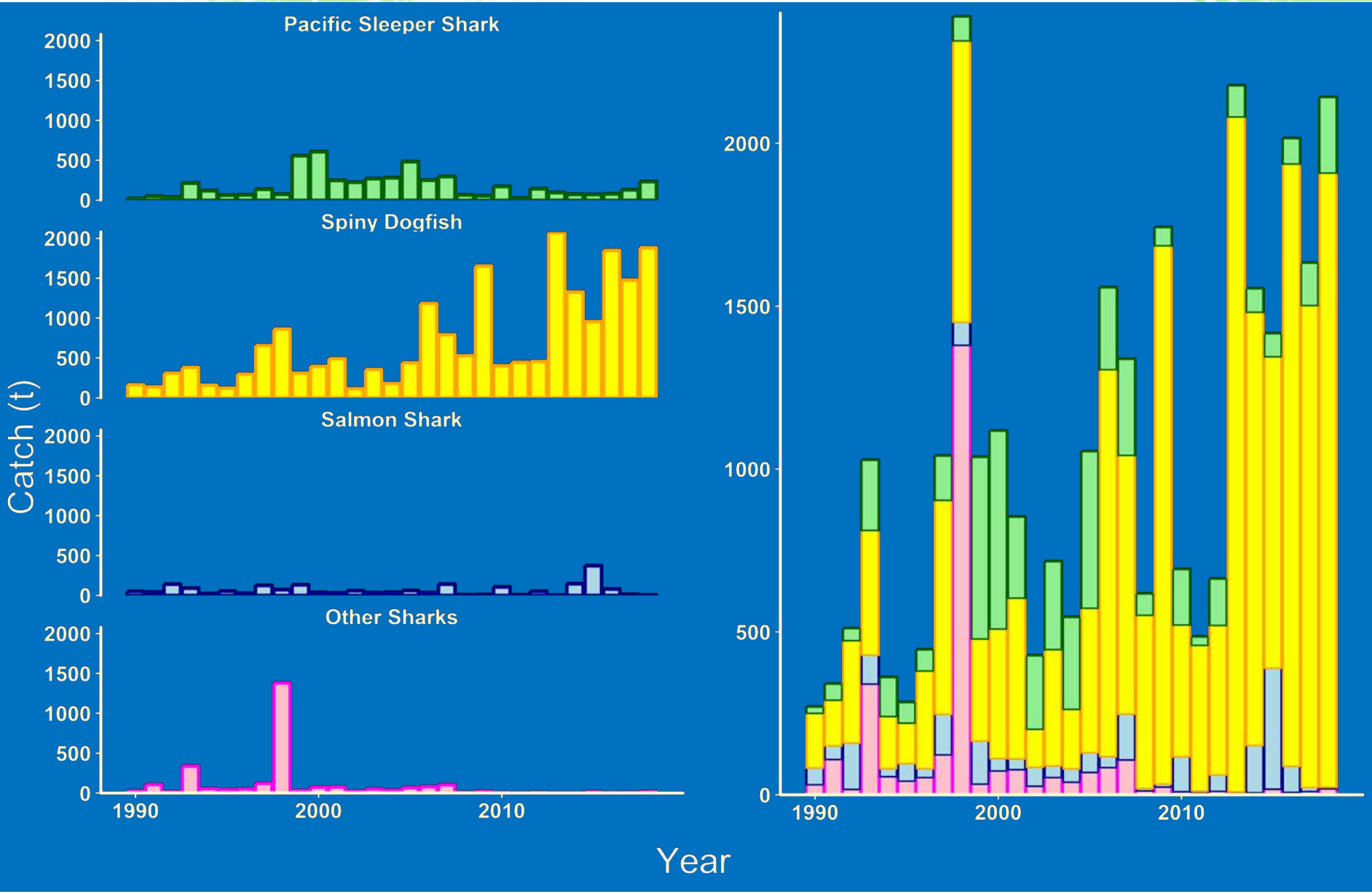
New data

- Updated catch data through 2018
- Updated data from AFSC trawl, AFSC longline, IPHC longline and ADF&G surveys
- Updated random effects biomass
- Estimate of catchability (q)

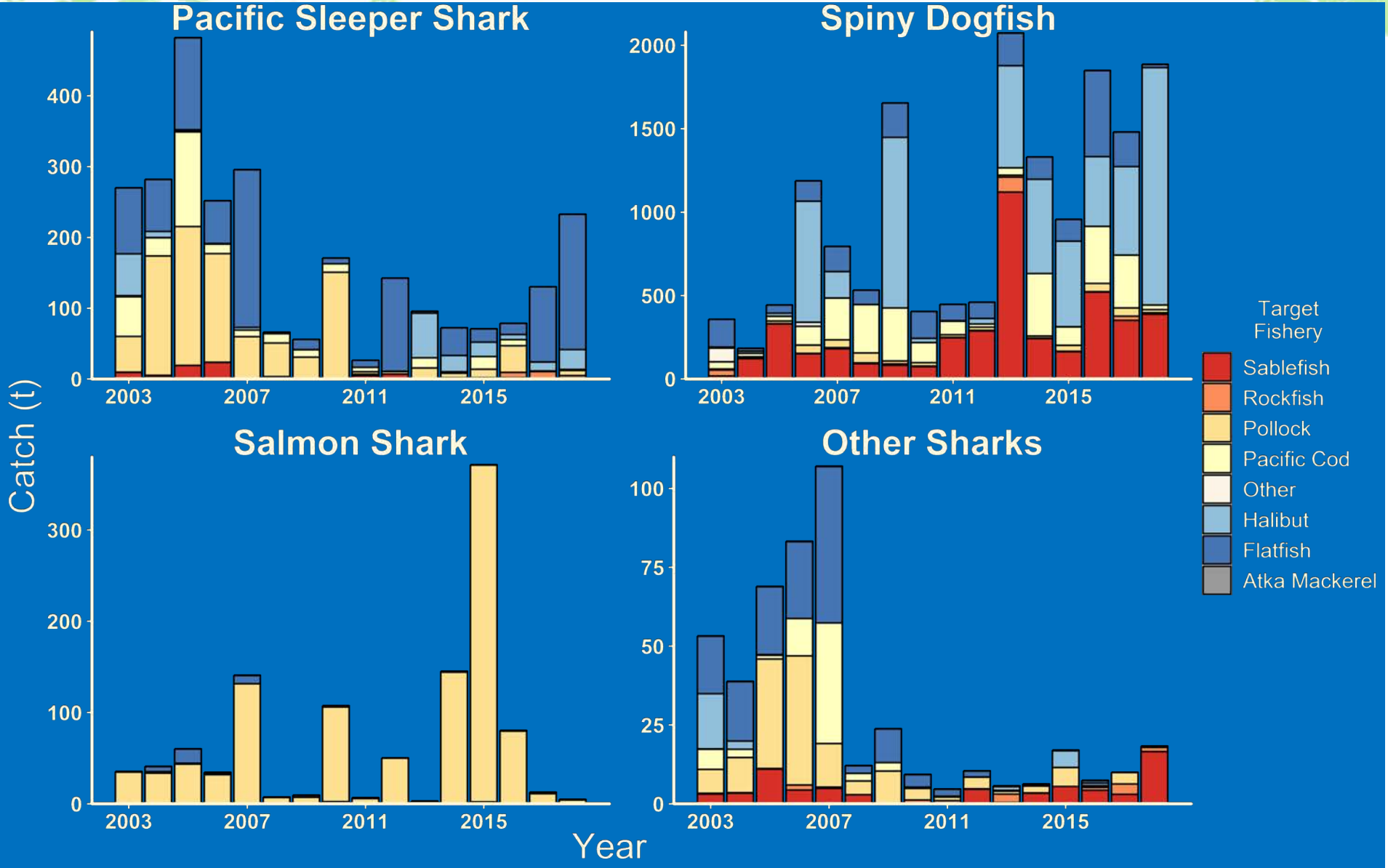
GOA Sharks

- Changes to assessment methodology:
  - Tier 6 species: none
  - Spiny dogfish (Model 15.3A)
    - Minimum biomass (B_{RFX}) adjusted by q = 0.21
    - $F_{OFL} = F_{max}$ = 0.04
    - Model 15.1 (status quo) assumes q = 1 and $F_{OFL} = M$ = 0.097

Species specific catch, GOA sharks

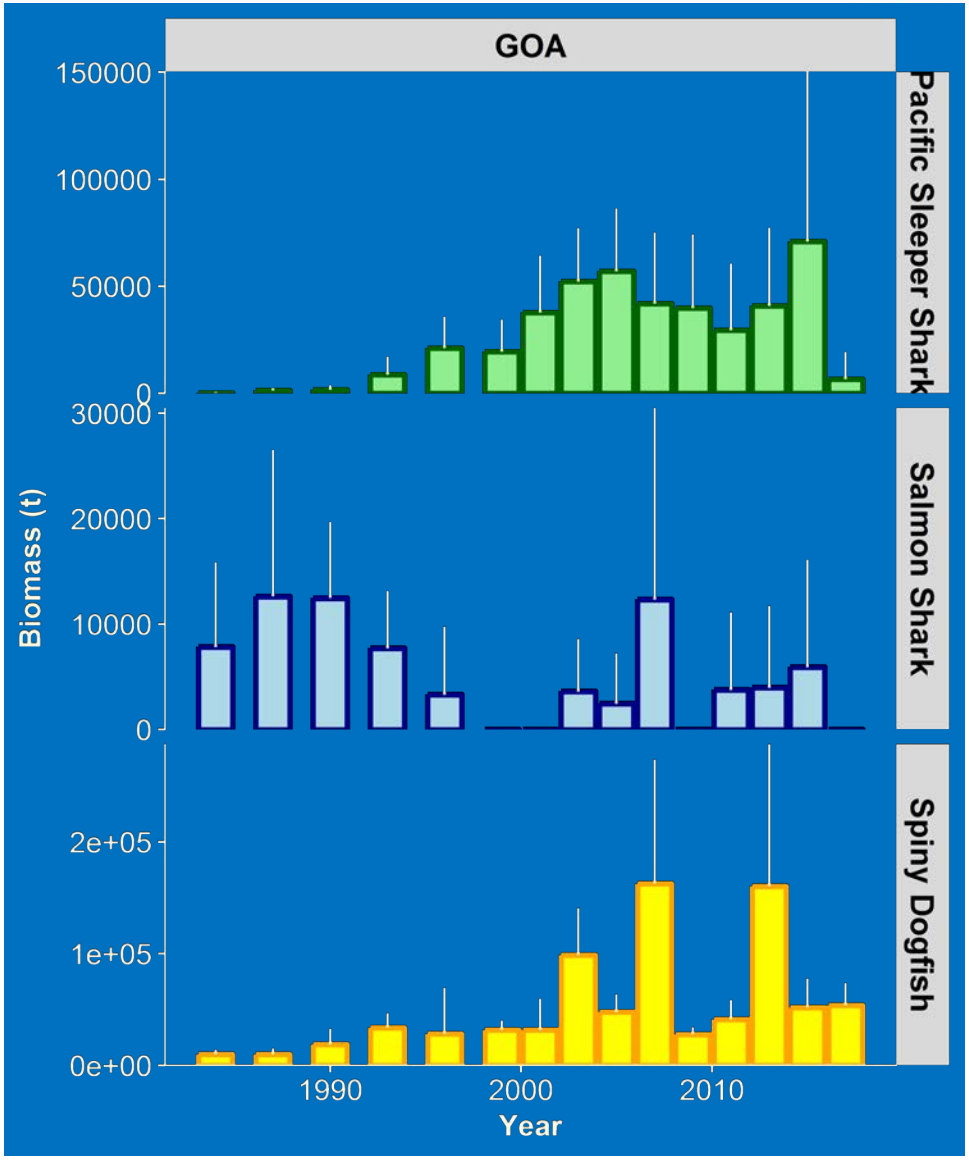


Catch by Target Group



AFSC Trawl Survey

- Pacific Sleeper shark one of lowest of time series
- Spiny dogfish flat
- Only used for spiny dogfish



20. Sharks

Team recommended:

Author proposed methods for ABC/OFL

Continue with efforts to estimate biomass in NMFS areas 649 and 659

- small workgroup form to examine estimation approaches for 649/659 catches

Forage species

- Author recommended title change
- **The Plan Team supported the author recommendation to include squid in the forage species category in the Ecosystem Chapter**