Gulf of Alaska SAFE report

Report of the
Gulf of Alaska Groundfish
Plan Team meeting
Nov 12th-15th, 2019

GOA Plan Team Members

James Ianelli (co-chair)	AFSC/REFM
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Jan Rumble	ADFG
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Paul Spencer	AFSC/REFM
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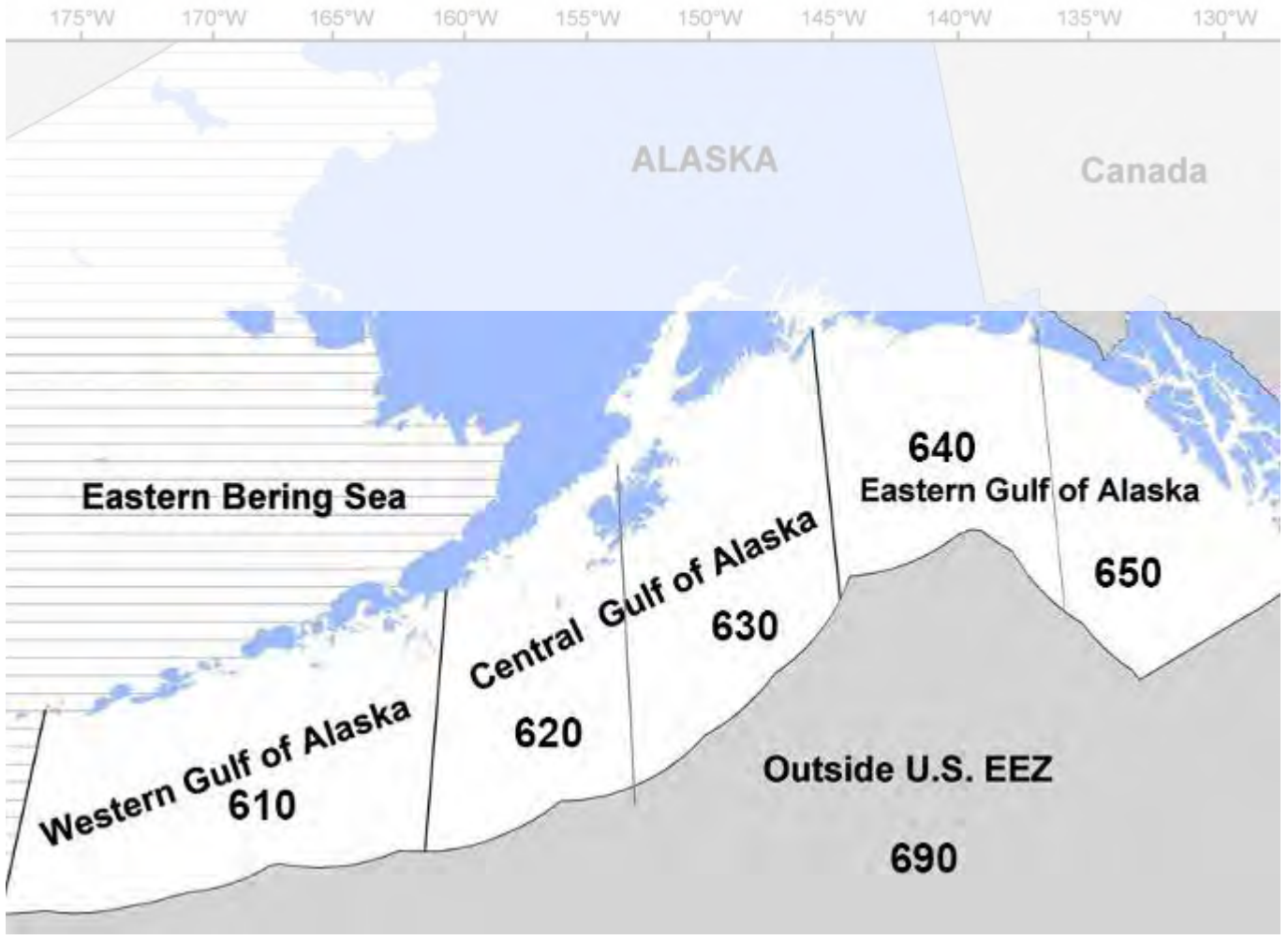
Overview

"On" year for GOA, NMFS bottom trawl survey occurred

12 "full" assessments reviewed (7 in Tier 3)

8 "partial" assessments (4 also in Tier 3)



Stock Assessment schedule for the Gulf of Alaska

Stock	Assessment	Tier	Frequency (yrs)	Full assessment Year due
Pollock	Full	3	1	2019
Pacific cod	Full	3	1	2019
Sablefish	Full	3	1	2019
Northern and southern rock sole	Partial	3	4	2021
Shallow water flatfish	Partial	5	4	2021
Deepwater flatfish (Dover)	Full	3/6	4	2019
Rex sole	Partial	5	4	2021
Arrowtooth flounder	Full	3	2	2019
Flathead sole	Partial	3	2	2021
Pacific ocean perch	Full	3	2	2019
Northern rockfish	Partial	3	2	2020
Shortraker rockfish	Full	5	2	2019
Other rockfish	Full	4/5/6	2	2019
Rougheye & blackspotted rockfish	Full	3	2	2019
Dusky rockfish	Partial	3	2	2020
Demersal shelf rockfish	Partial	4/6	2	2020
Thornyheads	None	5	2	2020
Atka mackerel	Full	6	2	2019
Skates	Full	5	2	2019
Octopus	Full	6	2	2019
Sculpins	Partial	5	4	2021
Sharks	none	6	2	2020
Forage species (includes squid)	Report	eco	2	2020
Grenadiers (BSAI/GOA)	None	eco	4	2020

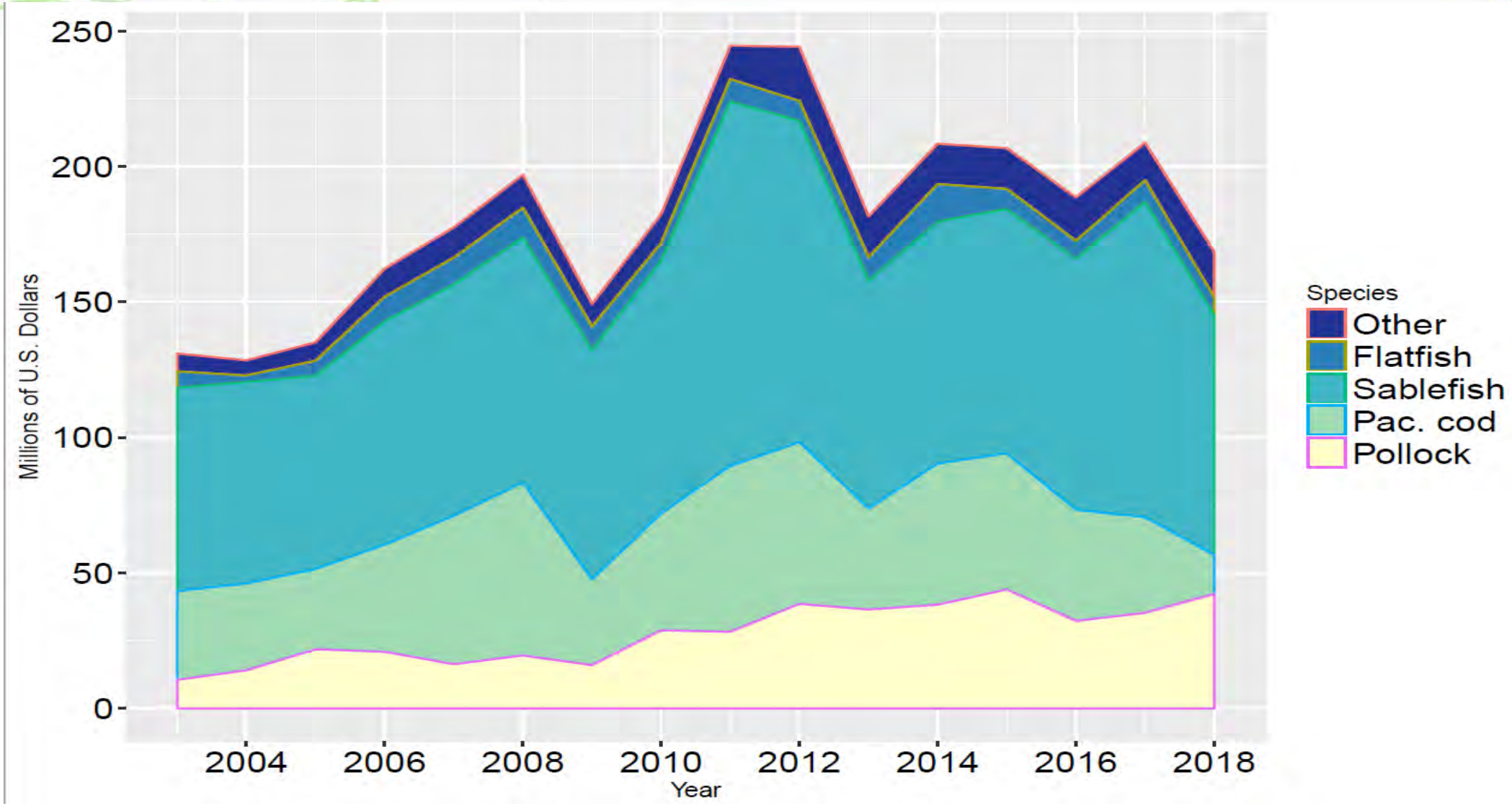
- Document layout and links…

Econ and Ecosystem summary in SAFE Introduction

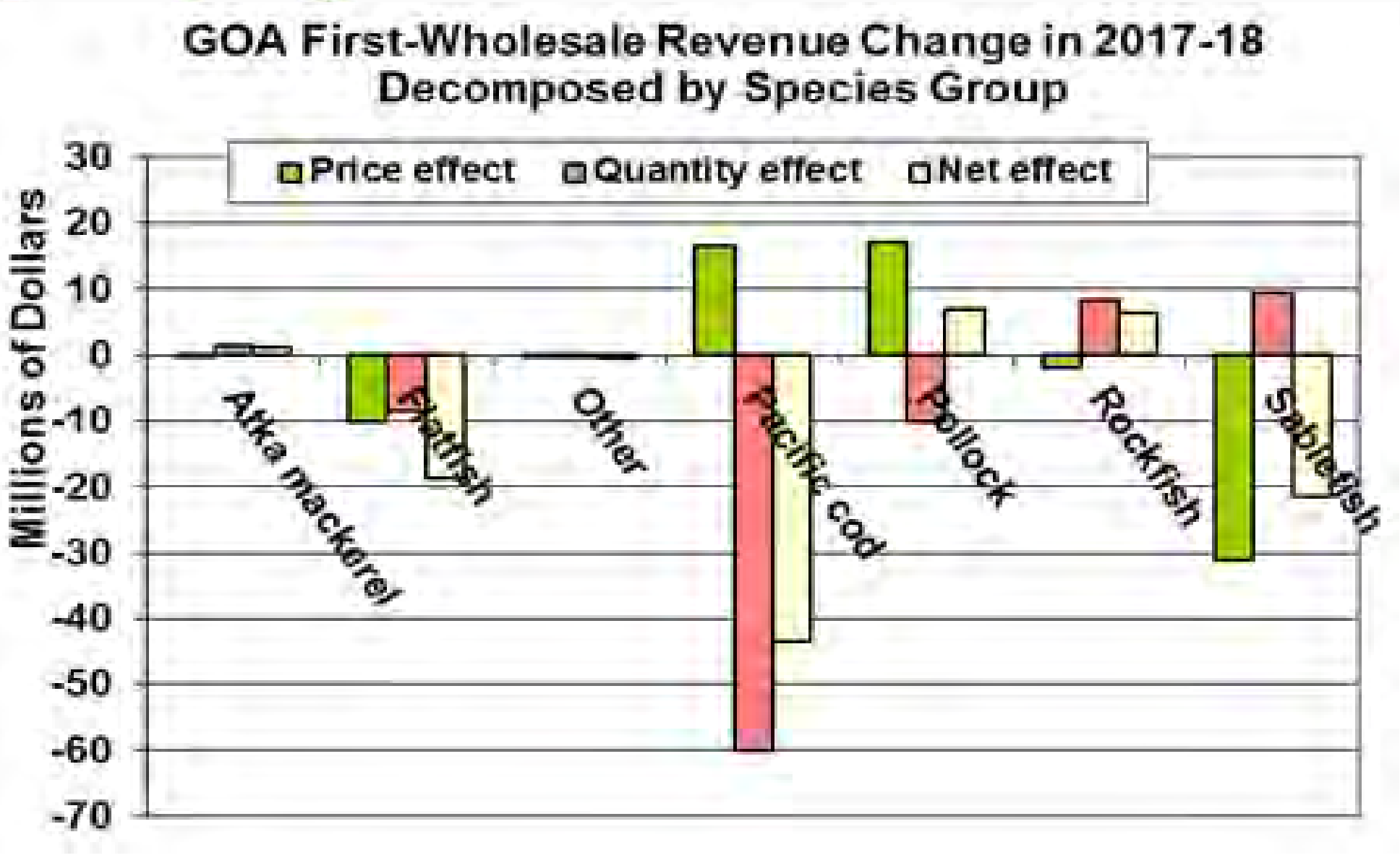
GOA Ecosystem SAFE…

- 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 2018 Ecosystem state with updated data sources,
- a current (2019) Western and Eastern GOA ecosystem state summary, and
- a listing of the ecosystem indicators.

GOA Economic synopsis



Revenue changes (and source)



Ecosystem component

Summary listed in GOA intro chapter split by Eastern and Western (about 9 items highlighted for each area)

- Noteworthy:
  - Large gray whale mortality event was observed coast-wide in 2019…emaciation evident
  - Possible range expansion of market squid (*Doryteuthis opalescens*) to Alaska–egg cases found on crab pot gear around Kodiak in 2016 and 2018 and on trawl nets in Little Port Walter
    - Thought to spawn only south of BC, Canada
    - also observed in seabird chick diets

Econ and Ecosystem summary in SAFE Introduction

The GOA Team recommended

- presenting the satellite chlorophyll data more clearly to see patterns highlighted in the document
- showing how well predictions of poor recruitment based on environmental indicators correlate to consequent larval fish survey data
- **Relative to economic section, discuss/present the figures shown in introduction**

General assessment considerations

The Team noted a discrepancy in how partial assessments are being conducted when new survey data is available. Authors are provided the following guidance for what to include in partial assessments:

> *For Tiers 1-3 partial assessments should include catch/biomass ratios for all species in addition to re-running the projection model with updated catch information, and also including updated survey biomass trends when available (note that partial assessments for Tiers 1-3 do not involve re-running the assessment model; only the projection model). Partial assessments for Tiers 4-5 should include catch/biomass ratios, and re-running the random effects model only if there is a new survey data point available. Partial assessments for Tier 6 should include catch trends for all stocks.*

Apportionment methodology is not specifically addressed in this guidance and this year the Team noted inconsistencies in how apportionment is determined for partial assessments. Some authors are using the most recent survey biomass estimates to apply regional apportionment percentages whereas others are using apportionment percentages determined in the last full assessment.

General assessment considerations

- **For Tiers 4-5 the Team recommended** when a new survey point warrants updating the random-effects model, apportionments be included
- For Tiers 1-3 on a 2-year cycle when only the projection model is run with updated catch and the new survey estimate is not included in model output, **the Team recommended** using apportionment percentages determined in the last full assessment.

General assessment considerations

GOA bottom trawl survey effort…

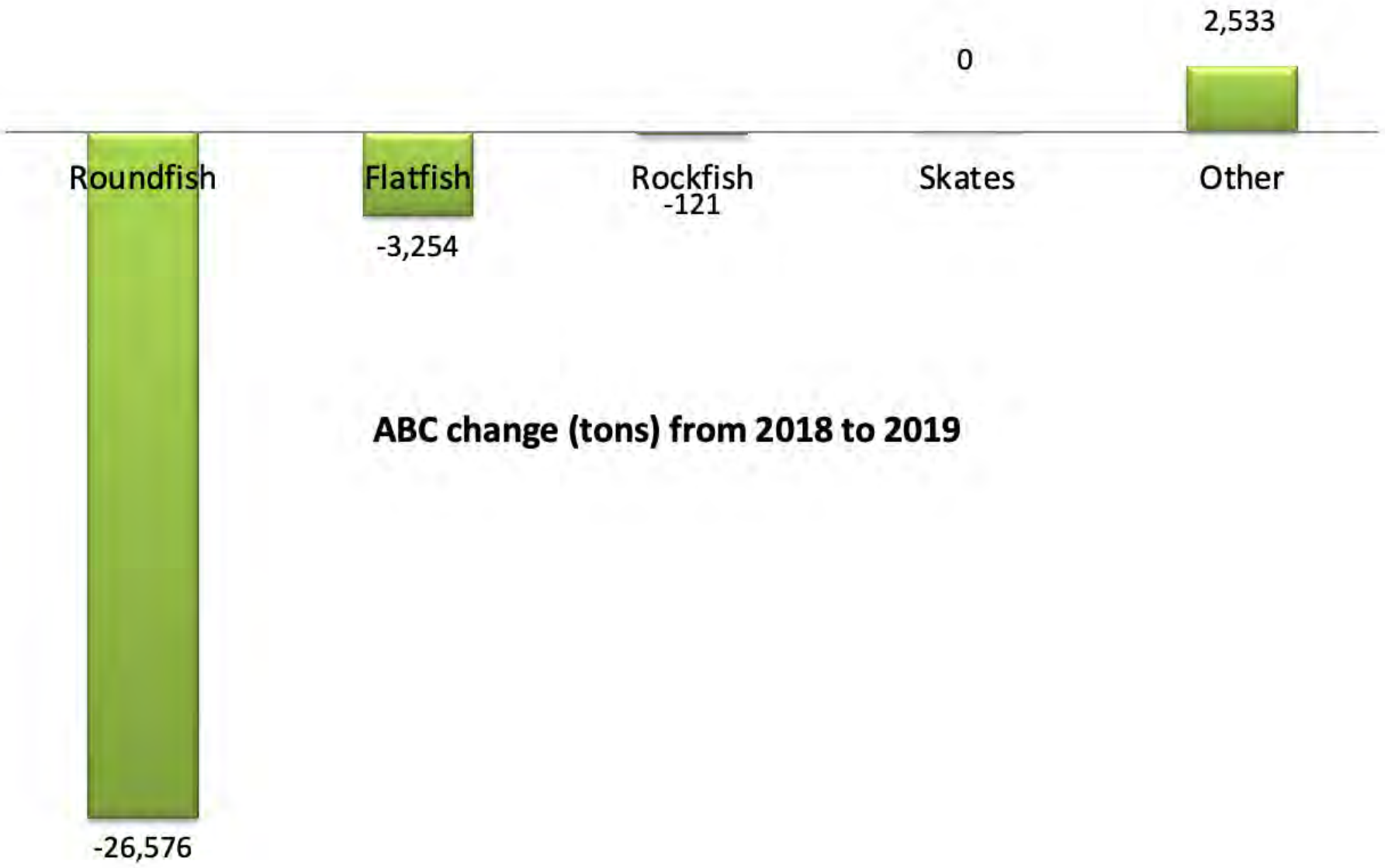
- Expressed concern regarding reducing the survey to two vessels and thinning the number of stations sampled in the survey in recent years
- In 2019 there were notable shifts in apportionment in many of the stocks, largely due to the absence of large catches of fish in the Western GOA but it is uncertain what's drivingthese observations
- There was also concern expressed for not having additional survey effort focused in the Western and Central areas in 2020 to help inform the Pacific cod stock assessment model and effectively evaluate stock status

The Team continues to recognize the importance of the GOA bottom trawl survey for making informed management decisions and continues to support full funding for the continuation of this survey

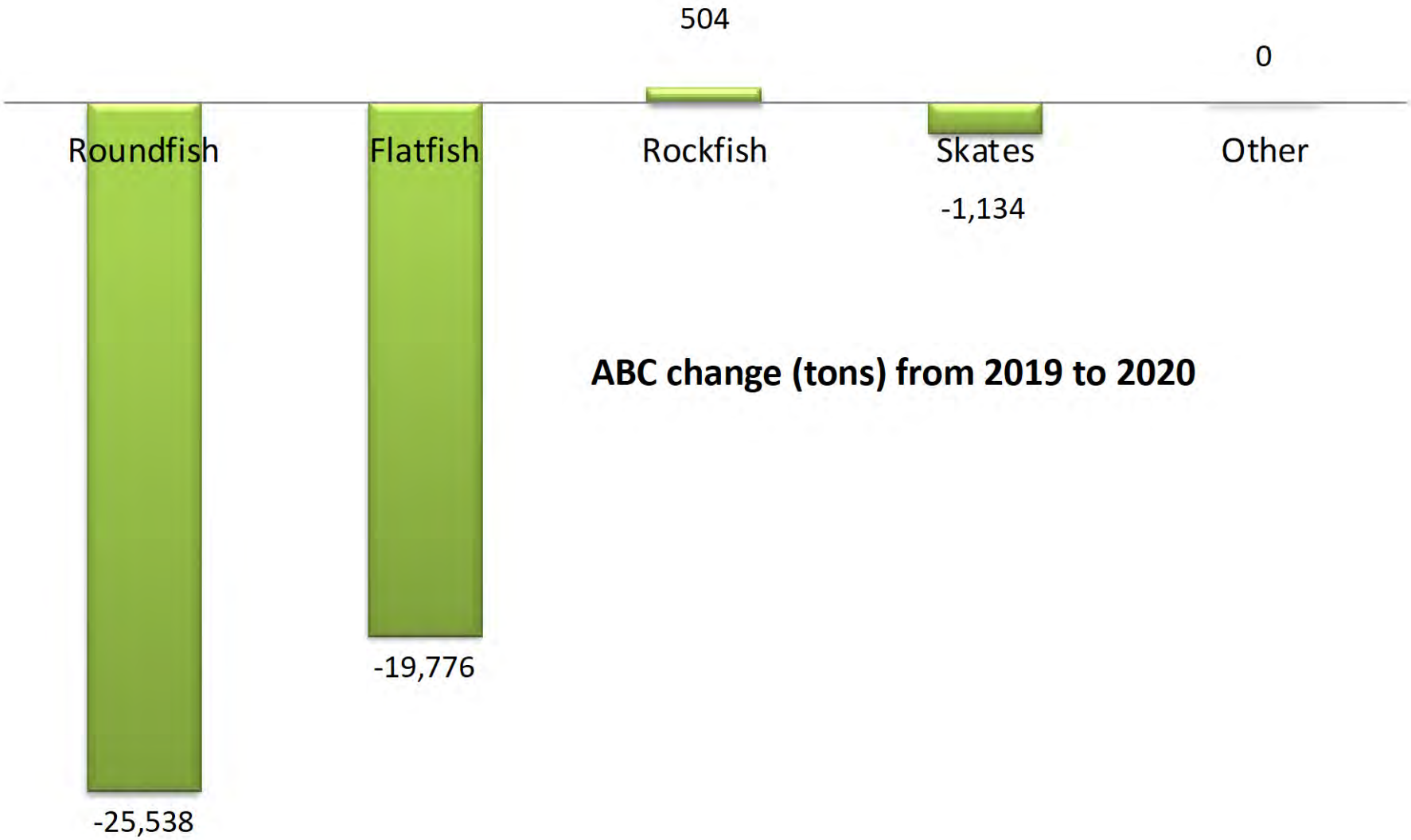
CIE reviews
(**C**enter for **I**ndependent **E**xperts)

- 2020: GOA Rockfish planned
- Team discussed appropriate level of Council involvement surrounding these reviews
- The Team encouraged authors to consistently notify Council of upcoming CIE activities to ensure these activities benefit to the extent practical the provision of management advice.

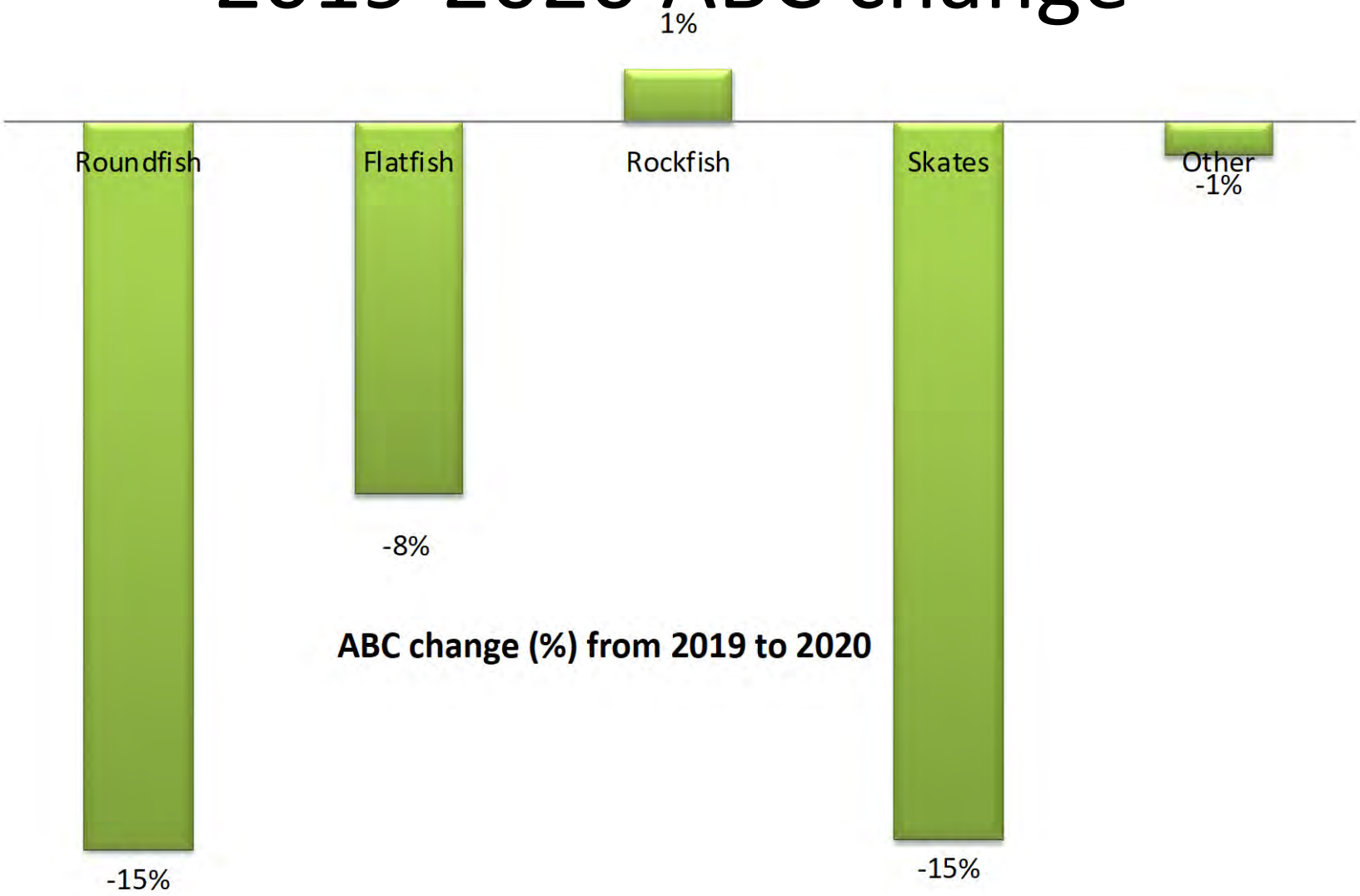
2018-2019 ABC change



2019-2020 ABC change

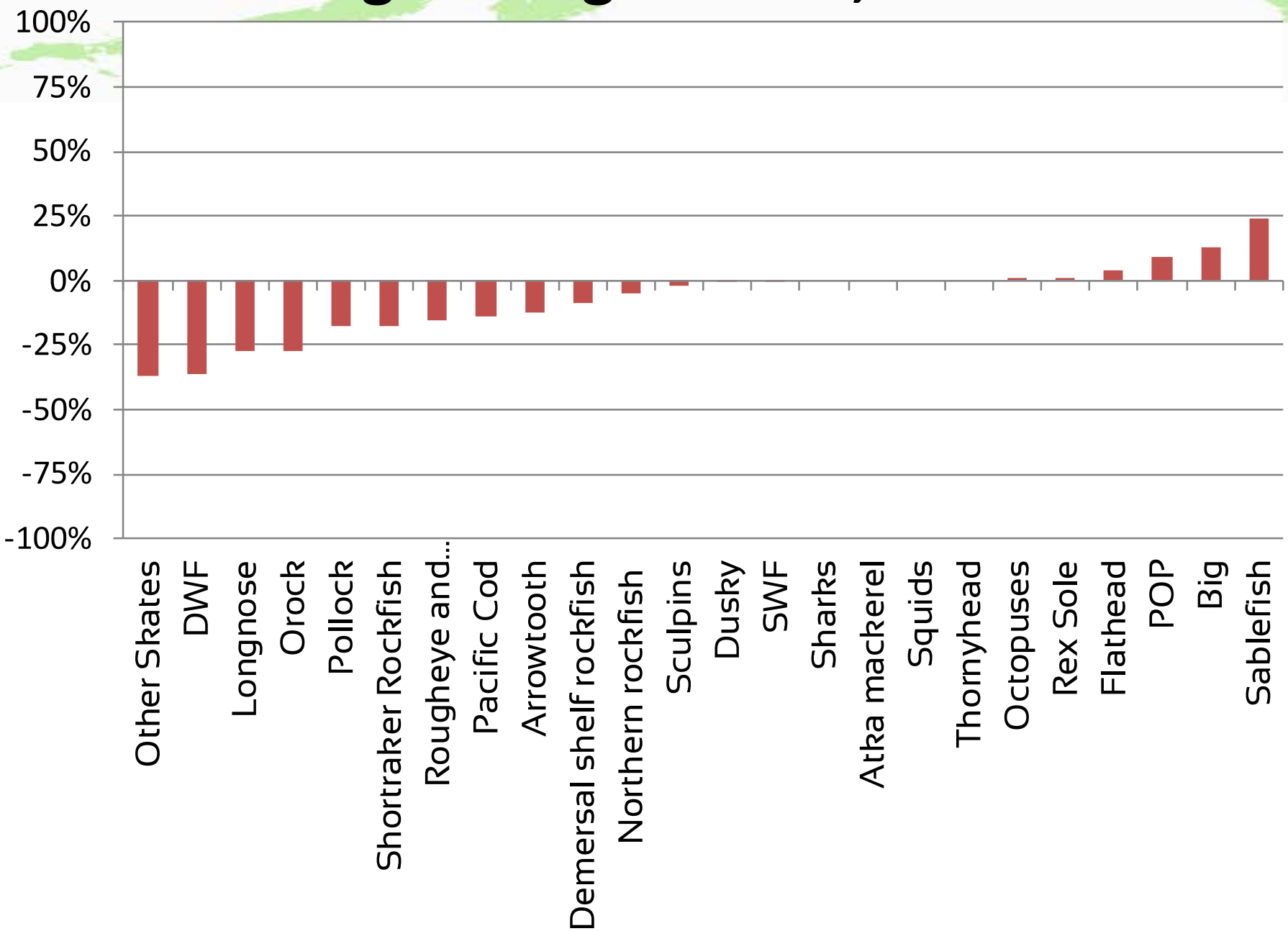


2019-2020 ABC change

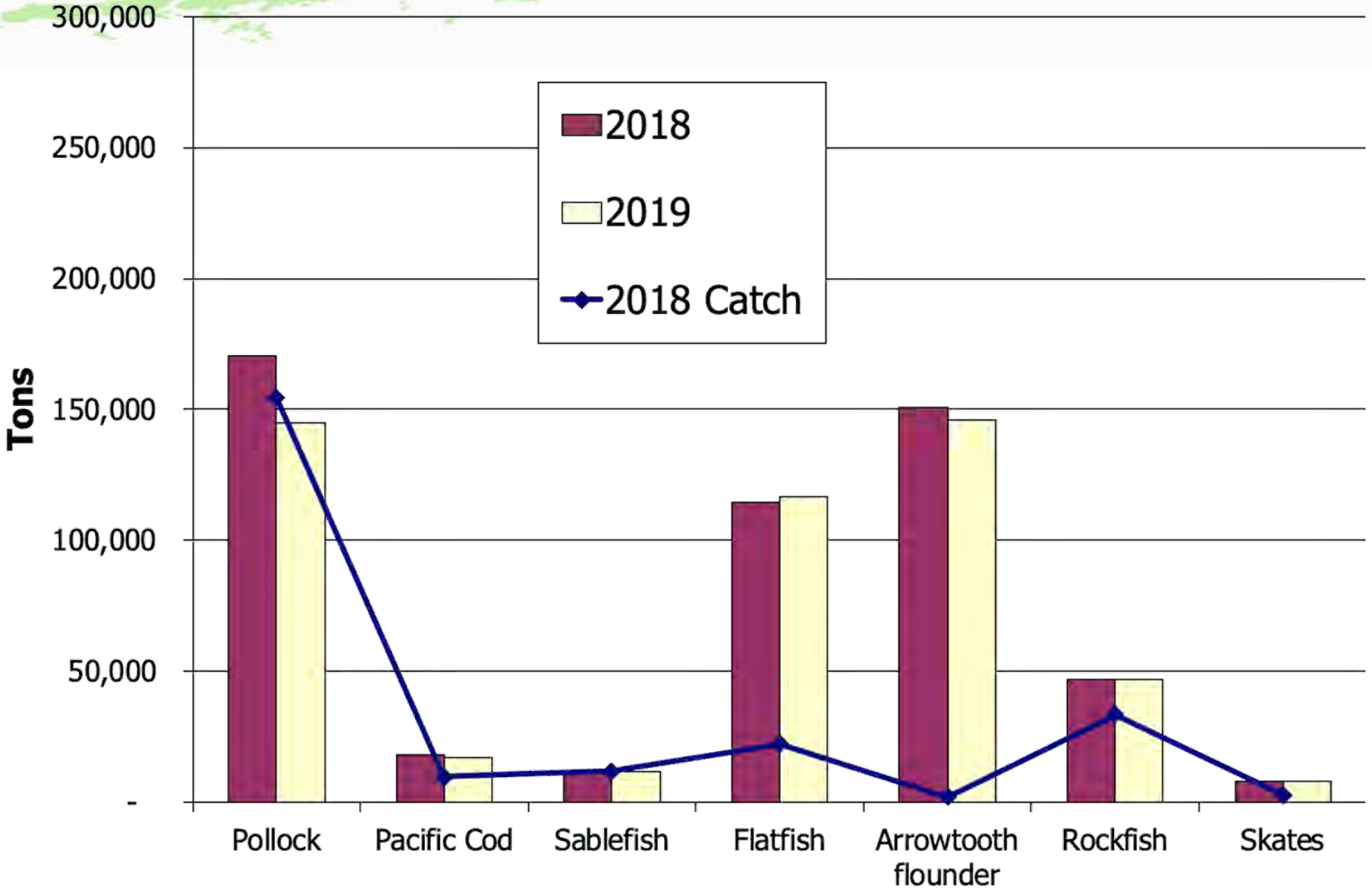


Overall a 9% decline

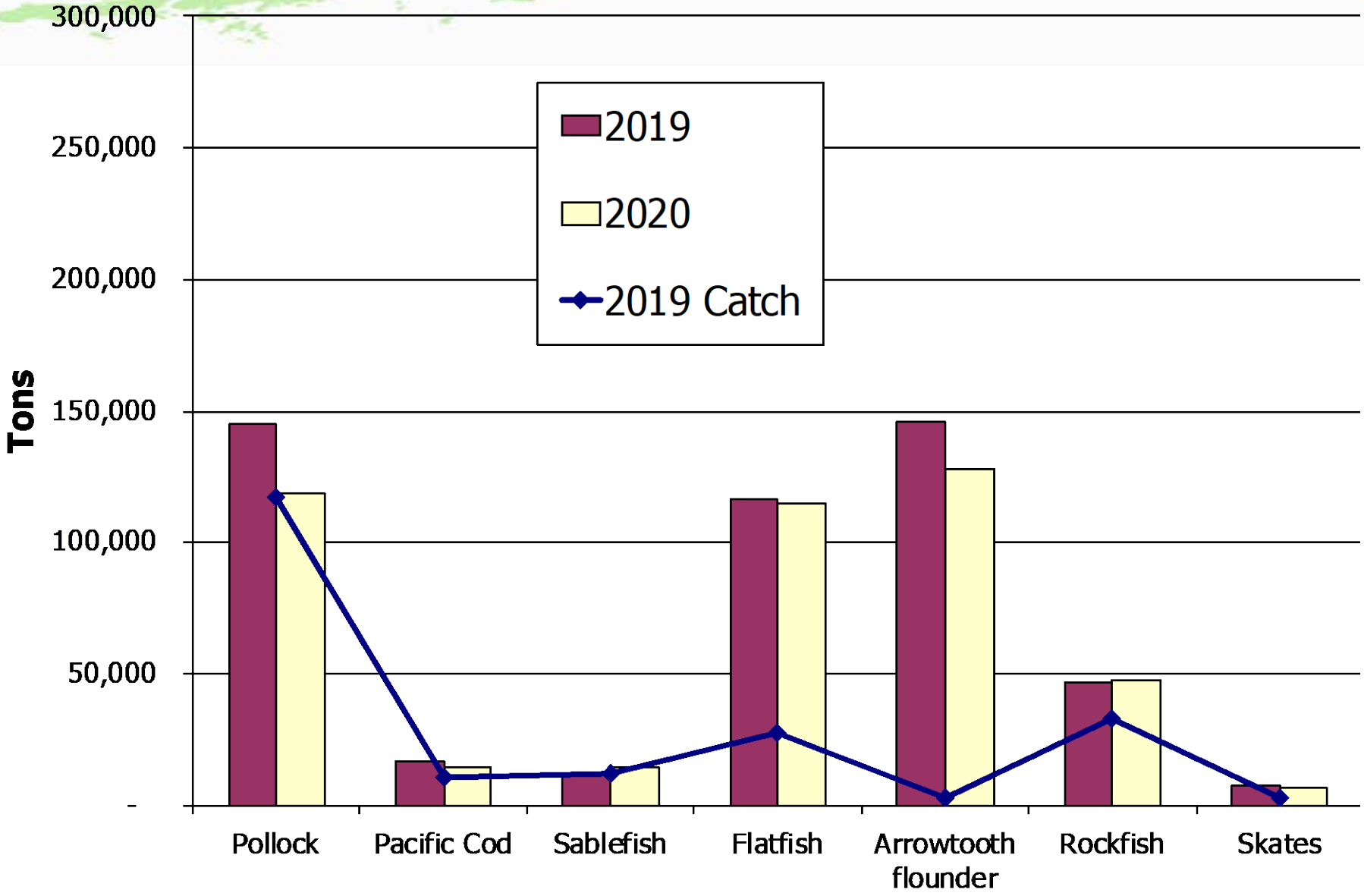
Percentage change in ABC, 2019-2020



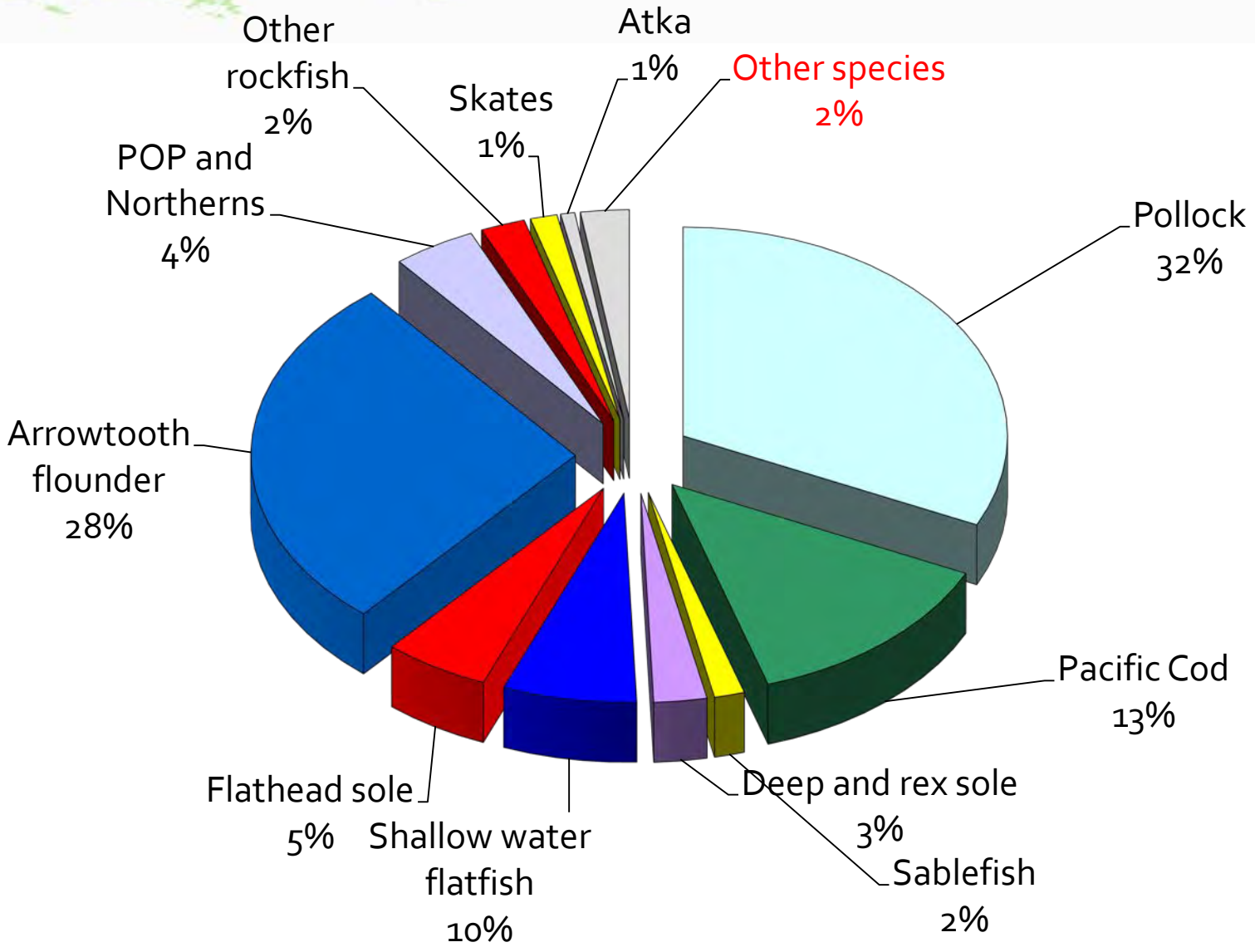
GOA Catch and ABC levels



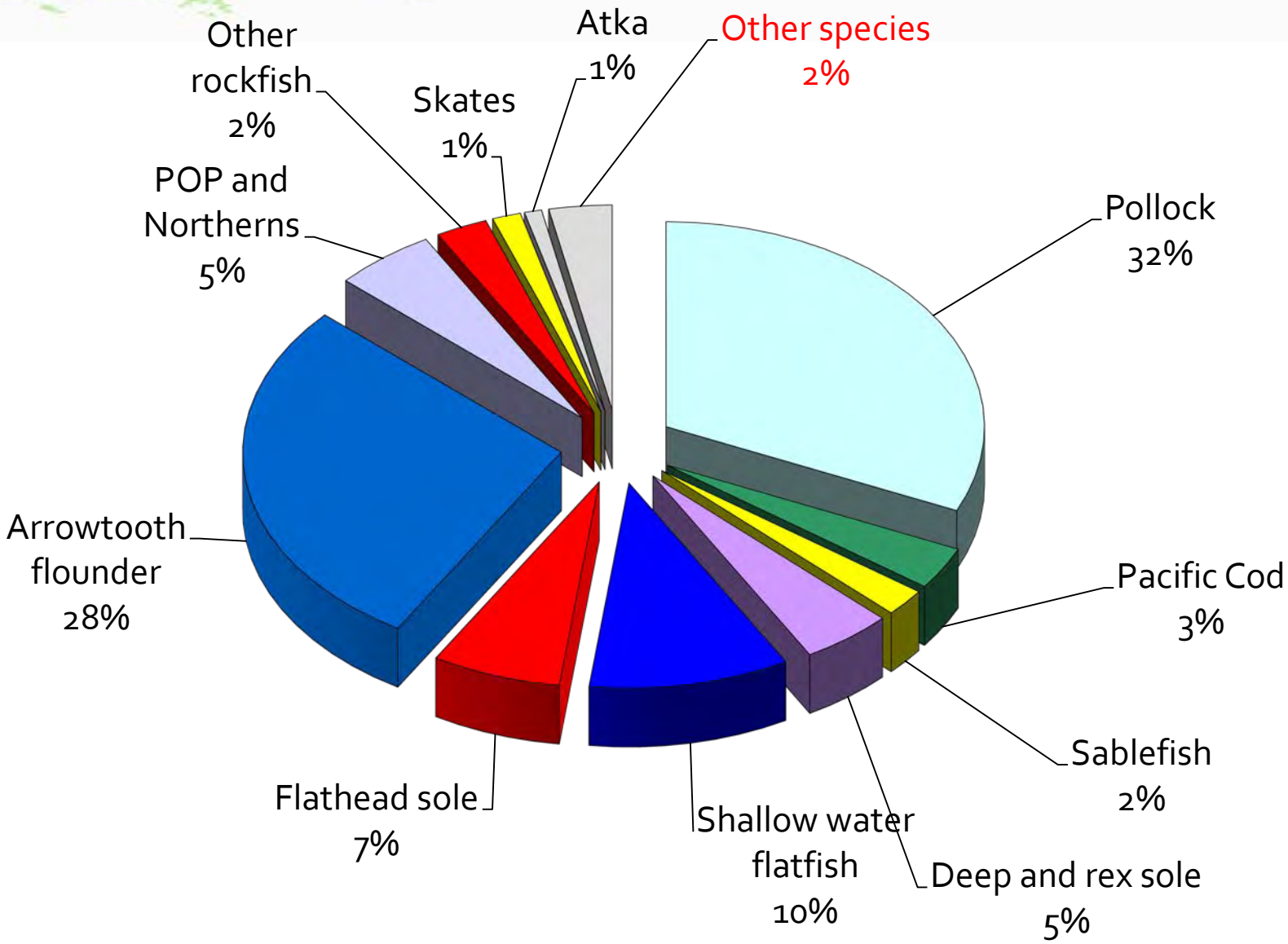
GOA Catch and ABC levels



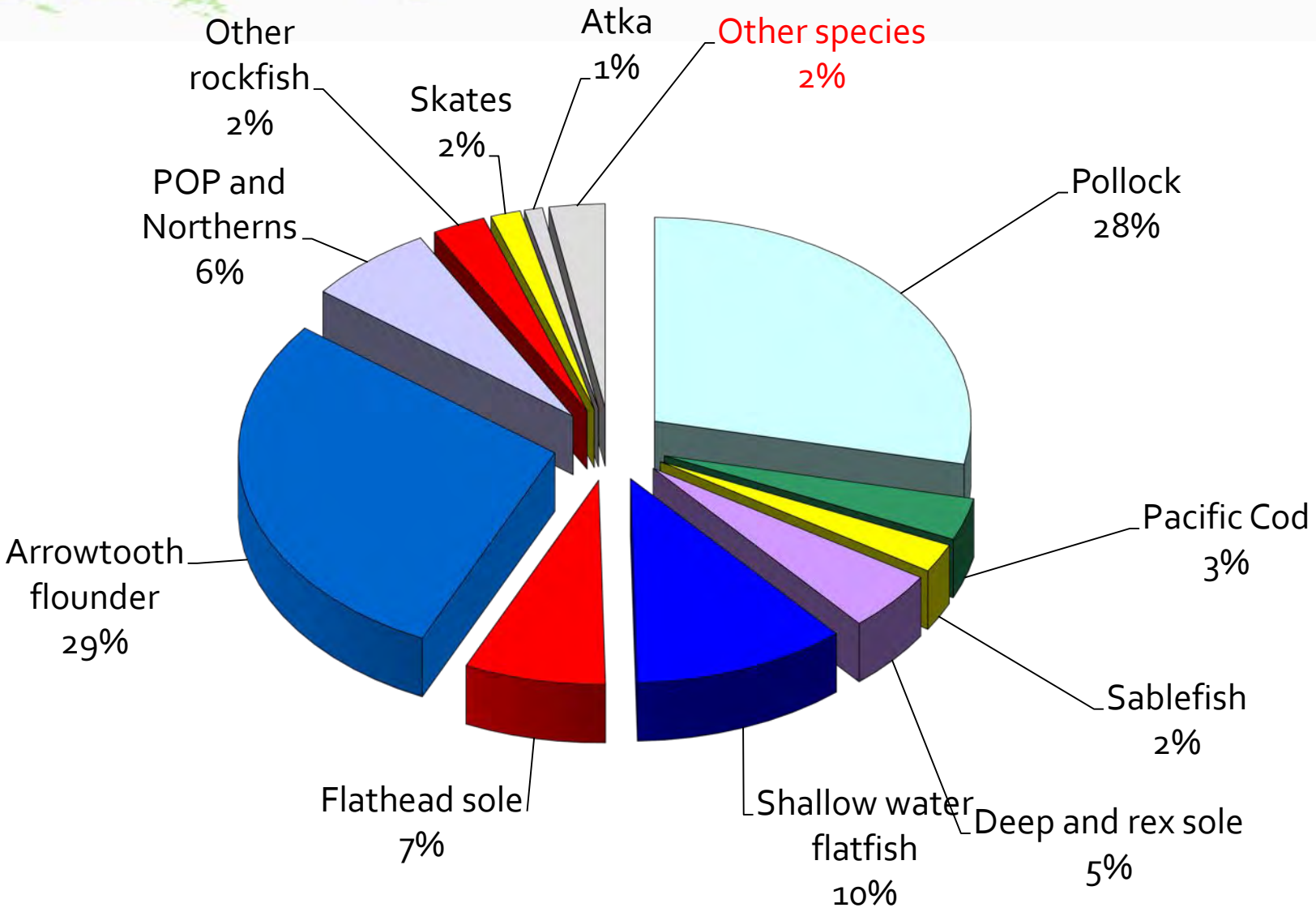
GOA 2017 ABC's: 667,877 t



GOA 2018 ABC's: 536,925 t

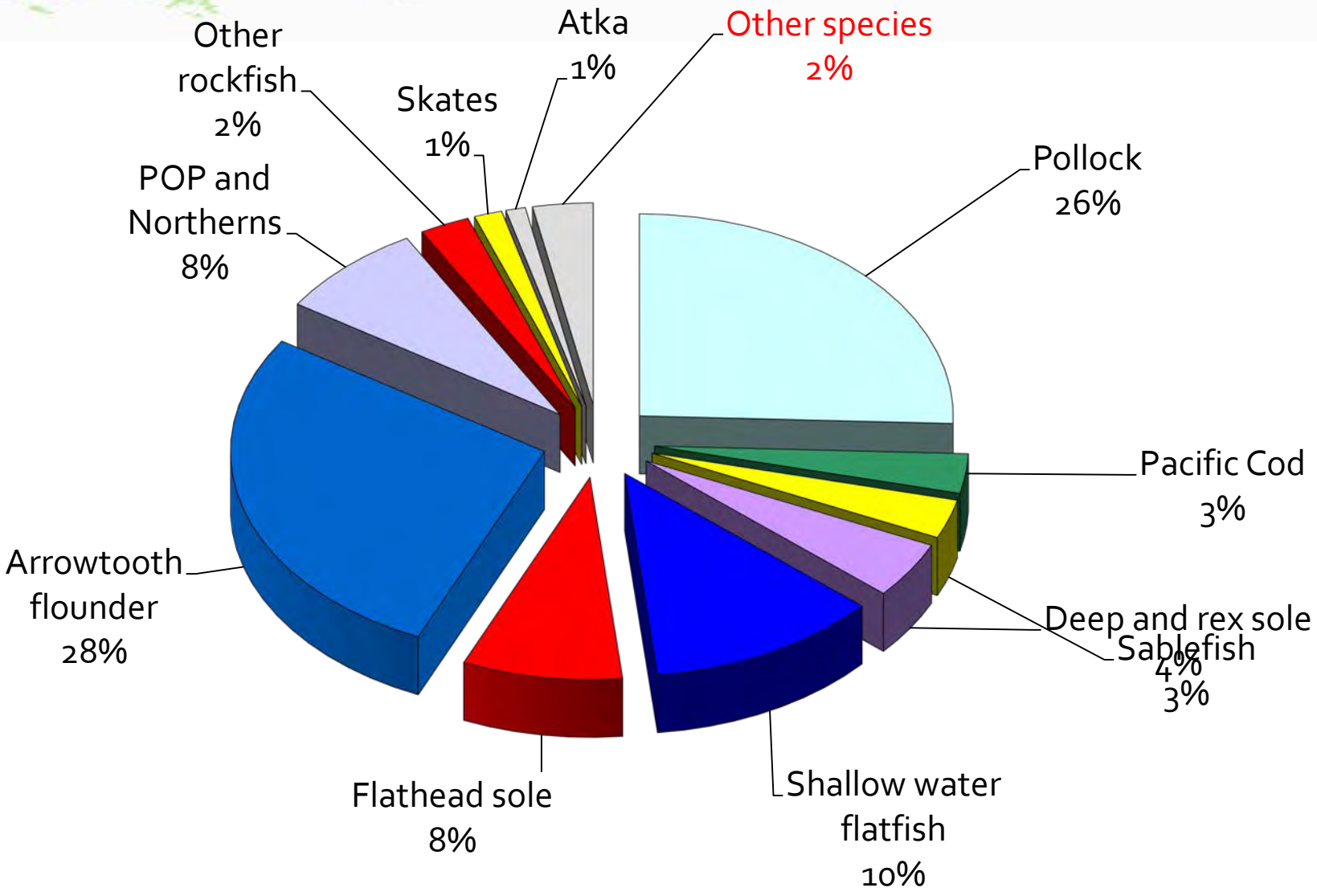


GOA 2019 ABC's: 509,507 t



Overall a 30% drop from 2016 aggregate ABC

GOA 2020 ABC's: 463,466 t



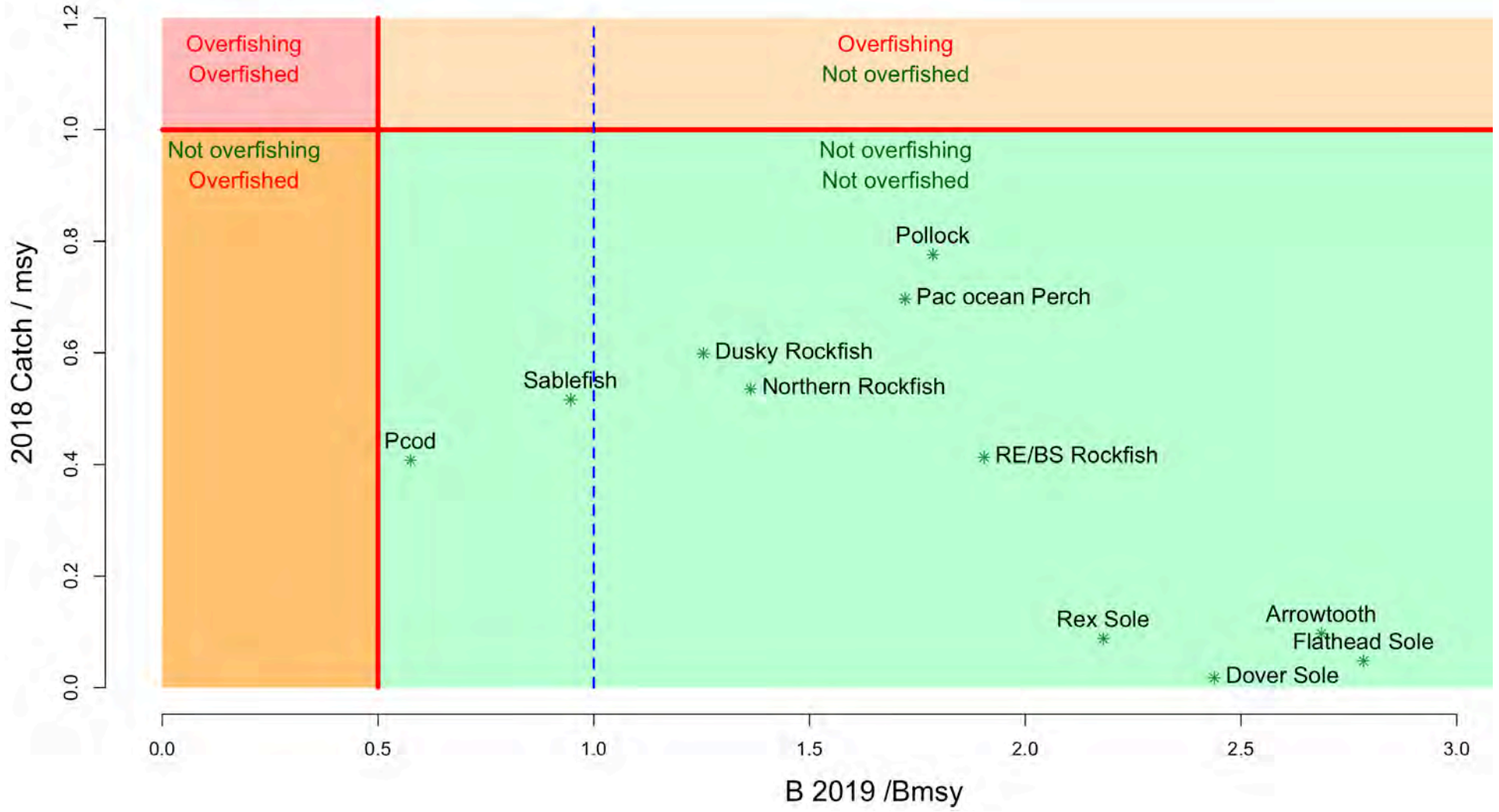
ABC / TAC

Team recommendations where ABC <maximum permissible:

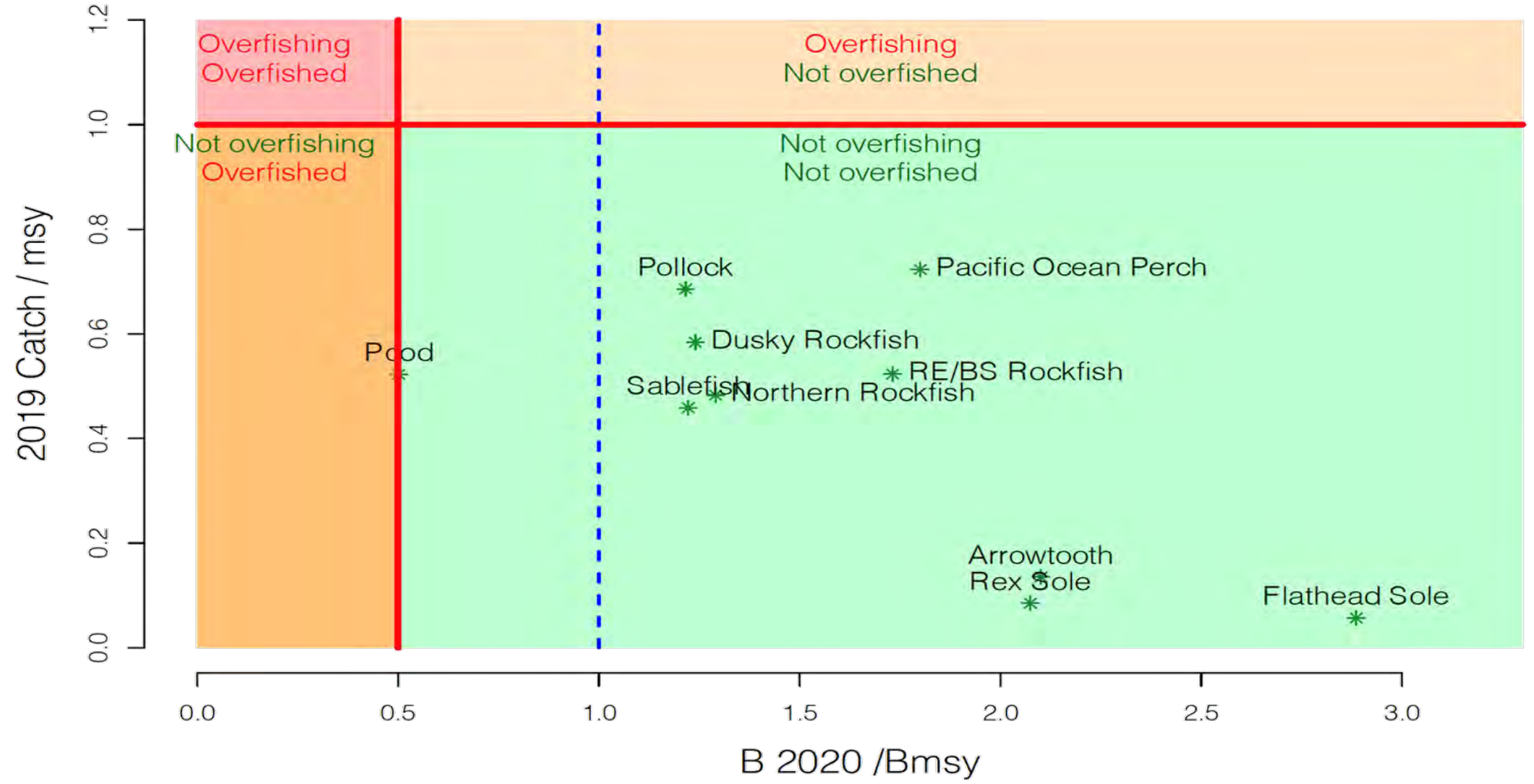
Table 3. Maximum permissible fishing mortality rates and ABCs as defined in Amendment 56 to the GOA and BSAI Groundfish FMPs, and the Plan Team's 2020 and 2021 recommended fishing mortality rates and ABCs, for those species whose recommendations were below the maximum permissible.

		2020			
Species	Tier	*Max* F_{ABC}	*Max* ABC	F_{ABC}	ABC
Pollock[1] (W/C/WYAK)	3a	0.28	120,549 t	0.23	108,494
Sablefish	3a	0.102	33,949	0.043	14,393
Demersal shelf rockfish	4, 6	0.026	303	0.02	238

Stock status summary last year

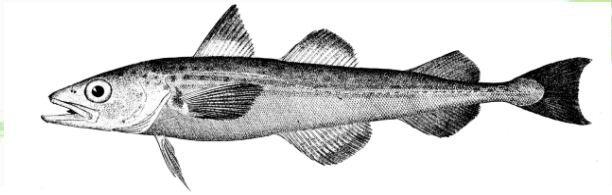


Stock status summary **this** year



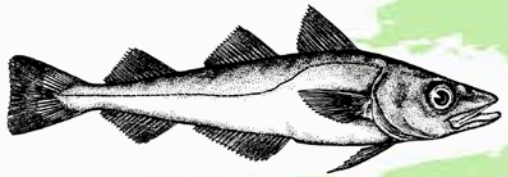
Species overviews

1. 2019 ABC/Catch and recommended changes
2. Highlights
   - New data
   - Analytic approach (changes)
3. Stock status and trend
4. ABC/OFL
   - Tier history and recommendations
   - 2020, 2021 maxABC; recommended ABC



ABC

Species	2019 Catch	2019	2020	Change
Pollock	117,019	144,623	118,642	down 25,981 (18%)
Pacific Cod	10,909	17,000	14,621	down 2,379 (14%)
Sablefish	12,219	11,571	14,393	up 2,822 (24%)
Flatfish	27,638	116,562	114,567	down 1,995 (2%)
Arrowtooth flounder	2,553	145,841	128,060	down 17,781 (12%)
Rockfish	32,730	46,946	47,450	up 504 (1%)
Atka mackerel	1,254	4,700	4,700	same (0%)
Skates	3,042	7,804	6,670	down 1,134 (15%)
Other Species	2,618	14,460	14,363	down 97 (1%)
Total	209,982	509,507	463,466	down 46,041 (9%)



1. GOA pollock overview

Changes to the assessment model

- New approach to estimating maturity
- Changed random walk penalty in catchability for Shelikof Strait acoustic survey

Author's 2020 ABC 108,494 t

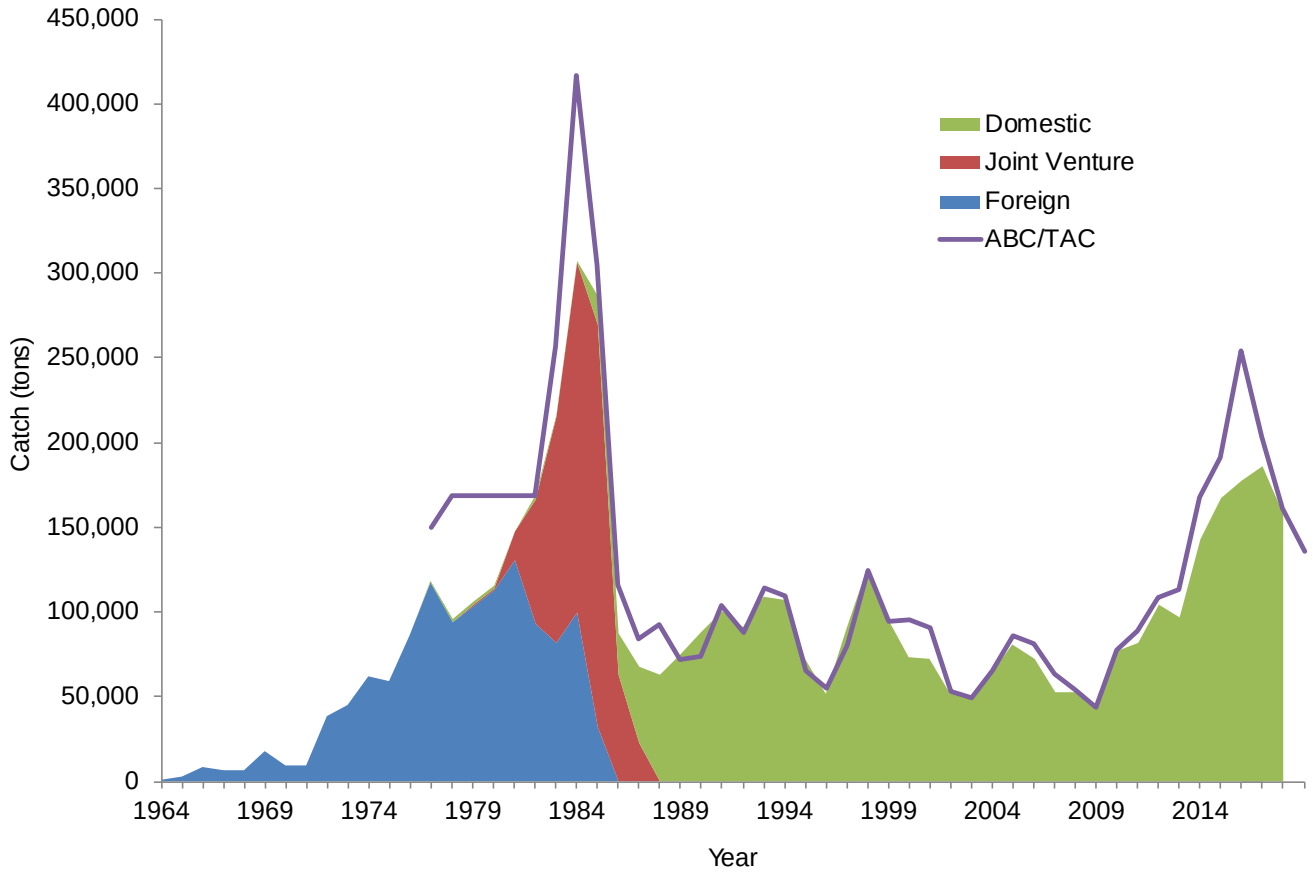
- 20% decrease from 2019 ABC
- 2021 ABC stabilizes ~110,000 t

Concerns:

- Conflicting trend data
- Poor model fit
- Assessment uncertainty

Positives

- Apparent strong 2018 year class
- Catches and SSB projected to stabilize
- Environmental condition seems OK for adults



Fishery catch locales 2018

GOA pollock

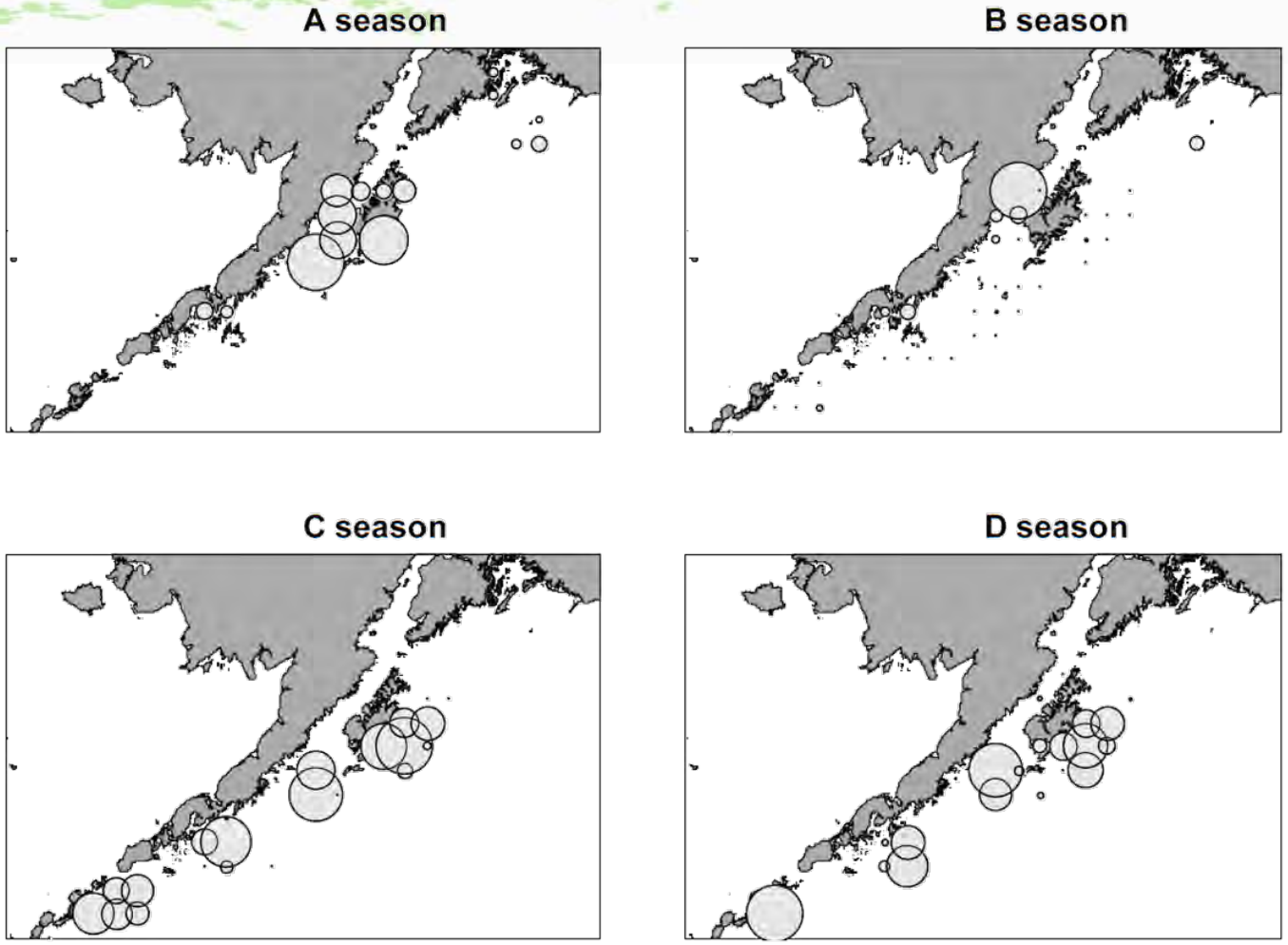
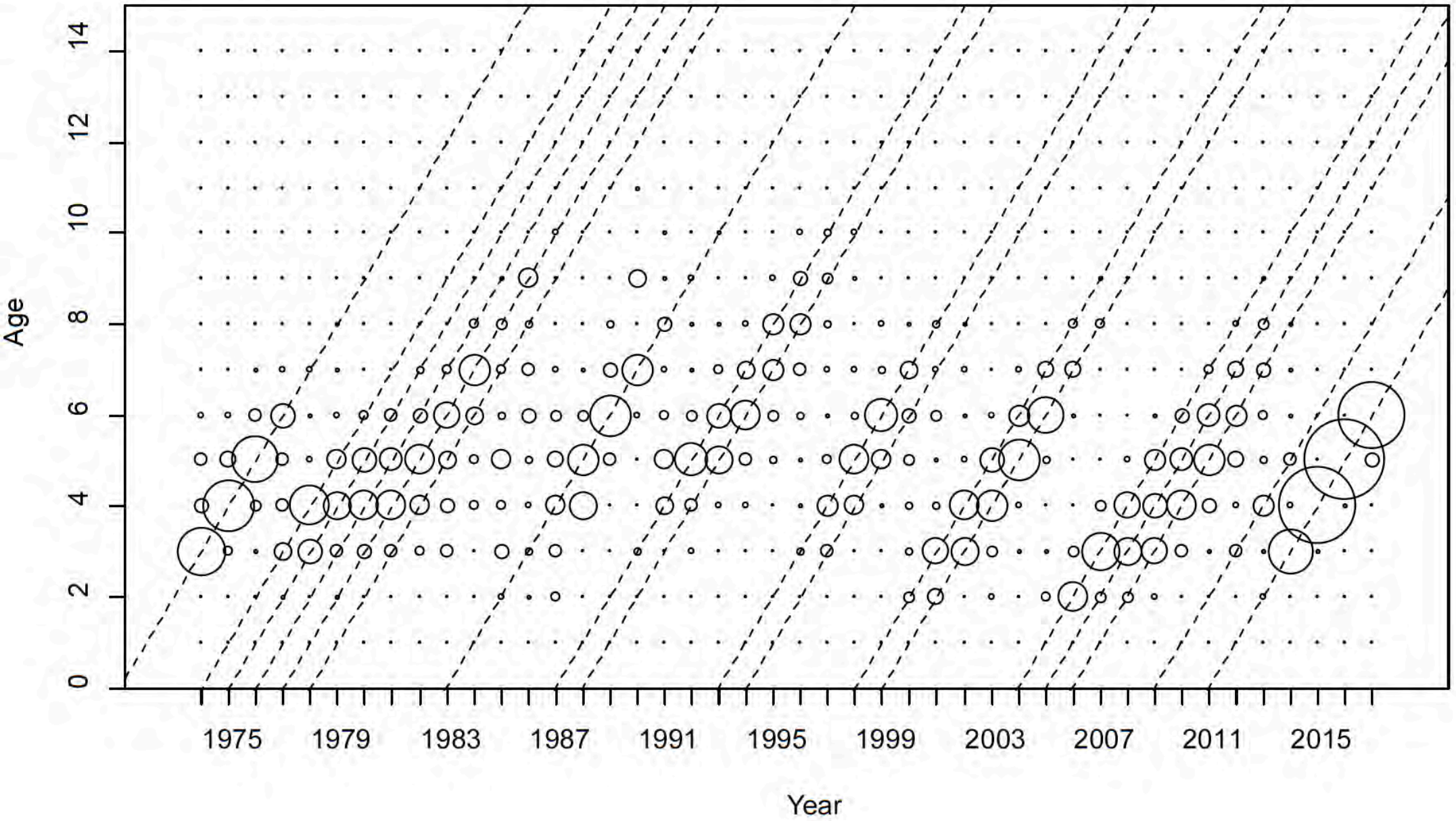
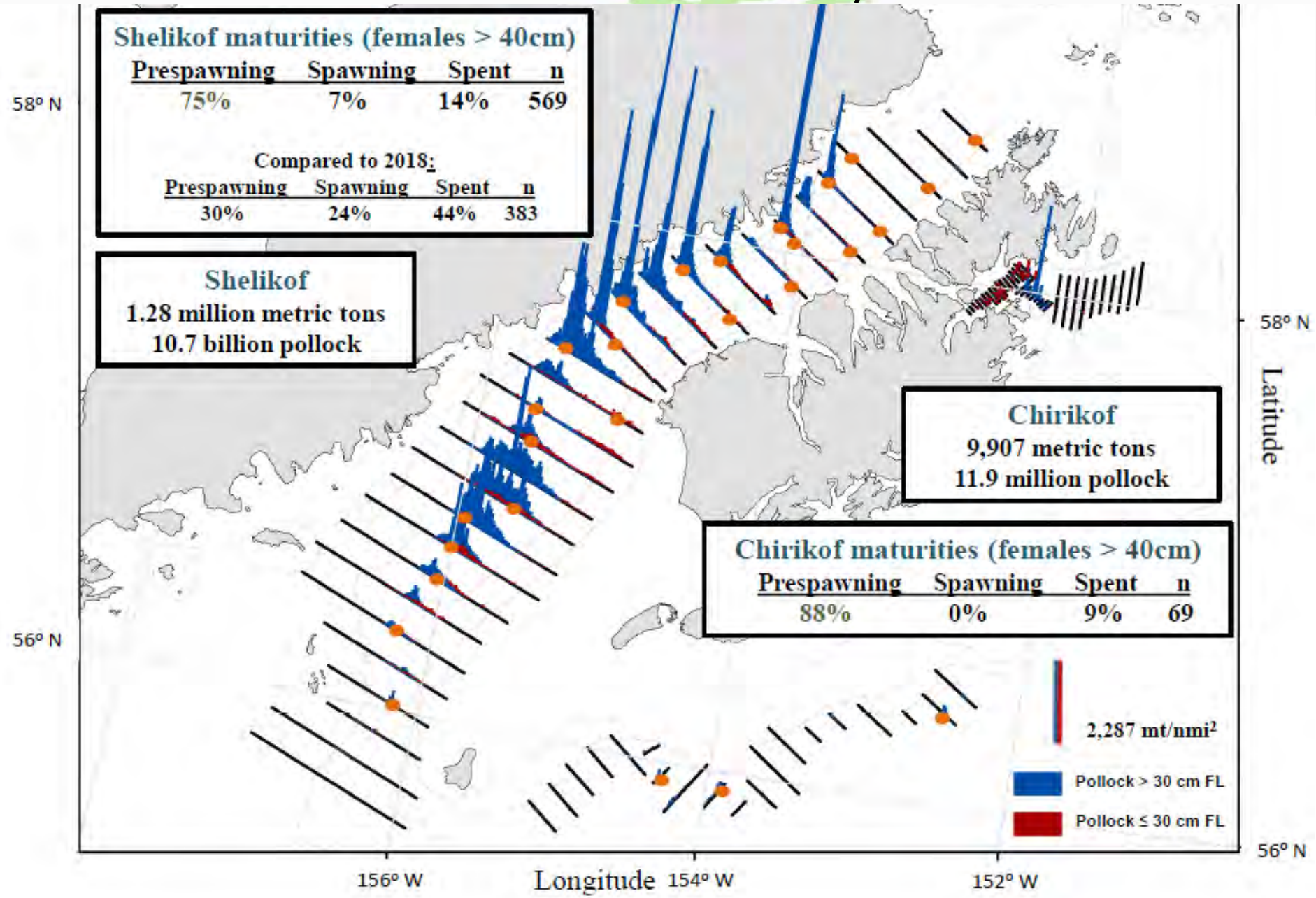


Figure 1.1. Pollock catch in 2018 for 1/2 degree latitude by 1 degree longitude blocks by season in the Gulf of Alaska as determined by fishery observer-recorded haul retrieval locations. Blocks with less than 1.0 t of pollock catch are not shown. The area of the circle is proportional to the catch.

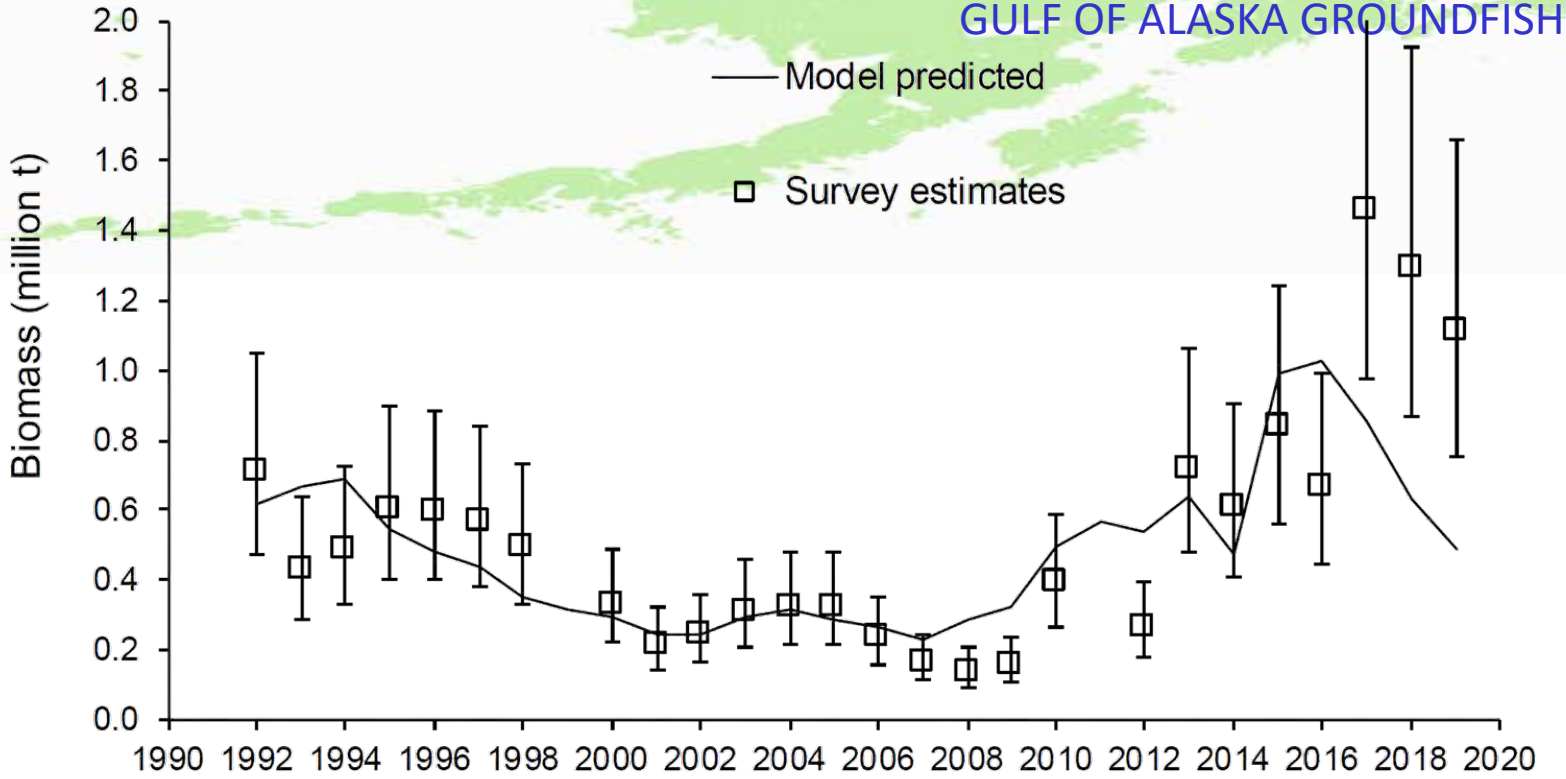
Fishery catch at age, 1976-2018



2019 Shelikof Strait EIT survey

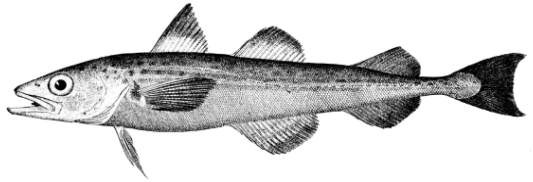


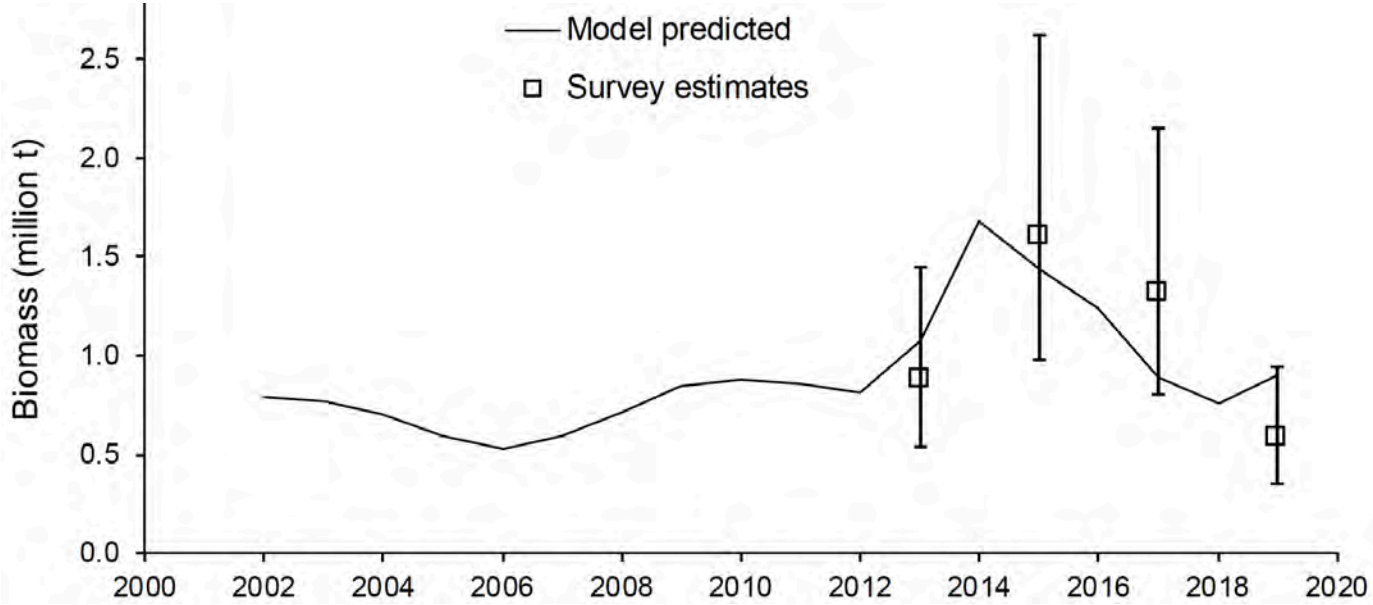
GOA pollock



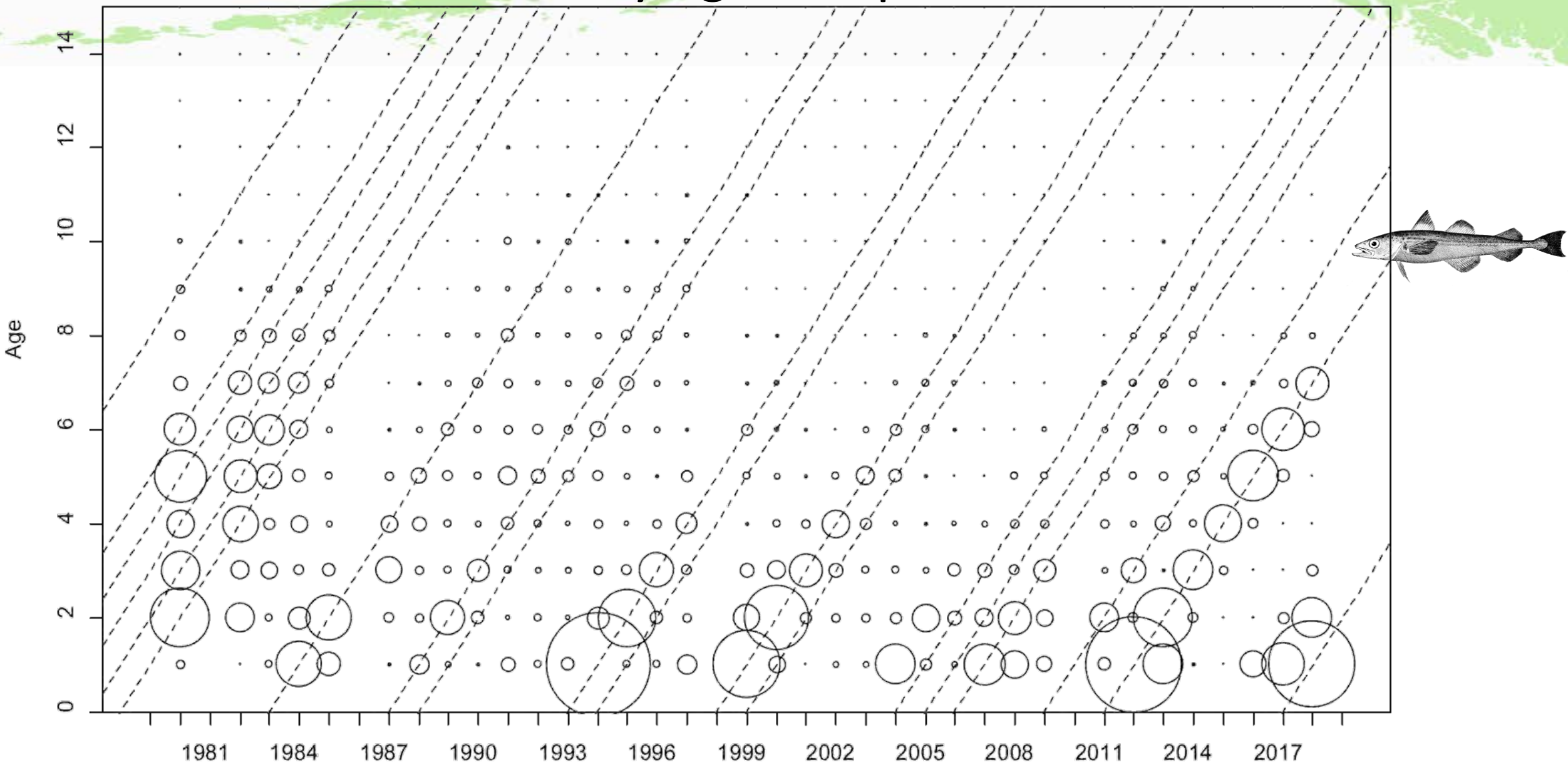
Shelikof Strait **winter** acoustic survey, 1992-2019

Summer acoustic survey 2013, 2015, 2017, 2019

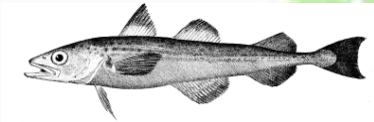


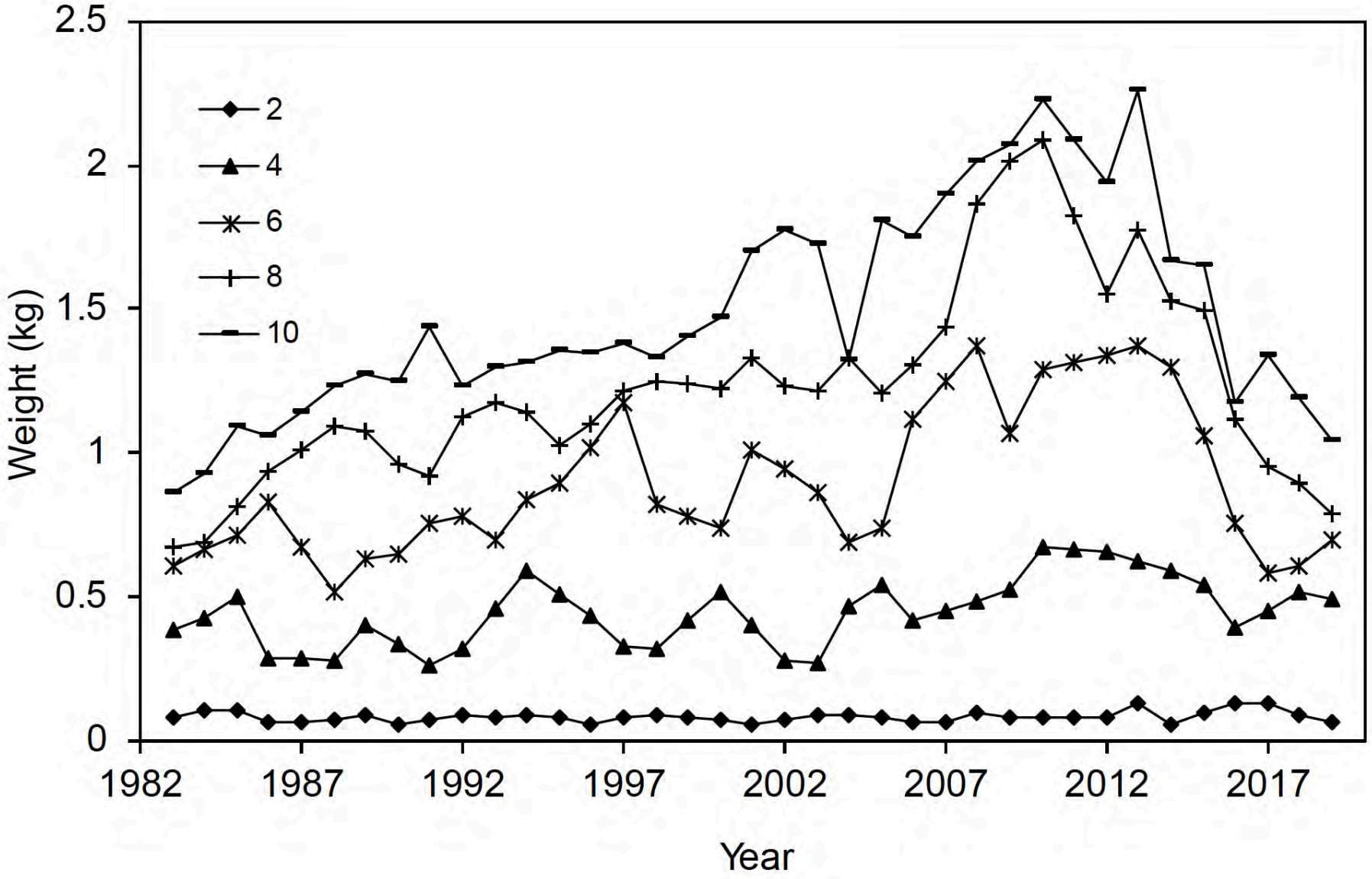


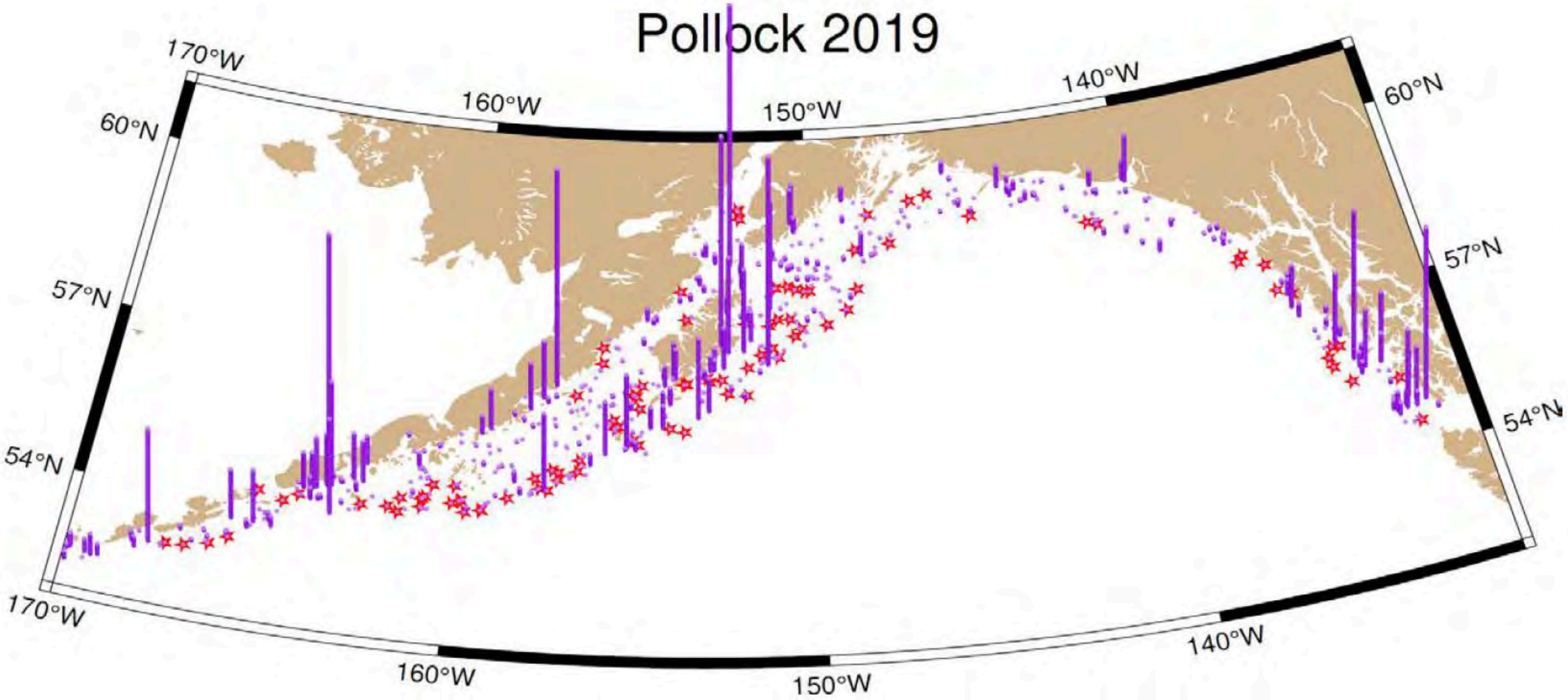
Shelikof Strait survey age compositions, 1981-2019



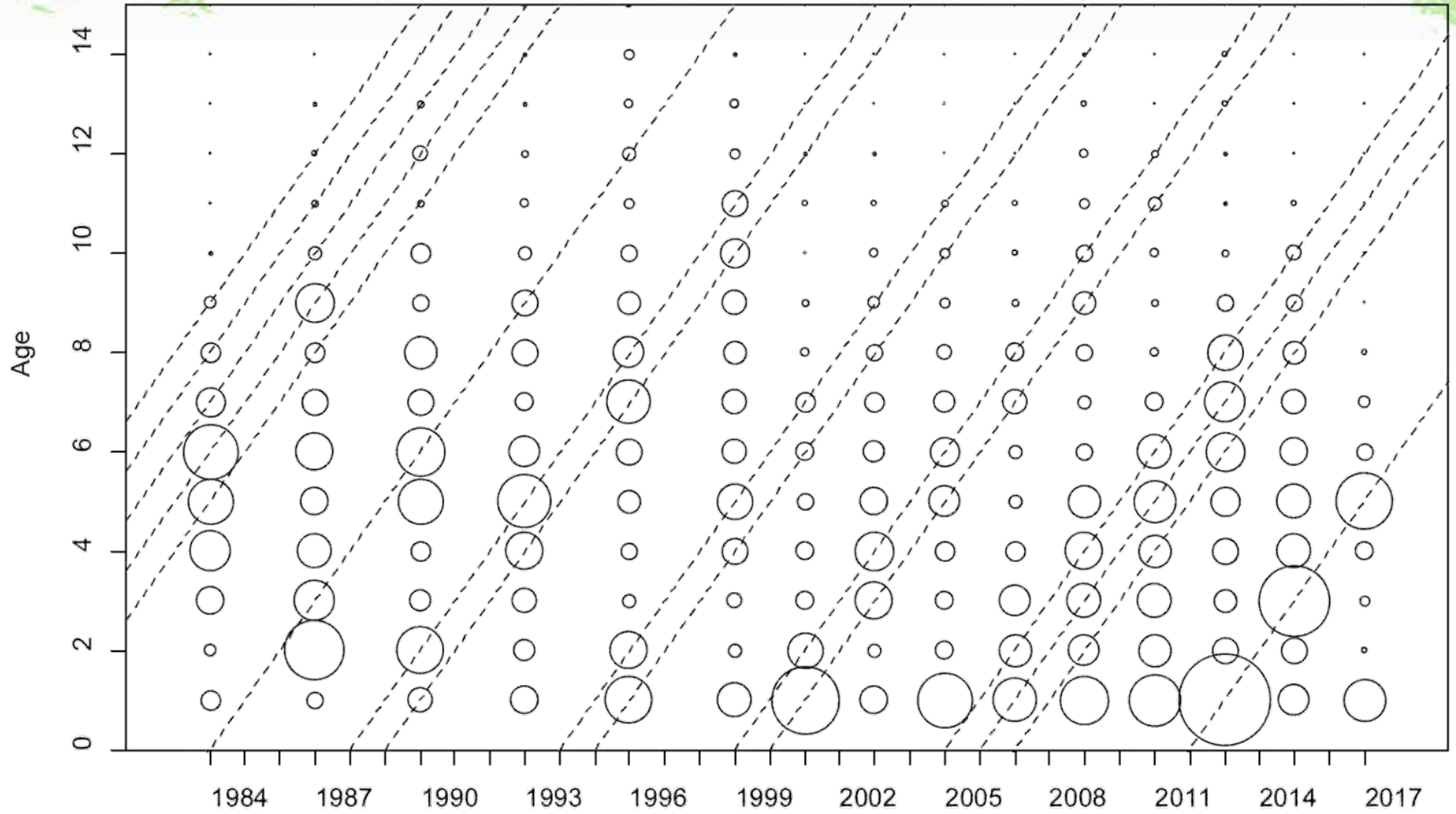
Shelikof survey weight-at-age over time, GOA pollock

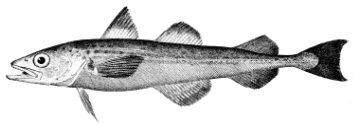





Pollock 2019
170°W
160°W
150°W
140°W
60°N
57°N
54°N

GOA pollock bottom-trawl survey age compositions

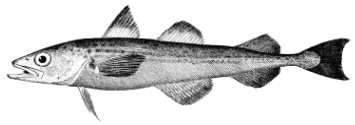




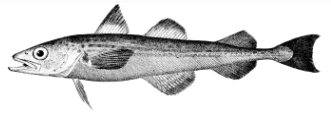
GOA pollock model changes:

Model 18.3 Last year's model

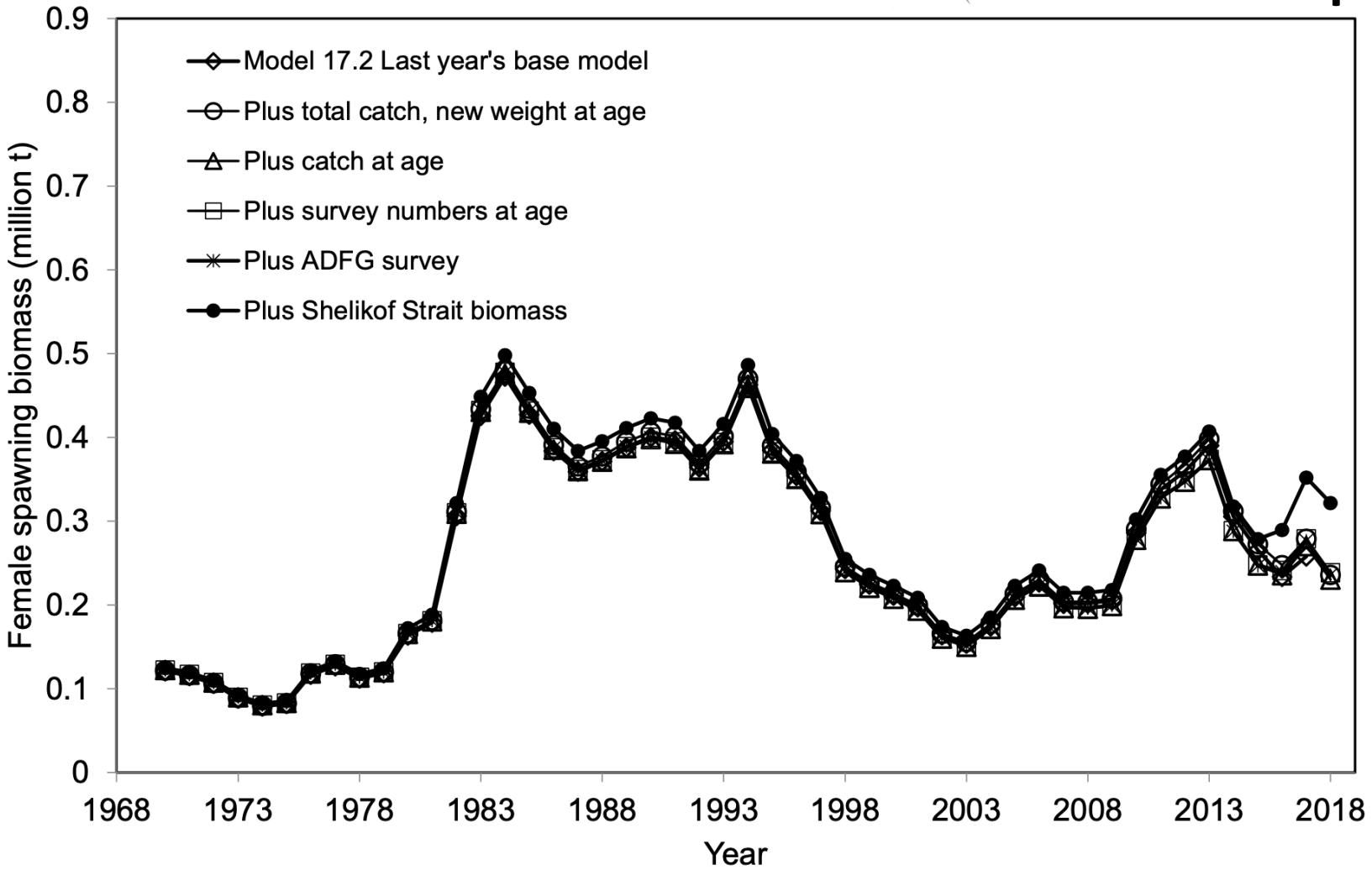
Model 19.1 Increased penalty on survey q random walk…



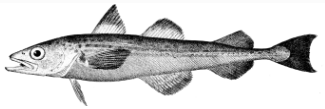
Sensitivity to new survey data…



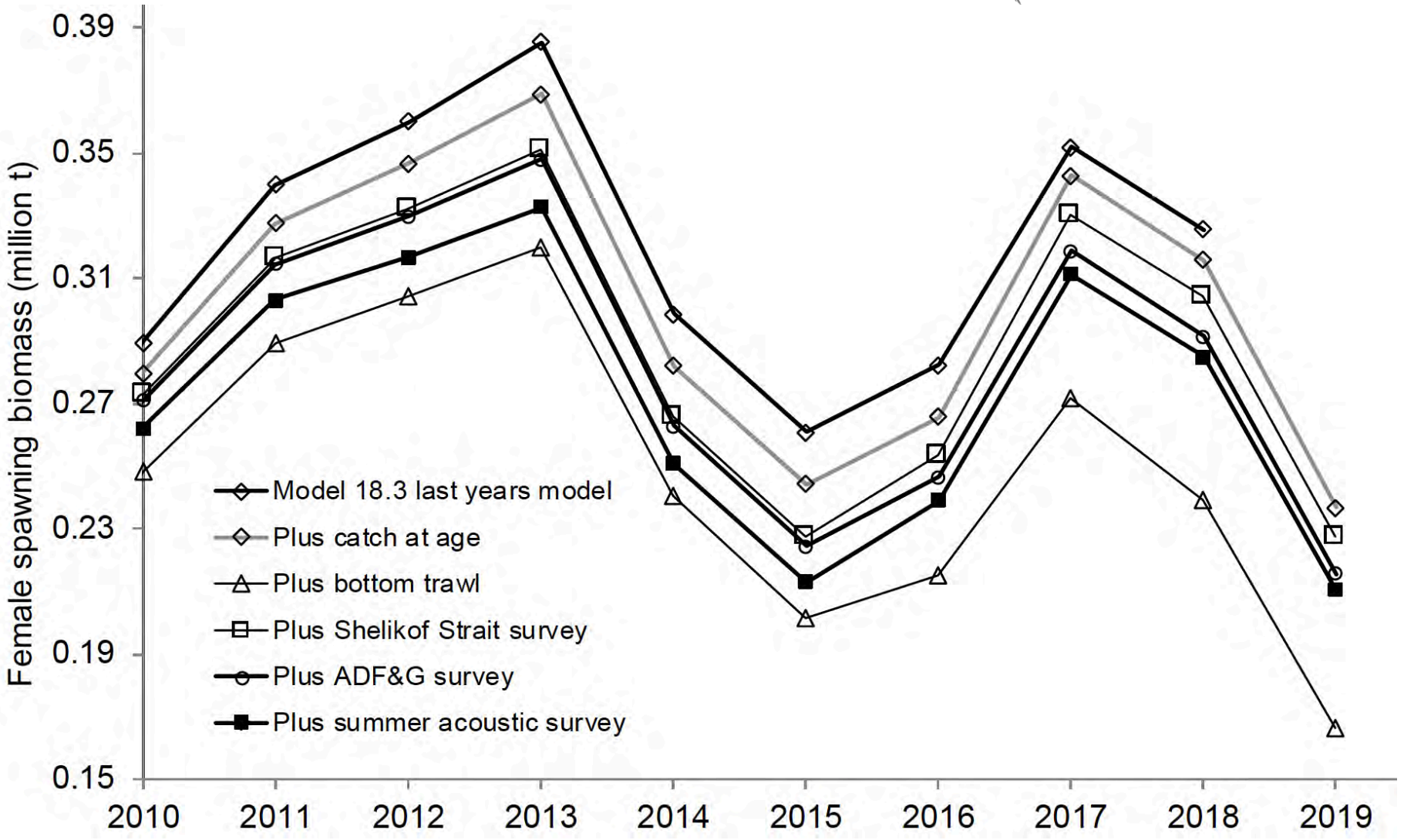
GOA pollock



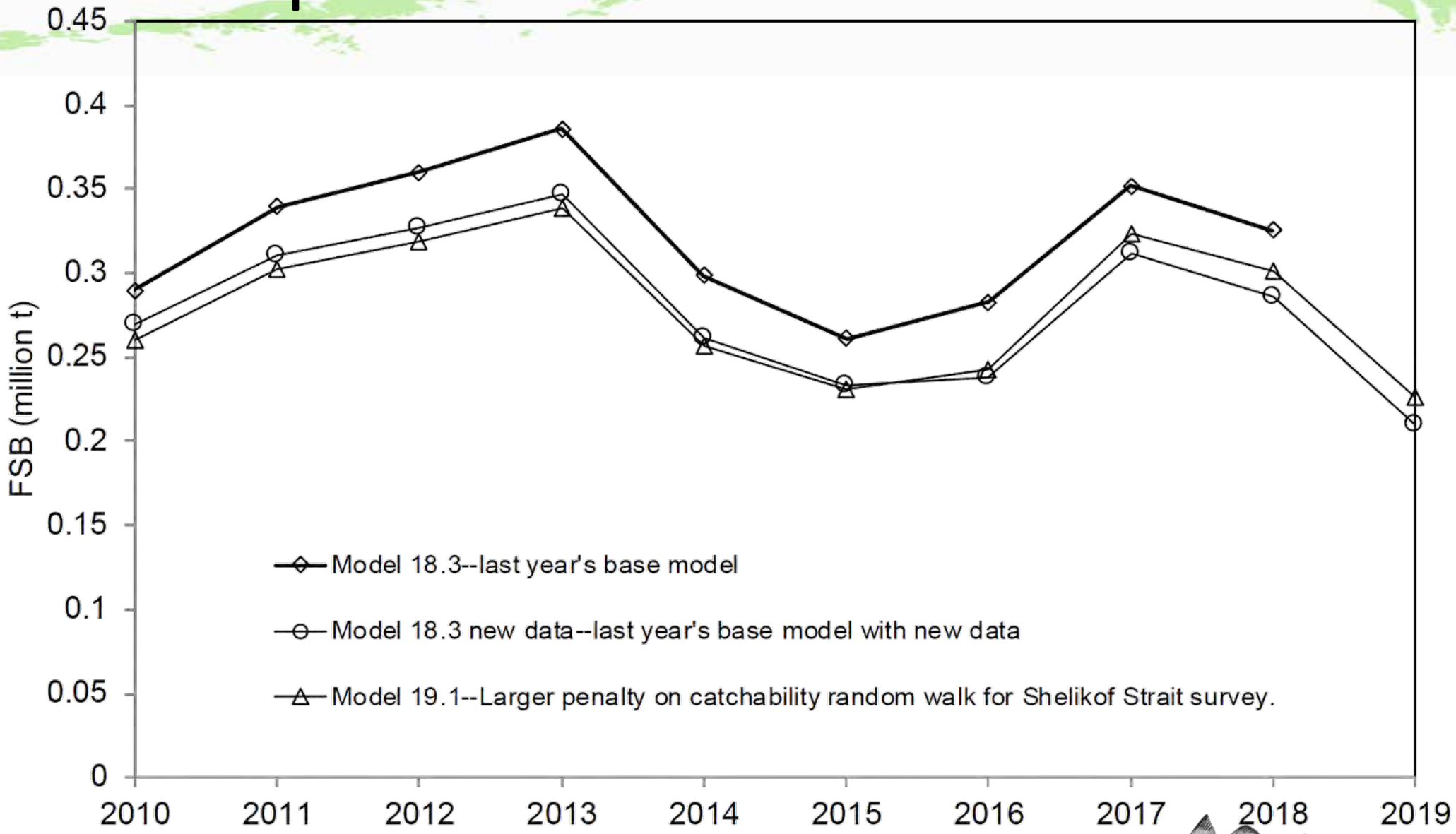
Sensitivity to new survey data…

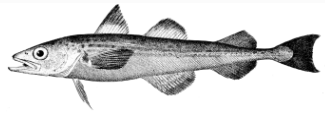


GOA pollock

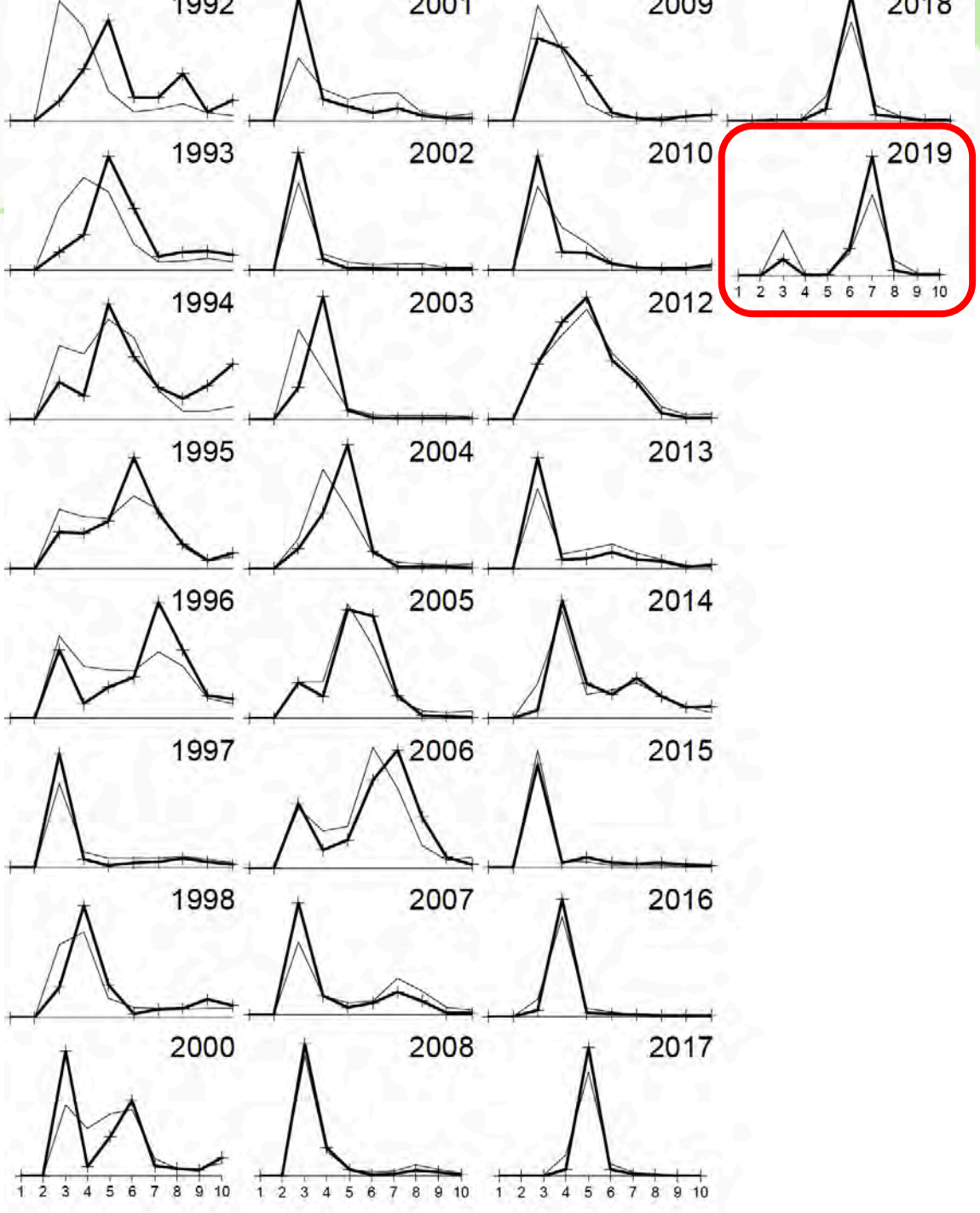


GOA pollock model evaluations

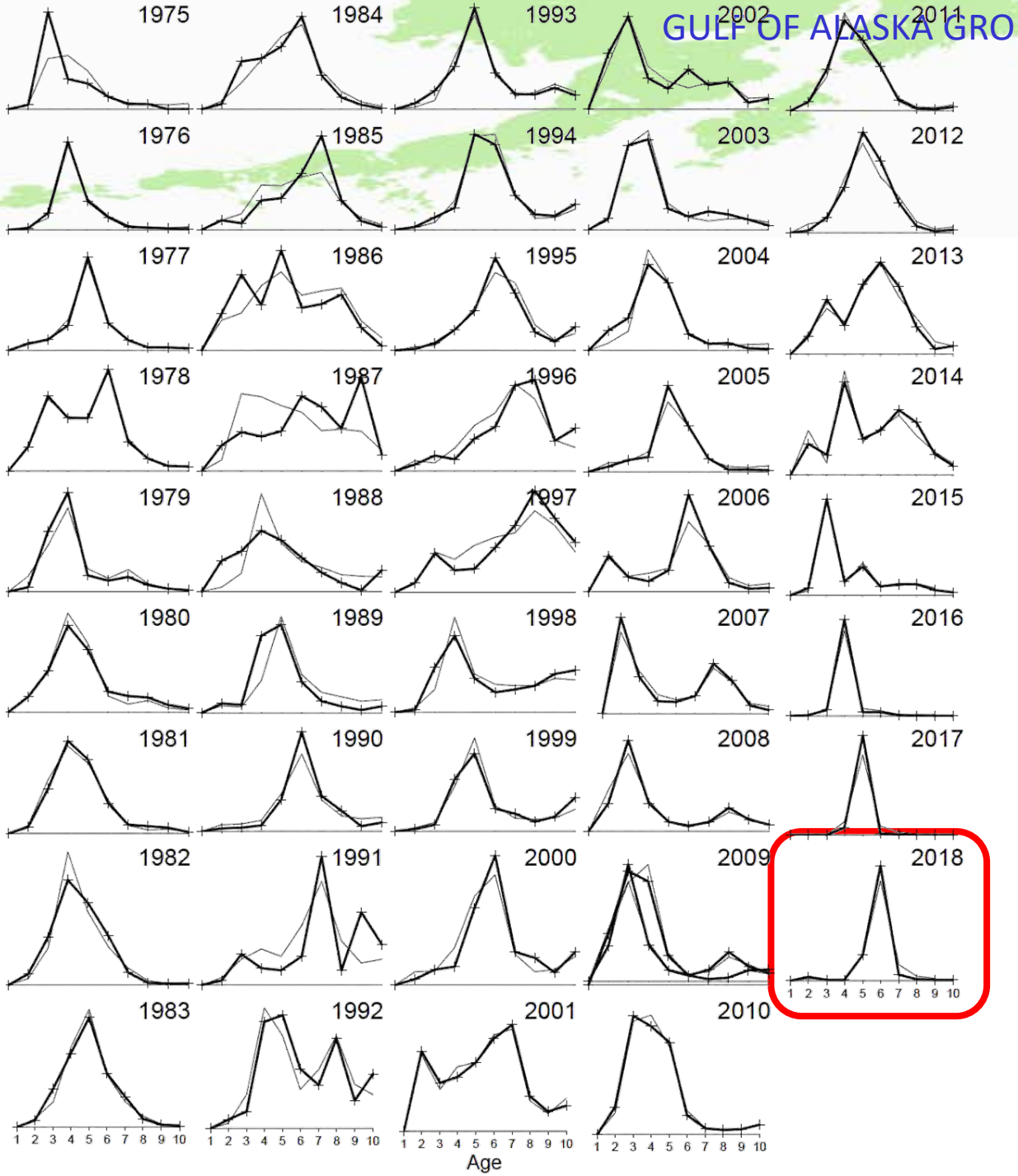




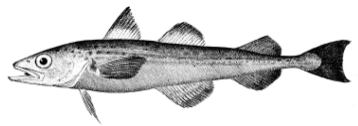
GOA pollock



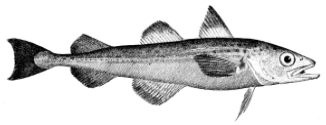
Shelikof Strait survey age composition (predicted vs observed)

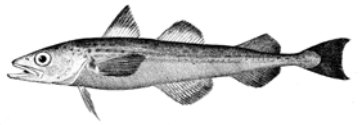


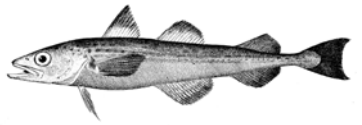
GOA pollock age composition (predicted vs observed)

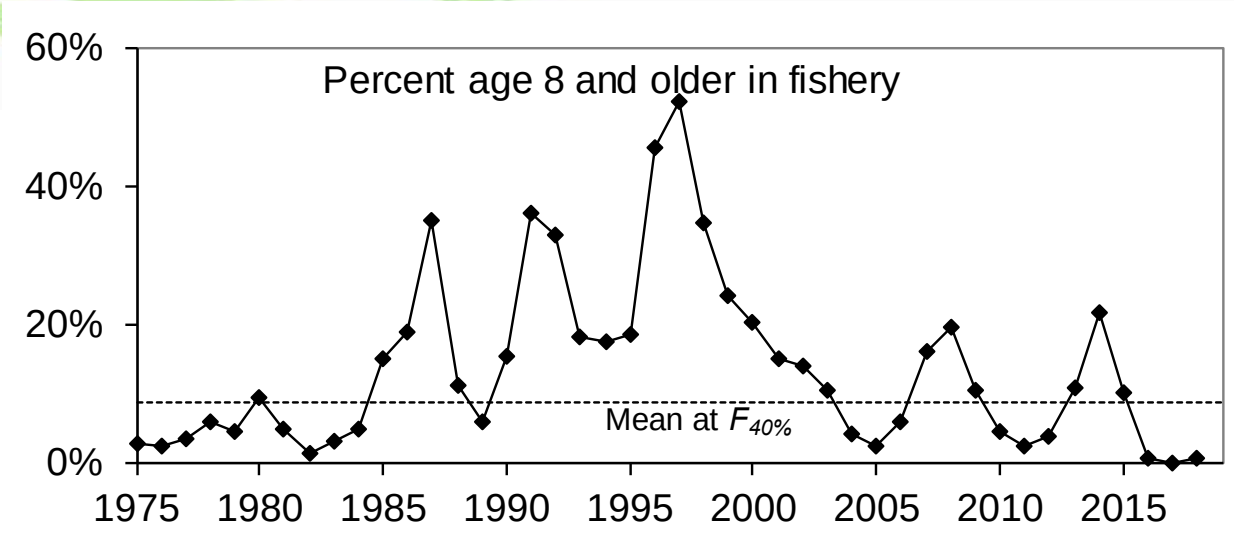


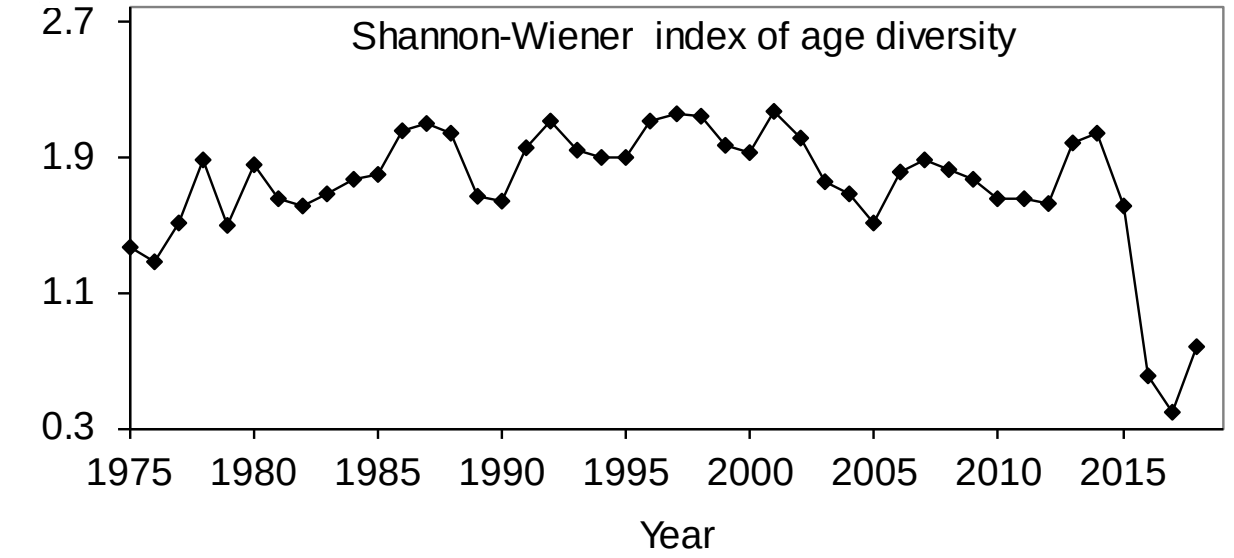
GOA Pollock age structure issues





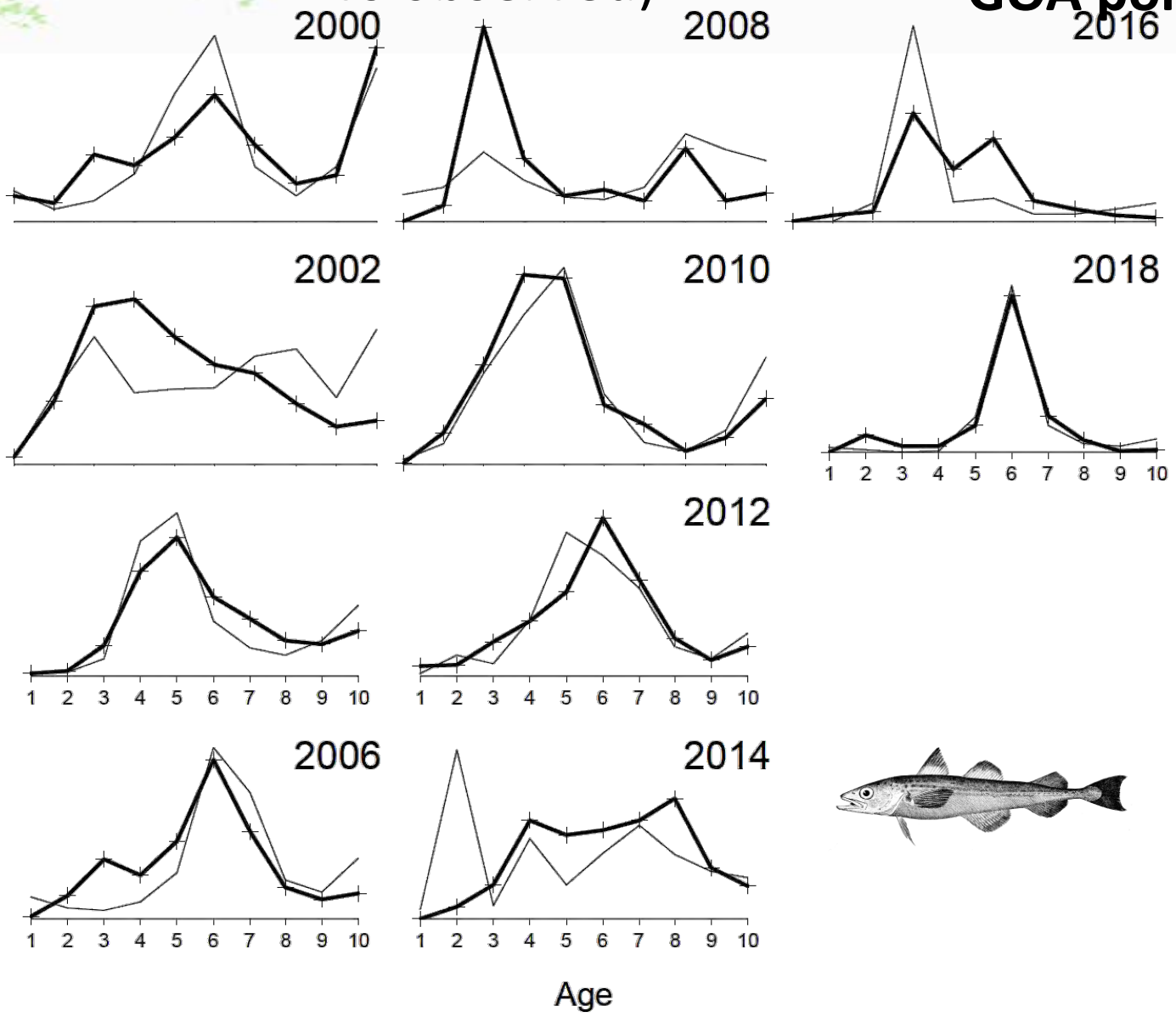






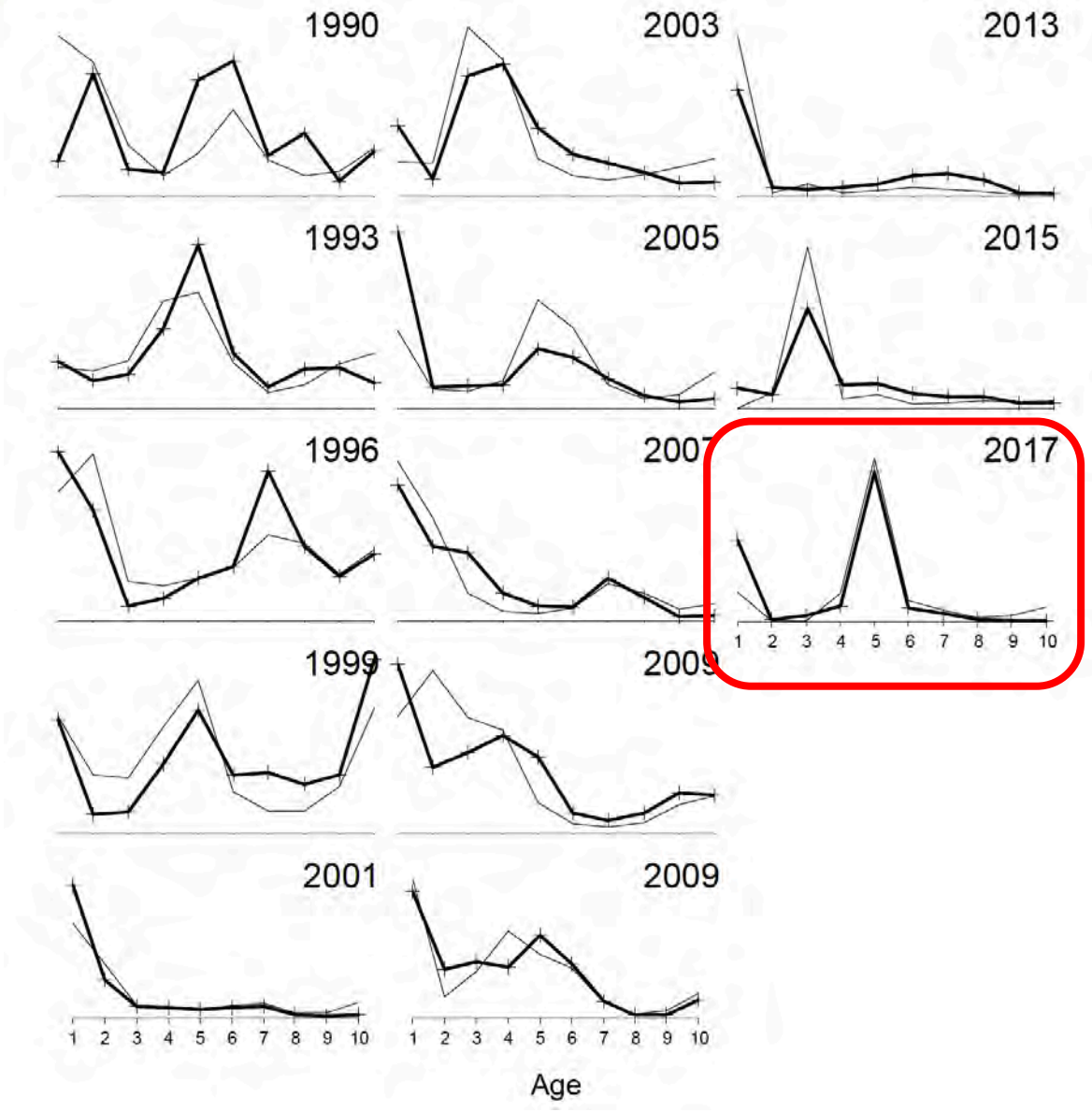
ADFG bottom trawl age composition (predicted vs observed)

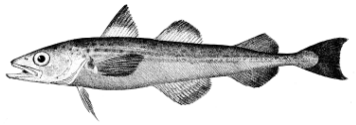
GOA pollock



NMFS bottom trawl age composition (predicted vs observed)

GOA pollock

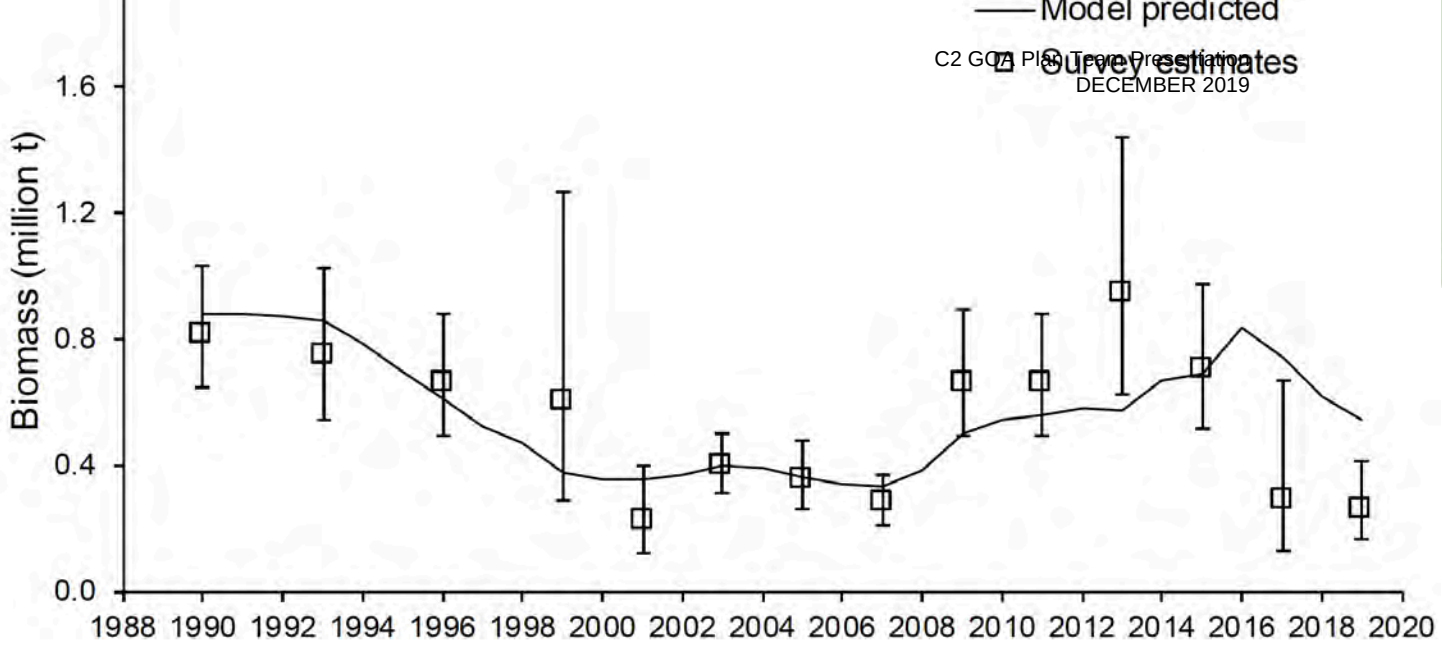




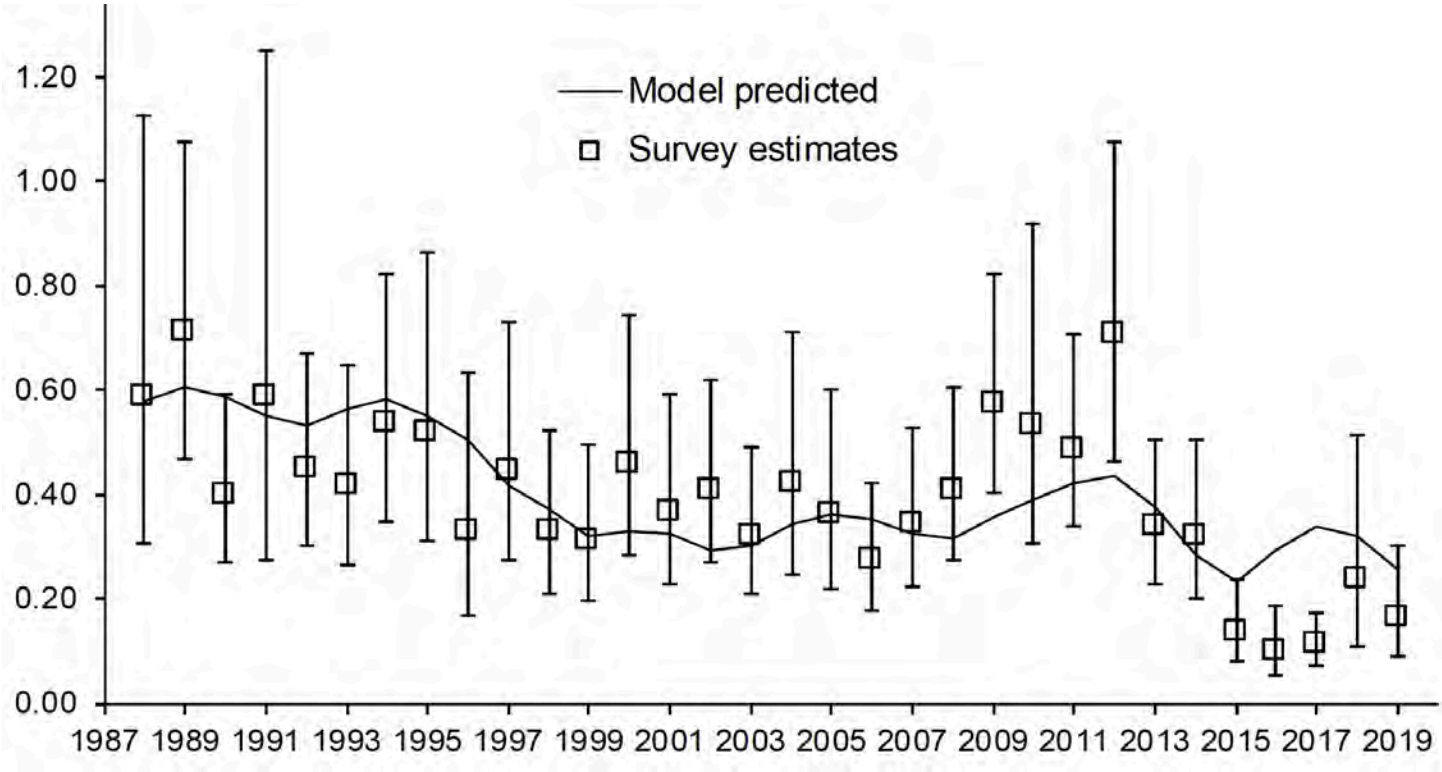
GOA pollock

GUL

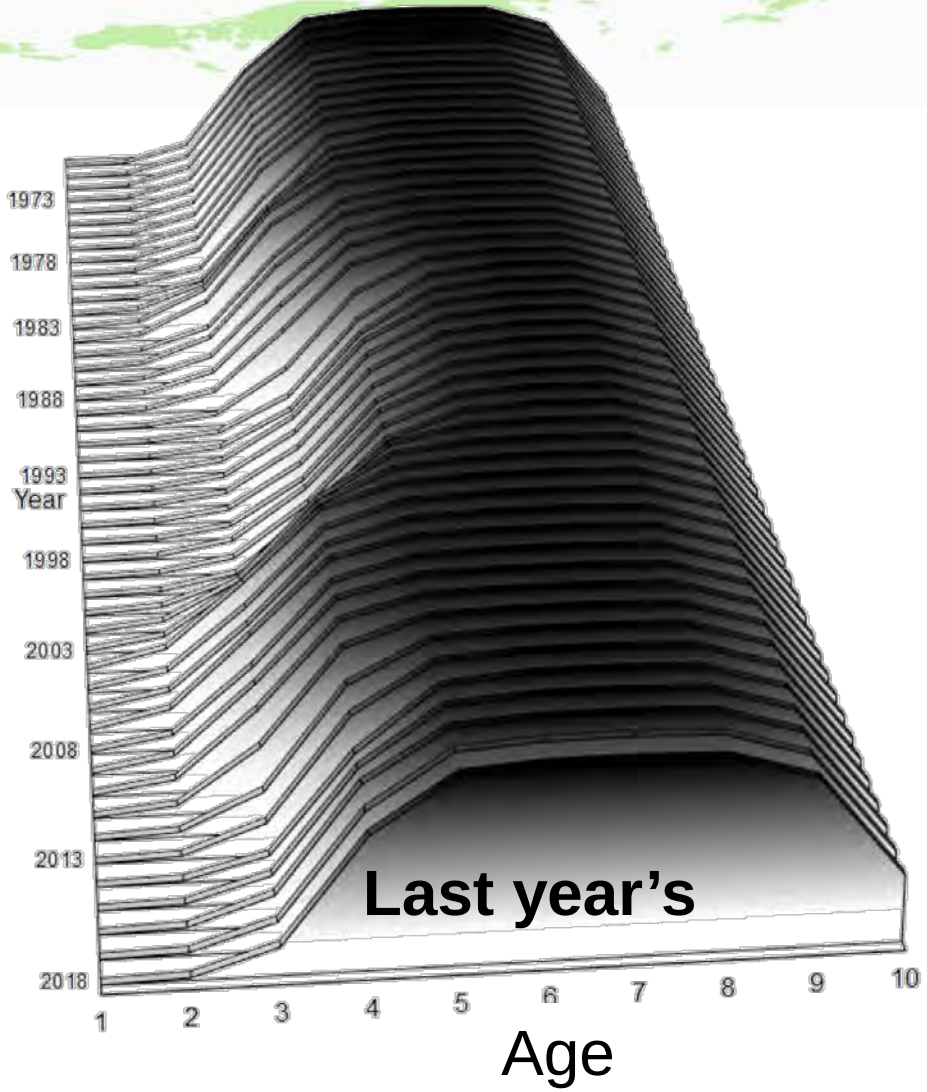
NMFS bottom trawl survey

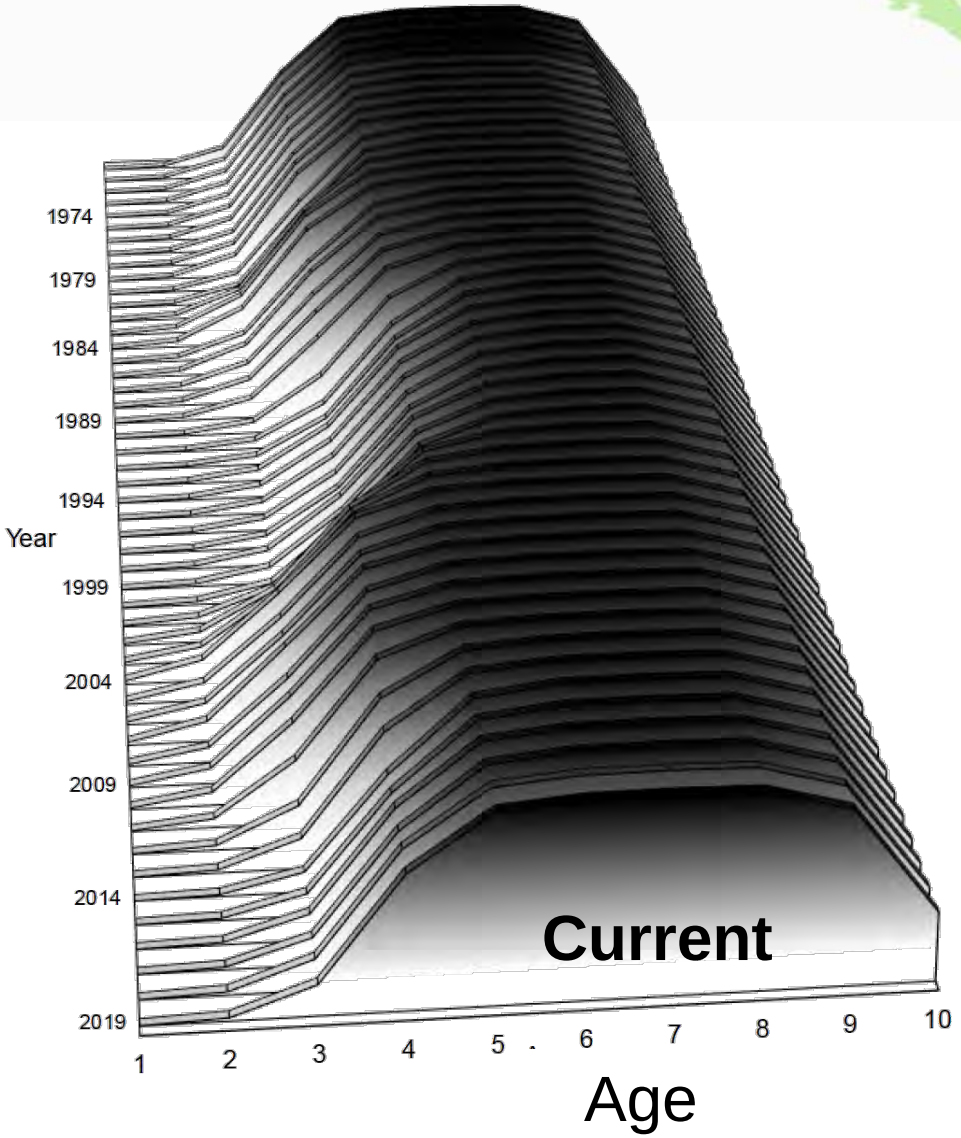


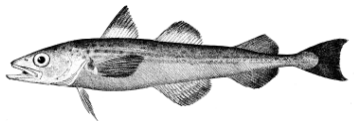
ADFG trawl survey



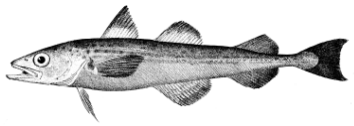
GOA pollock fishery selectivity

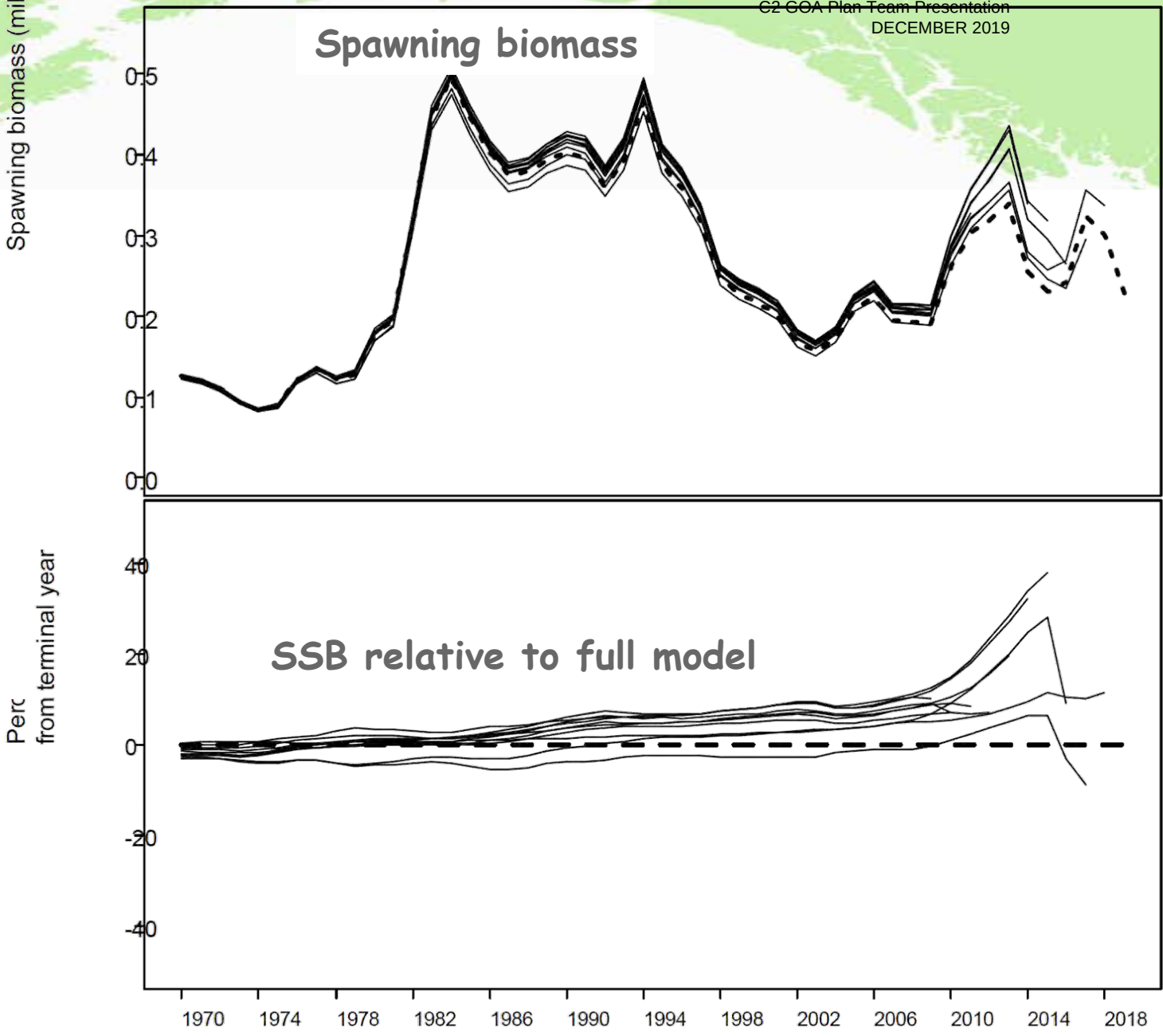




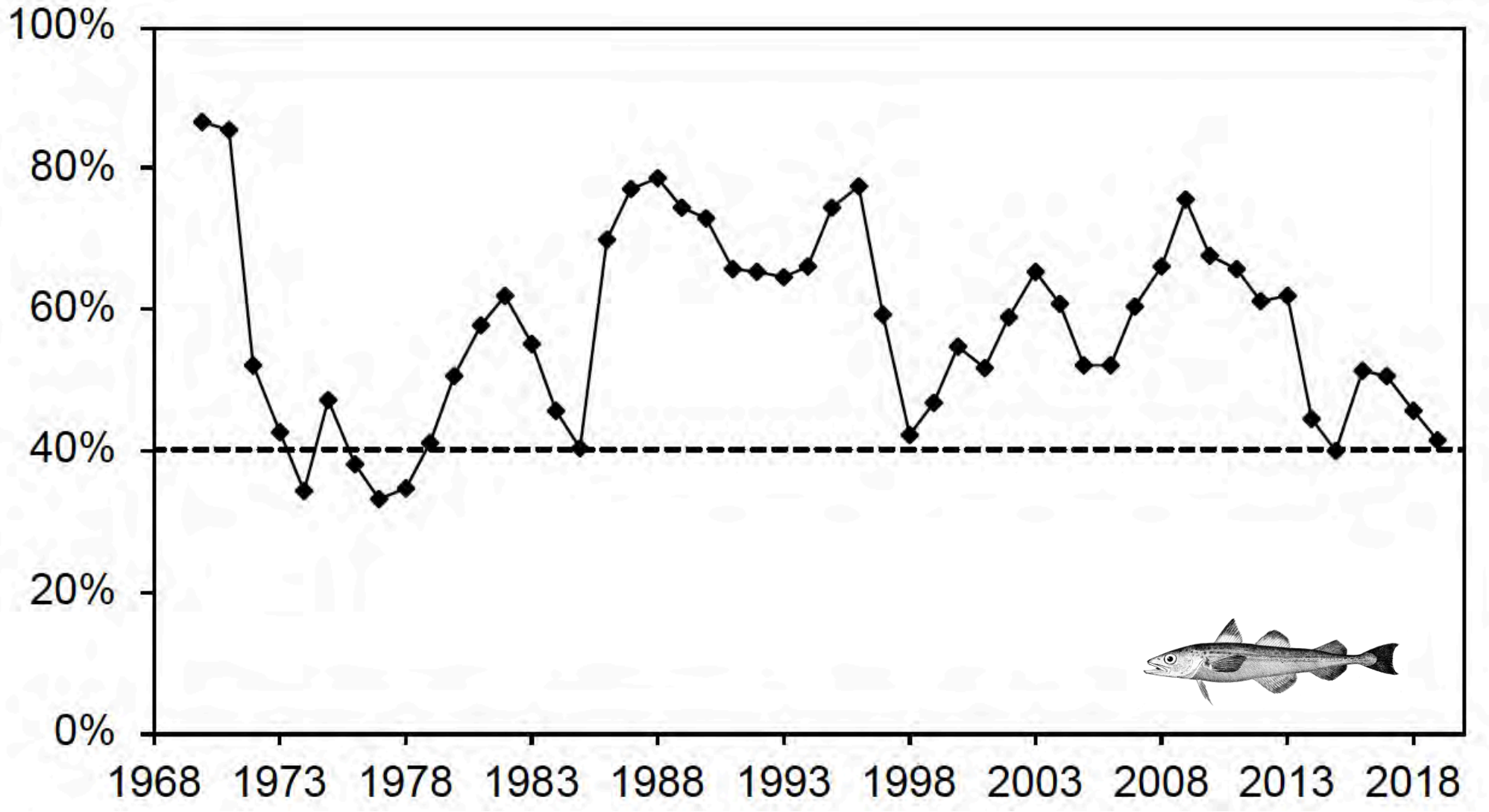


GOA pollock retrospective results Mohn=0.134

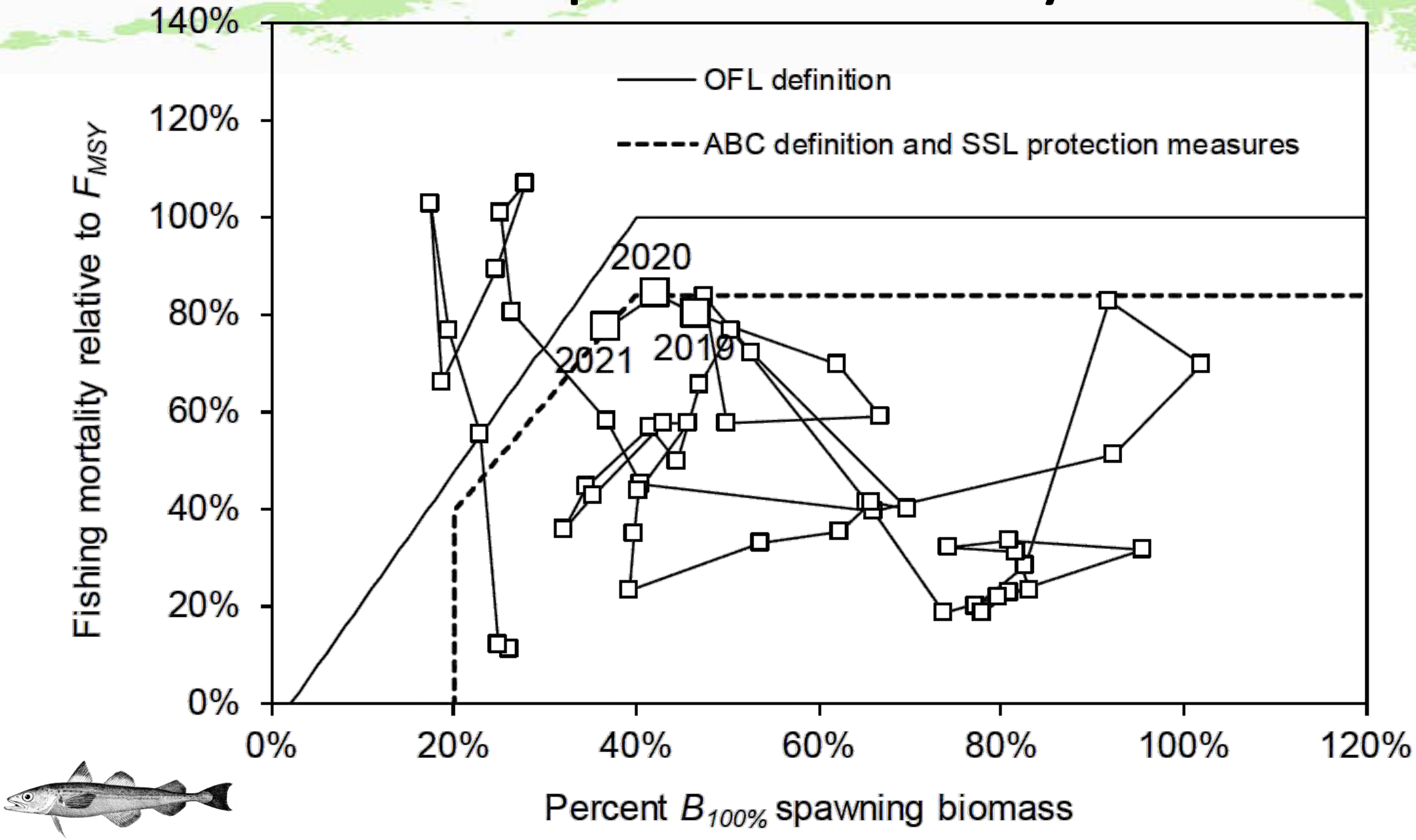




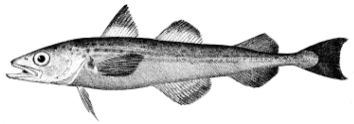
GOA pollock SPR history

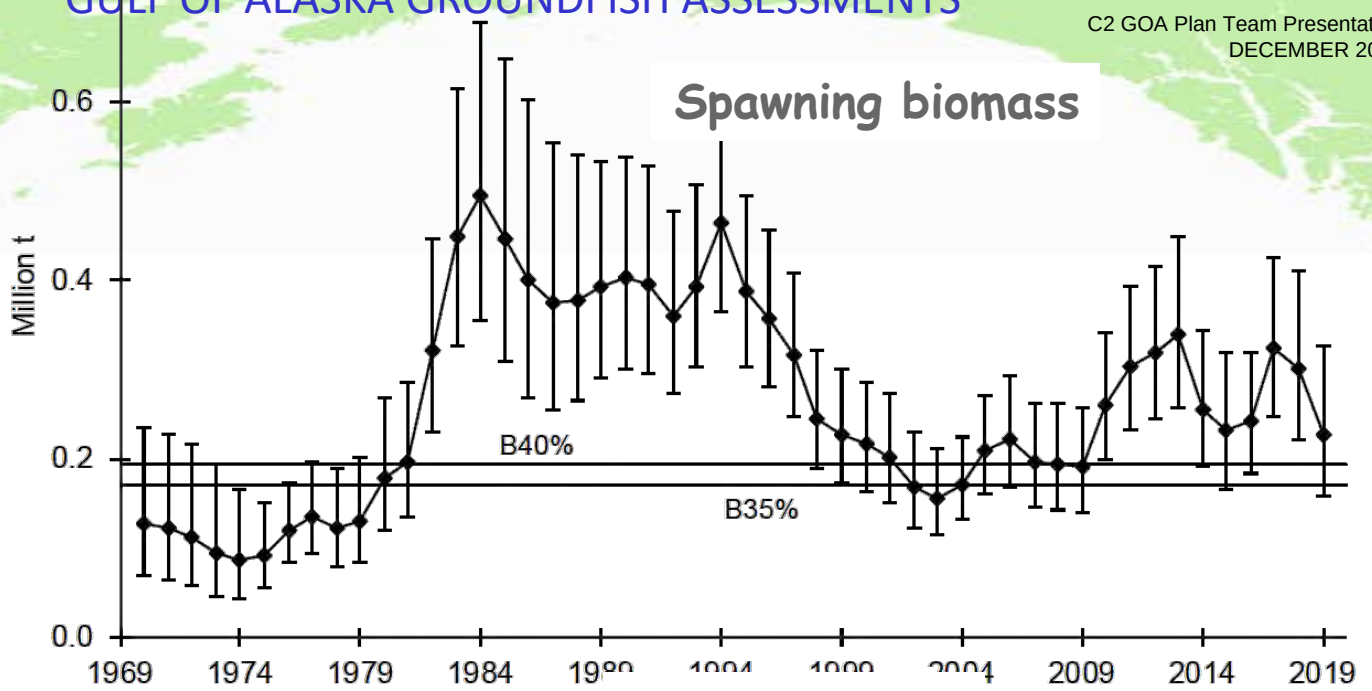


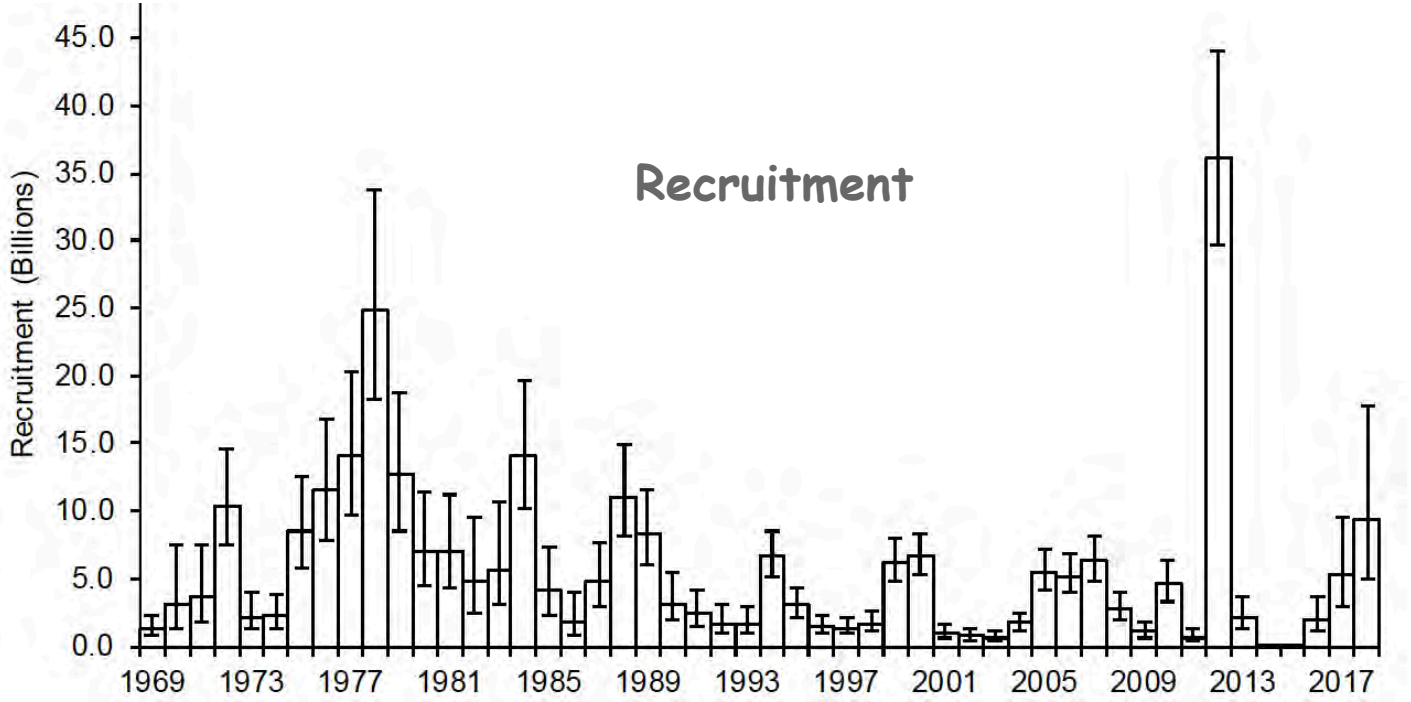
GOA pollock history



GOA pollock model results







GOA Pollock summer area allocation options

Option 5: Weighted average of acoustic plus bottom trawl biomass (2015-2019)

Area 610	*Area 620*	*Area 630*	*Area 640*
432,996	321,688	441,463	66,282
34.30%	25.48%	34.97%	5.25%

GOA pollock ESP

- National initiatives and AFSC research priorities led to doing an ecosystem and Socioeconomic profile (ESP) for Gulf of Alaska (GOA) walleye pollock
- Research that improves our understanding of environmental and climate forcing of ecosystem processes specifically to improve stock assessment and management supported by AFSC
- Standardized framework applied—can it help assessment and management advice?

Potential application for better clarity on uncertain aspects of assessment…

GOA pollock ESP

ESP steps: (paraphrased…)

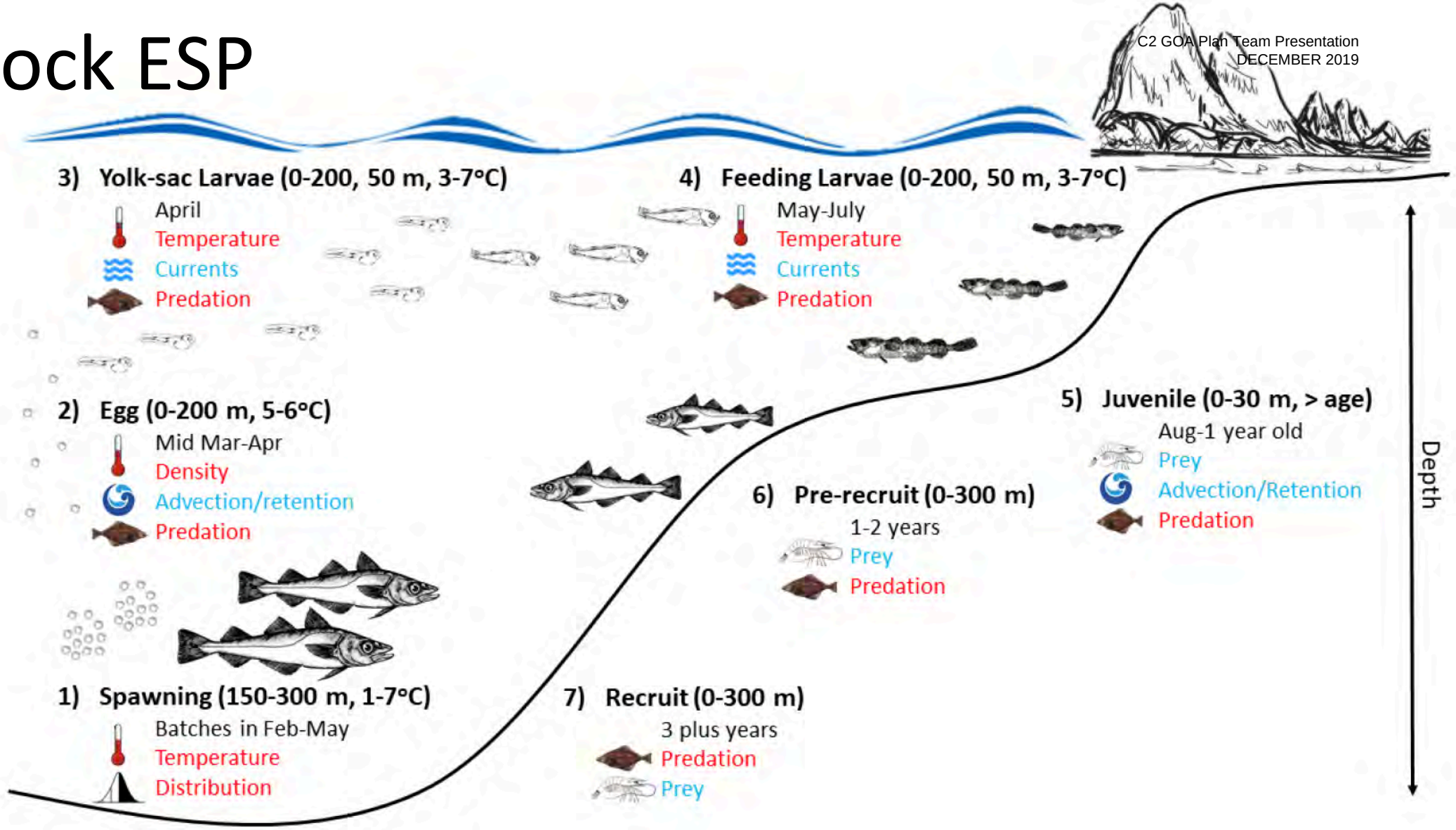
1. Evaluate national initiative and stock assessment classification scores against regional research priorities

2. Identify potential vulnerabilities and bottlenecks over life history stages to aid indicator selection (via mechanistic hypotheses)

3. Examine indicators using appropriate statistical approaches given available data

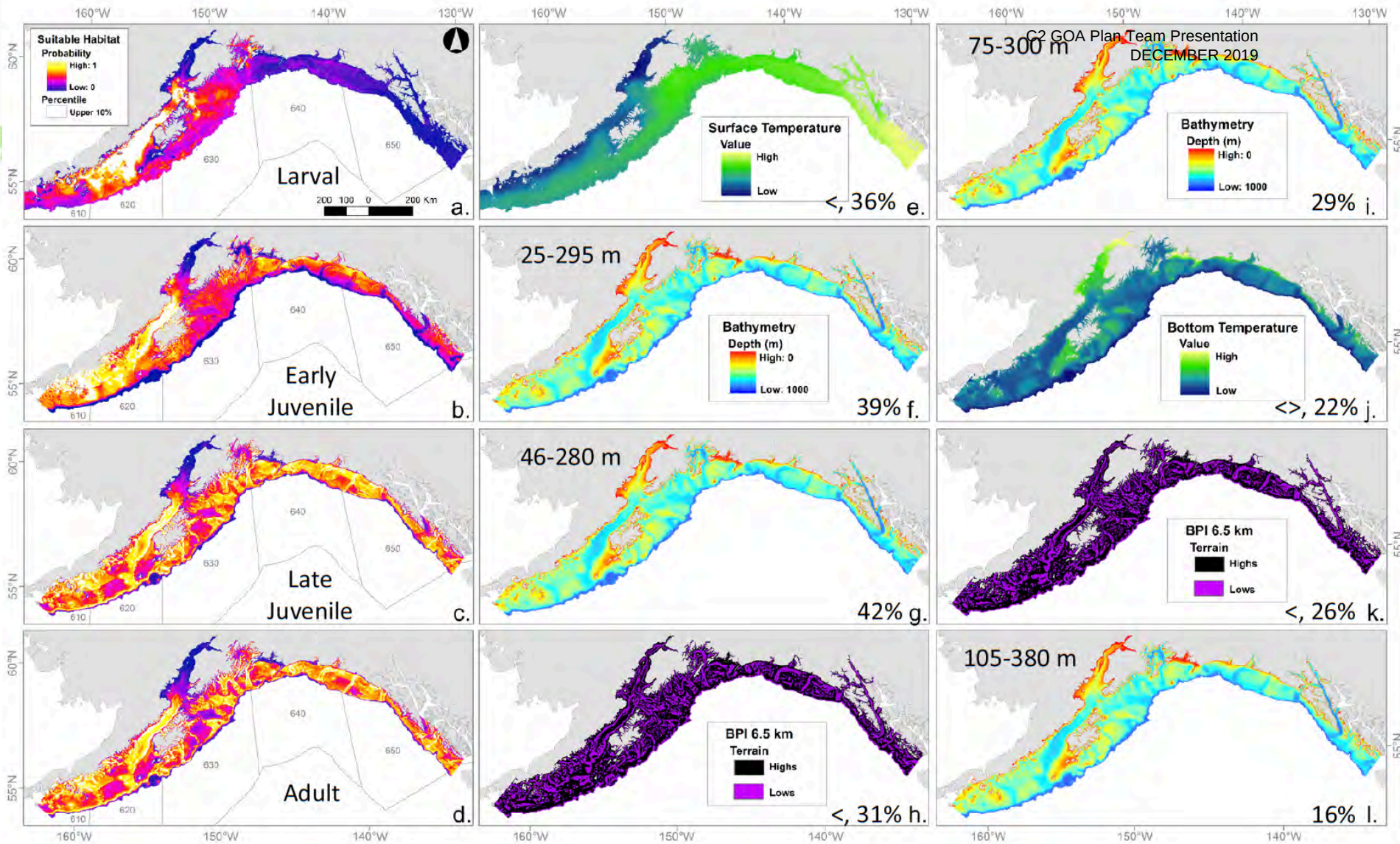
4. Use standardized template to report on ecosystem and socioeconomic considerations, data gaps, caveats, and research priorities

GOA pollock ESP



Appendix Figure 1A.2: Life history conceptual model for GOA pollock summarizing ecological information and key ecosystem processes affecting survival by life history stage. Red text means increases in process negatively affect survival, while blue text means increases in process positively affect survival.

GOA pollock ESP



Appendix Figure 1A.3. Pollock probability of suitable habitat by life stage (a = larval, b = early juvenile, c = late juvenile, and d = adult) with corresponding predictor habitat variables representing the highest (e = surface temperature, f = depth, g = depth, h = bathymetric position index) and second highest contribution (i = depth, j = bottom temperature, k = bathymetric position index, and l = depth). Upper 10 percentile of suitable habitat is shown in white within the probability of suitable habitat range (yellow to purple). Sign (<, >, <>) of the deviation from mean direction and the percent of contribution to predict suitability provided for each non-depth variable. Range provided for depth. See Shotwell et al., In Review for more details.

Ecosystem Processes

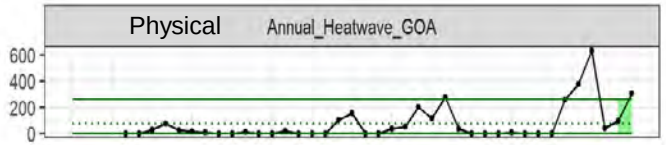
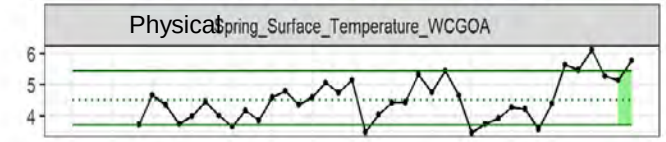
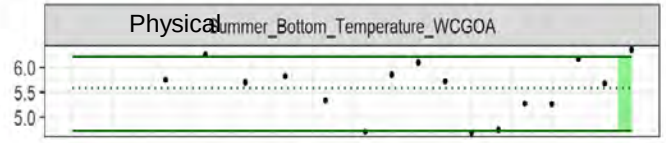
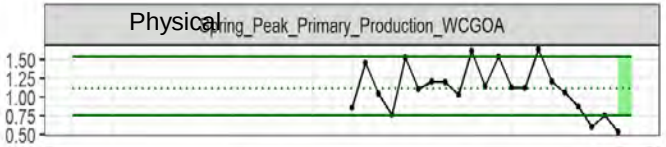
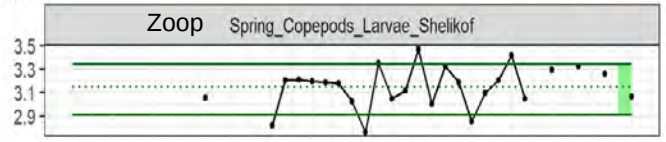
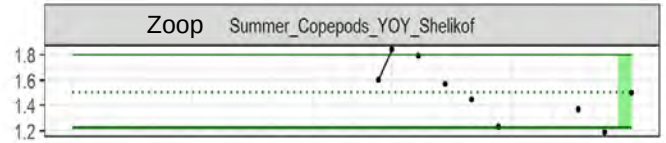
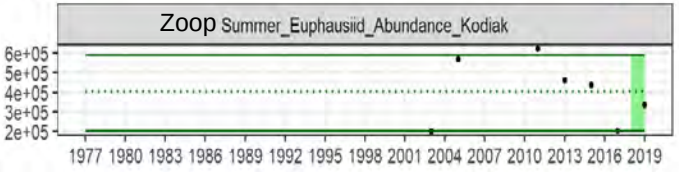
Stage		Processes Affecting Survival	Relationship to GOA Pollock
Adult	**Recruit**	1. Top-down predation increase on age 3+ 2. Bottom-up control on juvenile consumption	Increases in main predator of pollock would be negative but minor predators may indicate pollock biomass increase. Increases in primary prey biomass would be positive for pollock but may increase competition.
	Spawning	1. Distribution 2. Surface and bottom temperature$_{10}$	Increased distribution spread of adult pollock may be negative as pollock would experience non-preferred habitat and potentially lower quality prey options. Increases in temperature may be negative causing early maturation, mismatch with spring bloom.
Offshore to Nearshore Pelagic	**Egg**	1. Water column density 2. Advection/retention 3. Predation	Increases in density, advection, and predation would be negative for egg stage resulting in sinking or dispersal from preferred habitat and adequate zooplankton prey.
	Yolk-sac Larvae	1. Temperature-mediated metabolic rate 2. Currents that facilitate nearshore transport (6,8,10) 3. Predation	Increases in temperature would increase metabolic rate and may result in rapid yolk-sac absorption that may lead to mismatch with prey. Current direction to preferred habitat would be positive for pollock while predation increases would be negative.
	Feeding Larvae	1. Temperature-mediated metabolic rate 2. Currents that facilitate nearshore transport (6,8,10) 3. Predation	Increases in temperature would increase metabolic rate and may result in poor condition if feeding conditions are not optimal. Current direction to preferred habitat would be positive for pollock while predation increases would be negative.
	Juvenile	1. Spring/summer/fall abundance of zooplankton prey (11) 2. Advection/retention (offshore) 3. Predation	Increases in preferred zooplankton prey would be positive for pollock condition and relative biomass of pollock may also be measured by minor predators of pollock. Advection offshore may be positive for pollock to arrive at preferred habitat. Predation would be negative for pollock.
	Pre-Recruit	1. Bottom-up control juvenile consumption 2. Top-down predation increase on age 3+	Increases in main predator of pollock would be negative but minor predators may indicate pollock biomass increase. Increases in primary prey biomass would be positive for pollock but may increase competition.

Indicator Suite

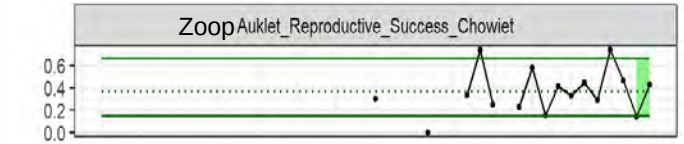
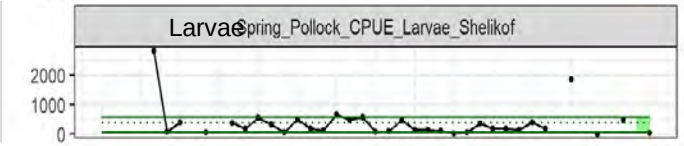
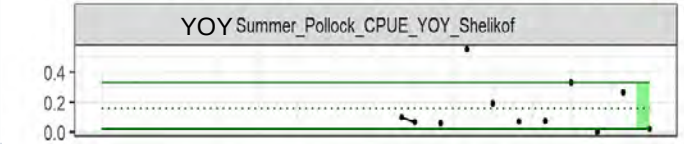
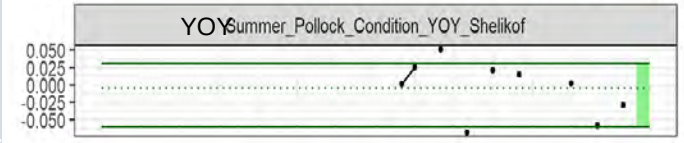
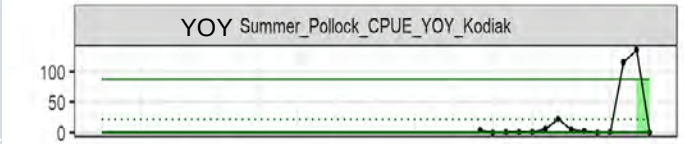
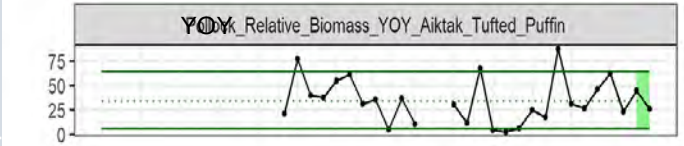
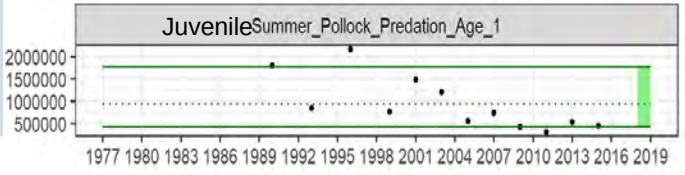
- Organization
  - By trophic level following ecosystem status report
  - GOA pollock life history stages and socioeconomics
- Summary
  - 21 total ecosystem: 15 current year, 6 not updated
  - 5 total socioeconomic: 3 current year, 2 not updated

Category	Total	2019	Gap
Physical	4	3	1
Zooplankton	4	4	0
Larval & YOY	5	4	1
Juvenile	2	0	2
Adult	6	4	2
Socioecon	5	3	2

Ecosystem Indicators

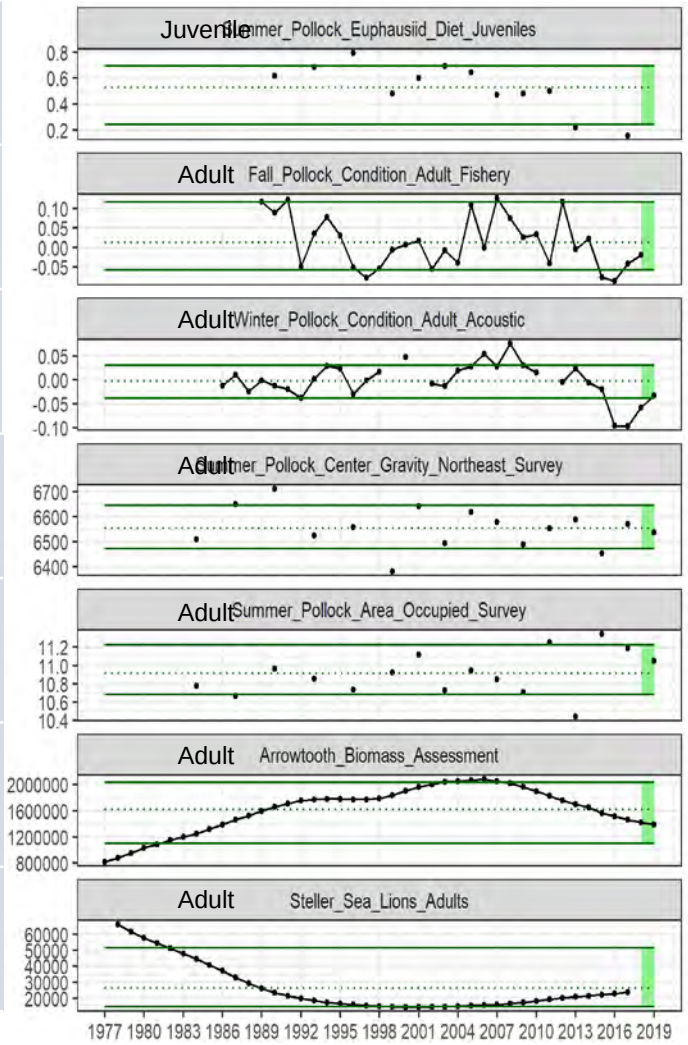
Title	Category/Description	Time series	Recent
Annual Heatwave GOA	Regional daily mean sea surface temperatures from NOAA climate model processed following Hobday et al., 2016 to obtain marine heatwave cumulative intensity (Barbeaux, 2019)		+
Spring Sea Surface Temperature WCGOA	Western/central GOA spring (Apr-May) sea surface temperature from Pathfinder v5.3 gridded monthly dataset (Casey et al., 2010, GHRSST, CoastWatch)		+
Summer Bottom Temperature WCGOA	Average summer bottom temperature (°C) over all hauls of the RACE GOA shelf bottom trawl survey. Available from AKFIN or online survey database.		+
Spring Peak Phytoplankton Production WCGOA	Western/central GOA peak (May) derived chlorophyll *a* from Ocean Colour CCI v4.0 gridded monthly dataset (Jackson et at., 2017, European Space Agency, CoastWatch)		–
Spring Copepods Larvae Shelikof	Mean abundance of small copepods (< 2 mm) in core Shelikof area measured in log scale numbers per meter cubed with associated rapid zooplankton assessment (Kimmel et al., 2019)		●
Summer Copepods YOY Shelikof	Mean abundance of large copepods (> 2 mm) in core Shelikof area measured in log scale numbers per meter cubed with associated rapid zooplankton assessment (Kimmel et al., 2019)		●
Summer Euphausiid Abundance Kodiak	Acoustic backscatter per unit area classified as euphausiids and integrated over the water column and across Kodiak core survey area from MACE summer survey (Ressler et al., 2019)		●

Ecosystem Indicators

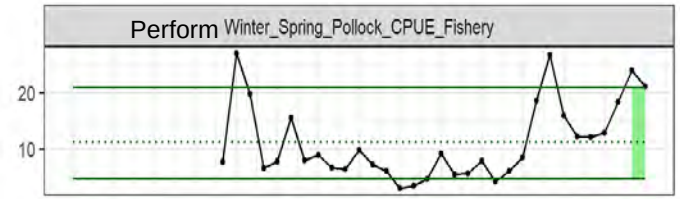
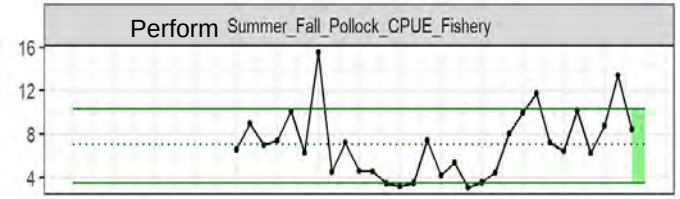
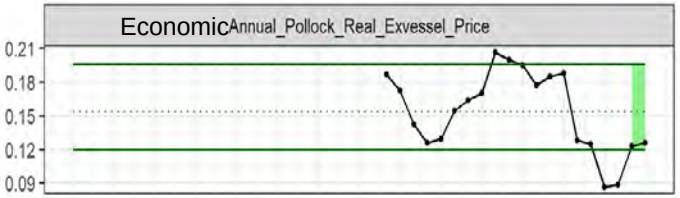
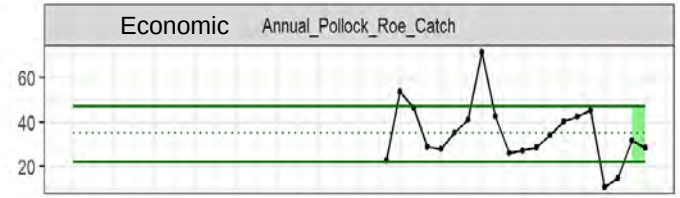
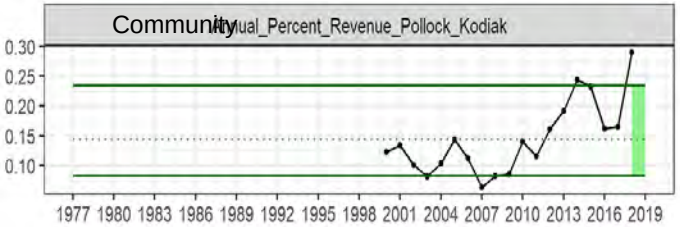
Title	Description	Time series	Recent
Auklet Reproductive Success Chowiet	Proportion of parakeet auklet nest sites with fledged chicks from total nest sites with eggs laid, Chowiet Island (Higgins et al., 2018)		●
Spring Pollock CPUE Larvae Shelikof	Mean abundance of larval pollock taken in bongos from core sampling area in Shelikof Strait during EcoFOCI spring survey with rapid assessment (Dougherty et al., 2019)		–
Summer Pollock CPUE YOY Shelikof	Mean abundance of YOY pollock taken in midwater trawl from core area in WGOA area during EcoFOCI summer survey with rapid assessment (Rogers et al., 2019b)		●
Summer Pollock Condition YOY Shelikof	Body condition of YOY pollock taken in midwater trawl from core area in WGOA area during EcoFOCI summer survey with rapid assessment (Rogers et al., 2019a)		●
Summer Pollock CPUE YOY Kodiak	Catch per unit effort of YOY pollock in beach seine from fixed sites in nearshore Kodiak survey (Laurel et al., 2019)		–
Pollock Relative Biomass YOY Aiktak	Relative biomass of pollock measured from screening burrows of tufted puffins diets at Aiktak Island (Youngren et al., 2019)		●
Summer Pollock Predation Age-1	Predation mortality estimates of age-1 pollock from multiple data sources and models (Barnes et al., *In Review*)		●

Ecosystem Indicators – Adults

Title	Description	Time series	Recent
Summer Pollock Euphausiid Diet Juvenile	Proportion-by-weight of euphausiids in the diets of juvenile pollock collected on summer bottom trawl survey samples in GOA (Aydin et al., 2007)		–
Fall Pollock Condition Adult Fishery	Length-weight regression of pollock sampled by observers in the fall pollock fishery (M. Dorn, *pers. commun.*)		●
Winter Pollock Condition Adult Acoustic	Length-weight regression of pollock sampled in Shelikof Strait during the late winter MACE acoustic survey (M. Dorn, *pers. commun.*)		●
Summer Pollock Center of Gravity Northeast	Biomass-weighted avg location of grid cells in northeasting direction from spatio-temporal model of pollock in summer bottom trawl survey (Thorson and Barnett, 2017)		●
Summer Pollock Area Occupied	Area required to contain the population at its average biomass from spatio-temporal model of pollock in the summer bottom trawl survey (Thorson and Barnett, 2017)		●
Arrowtooth Biomass Assessment	Total biomass estimates from arrowtooth flounder stock assessment model output (Spies et al., 2017)		●
Steller Sea Lion Adult Counts	Non-pup estimates of Steller sea lions from the GOA portion of the western Distinct Population Segment (Sweeney, 2017)		●



Socioeconomic Indicators

Title	Description	Time series	Recent
Winter-Spring Pollock CPUE Fishery	Catch of pollock in tons/hour from the winter-spring (first trimester) of the pollock fishery (M. Dorn, *pers. commun.*)		+
Summer-Fall Pollock CPUE Fishery	Catch of pollock in tons/hour from the summer-fall (third trimester) of the pollock fishery (M. Dorn, *pers. commun.*)		●
Annual Pollock Real Ex-vessel Price	Estimate of real ex-vessel value in price per pound inflation adjusted to 2018 USD (Fissel et al., 2019)		●
Annual Pollock Roe per unit Catch	Roe per-unit-catch calculated as 1000*(roe production)/(retained catch) (Fissel et al., 2019)		●
Annual Percent Revenue Pollock in Kodiak	Percentage of the total revenue Kodiak gets from the GOA pollock fishery (aka, local quotient) (S. Wise, *pers. commun.*)		+

Traffic Light

- Evaluated for current year
  - Ecosystem: 5 poor, 12 stable
  - Socioecon: 1 good, 2 stable
- Summary
  - Physical indicators poor with increased heat, prey stable
  - Larvae/YOY poor, but adult condition, predators stable
  - Good/stable socioecon

Category	Good	Poor	Stable
Physical		3	
Zooplankton			4
Larval & YOY		2	2
Juvenile			
Adult			4
Socioecon	1		2

Indicator Considerations

- 2012 Year Class
  - CPUE larvae and YOY high following first overwinter, and seabird diets show high amounts, good YOY conditions
  - Major heatwave started in 2014, warm temps mixed from surface to bottom, peak production downward trend
  - Small copepods dominate zooplankton, large copepods and euphausiids low, and lower % in age-1 pollock diet
  - Poor feeding for juveniles, poor condition when recruited to fishery/survey, increased spatial changes

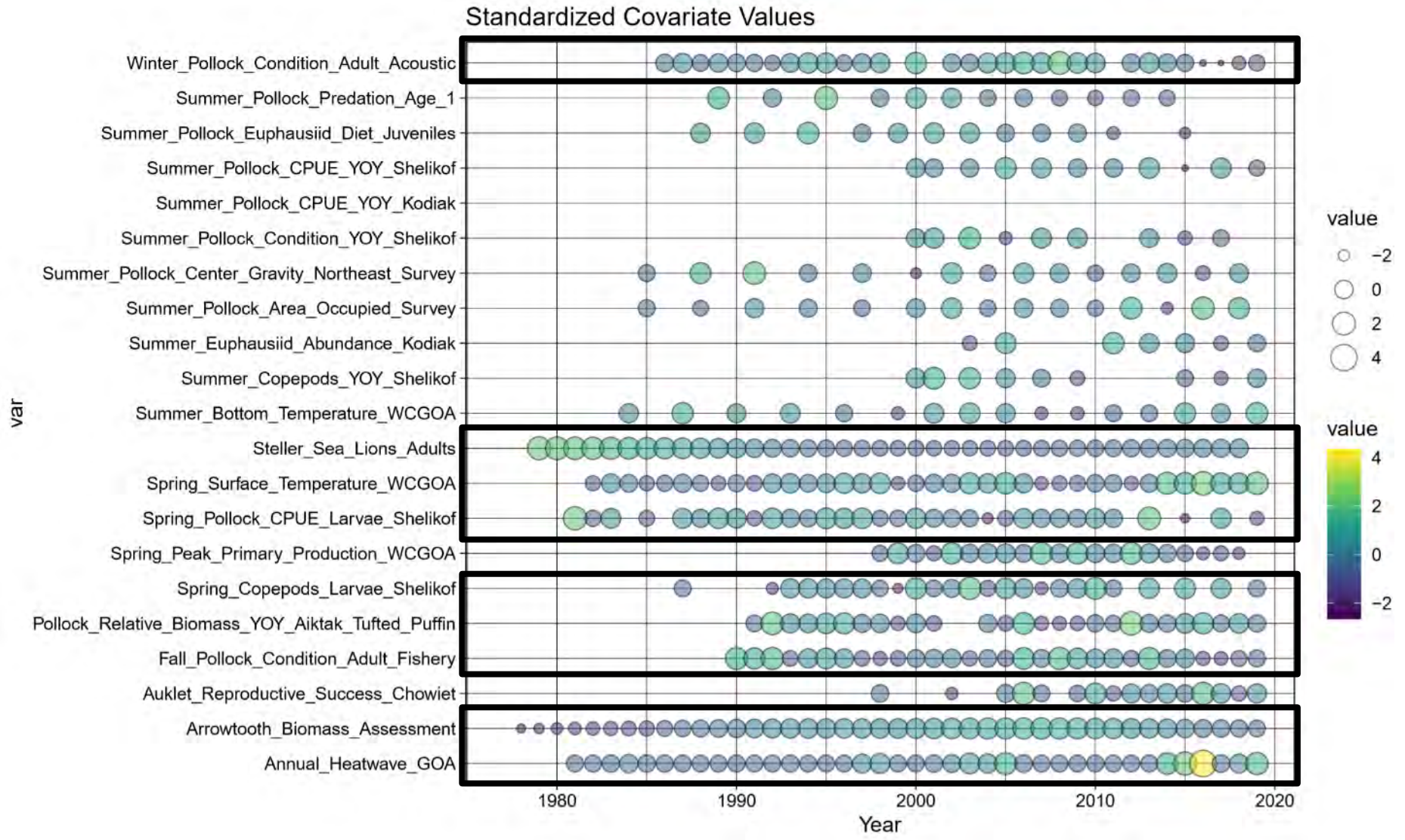
Indicator Considerations

- Subsequent year classes
  - Return to heatwave conditions, recently abated but surface and bottom temps high in 2019 survey
  - Prey for 2017 or 2018 year class similar to 2012 year class although some recovery in 2019
  - CPUE larvae/YOY were high in 2017 and 2018 but low in 2019 for both offshore and nearshore surveys
  - Condition of adult pollock steadily increasing since 2016/17 low, spatial distribution average, pred low

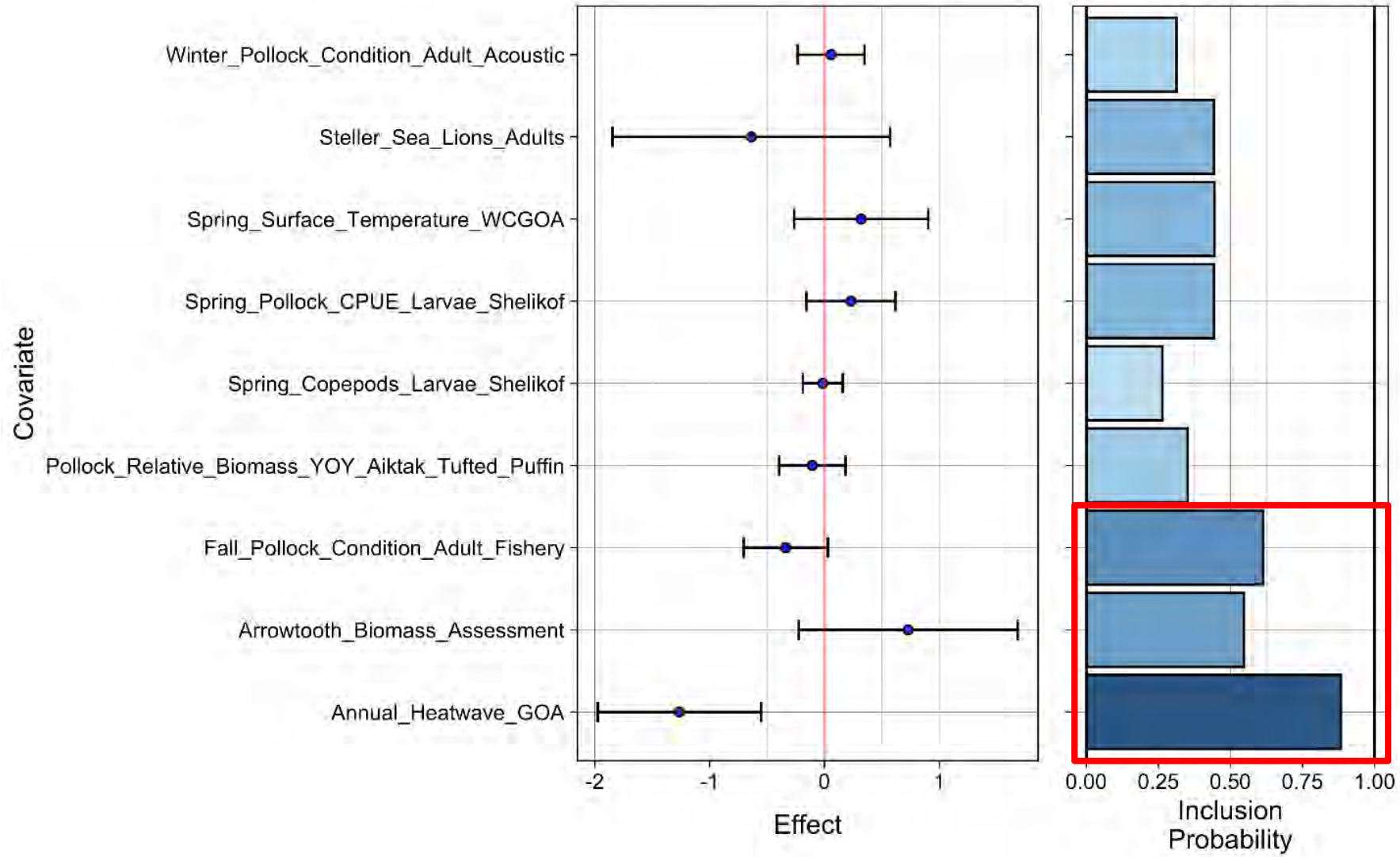
Indicator Considerations

- Socioeconomic
  - Fishery CPUE above average since 2016, consistent with stock biomass levels
  - Precipitous drop ex-vessel price and in roe per-unit catch in 2014/2015 that rebounded in 2018/2019 and may be related to poor body condition of adult pollock since 2015
  - Percent revenue in Kodiak from GOA pollock reached high in 2018, suggesting high level of reliance on GOA pollock fishery by Kodiak residents

Modeling Application

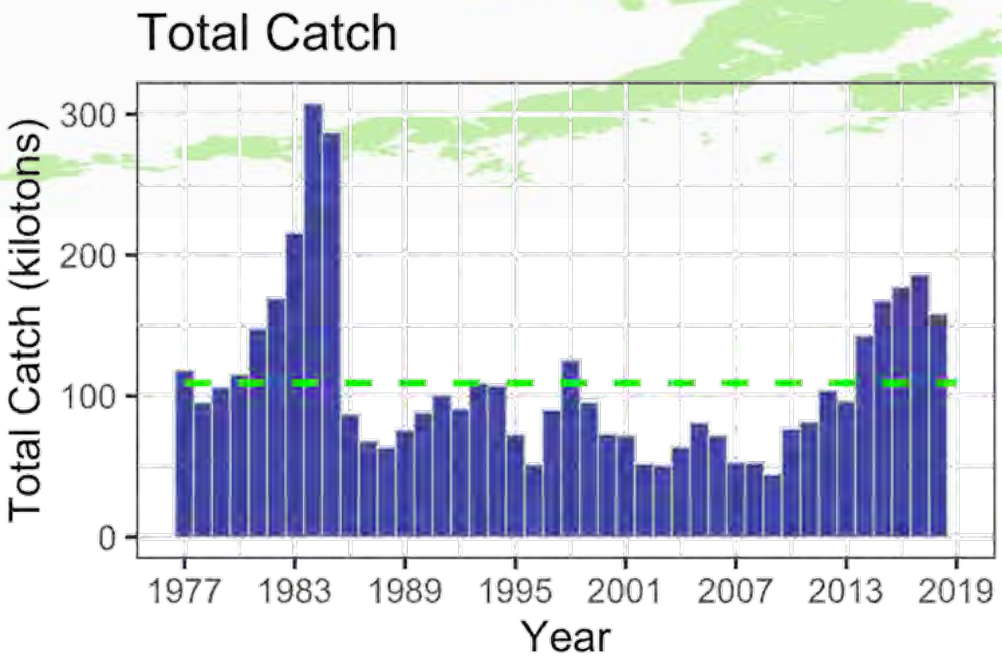


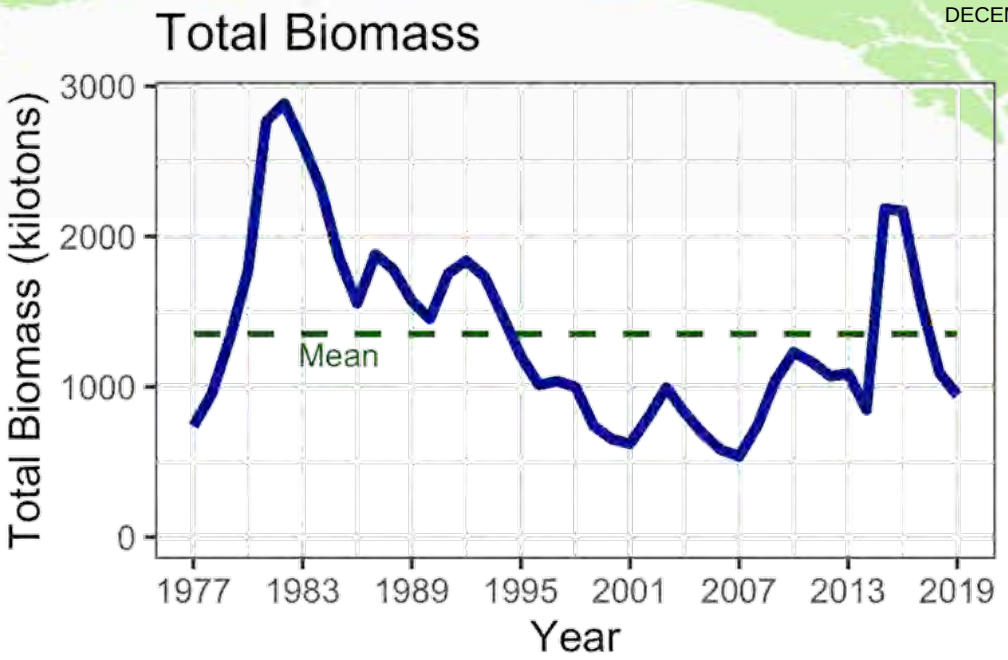
Bayesian Adaptive Sampling

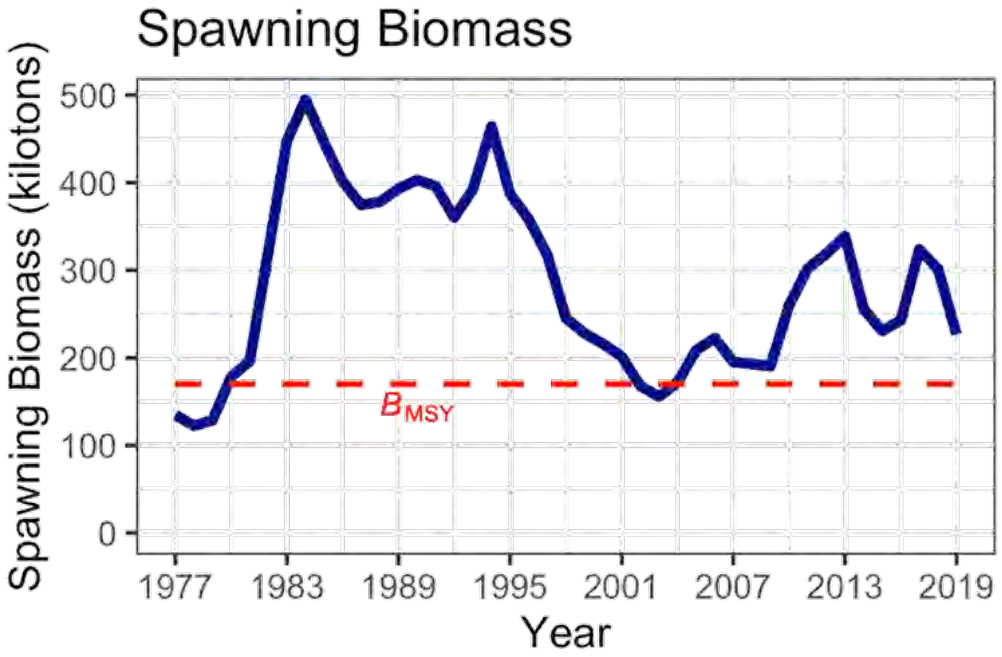


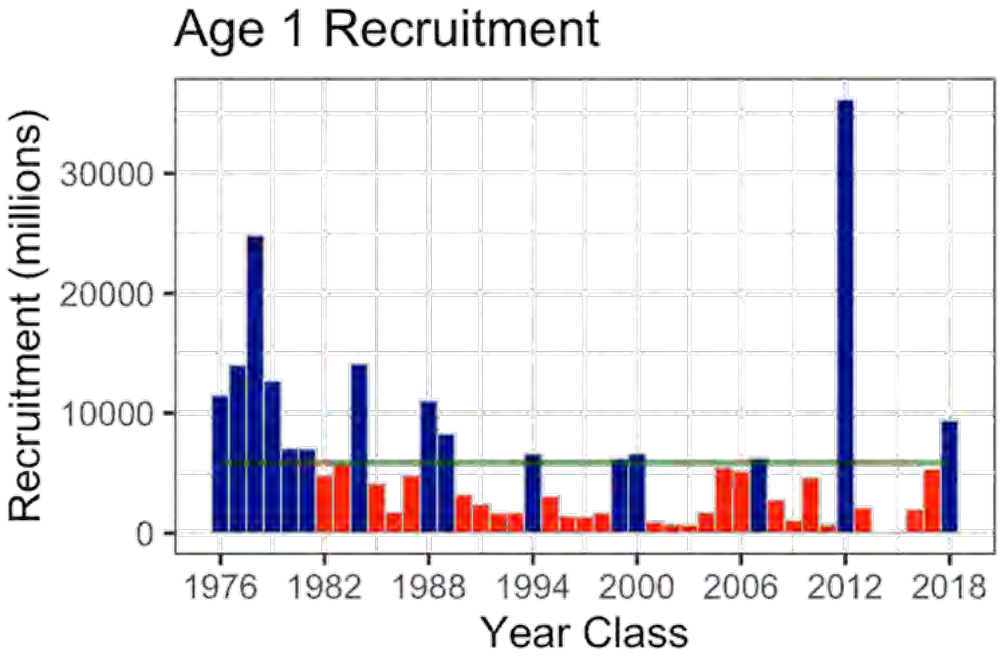
Gaps & Future

- **Indicator Gappiness**
  - Investigate remote sensing, climate model options
  - Refinement of GOA CEATTLE model
- **Alternative Indicators**
  - Upcoming competitors (sablefish, POP)
  - Condition, energy density at edges of range
- **Next Year**
  - ESP modeling workshop (March 10-12, 2020)
  - Potentially conduct partial ESP


Total Catch
Total Catch (kilotons)
300
200
100
0
1977
1983
1989
1995
2001
2007
2013
2019
Year

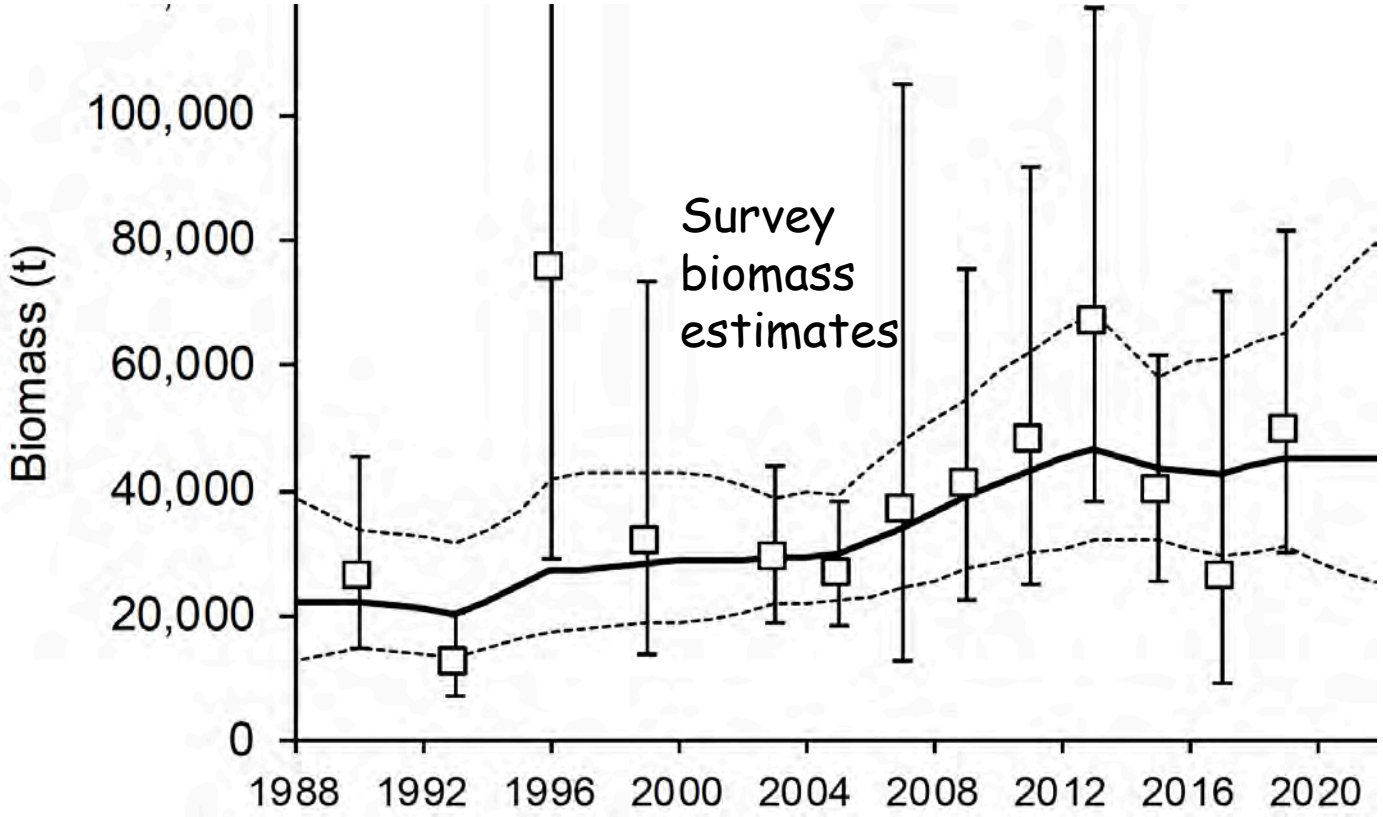

Total Biomass
Total Biomass (kilotons)
3000
2000
1000
0
Mean
1977
1983
1989
1995
2001
2007
2013
2019
Year

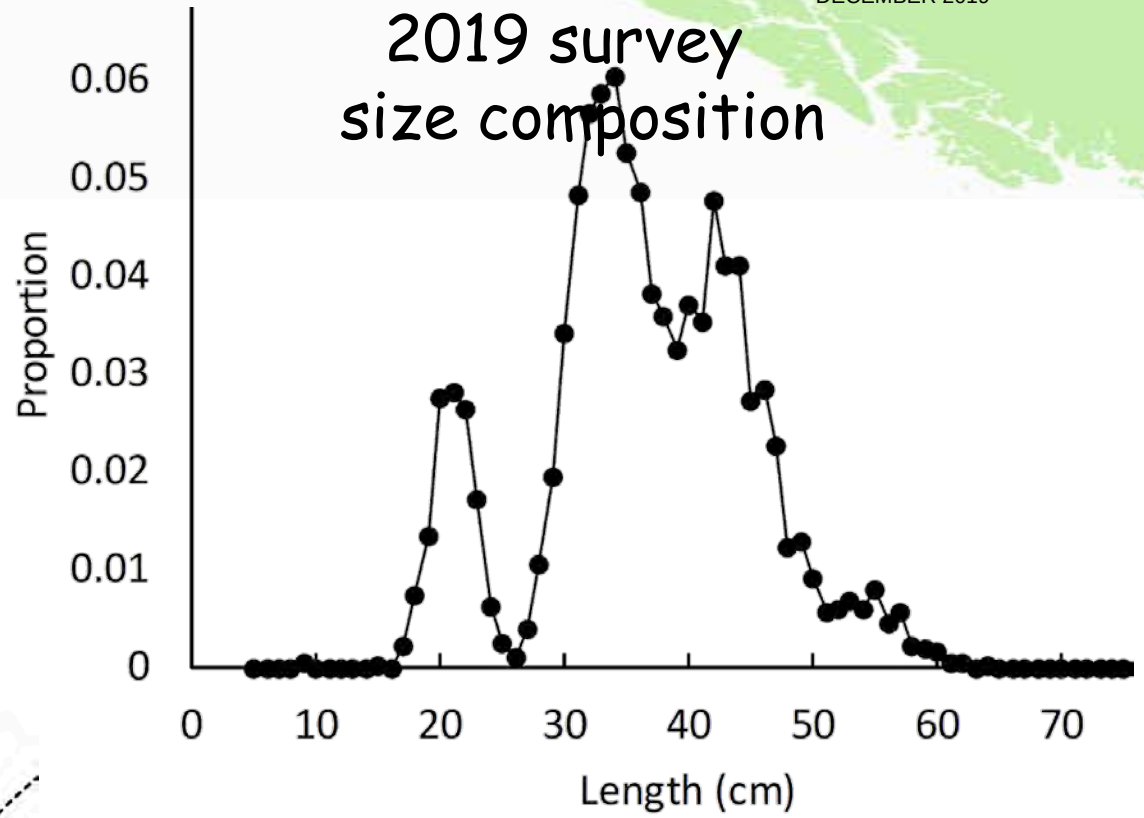

Spawning Biomass
Spawning Biomass (kilotons)
500
400
300
200
100
0
B_{MSY}
1977
1983
1989
1995
2001
2007
2013
2019
Year


Age 1 Recruitment
Recruitment (millions)
30000
20000
10000
0
1976
1982
1988
1994
2000
2006
2012
2018
Year Class

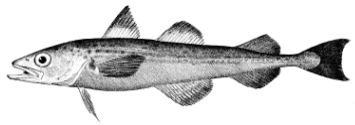
EGOA pollock (Tier 5)

EGOA Pollock	Biomass	OFL	ABC
2018	45,103	13,531	10,148
2019		13,531	10,148

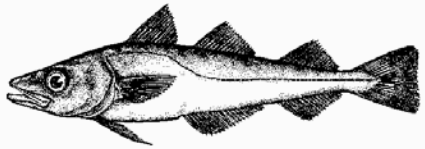




Random effects model



Gulf of Alaska pollock
Authors' risk table evaluation



Assessment-related considerations	*Population dynamics considerations*	*Environmental/ ecosystem considerations*	*Fishery Performance*	*Overall score (highest of the individual scores)*
Level 2: substantially increased concerns	Level 1: no increased concerns	Level 1: no increased concerns	Level 1: no increased concerns	Level 2: Substantially increased concerns

Overall score is Level 2: Substantially increased concerns.
Author's recommended ABC = 90% of maximum permissible (10% buffer)

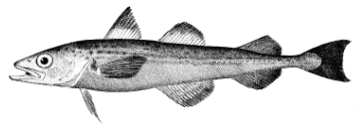
- based on mode of historical buffers.

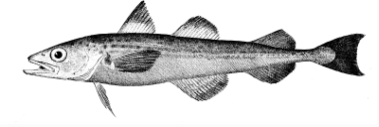
GOA Pollock Team discussions

Relative to reductions from maximum permissible:

The Team

- Agreed with the scoring of level 2
- Concurred with the author's 10% reduction—but on the premise that it was consistent with keeping fishing mortality stable

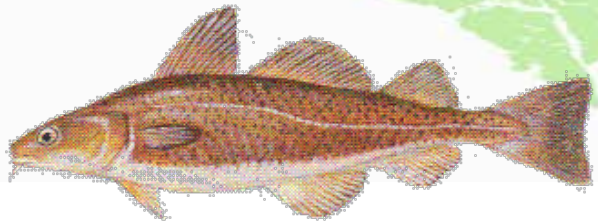




Team discussions—GOA pollock

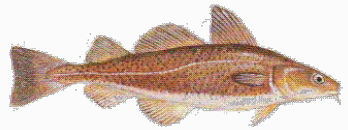
- **The Team recommended…**
  - **a re-analysis of maturity at length and age be made for individual cohorts, which would prevent poor estimates for years where age and size diversity is low, such as 2004 and 2017.**
  - **the author examine fishery selectivity, as persistent patterns in the residuals of observed and model fitted catch-at-age may represent artifacts of the selectivity functional form used.**
  - **the author ensures adequate fishery data is collected and available due to the observer program implementation of Electronic Monitoring.**
  - **the author explore better methods for constraining the time varying catchability parameter to be under 1 for the Shelikof Strait acoustic survey.**
  - **An exploration of combining the Acoustic summer survey and the GOA bottom trawl survey using a VAST framework, similar to the approach used by Cole Monahan for EBS pollock surveys.**

2. GOA Pacific cod



Species	2019 Catch	2019	2020	Change
Pollock	117,019	144,623	118,642	down 25,981 (18%)
Pacific Cod	10,909	17,000	14,621	down 2,379 (14%)
Sablefish	12,219	11,571	14,393	up 2,822 (24%)
Flatfish	27,638	116,562	114,567	down 1,995 (2%)
Arrowtooth flounder	2,553	145,841	128,060	down 17,781 (12%)
Rockfish	32,730	46,946	47,450	up 504 (1%)
Atka mackerel	1,254	4,700	4,700	same (0%)
Skates	3,042	7,804	6,670	down 1,134 (15%)
Other Species	2,618	14,460	14,363	down 97 (1%)
Total	209,982	509,507	463,466	down 46,041 (9%)

GOA Pacific cod



- Presentation from author

GOA Pacific cod

Team recommended

- **that the author coordinate with IPHC to obtain and evaluate length compositions so that the IPHC RPN index can be investigated within the assessment model.**
- **that the author work with the AFSC FMA Division (Observer Program) to identify alternative ways to collect information on cod for 2019 and beyond**
  - **…given the likelihood of a reduced fishery and expanding displacement of observers with EM and that these efforts should complement ADFG data collection efforts.**

GOA Pacific cod

Team discussions

The Team recommended that the author coordinate with IPHC to obtain and evaluate length compositions so that the IPHC RPN index can be investigated within the assessment model.

Further ABC reductions?

- Consistent with last year's recommendation as adopted by the SSC
- Assurance that spawning biomass above 20% of unfished

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.

GOA Pacific cod

Team discussions

ABC reductions from risk table?

The Team agreed that a reduction from maxABC is warranted, given the concerns highlighted in the risk table, but concurs with the author to defer to the SSC to set the specific reduction percentage

GOA Pacific cod

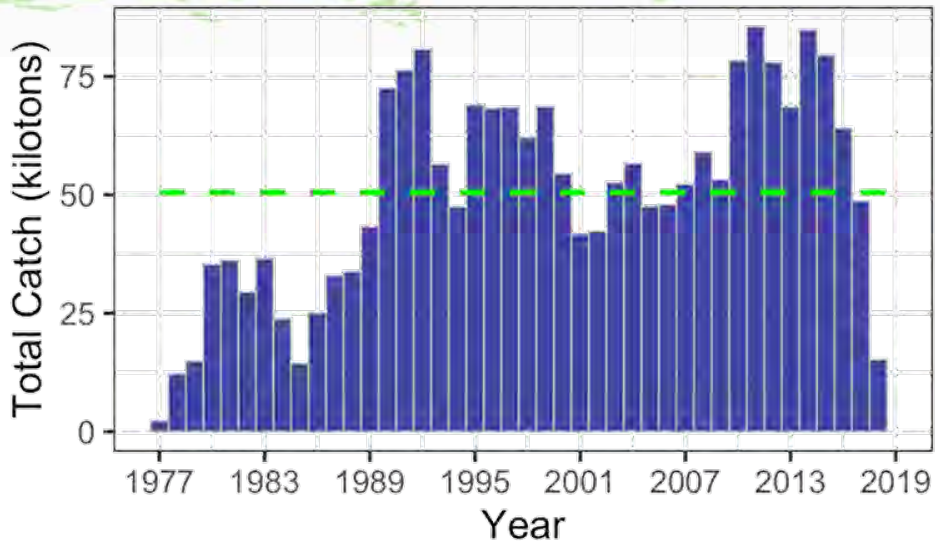
Apportionment

The Team proposed apportionment percentages that are an average between the apportionments estimated in 2017 and 2019 as an alternative to the 2019 random effects model results.

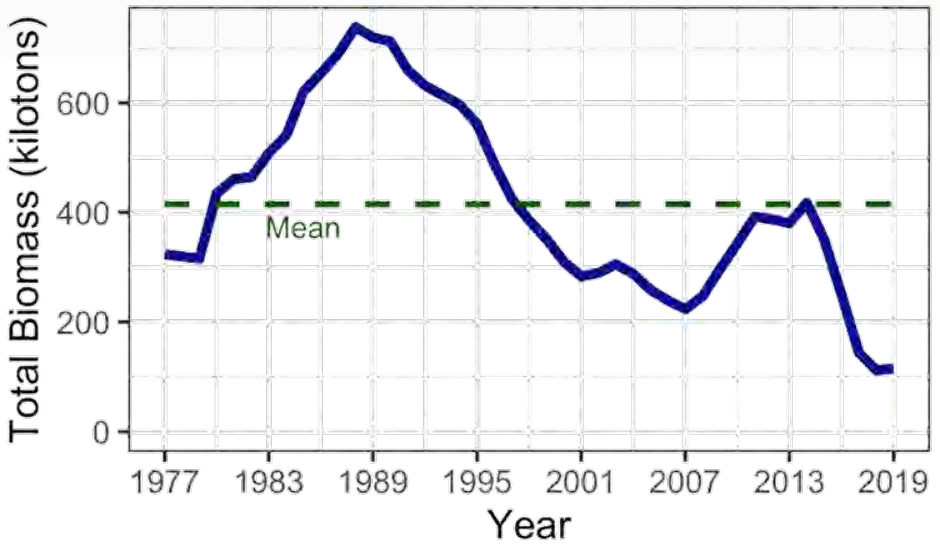
The Team also recommended that the author investigate alternatives of the random effects model that integrates multiple population indices.

GOA Pacific cod

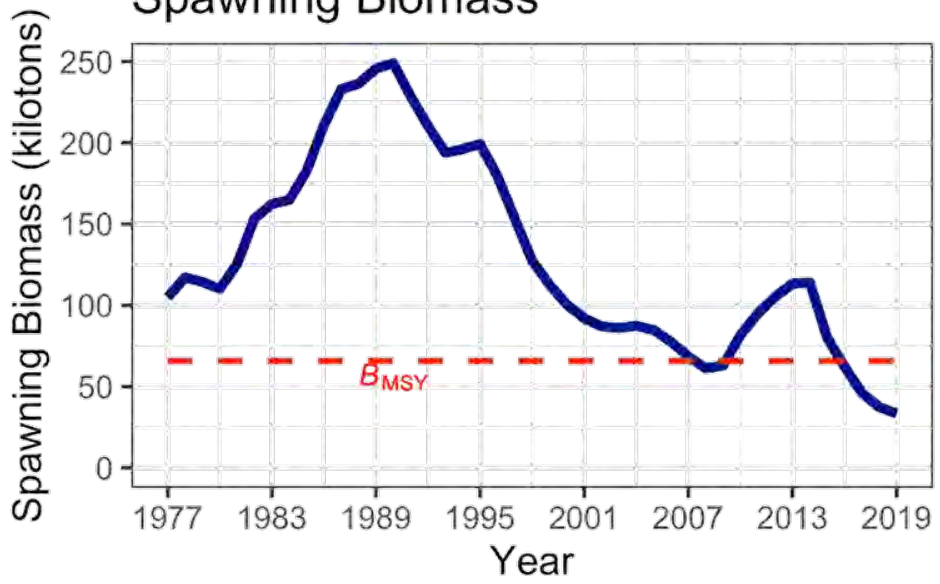
Total Catch



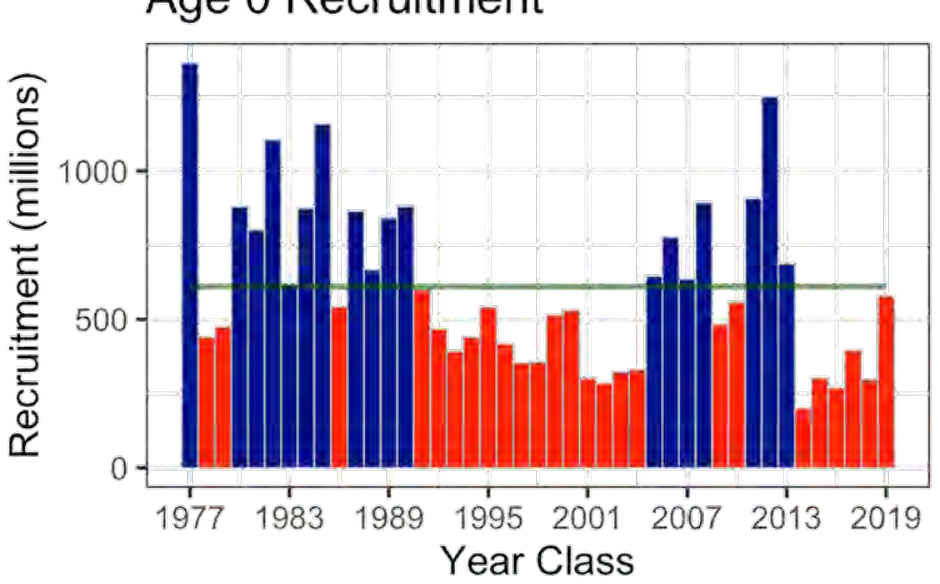
Total Biomass



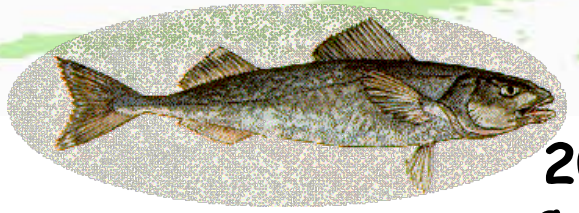
Spawning Biomass



Age 0 Recruitment



3. Sablefish



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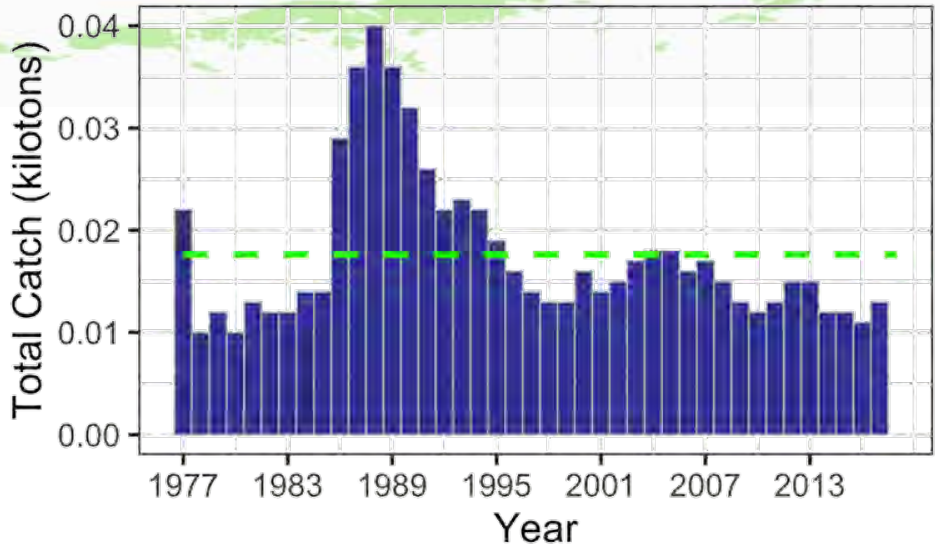
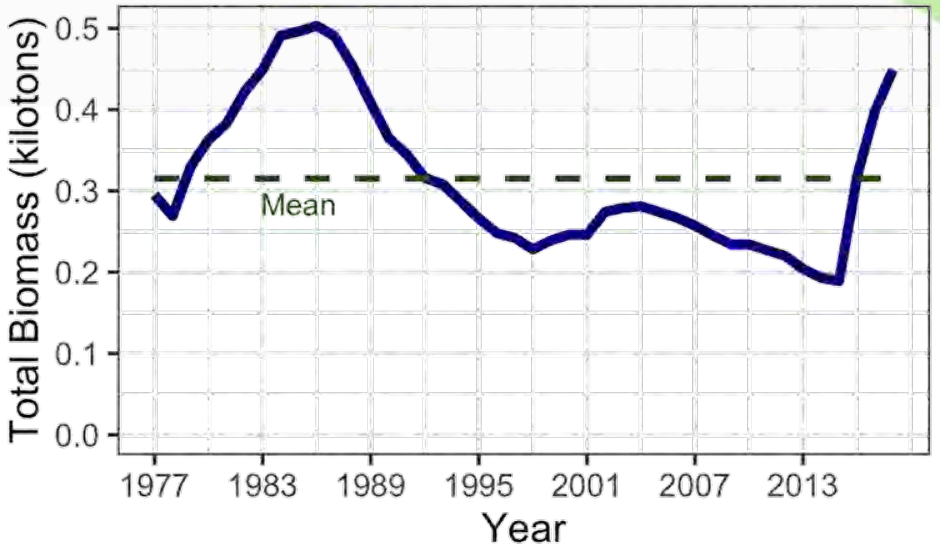
2018

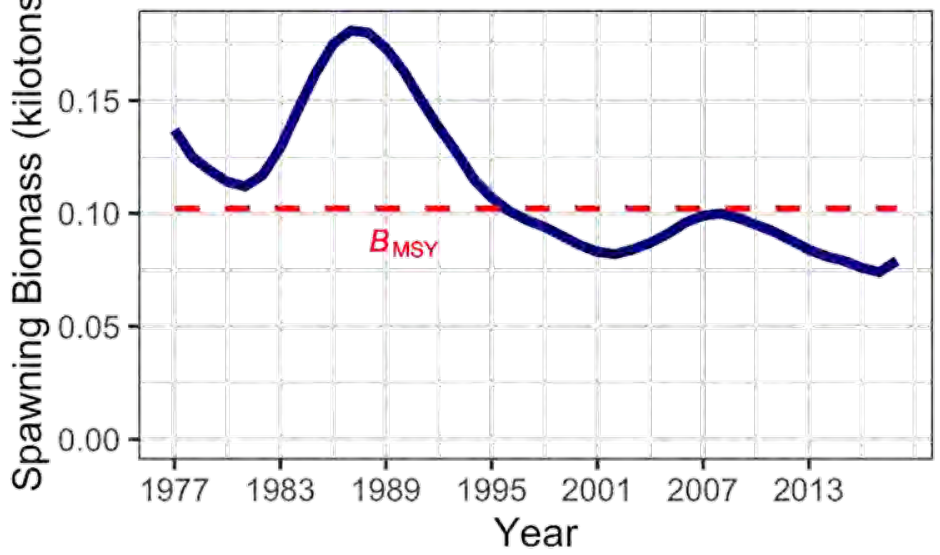
Total Catch



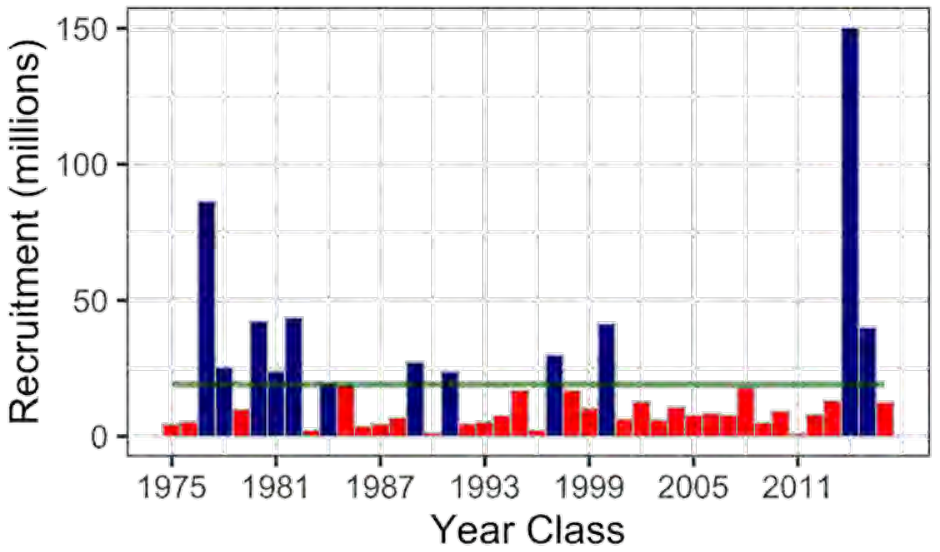
Total Biomass



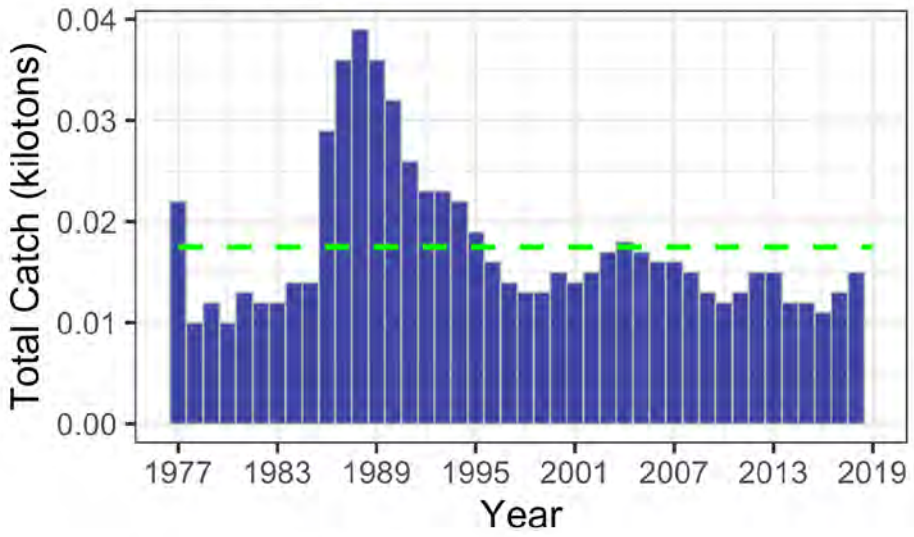
Spawning Biomass

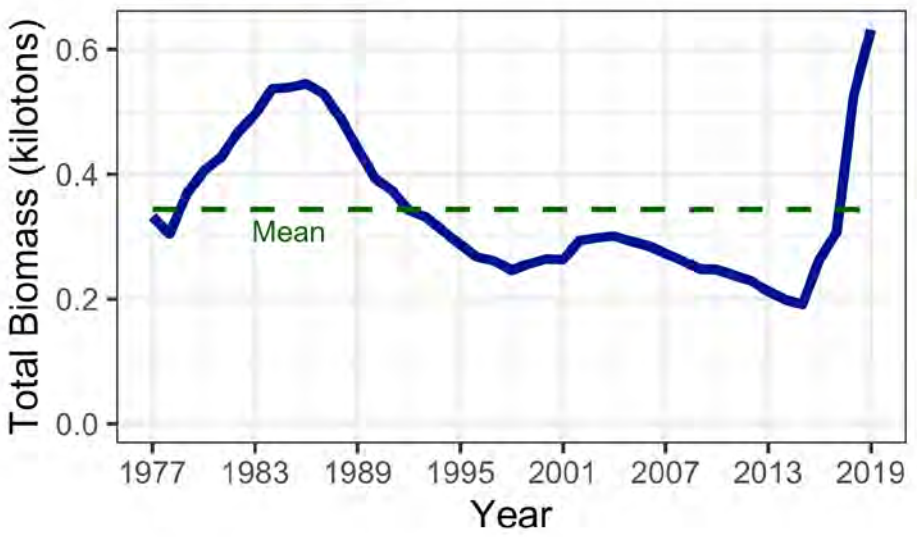


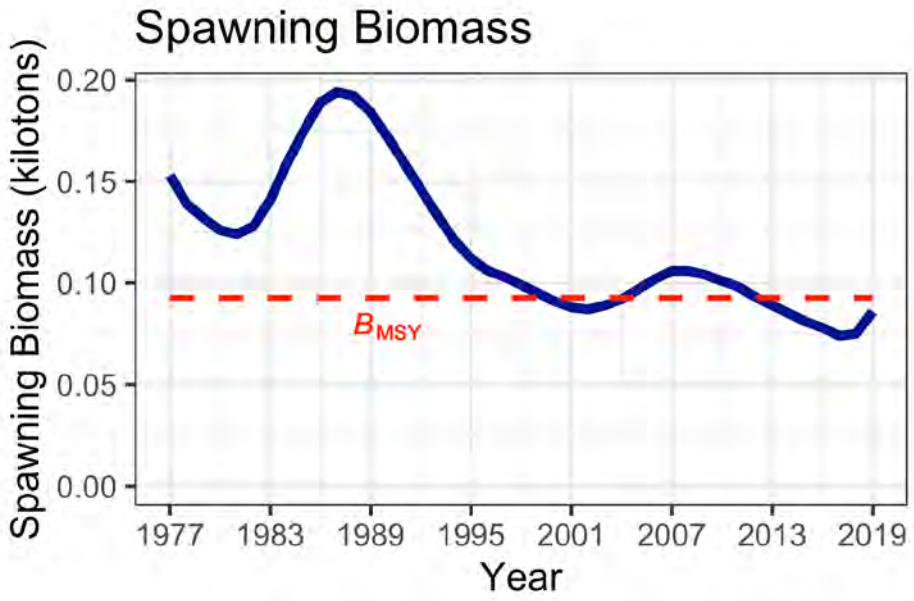
Age 2 Recruitment

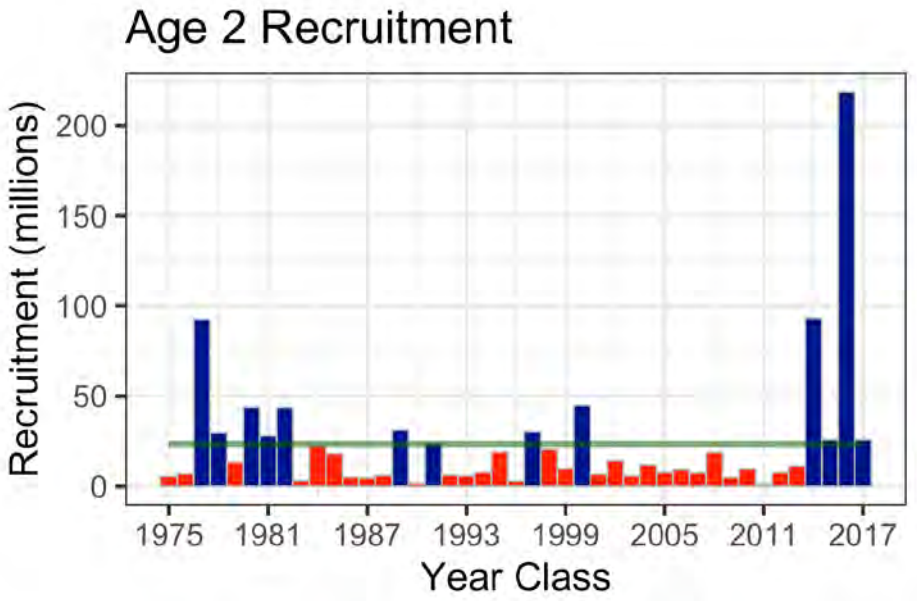


AK Sablefish

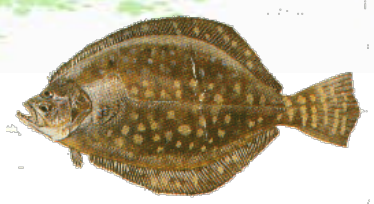








Flatfish ABC Summary



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Total	209,982	509,507	463,466	down 46,041 (9%)

Flatfish ABC's

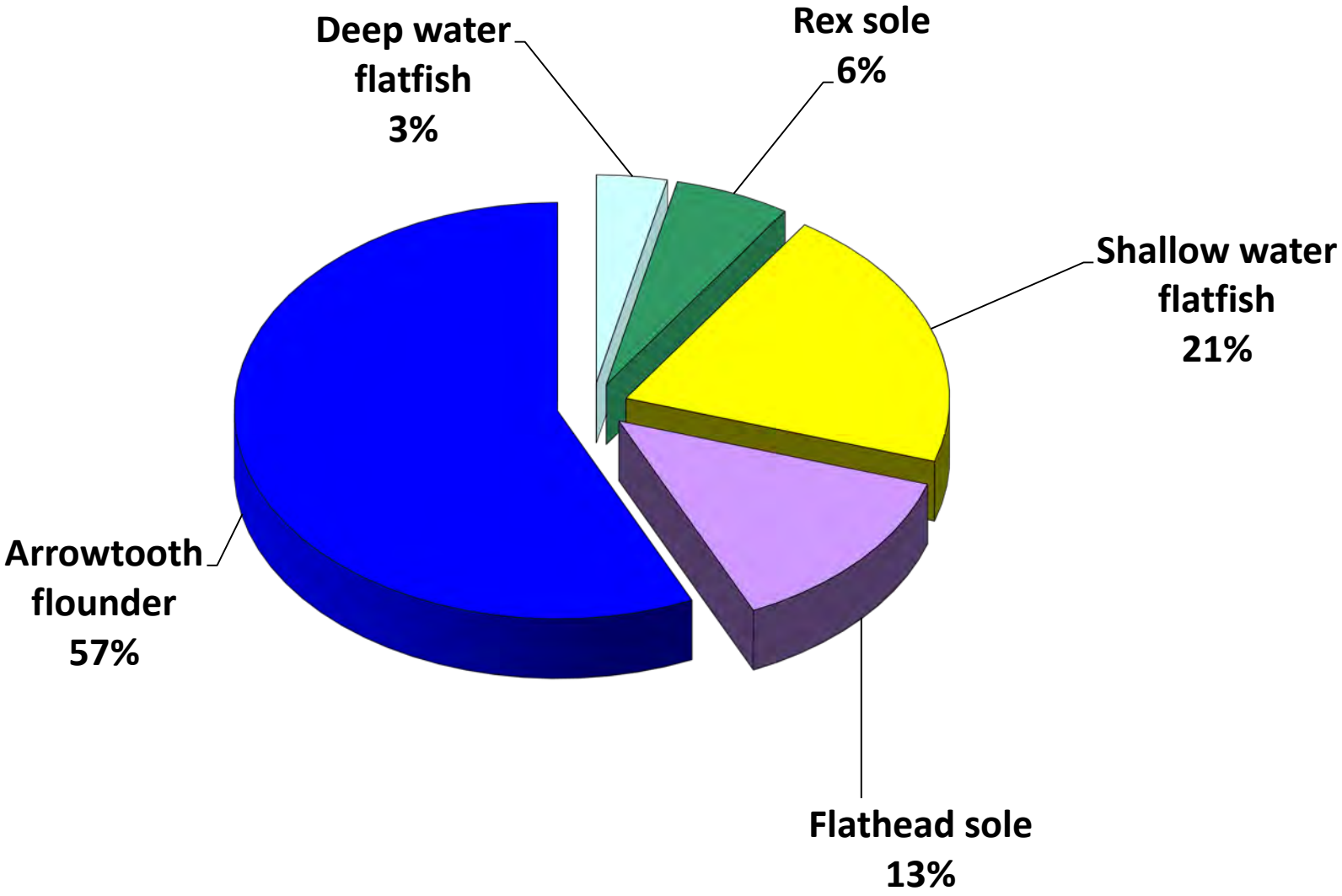
Species	2019 ABC	2020 ABC	Change
Shallow water flatfish	55,587	55,463	down 124 (0%)
Rex sole	14,692	14,878	up 186 (1%)
Deep water flatfish	9,501	6,030	down 3,471 (37%)
Flathead sole	36,782	38,196	up 1,414 (4%)
Arrowtooth flounder	145,841	128,060	down 17,781 (12%)
Subtotal	262,403	242,627	down 19,776 (8%)
Subtotal (without ATF)	116,562	114,567	down 1,995 (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

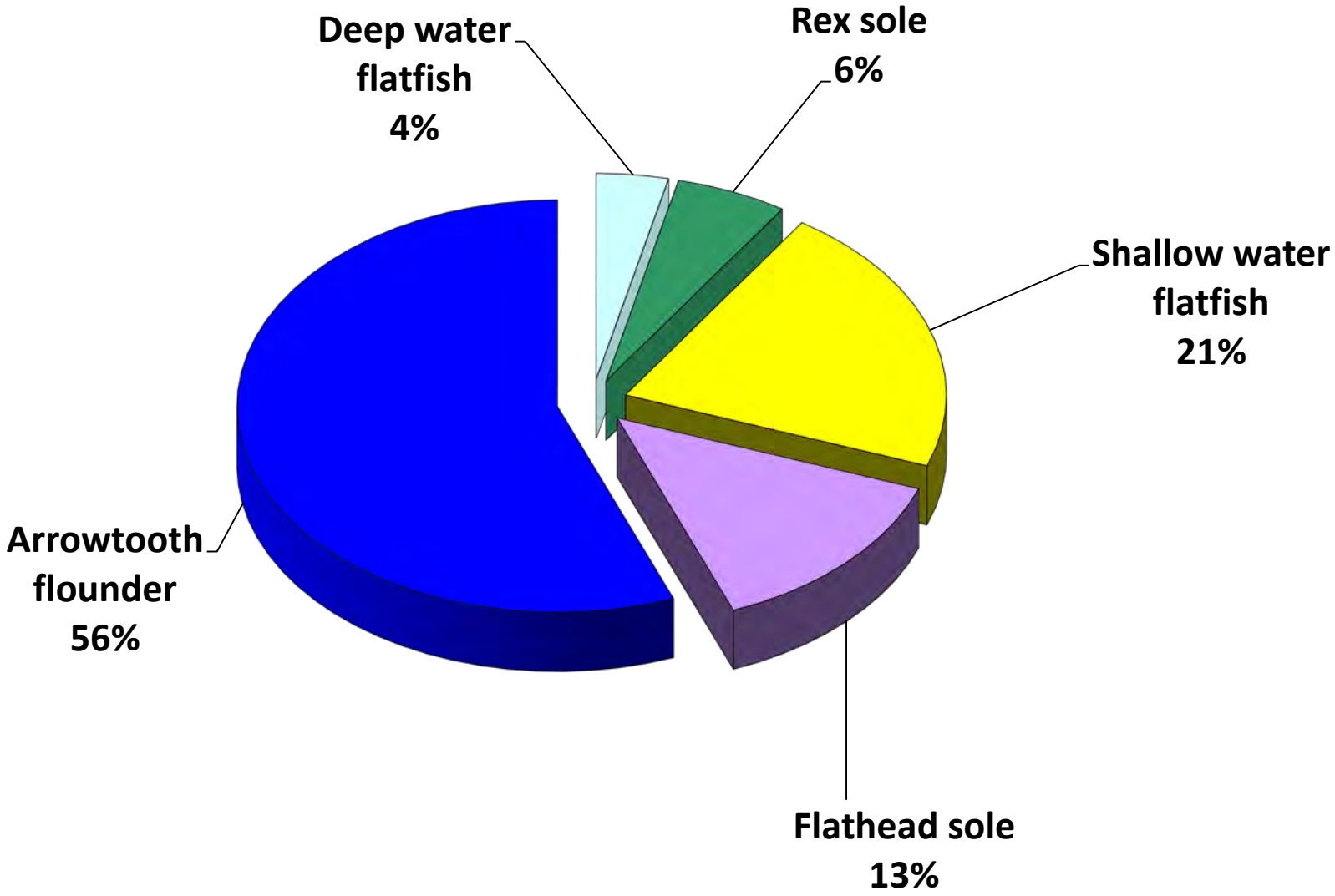
265,657 t combined



260,887

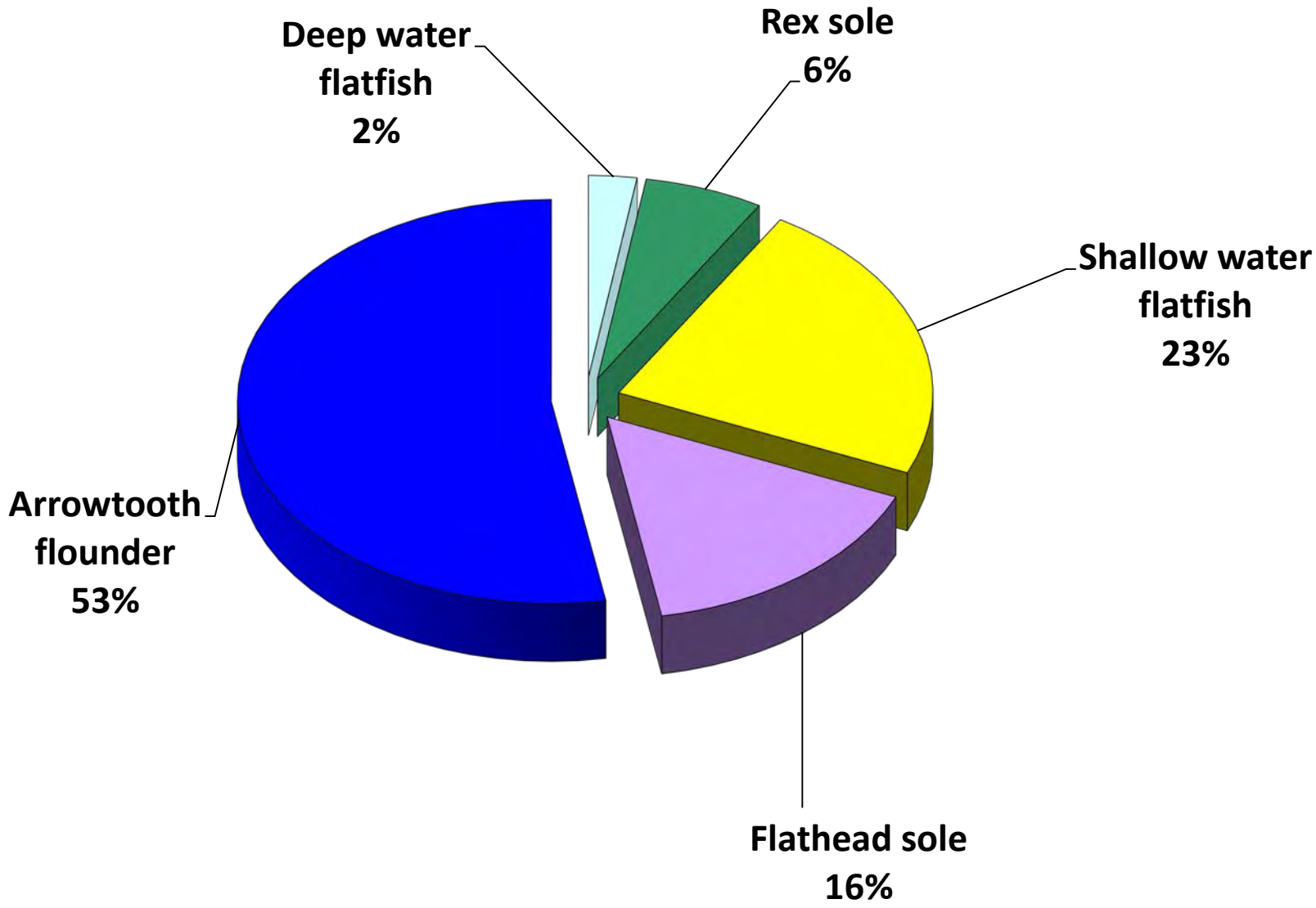
Flatfish 2019 ABC's

260,887 t combined



Flatfish 2020 ABC's

242,627 t combined



General comments on flatfish assessments

- Lightly exploited
- Analytical developments:
  - Dover and flathead sole models full in 2019

    Stock Synthesis modeling platform (SS3) application

Flatfish ABC's

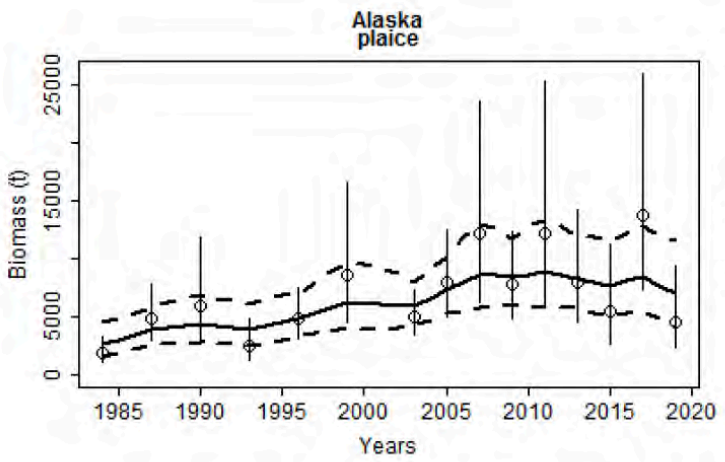
Species	2019 ABC	2020 ABC	Change
Shallow water flatfish	55,587	55,463	down 124 (0%)
Rex sole	14,692	14,878	up 186 (1%)
Deep water flatfish	9,501	6,030	down 3,471 (37%)
Flathead sole	36,782	38,196	up 1,414 (4%)
Arrowtooth flounder	145,841	128,060	down 17,781 (12%)
Subtotal	262,403	242,627	down 19,776 (8%)
Subtotal (without ATF)	116,562	114,567	down 1,995 (2%)

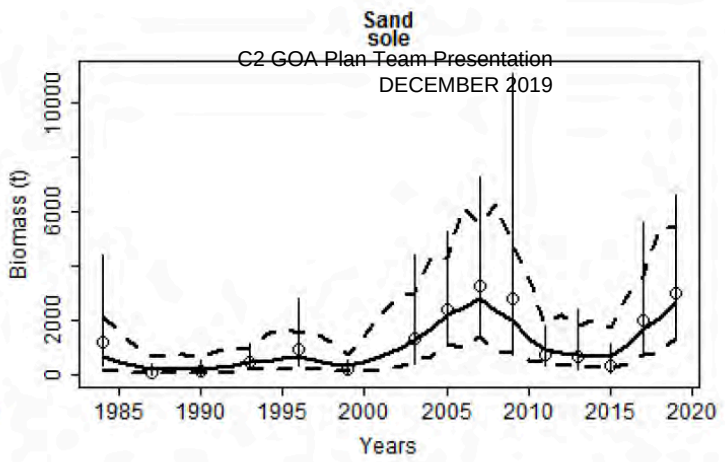
Shallow water flats: N and S rock sole Tier 3, others Tier 5

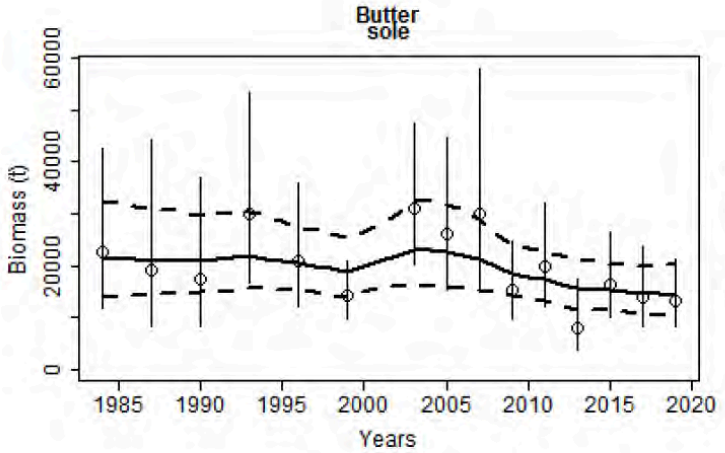
4. Shallow-water flatfish

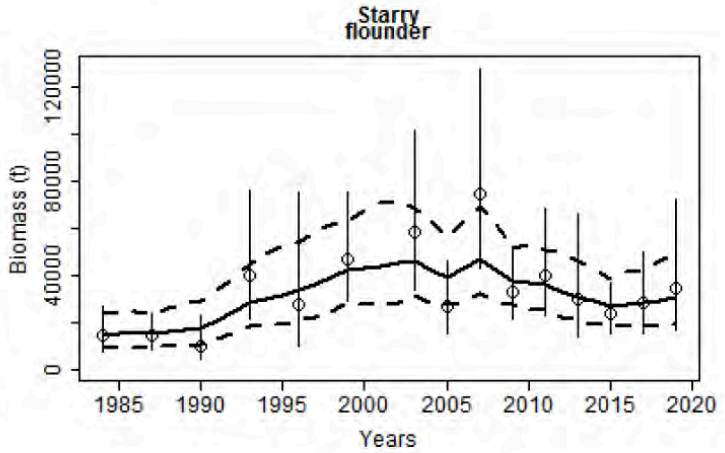
Partial assessment

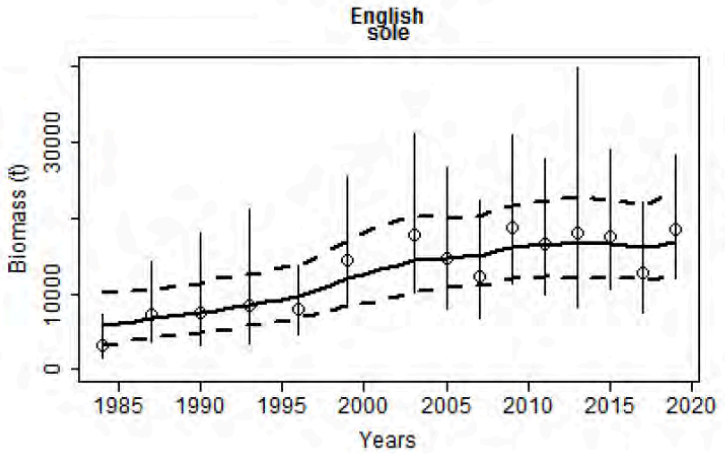
- 2019 GOA survey biomass down 7% for southern rock sole and down 28% for northern rock sole

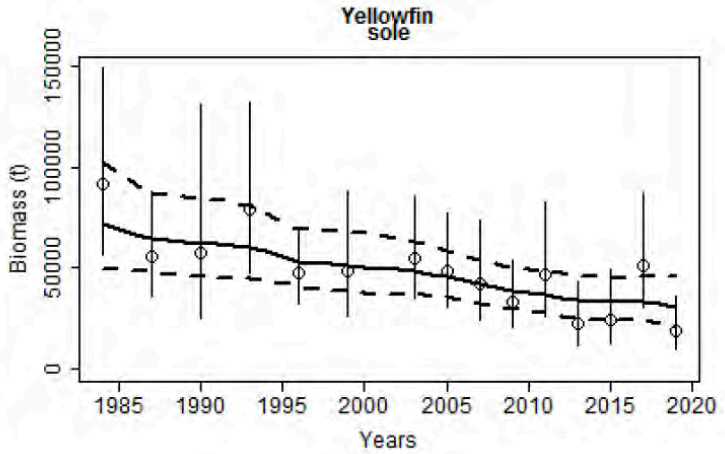








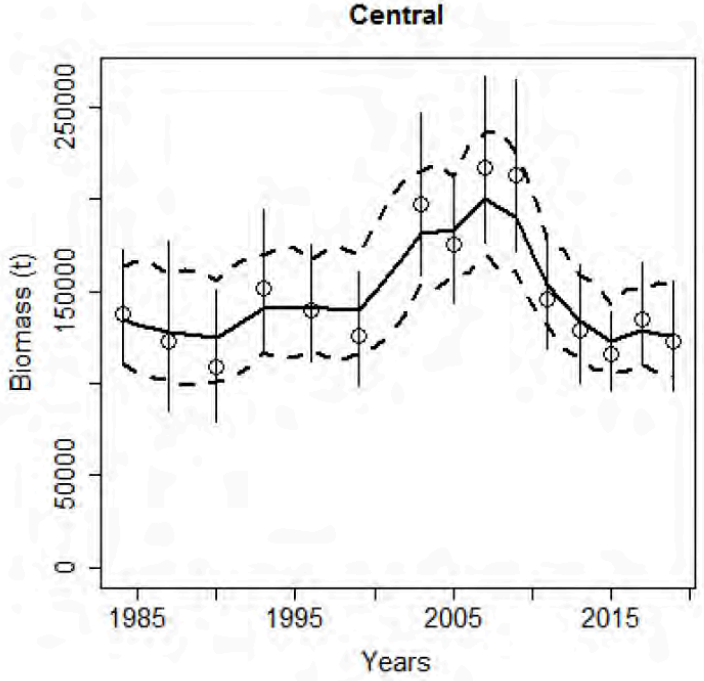


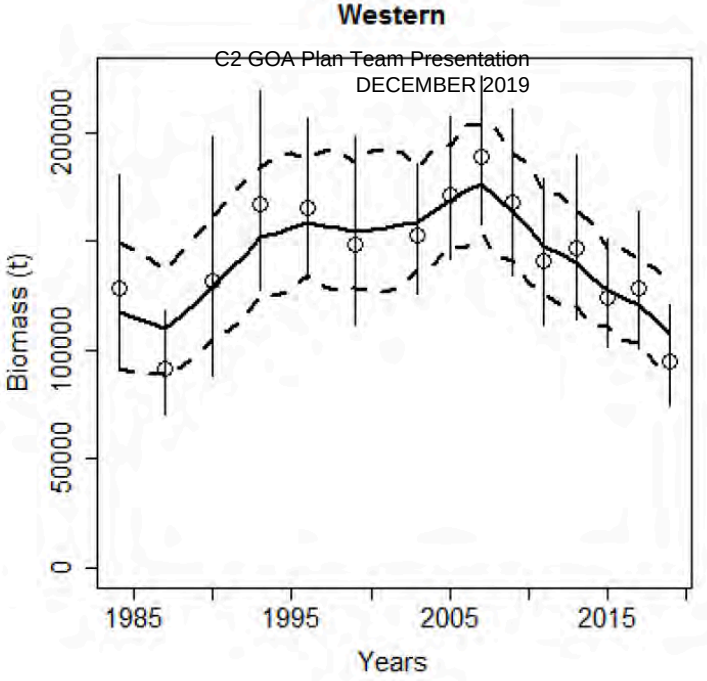


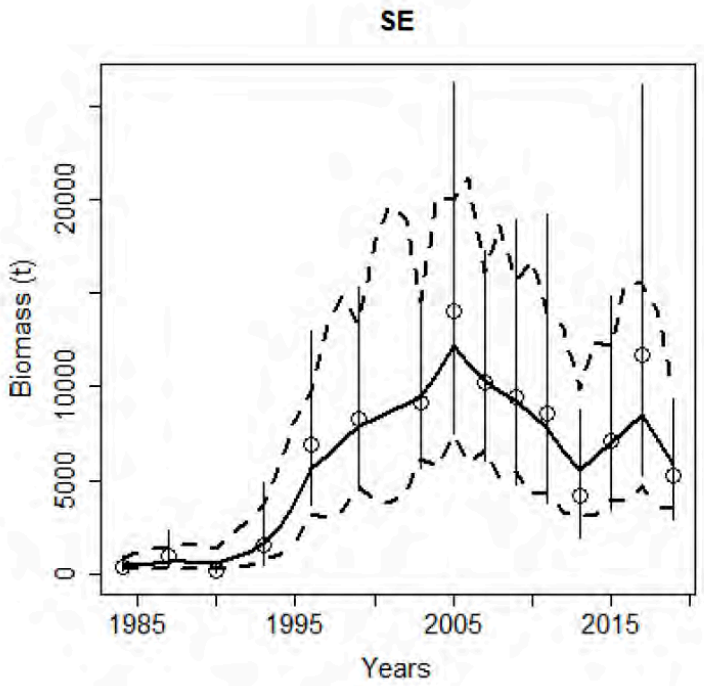
4. Shallow-water flatfish

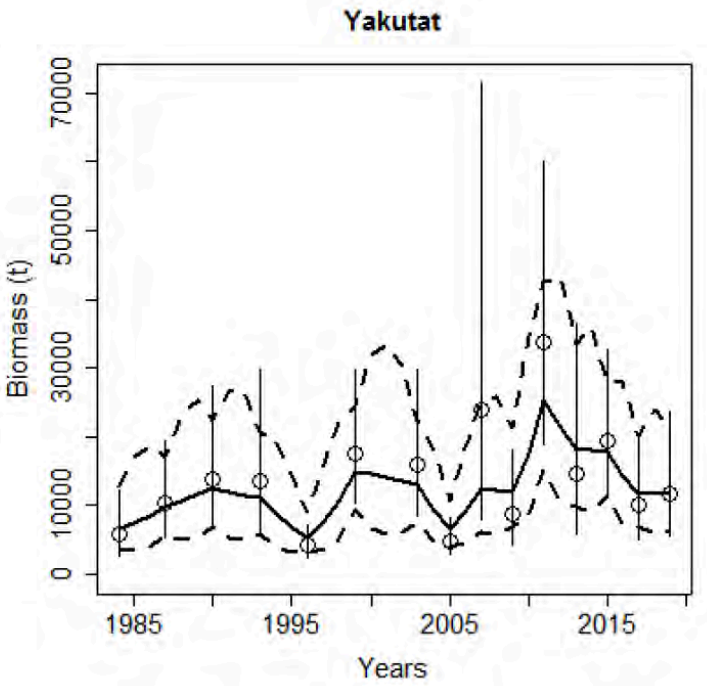
Partial assessment

- Apportionments re-run

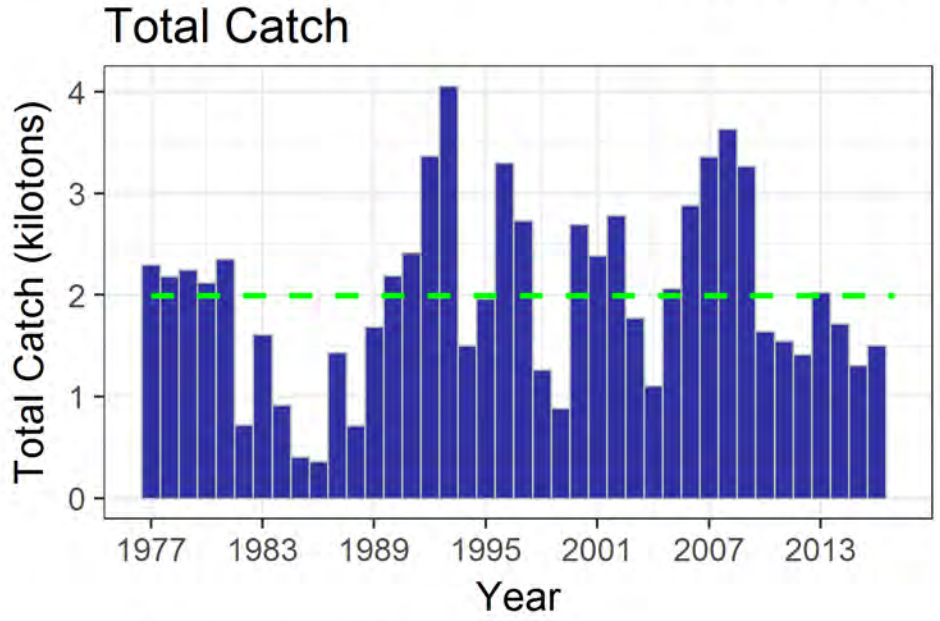


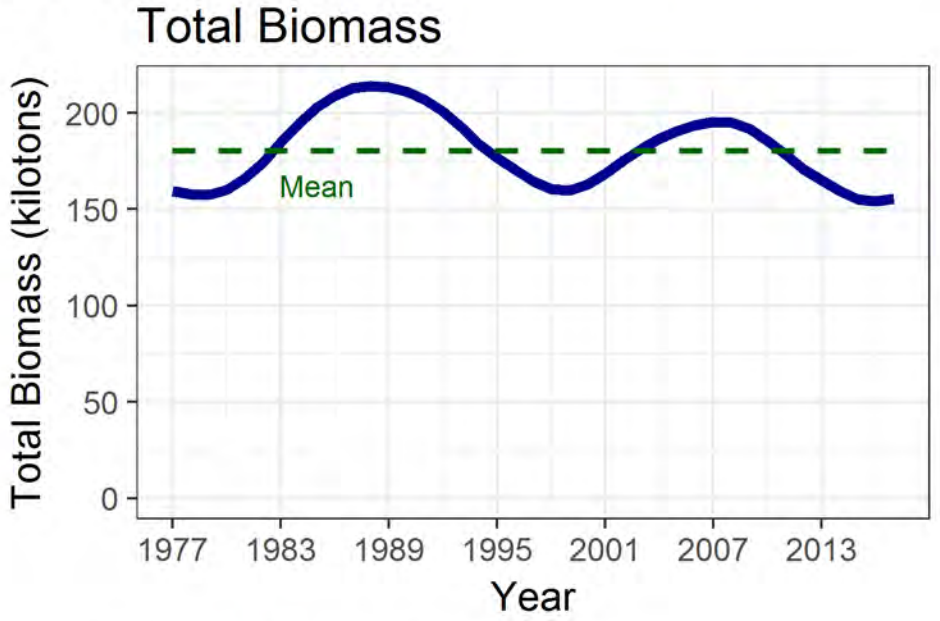


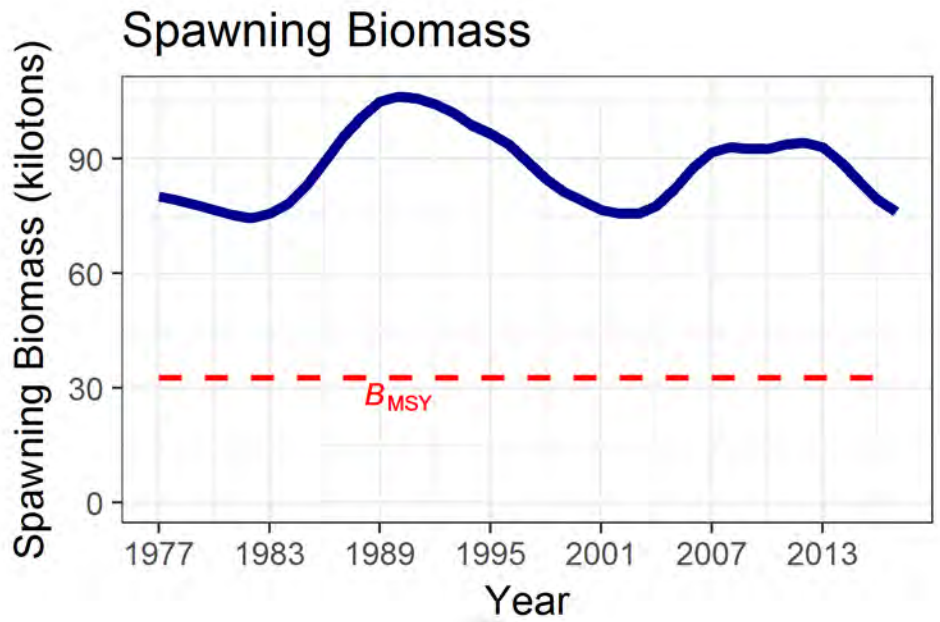


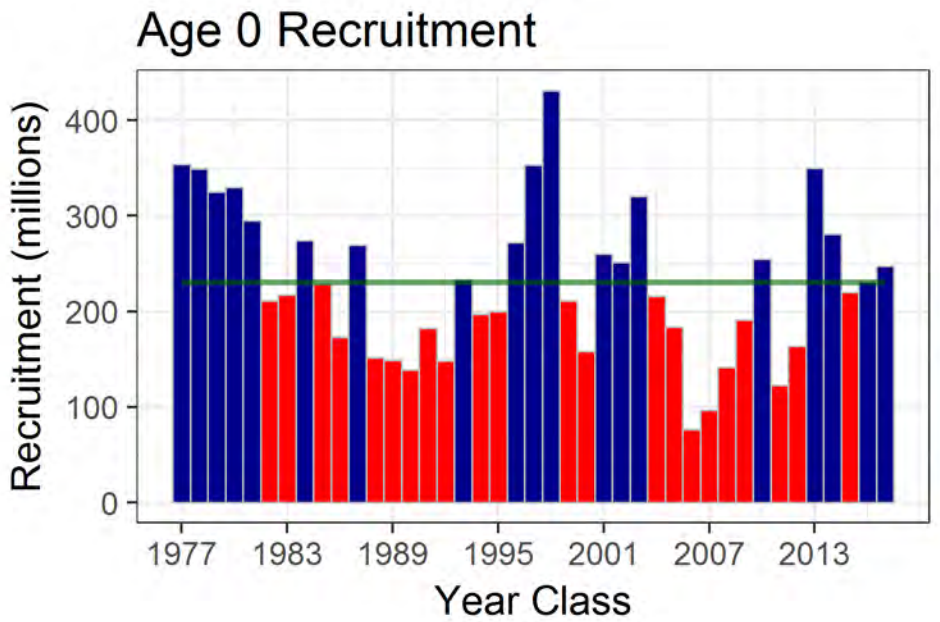


GOA Southern Rock Sole

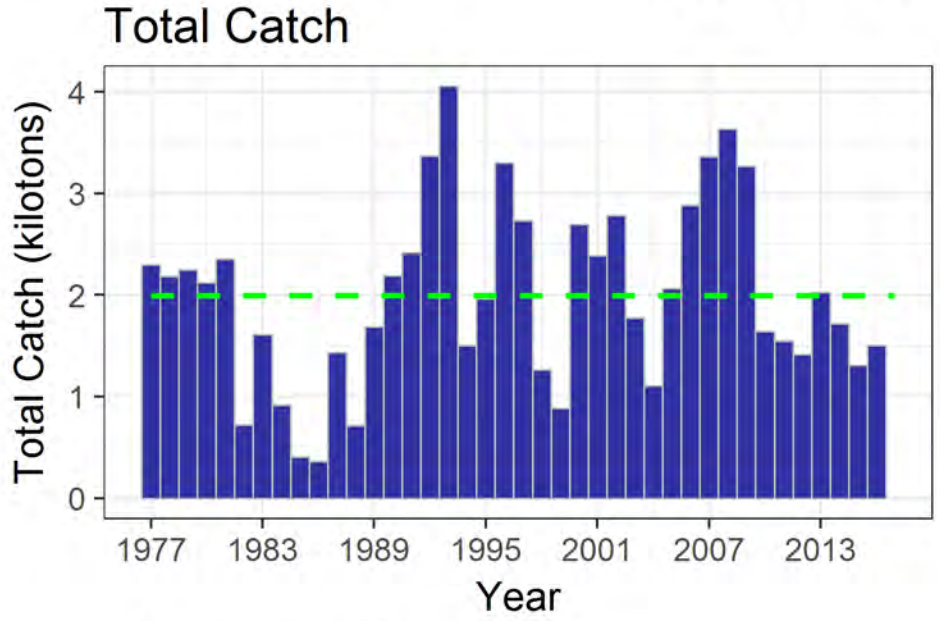


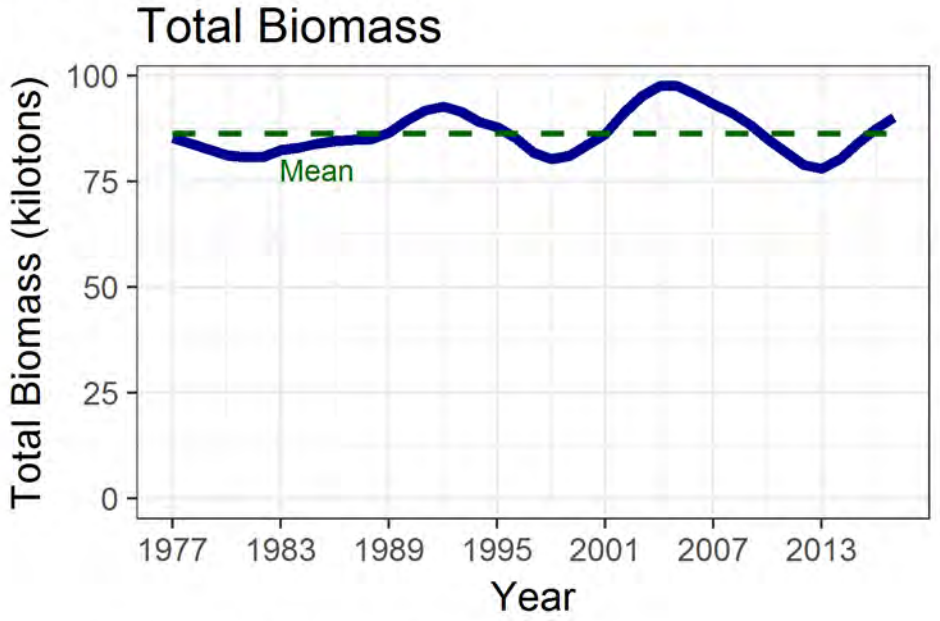


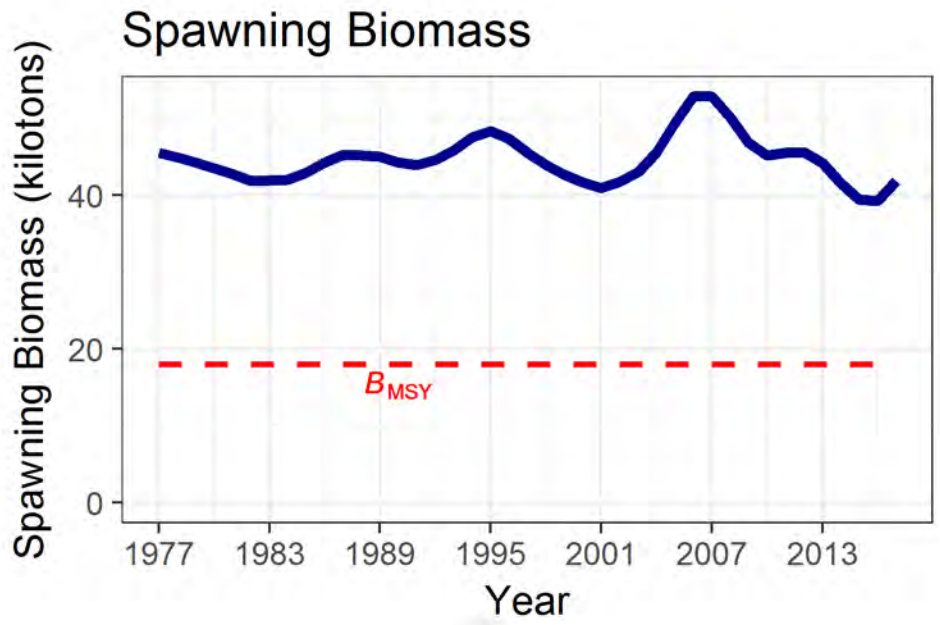


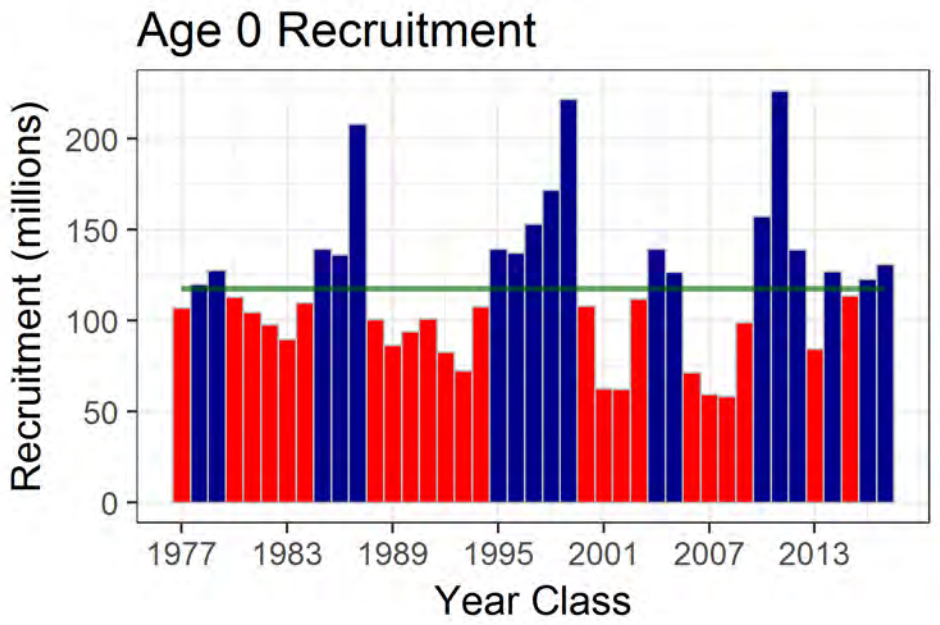


GOA Northern Rock Sole









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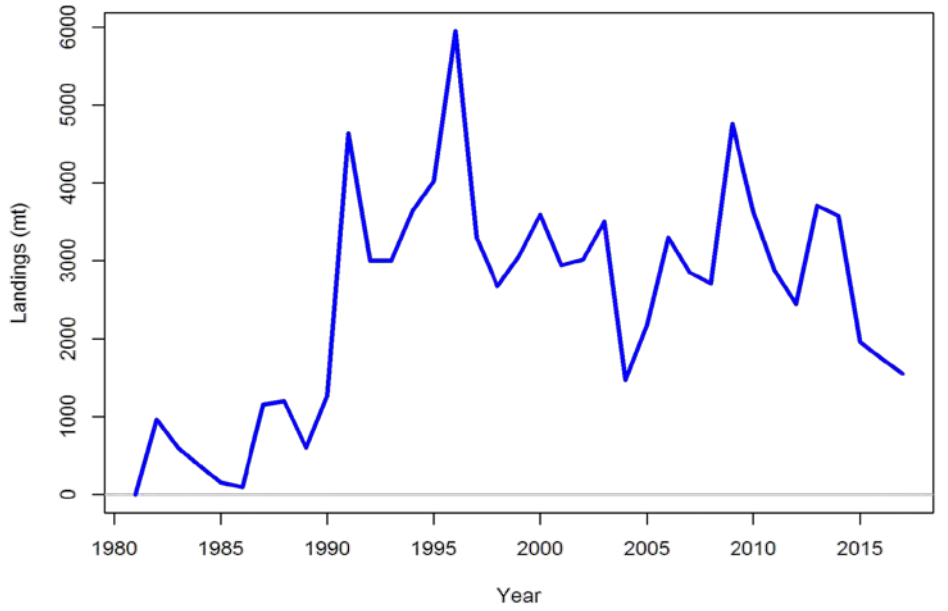
Deep-water ABC from Dover assessment Tier 3 + others Tier 6

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

6. Rex sole

Partial Assessment, Tier 3a

- Projections done separately for the Western/Central region and the Eastern region
  - Done to account for differing growth patterns in these areas
- 2019 survey biomass 90,414 t
  - Down ~8% from 2017 (97,720 t)
- Apportionment **updated** using random effects model including 2019 survey biomass
- Catch below ABC and catch to biomass ratio low



Catch

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

5. Deepwater flatfish

Full assessment

CIE review done in March 2019

Responses presented at September Team meeting

What is the deepwater flatfish complex?

Historically:

- Dover
- Greenland turbot
- Deepsea sole
  (Absent in AKRO CAS)
- Unidentified

Since 2011 AK Regional Office Includes:

- Dover
- Greenland turbot
- **Kamchatka flounder**

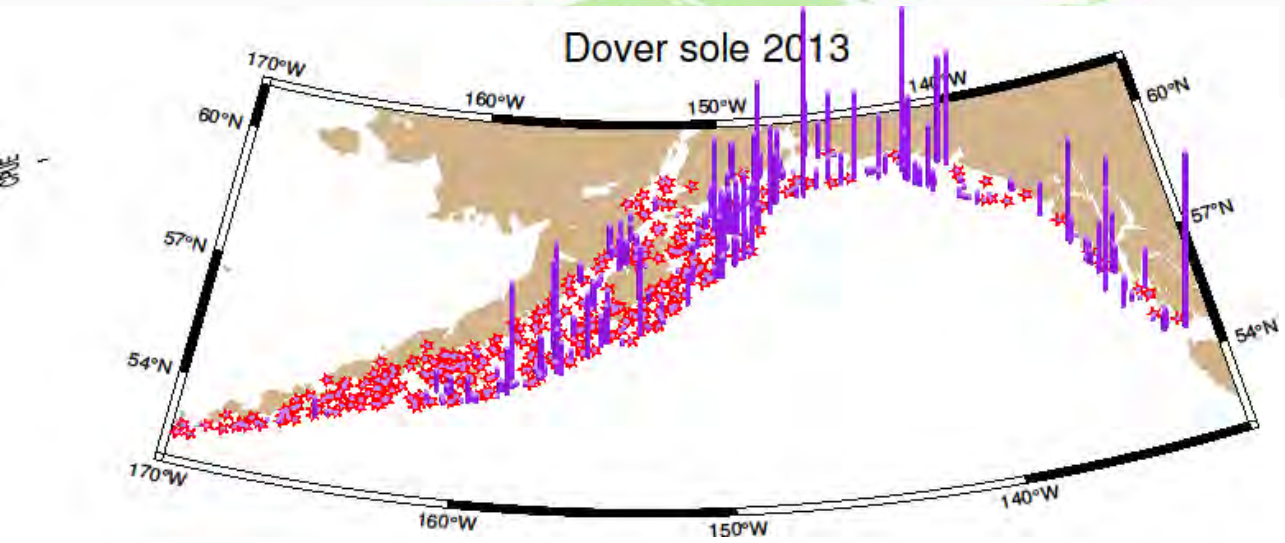
Deepwater flatfish

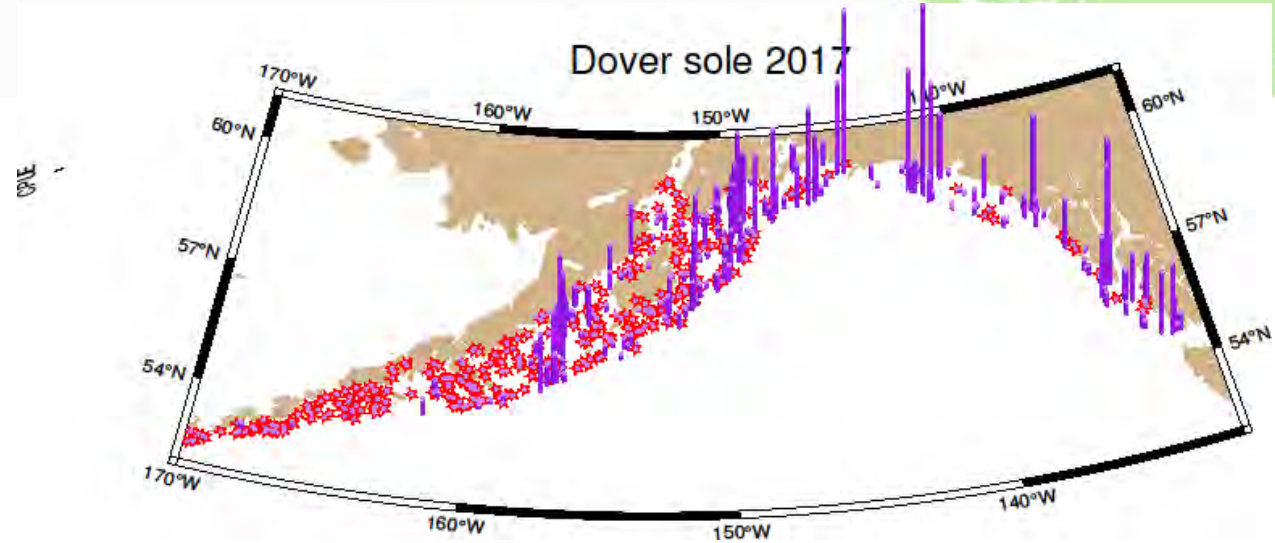
Catch by species for the deepwater flatfish complex

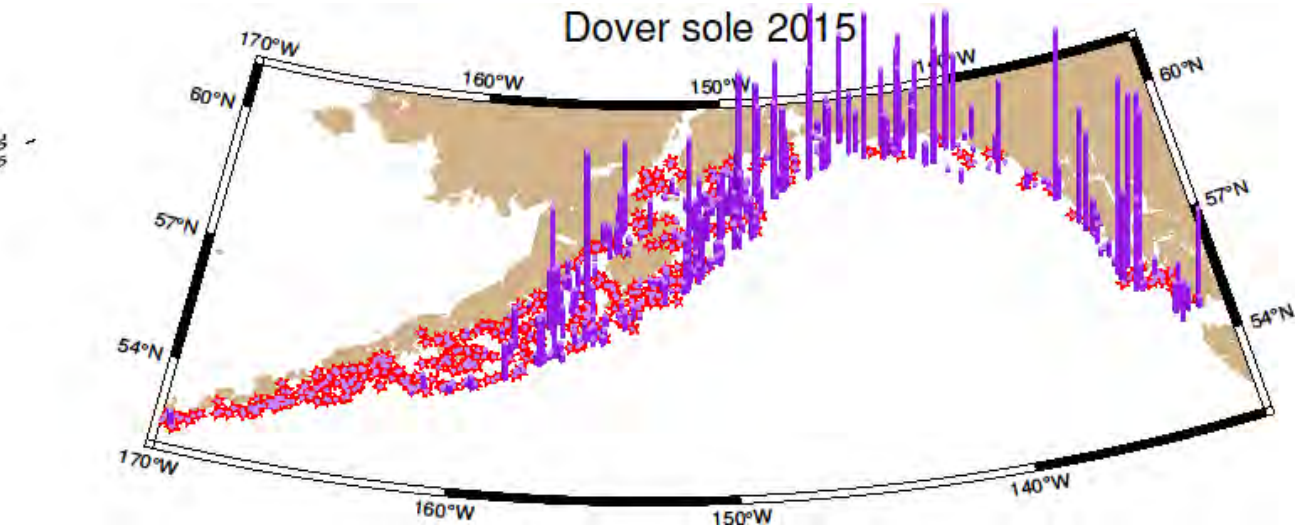
Year	Greenland turbot	Dover sole	Unidentified	Total
1978	51	827		878
1979	24	530		554
1980	57	570		627
1981	8	457		465
1982	23	457		480
1983	145	354		499
1984	18	132		150
1985	0	43		43
1986	0	23		23
1987	44	56		100
1988	256	1,087		1,343
1989	56	1,521		1,577
1990	0	2,348		2,348
1991			10,196	10,196
1992			8,497	8,497
1993	19	1,869	1,935	6,706
1994	3	2,538	537	3,078
1995	78	1,416	721	2,215
1996	6	1,485	704	2,195
1997	3	2,676	996	3,674
1998	10	2,111	168	2,289
1999	6	1,833	447	2,285
2000	5	813	167	985
2001	4	654	146	804
2002	4	411	146	560
2003	3	899	51	902
2004	1	646	41	647
2005	1	378	41	379
2006	10	327	74	337
2007	1	235	47	236
2008	4	517	53	521
2009	0	435	42	435
2010	0	546		546

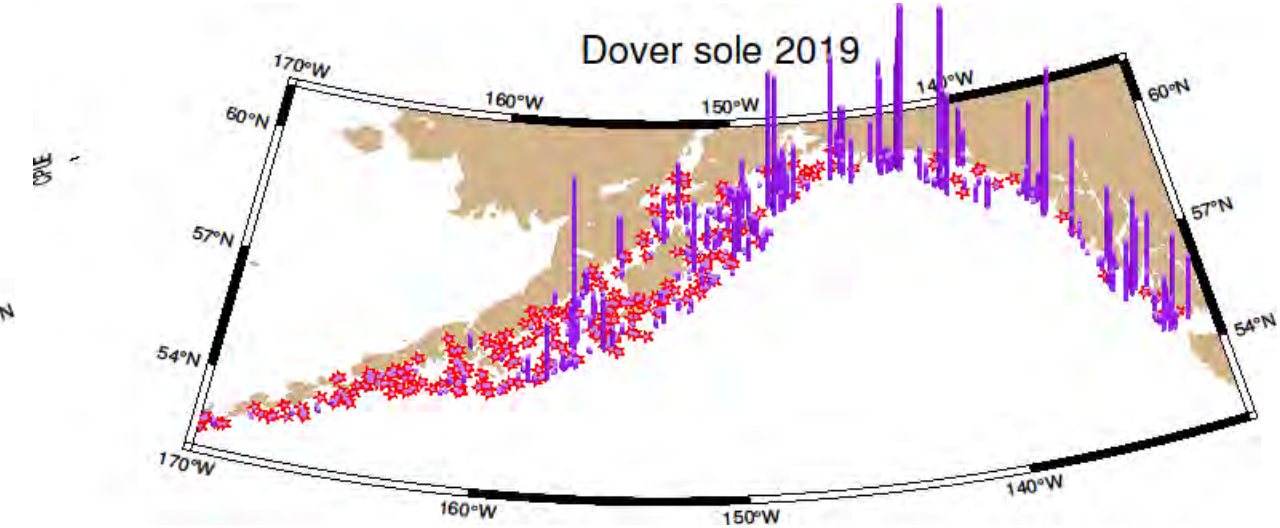
Year	Greenland turbot	Dover sole	Kamchatka flounder	Total
2011	3	453	12	467
2012	0	260	4	265
2013	15	216	15	245
2014	3	284	69	356
2015	26	198	35	259
2016	4	231	5	240
2017	8	188	67	263
2018	3	144	40	186
2019	9	72	4	86

Dover sole survey cpue



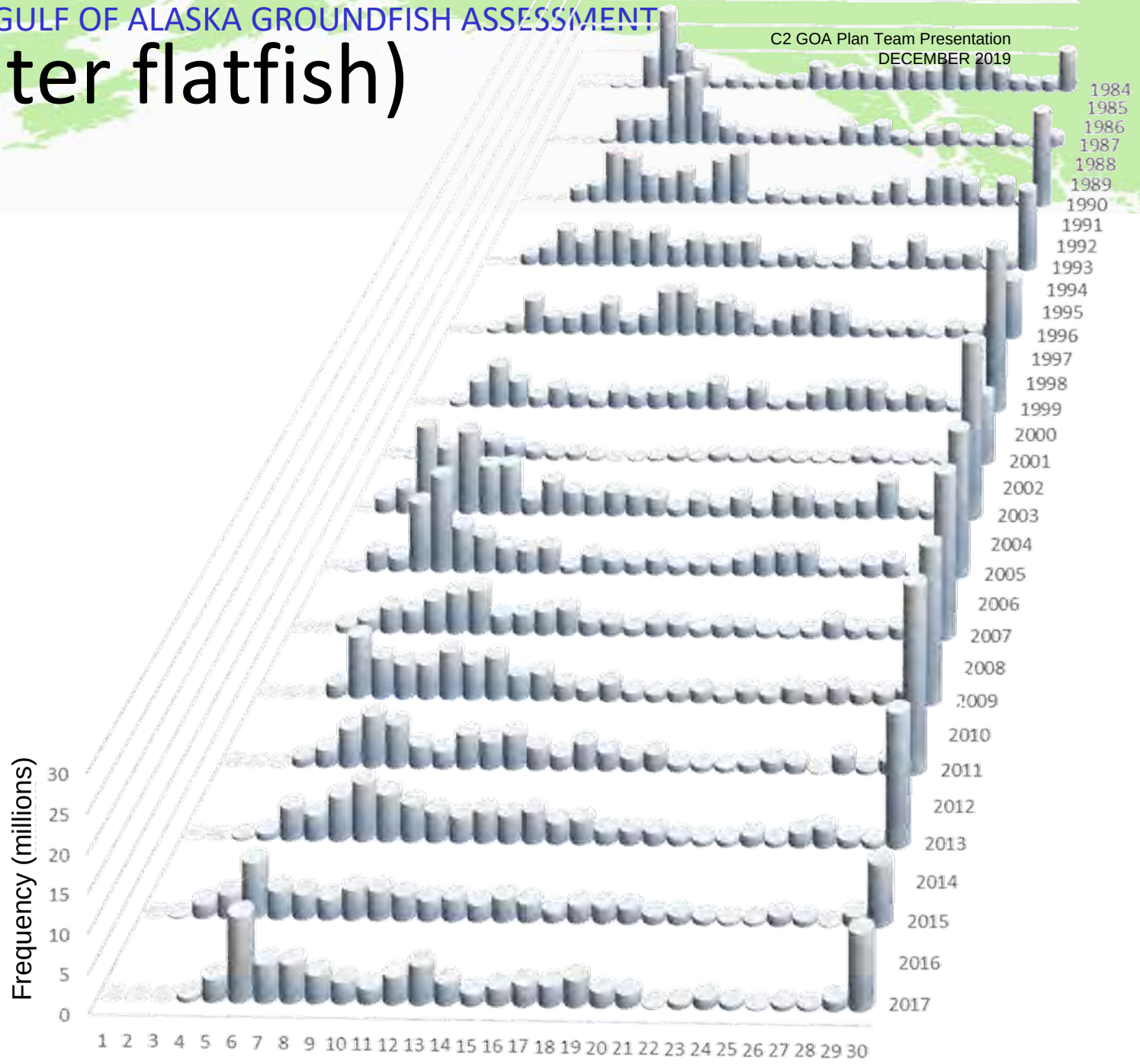






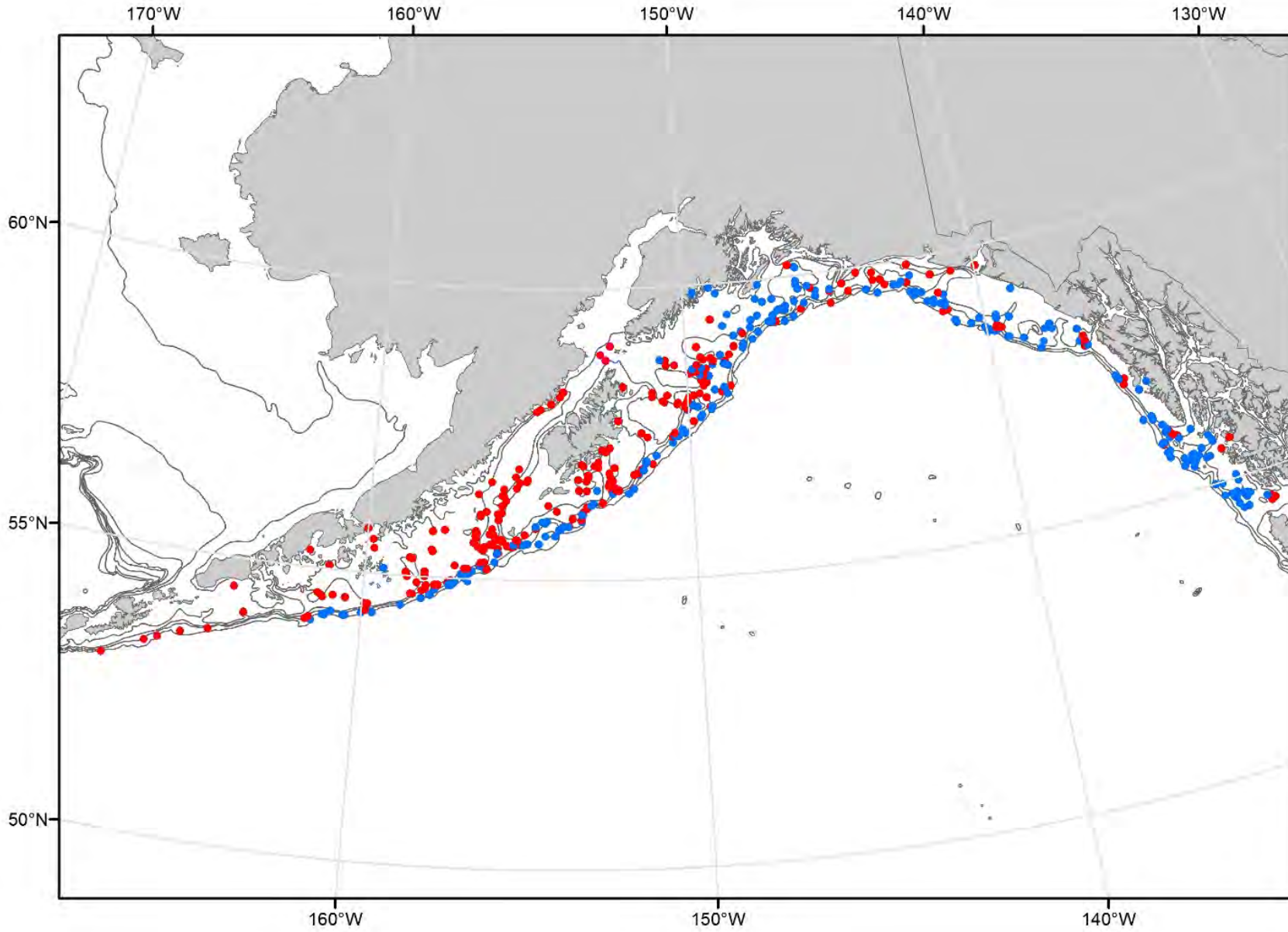
Dover sole (deepwater flatfish)

Distribution of age composition, males and females aggregated



GOA Dover sole growth residuals

- sex-specific von-Bertalanffy fits
- Blue points > 1 std error
- Red points < 1 std error



Dover sole (deepwater flatfish)

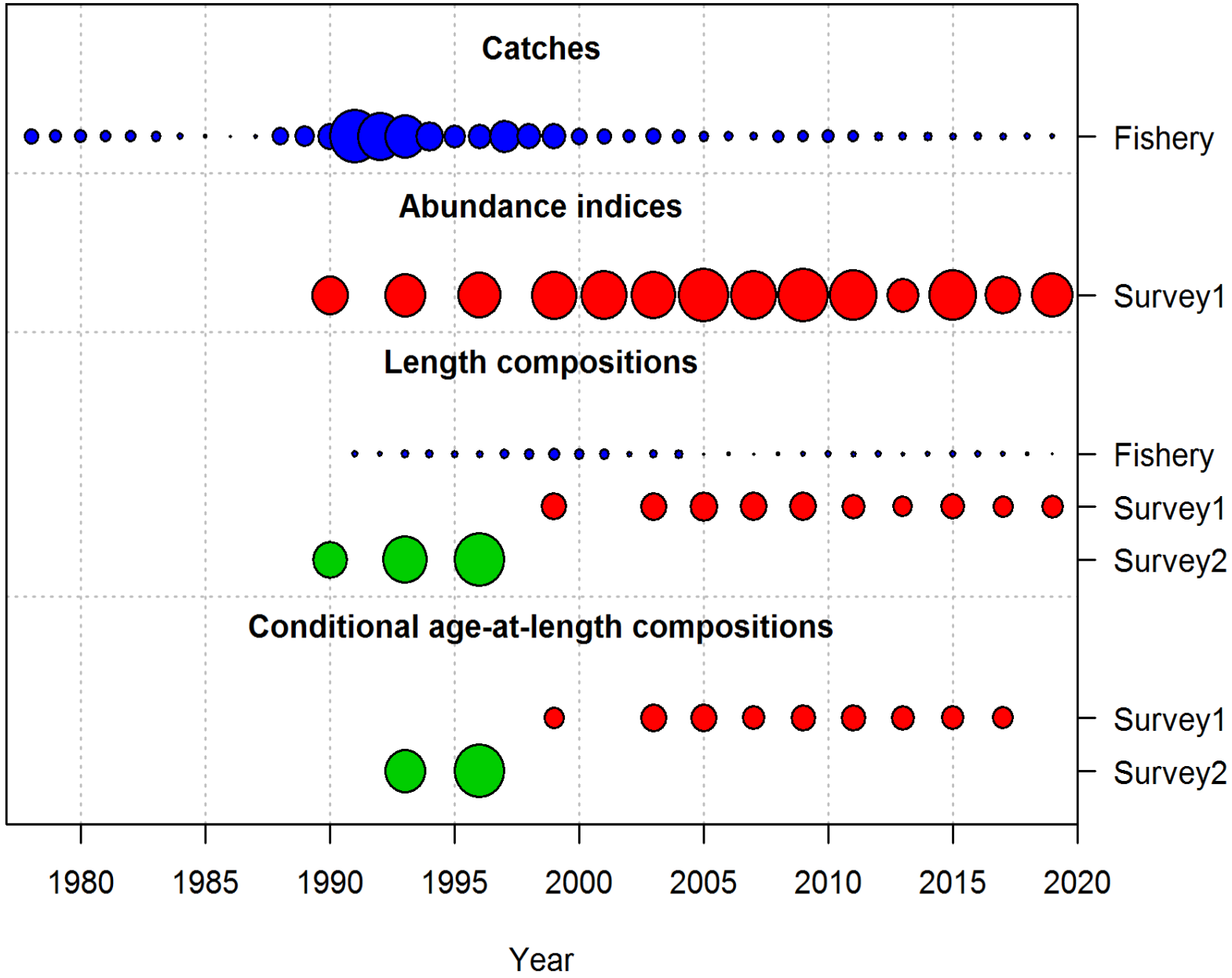
Model work…bridging 2015-2019

"Cleaned-up" version of 2015 model based on CIE and SSC/PT comments

- Disaggregated age 1-3 age data
- Omitted 1984 and 1987 survey data (all)
- Historical F = 0
- Omit early recruitment deviations
- Francis data weighting
- Timing of survey refined to occur in June in model
- Poorly informed selectivity parameters corrected

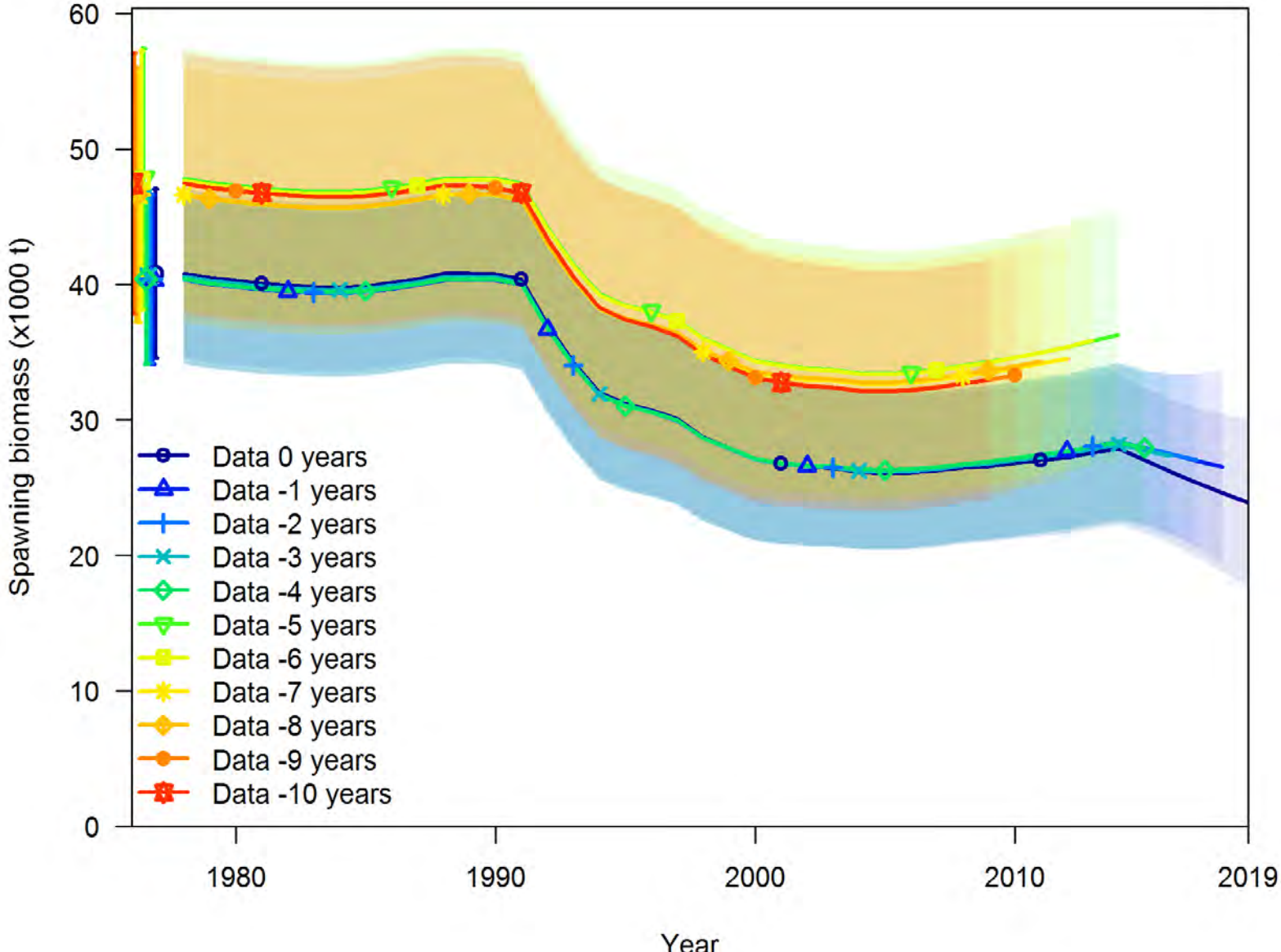
- No parameters on bounds in cleaned-up model

Dover sole (deepwater flatfish)



Dover sole (deepwater flatfish)

Bridging 2015-2019…retrospective pattern poor



Dover sole (deepwater flatfish)

Models

19.0: “Cleaned-up,” but M and q estimated (time-invariant)

=> Low recent survey bio. due to observation error

19.1: M block 2014-2019

=> Low recent survey bio. due to change in natural mortality

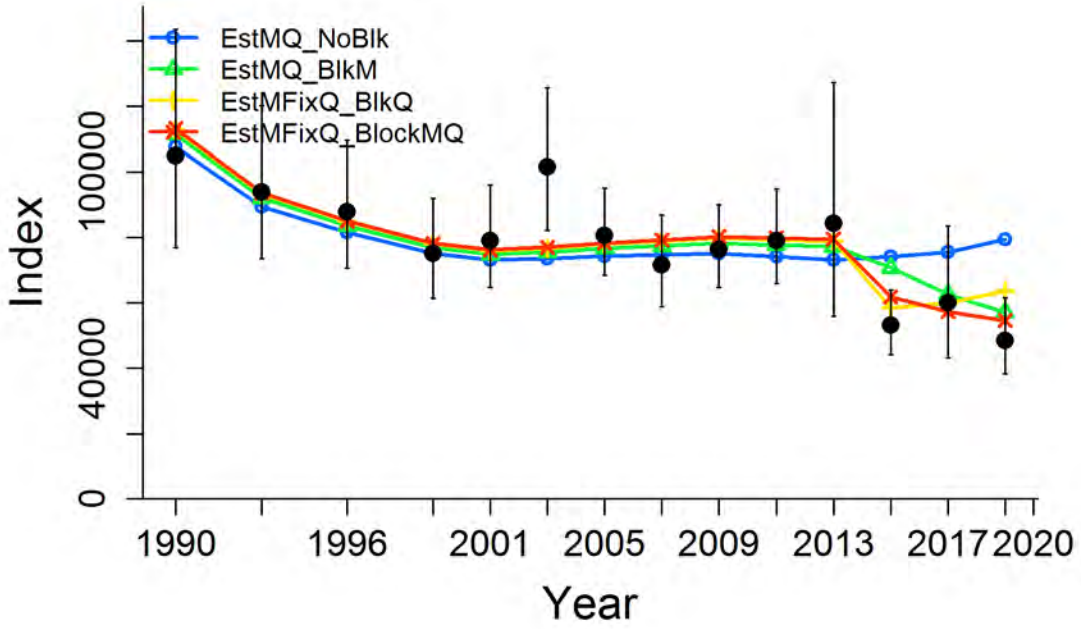
19.2: q fixed at 19.1’s estimate for 1978-2013, q estimated after

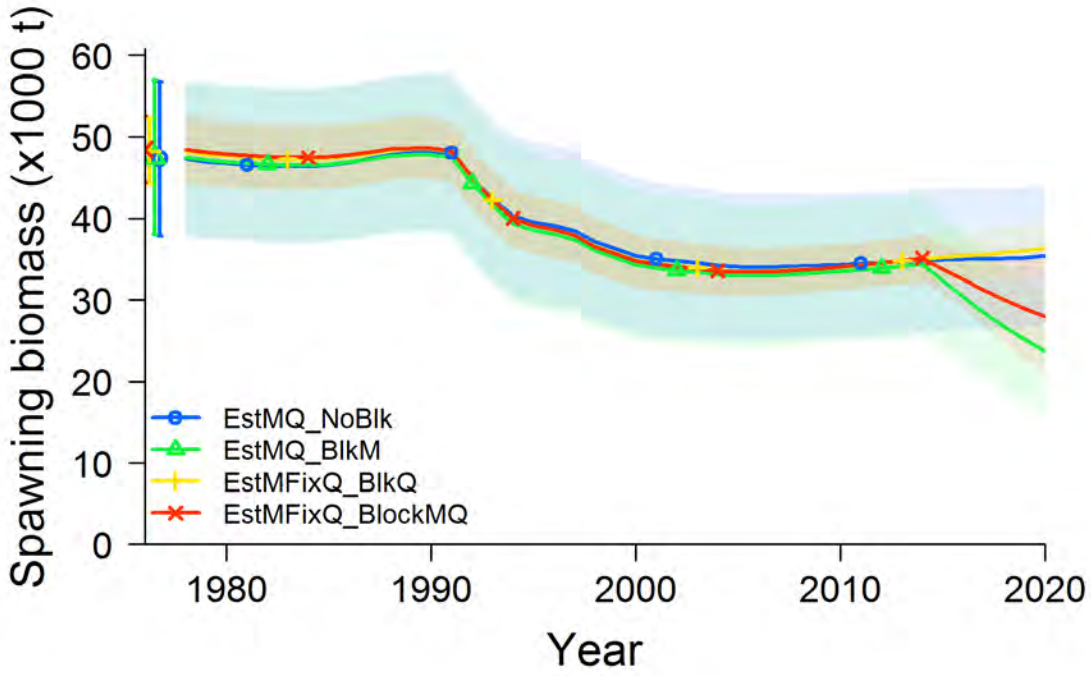
=> Low recent survey bio. due to change in catchability

19.3: As 19.2, M and q both estimated after 2013

=> Low recent survey bio. due to both change in natural mortality and change in catchability

Dover sole (deepwater flatfish)





Executive Summary

- Projection model for Dover sole using output from age-structured model (Model 19.3)
- Used age 3 recruits
- 2019 catch estimated as 2019 current catch up to Oct 19 + 5-yr average Oct 19-Dec 31 catch
- 2020-2021 catch estimated as 2014-2018 average catch for Dover sole
- No management definitions for Kamchatka flounder

Species	Quantity	As estimated or *specified last* year for: 2019	2020	As estimated or *recommended this* year for: 2020*	2021*
Dover sole	*M* (natural mortality rate)	0.085	0.085	0.113(f), 0.119(m)	0.113(f), 0.119(m)
	Tier	3a	3a	3a	3a
	Projected total (3+) biomass (t)	145,926	147,001	86,827	84,771
	Projected Female spawning biomass (t)	49,385	49,418	27,935	27,011
	$B_{100\%}$	57,871	57,871	19,032	19,032
	$B_{40\%}$	23,148	23,148	7,613	7,613
	$B_{35\%}$	20,255	20,255	6,661	6,661
	F_{OFL}	0.12	0.12	0.11	0.11
	$maxF_{ABC}$	0.1	0.1	0.09	0.09
	F_{ABC}	0.1	0.1	0.09	0.09
	OFL (t)	11,190	11,337	6,919	6,796
	maxABC (t)	9,318	9,441	5,847	5,743
	ABC (t)	9,318	9,441	5,847	5,743
Greenland turbot	Tier	6	6	6	6
	OFL (t)	238	238	238	238
	maxABC (t)	179	179	179	179
	ABC (t)	179	179	179	179
Deepsea sole	Tier	6	6	6	6
	OFL (t)	6	6	6	6
	maxABC (t)	4	4	4	4
	ABC (t)	4	4	4	4
Deepwater Flatfish Complex	OFL (t)	11,434	11,581	7,163	7,040
	maxABC (t)	9,501	9,624	6,030	5,926
	ABC (t)	9,501	9,624	6,030	5,926
	Status	As determined *last* year for: 2017	2018	As determined *this* year for: 2018	2019
	Overfishing	no	n/a	no	n/a
	Overfished	n/a	no	n/a	no
	Approaching overfished	n/a	no	n/a	no

Area Apportionment (PT chose method in 2016)

- Dover sole proportions from area- and depth-specific random effects models to smooth survey biomass and fill in depth/area gaps
- Greenland turbot and deepsea sole proportions based on average survey biomass for each species since 2001
- ABCs are applied at the complex level

Species	Year	Western	Central	West Yakutat	Southeast	Total
Dover Sole		0.8%	33.3%	36.0%	29.9%	100.0%
	2020	47	1,945	2,104	1,751	5,847
	2021	46	1,911	2,067	1,719	5,743
Greenland Turbot		100.0%	0.0%	0.0%	0.0%	100.0%
	2020	179	0	0	0	179
	2021	179	0	0	0	179
Deepsea Sole		0.7%	72.8%	14.5%	12.0%	100.0%
	2020	0	3	1	0	4
	2021	0	3	1	0	4
Deepwater Flatfish	**2020**	**226**	**1,948**	**2,105**	**1,751**	**6,030**
	2021	**225**	**1,914**	**2,068**	**1,719**	**5,926**

GOA Dover sole / Deepwater flatfish

The Team recommended:

- **Kamchatka flounder be included in the 2021 partial assessment as a Tier 6 species using 2011–2019 maximum catch (69 t) as the OFL.**
  - Maximum catch is more appropriate than average catch based on the high variability and short time series of catch.
- **Examining area apportionment relative to Kamchatka flounder**
  - Are they only in WGOA?
- **That the presentation on VAST and further work on multi-area model be reviewed at the September 2020 Plan Team meetings for consideration in future assessment applications**
  - An appendix was in development this year but was unavailable in time for review

Flatfish ABC's

Species	2019 ABC	2020 ABC	Change
Shallow water flatfish	55,587	55,463	down 124 (0%)
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Deep-water ABC from Dover assessment Tier 3 + others Tier 6

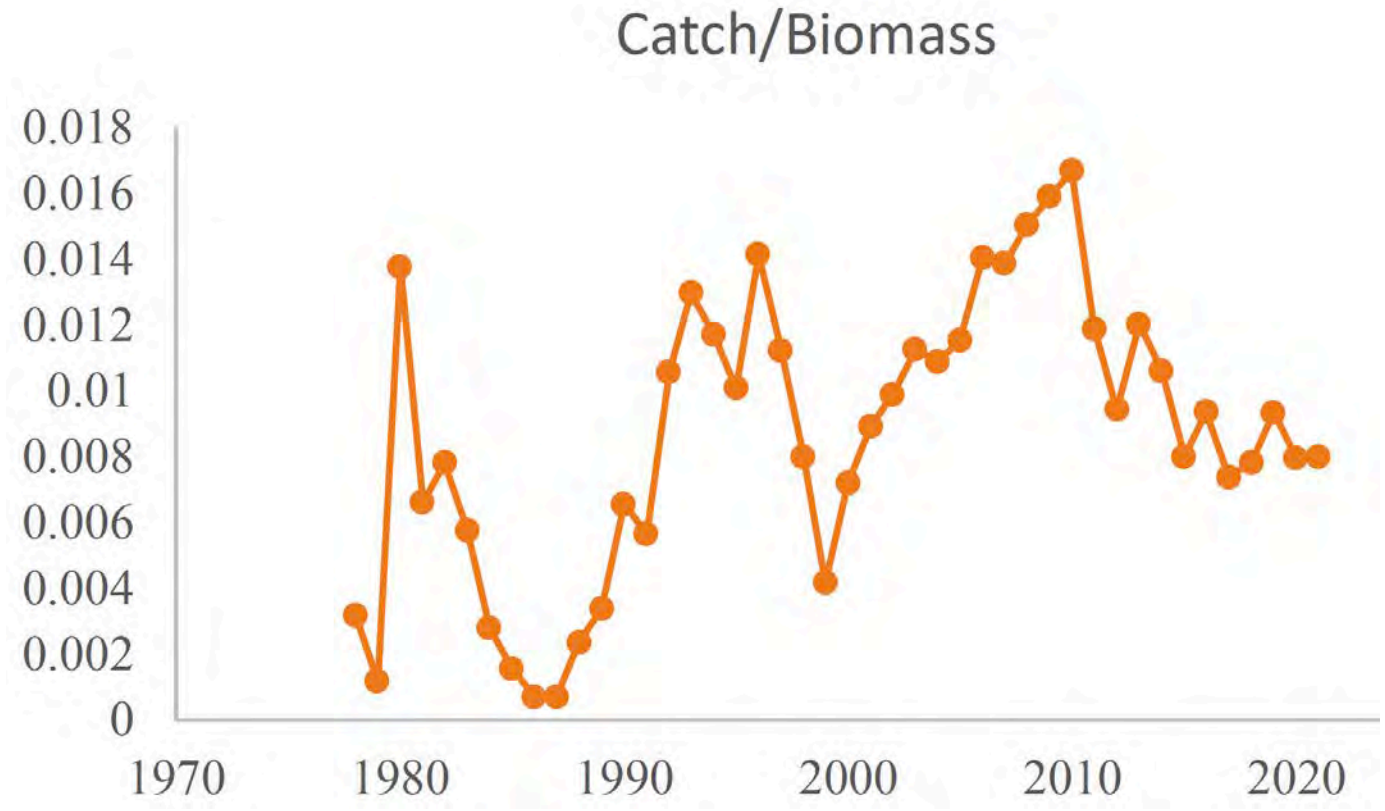
Shallow water flats: N and S rock sole Tier 3, others Tier 5

8. GOA Flathead sole

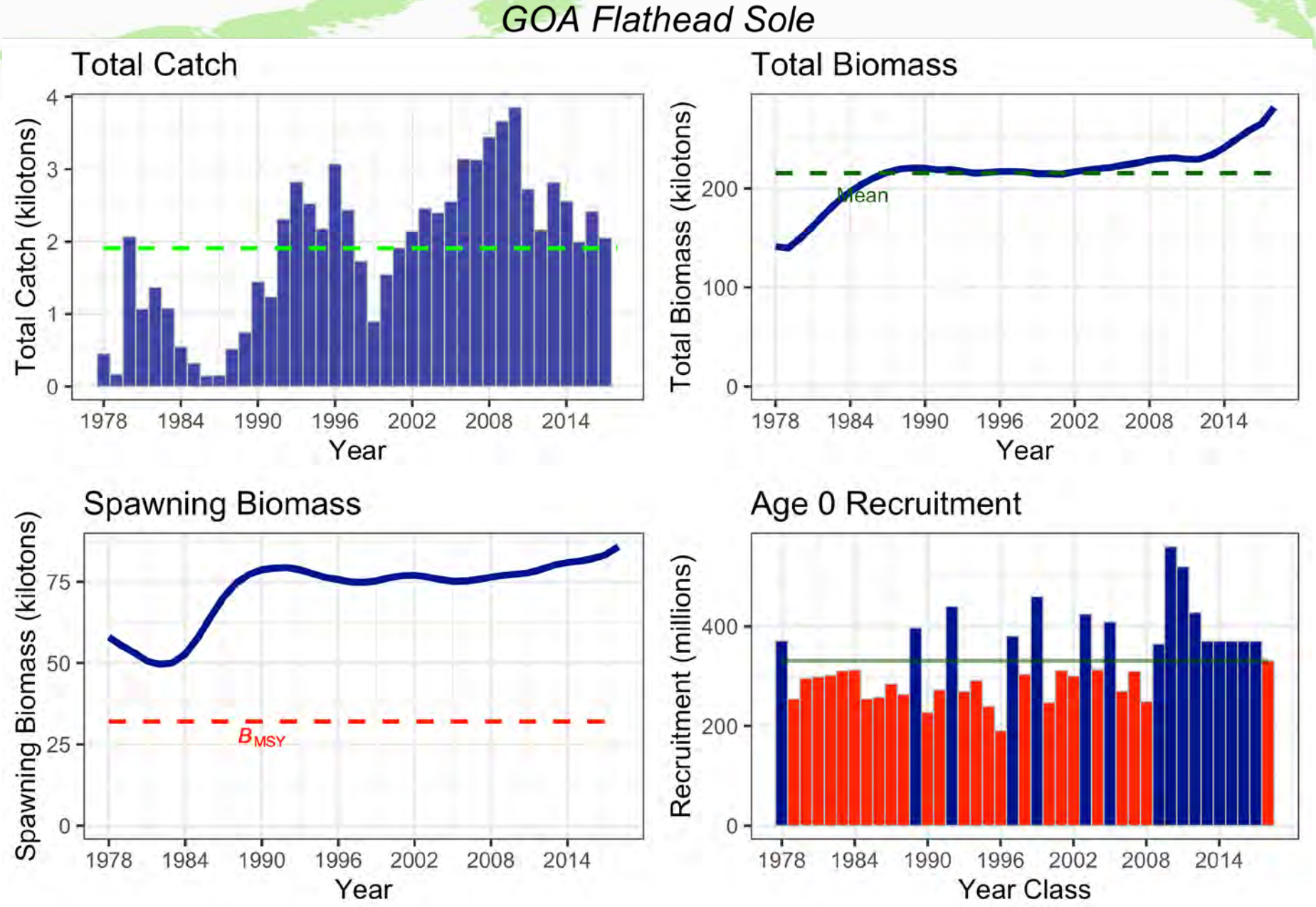
Partial Assessment, Tier 3a

- 2019 survey 185,840 t
  down from 236,588 t in 2017
- Apportionment updated

Quantity	Western	Central	West Yakutat	Southeast	Total
Area Apportionment	36.08%	52.89%	6.16%	4.86%	100.00%
2020 ABC (t)	13,783	20,201	2,354	1,858	38,196
2021 ABC (t)	14,191	20,799	2,424	1,912	39,326



8. Flathead sole



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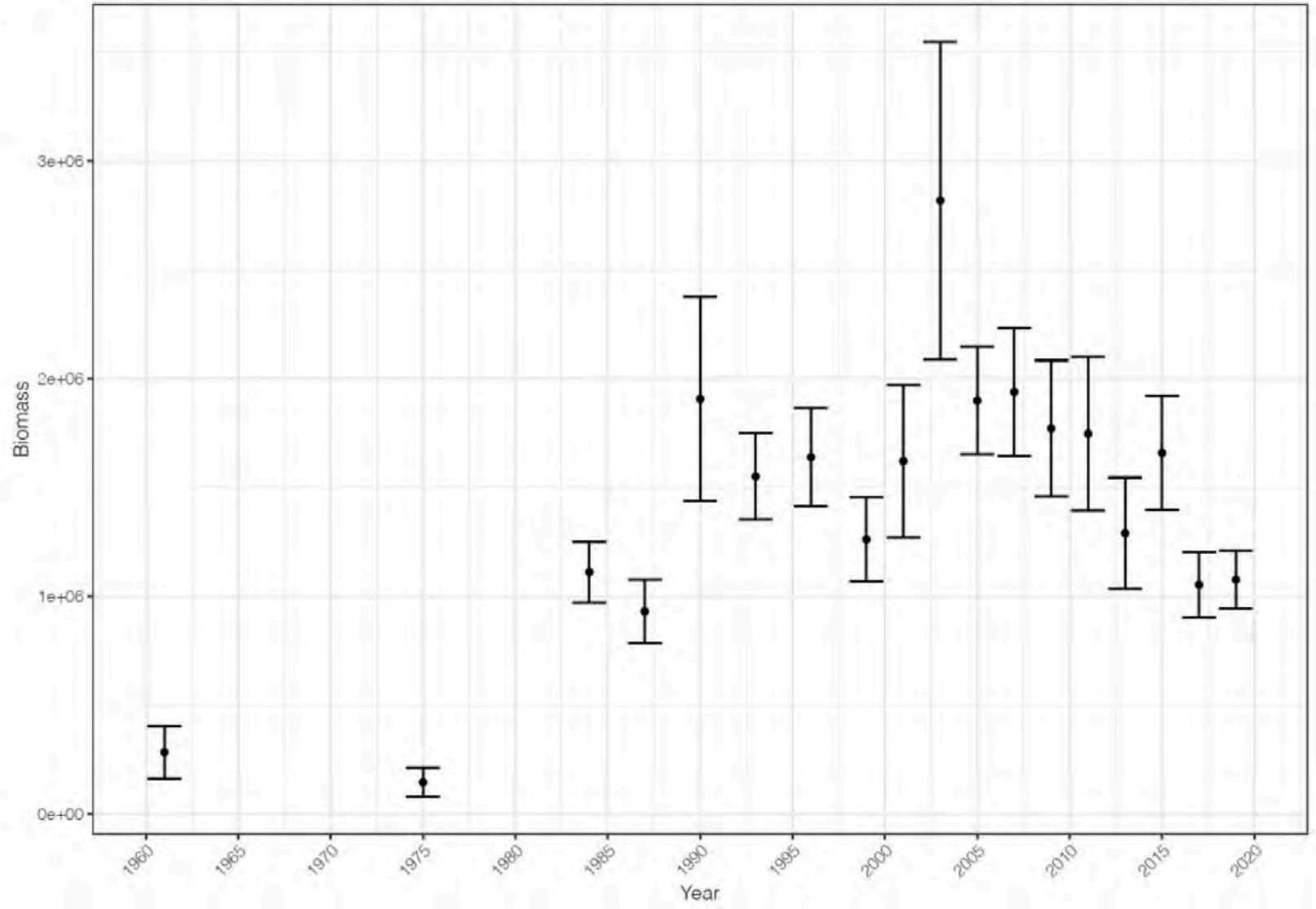
Deep-water ABC from Dover assessment Tier 3 + others Tier 6

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

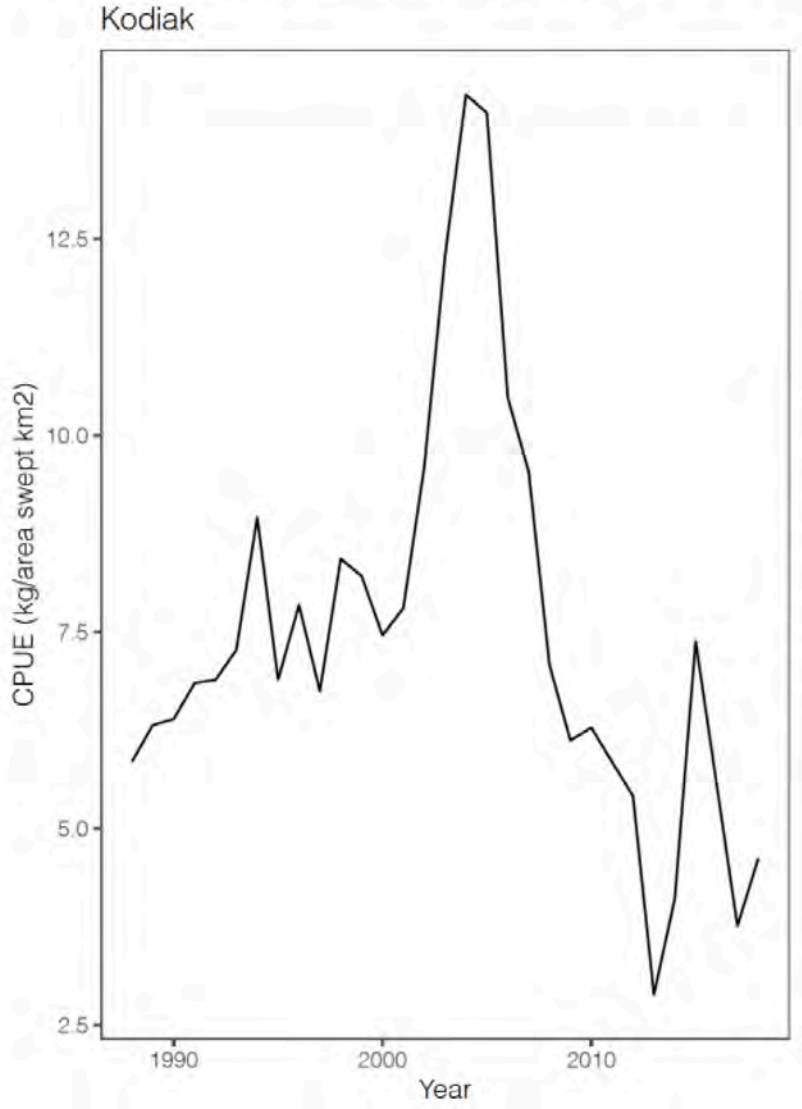
7. GOA arrowtooth flounder

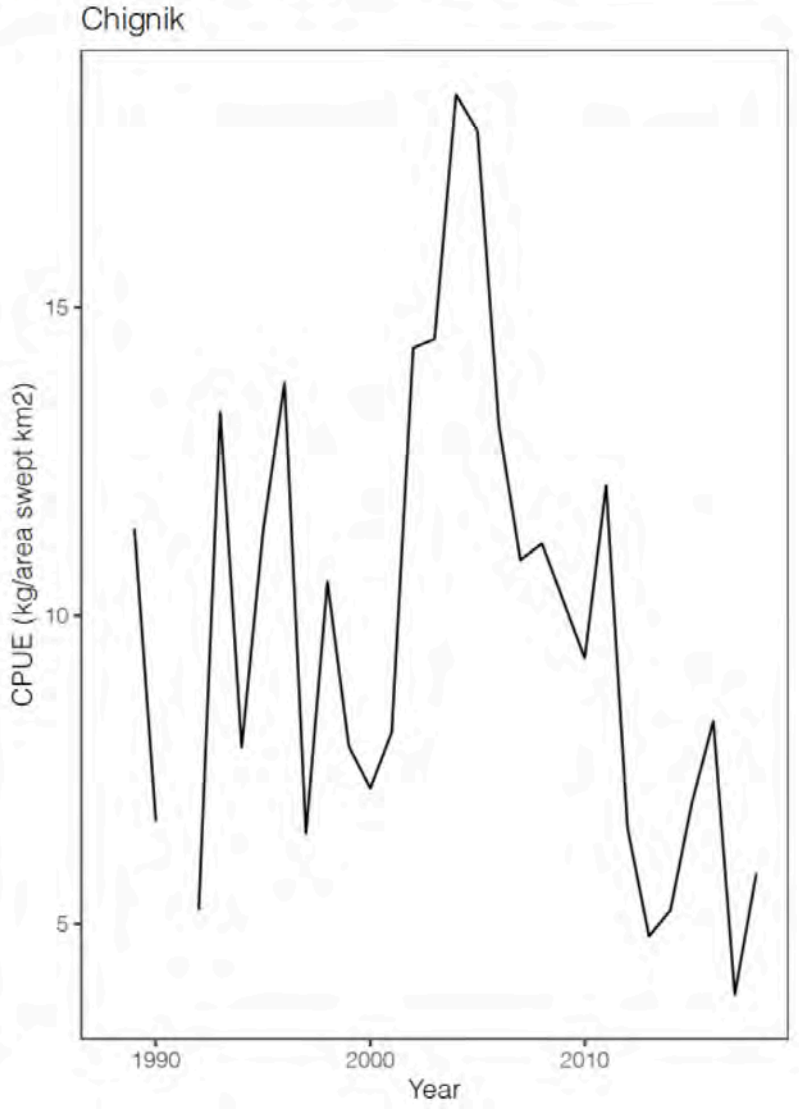
Two early nonstandard surveys, 1961-1962 (IPHC trawl survey) and 1973-1976 (NMFS exploratory trawl).



7. GOA arrowtooth flounder

ADF&G surveys since 1988 CPUE reflects low biomass in 1990s followed by a peak in the early 2000s.



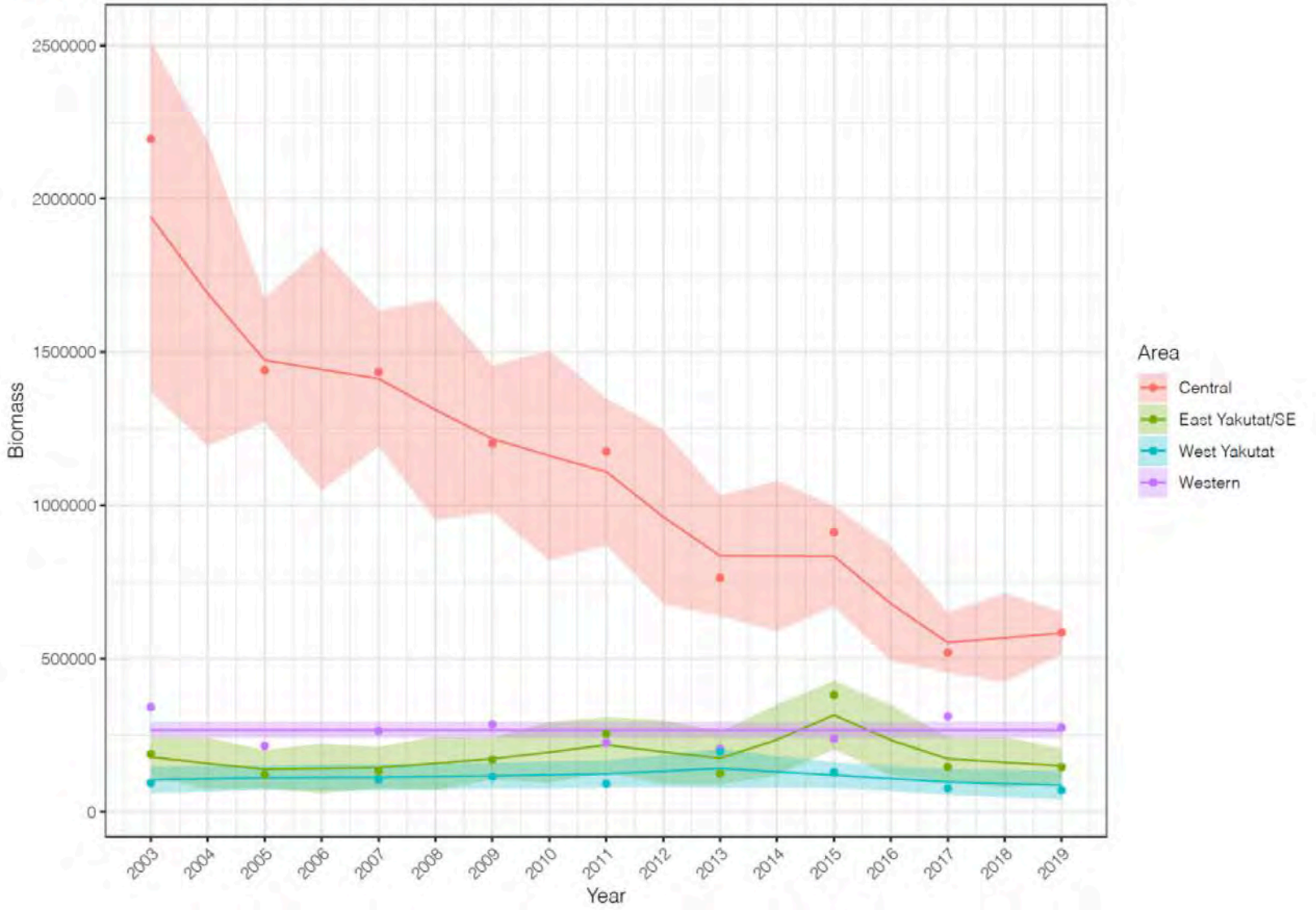


7. GOA arrowtooth flounder

- Model 17.0e: The model used for the 2017 assessment.
- Model 17.1a. Model 17.0e with data from 1961 through 2019.
- Model 19.0: Same as Model 17.1a omitting 1961 and 1975 surveys and starts at 1977.

7. GOA arrowtooth flounder

Central area (NMFS area 620 and 630) shows greatest decline in biomass of Arrowtooth Flounder



7. GOA arrowtooth flounder

	Survey Biomass	Fishery Length	Survey Length	Survey Age	Recruitment	Fishery Selectivity
Model 17.1a	50.5932	808.392	105.1390	244.234	20.7069	1.42204
Model 19.0	28.4486	796.457	92.2046	250.048	4.9668	1.46121

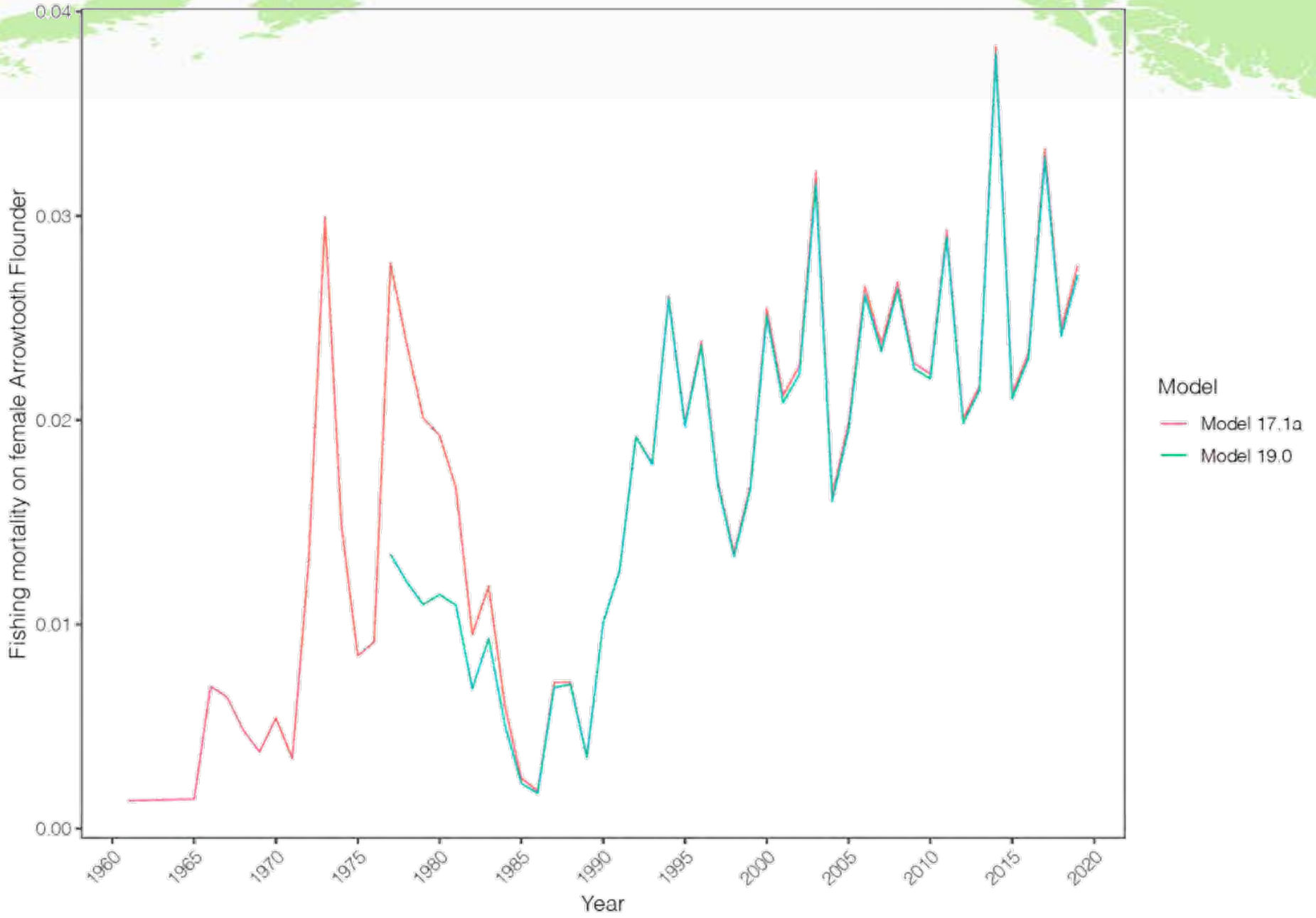
	Survey selectivity	SDNR	N. Parameters	Total Likelihood	ADSB	Objective Function
Model 17.1a	5.5239	2.4509	193	1254.011	-	223.355
Model 19.0	5.5941	1.9397	161	1197.180	0.178	183.487

7. GOA arrowtooth flounder

Quantity	Model 17.1a *this* year for: 2020	2021	Model 19.0 *this* year for: 2020	2021
M (natural mortality rate)	0.35, 0.2	0.35, 0.2	0.35, 0.2	0.35, 0.2
Tier	3a	3a	3a	3a
Projected total (age 1+) biomass (t)	1,270,359 t	1,251,117 t	1,325,867 t	1,321,075 t
Projected female spawning biomass (t)	746,658 t	706,966 t	756,100 t	718,325 t
$B_{100\%}$	867,147 t	867,147 t	1,028,329 t	1,028,329 t
$B_{40\%}$	346,859 t	346,859	411,332 t	411,332 t
$B_{35\%}$	303,501 t	303,501	359,915 t	359,915 t
F_{OFL}	0.236	0.236	0.234	0.234
$maxF_{ABC}$	0.194	0.194	0.193	0.193
F_{ABC}	0.194	0.194	0.193	0.193
OFL	151,702 t	146,554 t	153,017 t	127,773 t
$maxABC$	126,872 t	122,568 t	128,060 t	124,357 t
ABC	126,872 t	122,568 t	128,060 t	124,357 t

7. GOA arrowtooth flounder

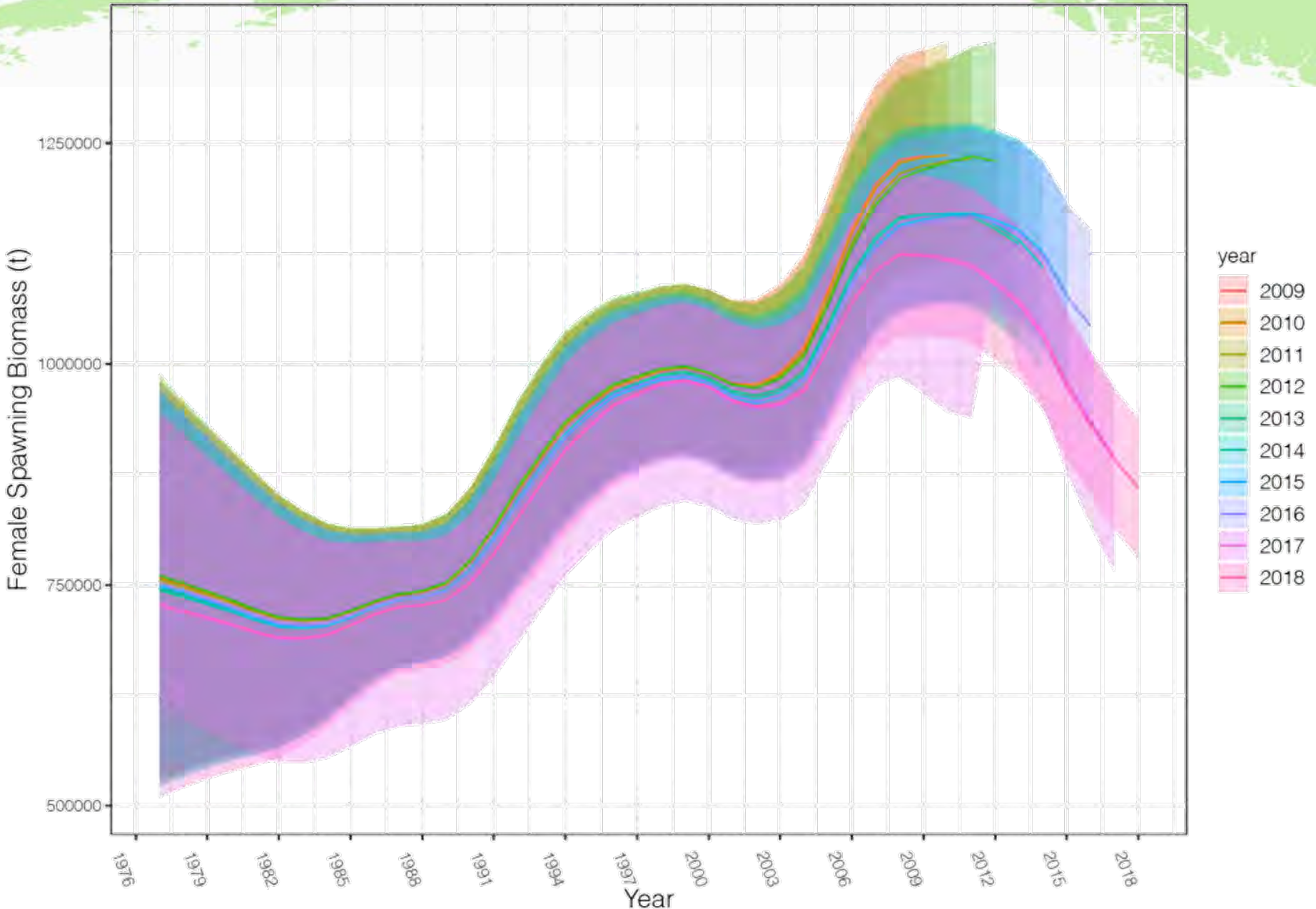
Fishing mortality nearly identical…



7. GOA arrowtooth flounder

Retrospective

Mohn's rho = 0.02

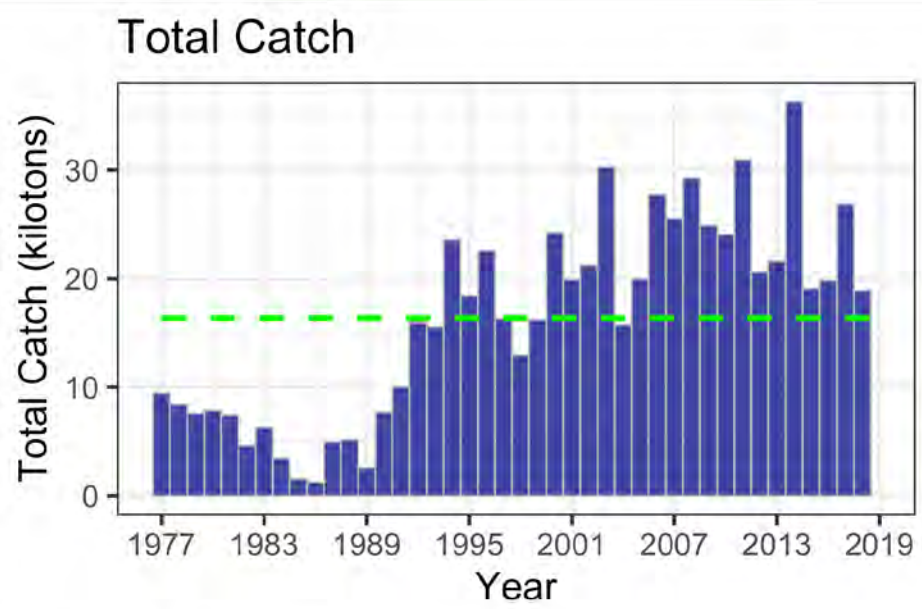


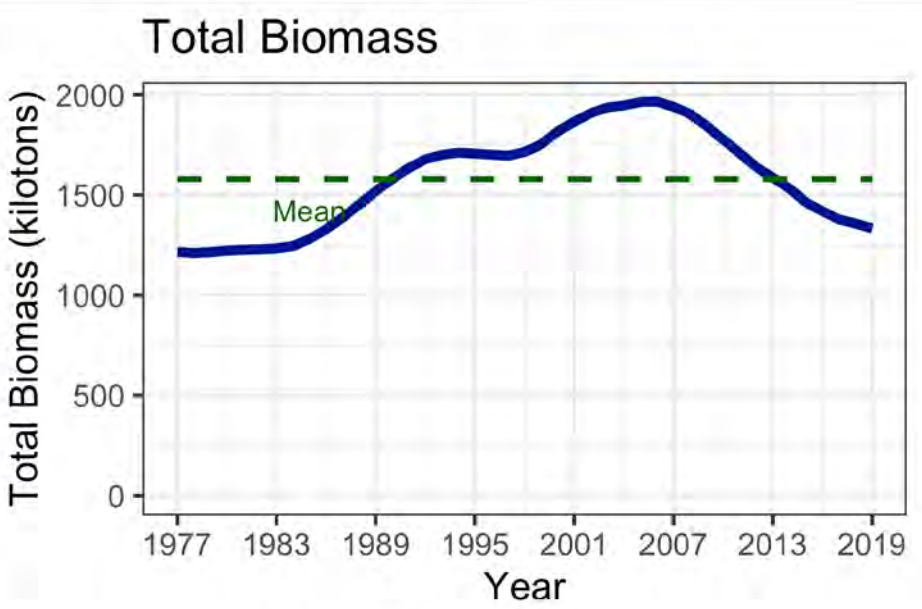
7. GOA arrowtooth flounder

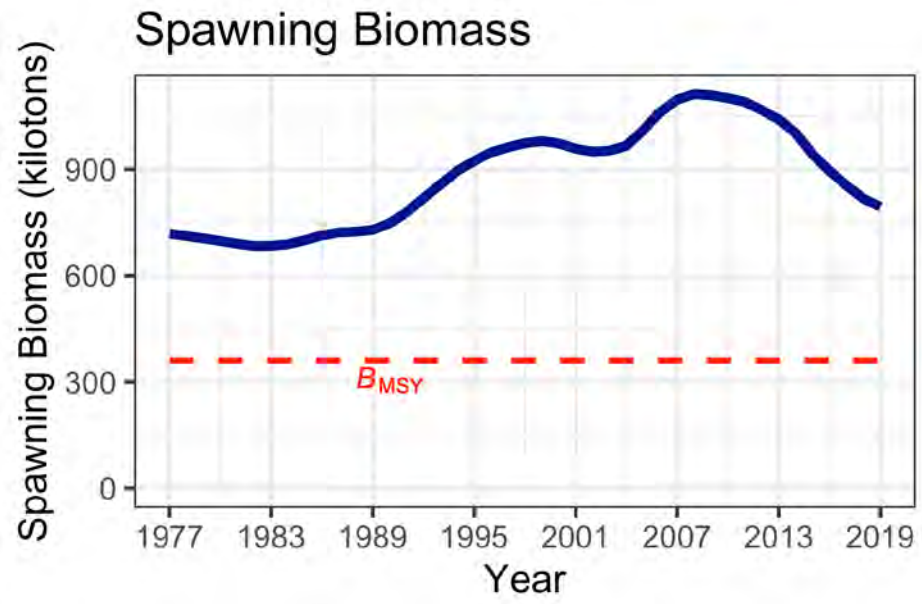
Team discussions

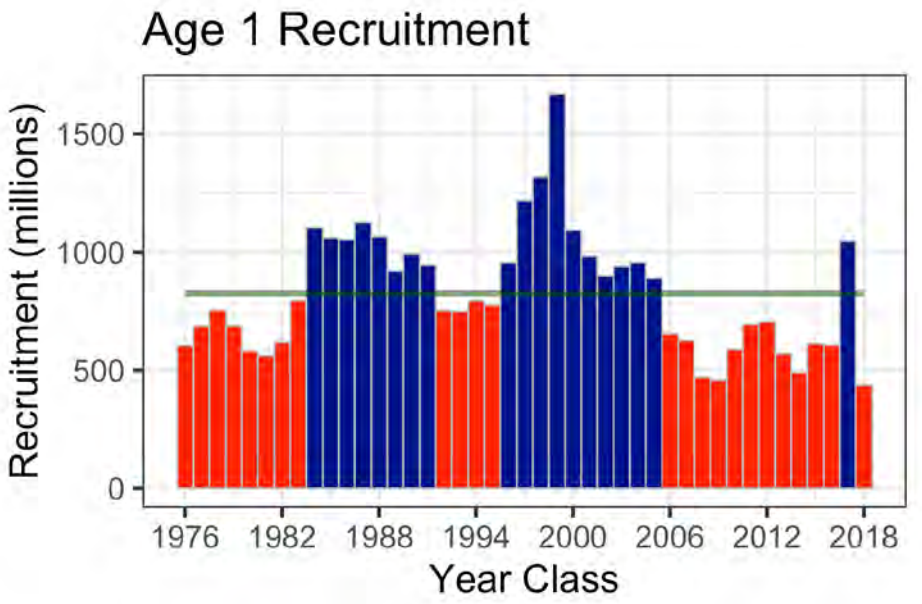
- Accepted the shorter model
- Lower recruitment in recent years, beginning in 2006
  - **The Team recommended investigating whether these lower recruitments are related to environmental conditions in the GOA.**
- Noted the potential of using AFSC longline survey data
- T**he Team recommended investigating whether 1980s data should be omitted**

GOA Arrowtooth Flounder





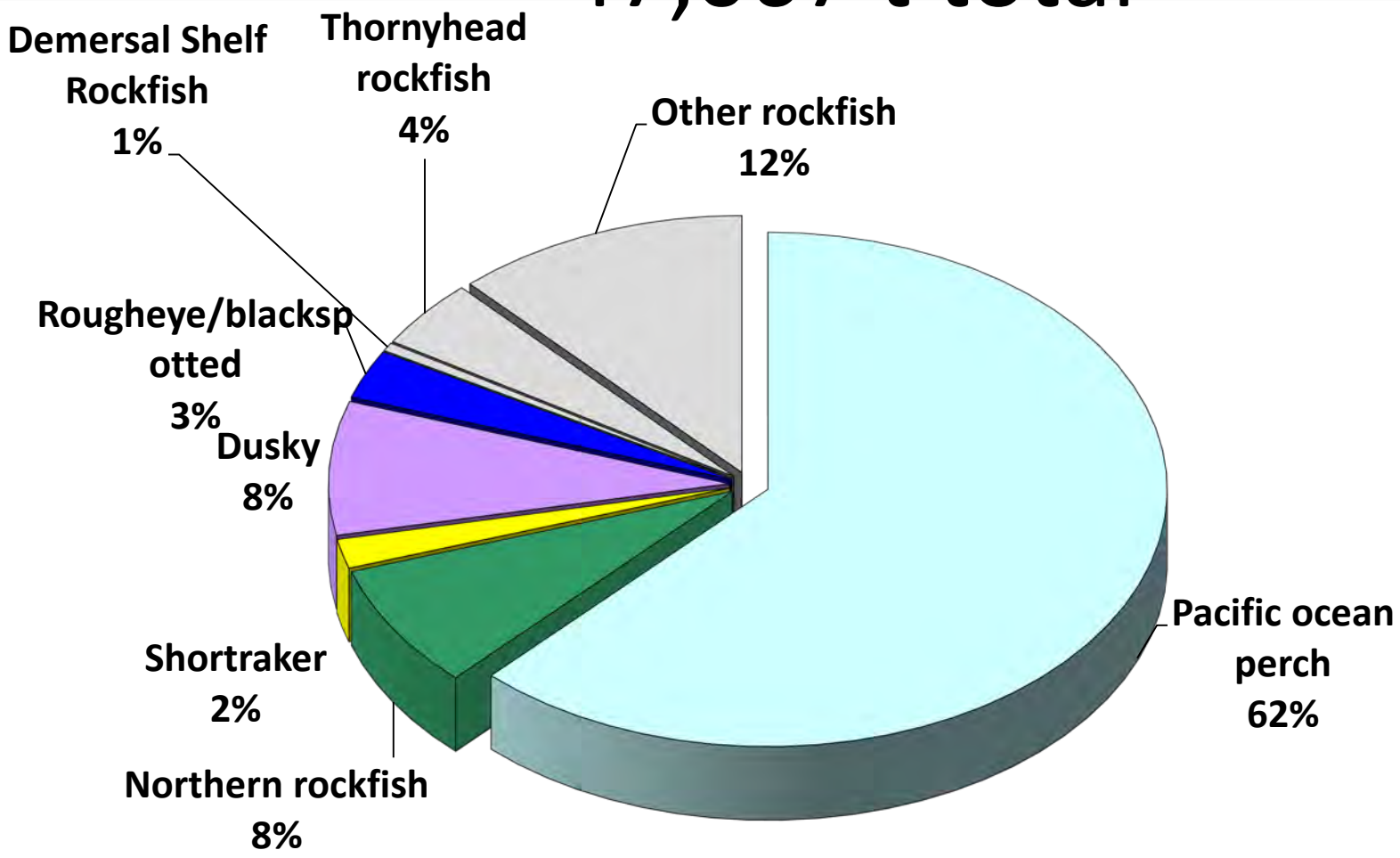




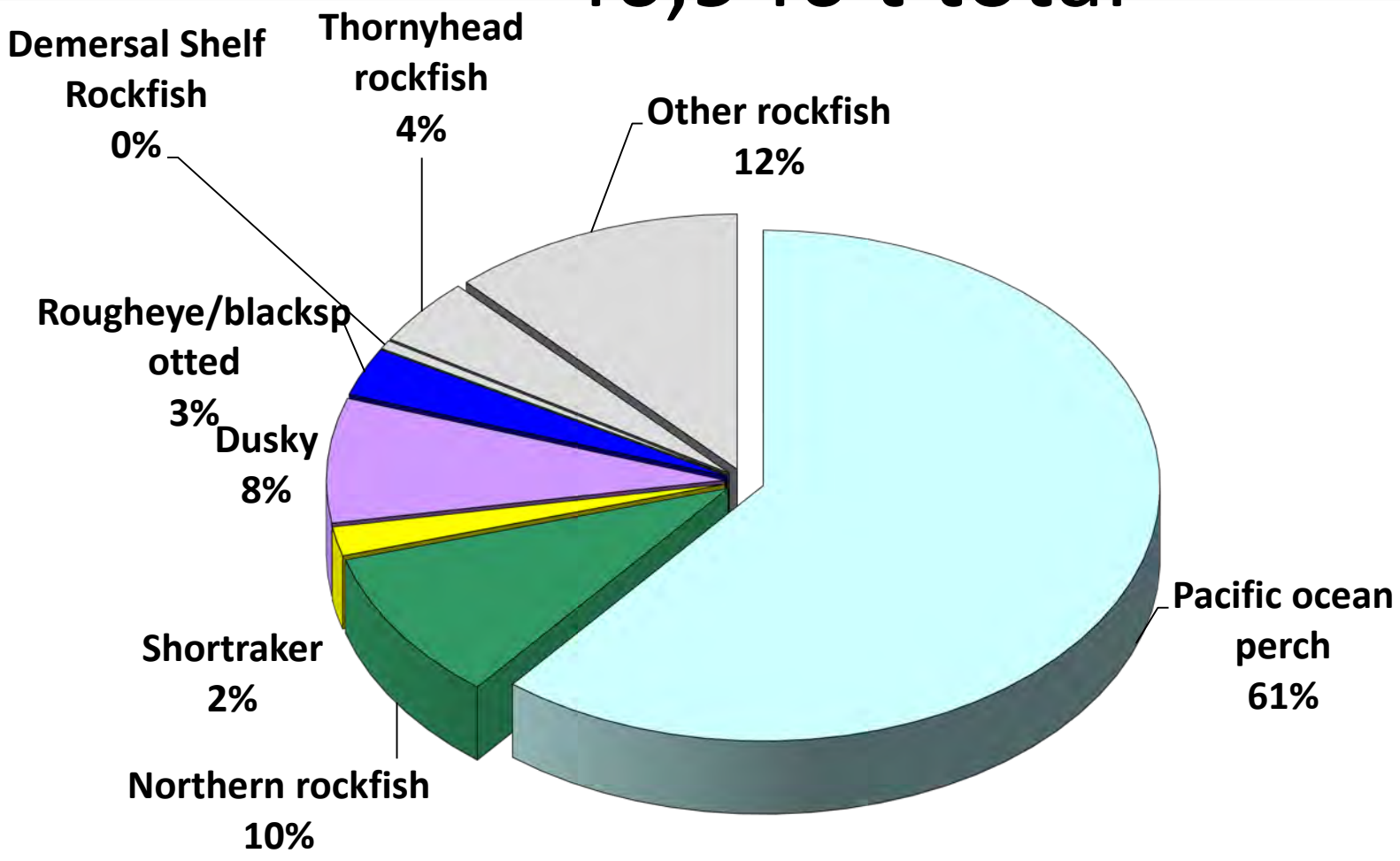
GOA Rockfish

Species	2019 Catch	2019	2020	Change
Pollock	117,019	144,623	118,642	down 25,981 (18%)
Pacific Cod	10,909	17,000	14,621	down 2,379 (14%)
Sablefish	12,219	11,571	14,393	up 2,822 (24%)
Flatfish	27,638	116,562	114,567	down 1,995 (2%)
Arrowtooth flounder	2,553	145,841	128,060	down 17,781 (12%)
Rockfish	32,730	46,946	47,450	up 504 (1%)
Atka mackerel	1,254	4,700	4,700	same (0%)
Skates	3,042	7,804	6,670	down 1,134 (15%)
Other Species	2,618	14,460	14,363	down 97 (1%)
Total	209,982	509,507	463,466	down 46,041 (9%)

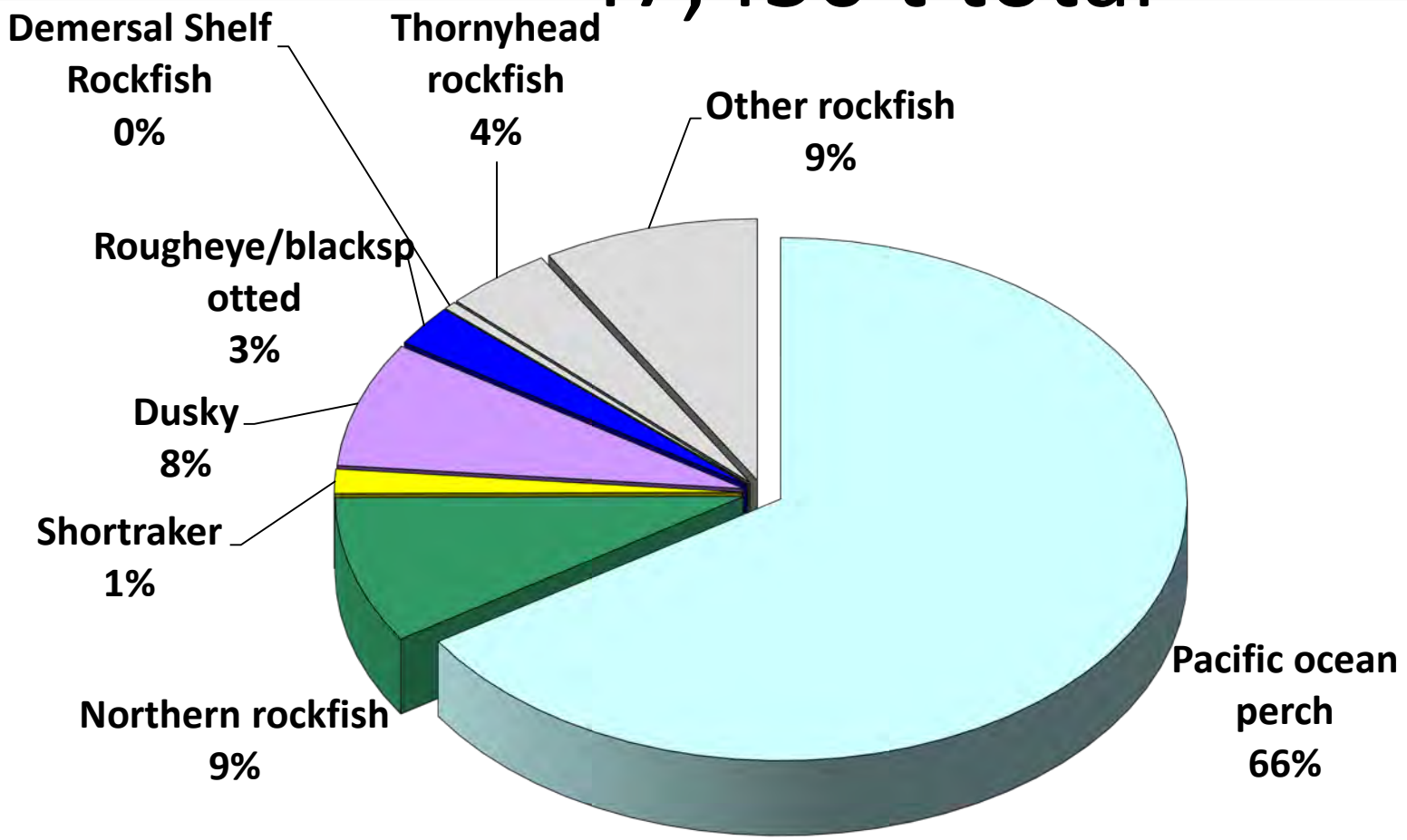
Rockfish 2018 ABC's
47,067 t total



Rockfish 2019 ABC's
46,946 t total



Rockfish 2020 ABC's
47,450 t total



Rockfish ABC Summary

Species	2019	2020	Change
POP	28,555	31,238	up 2,683 (9%)
northern rockfish	4,529	4,312	down 217 (5%)
Shortraker Rockfish	863	708	down 155 (18%)
Dusky	3,700	3,676	down 24 (1%)
Rougheye and Blackspotted Rockfish	1,428	1,209	down 219 (15%)
Demersal shelf rockfish	261	238	down 23 (9%)
Thornyhead	2,016	2,016	same (0%)
Other rock	5,594	4,053	down 1,541 (28%)
Sub Total	46,946	47,450	up 504 (1%)

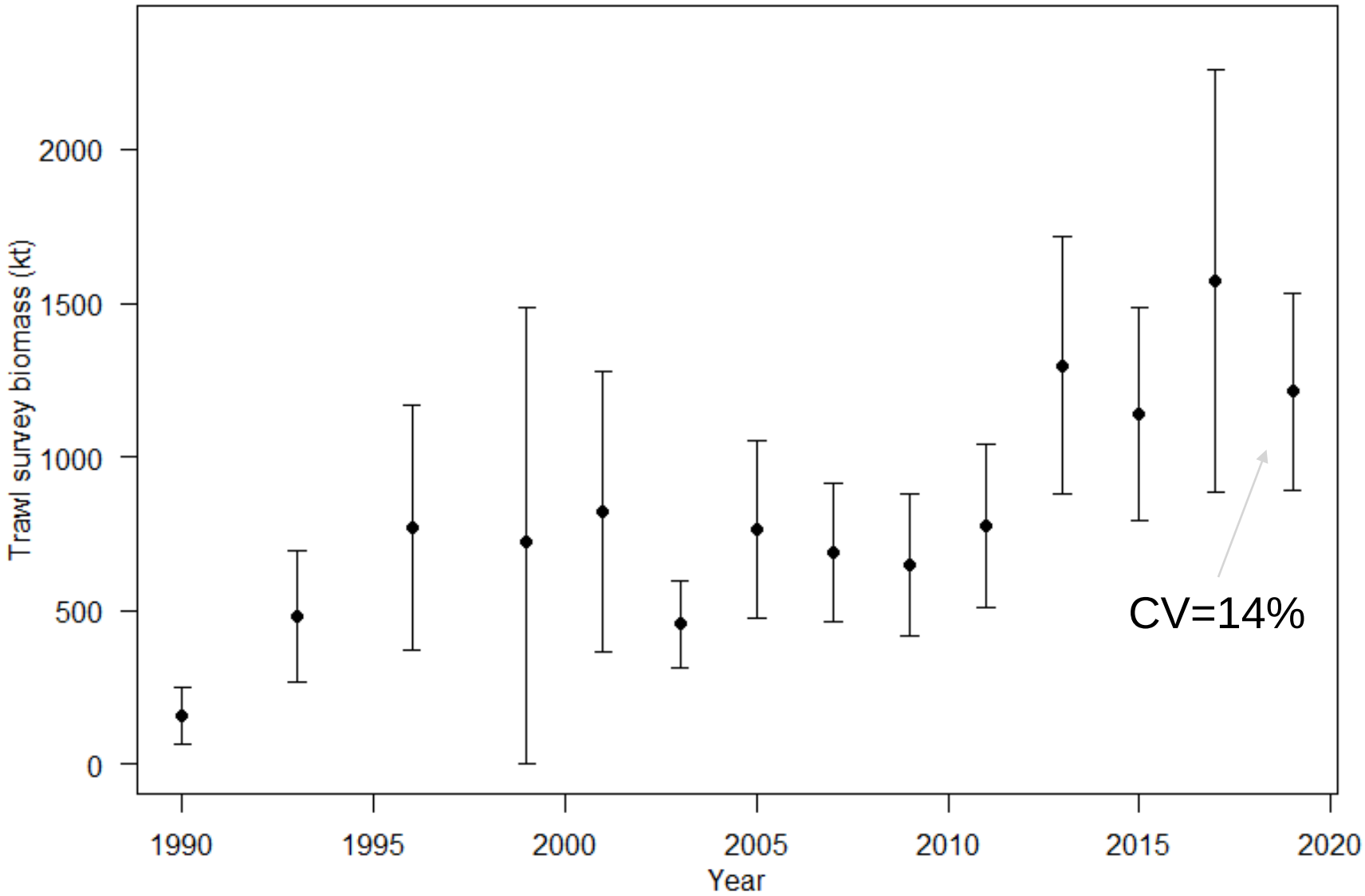
9. Pacific ocean perch

- Full 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

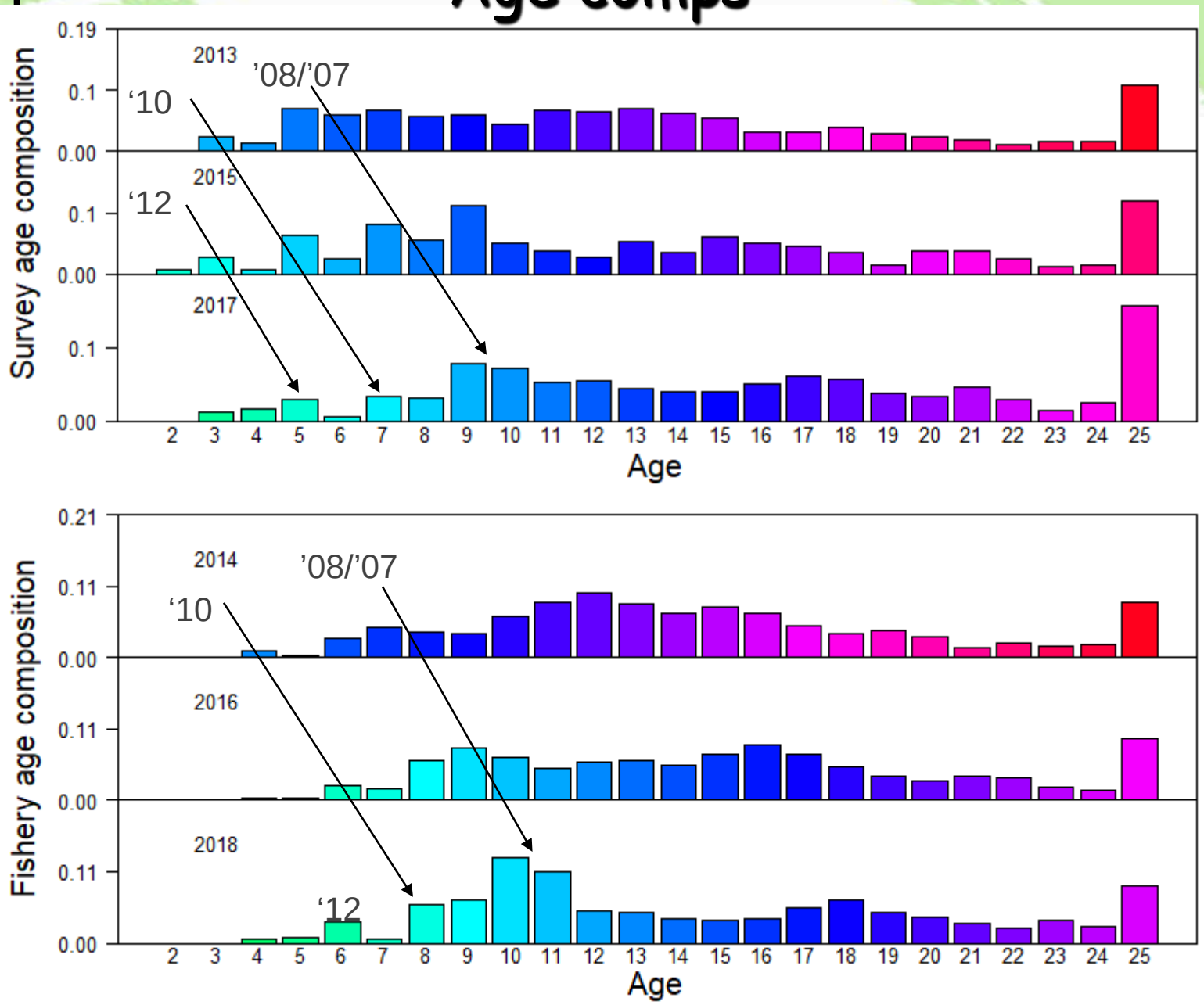
9. GOA Pacific ocean perch

NMFS trawl survey biomass



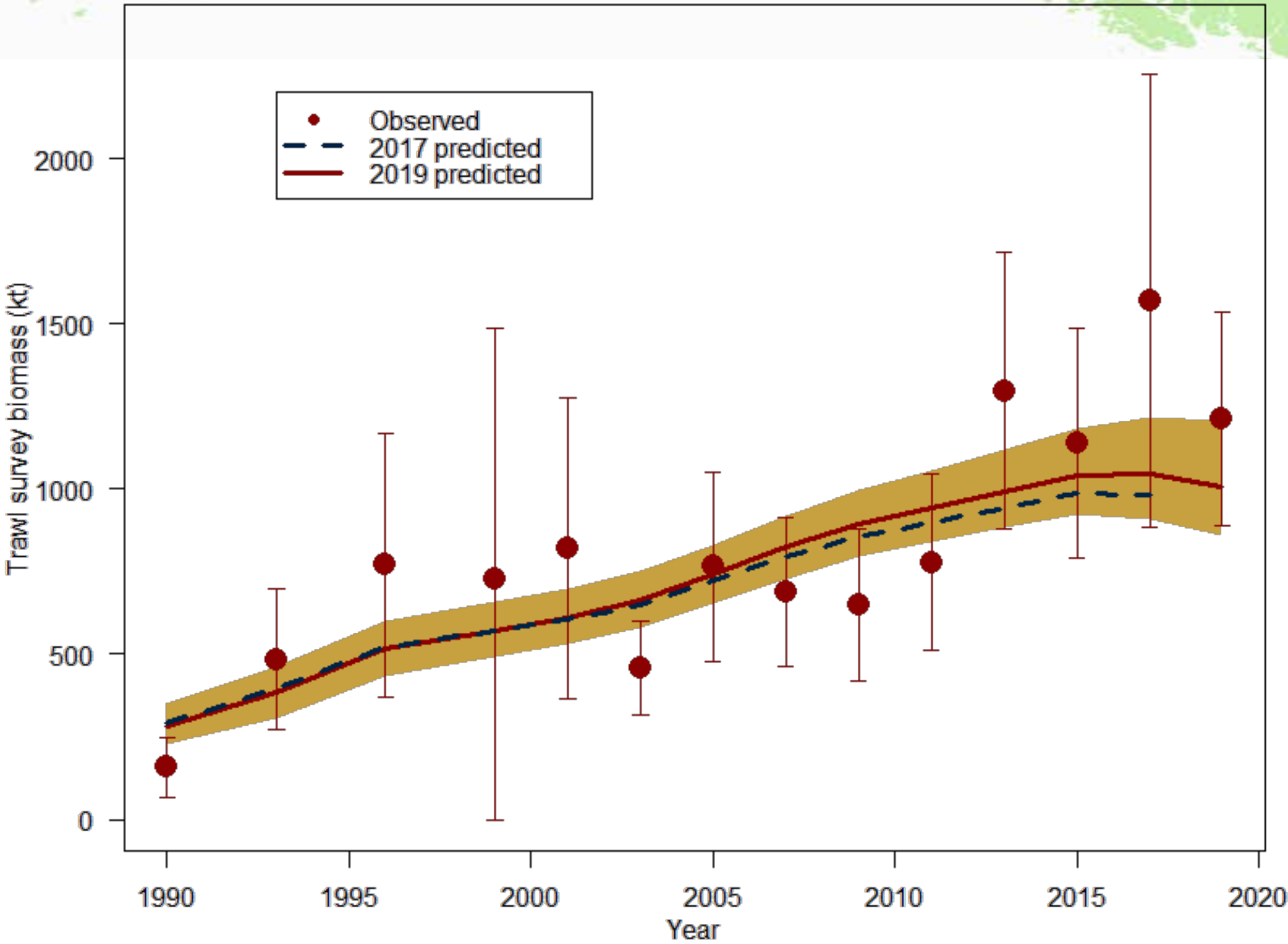
9. GOA Pacific ocean perch

Age comps



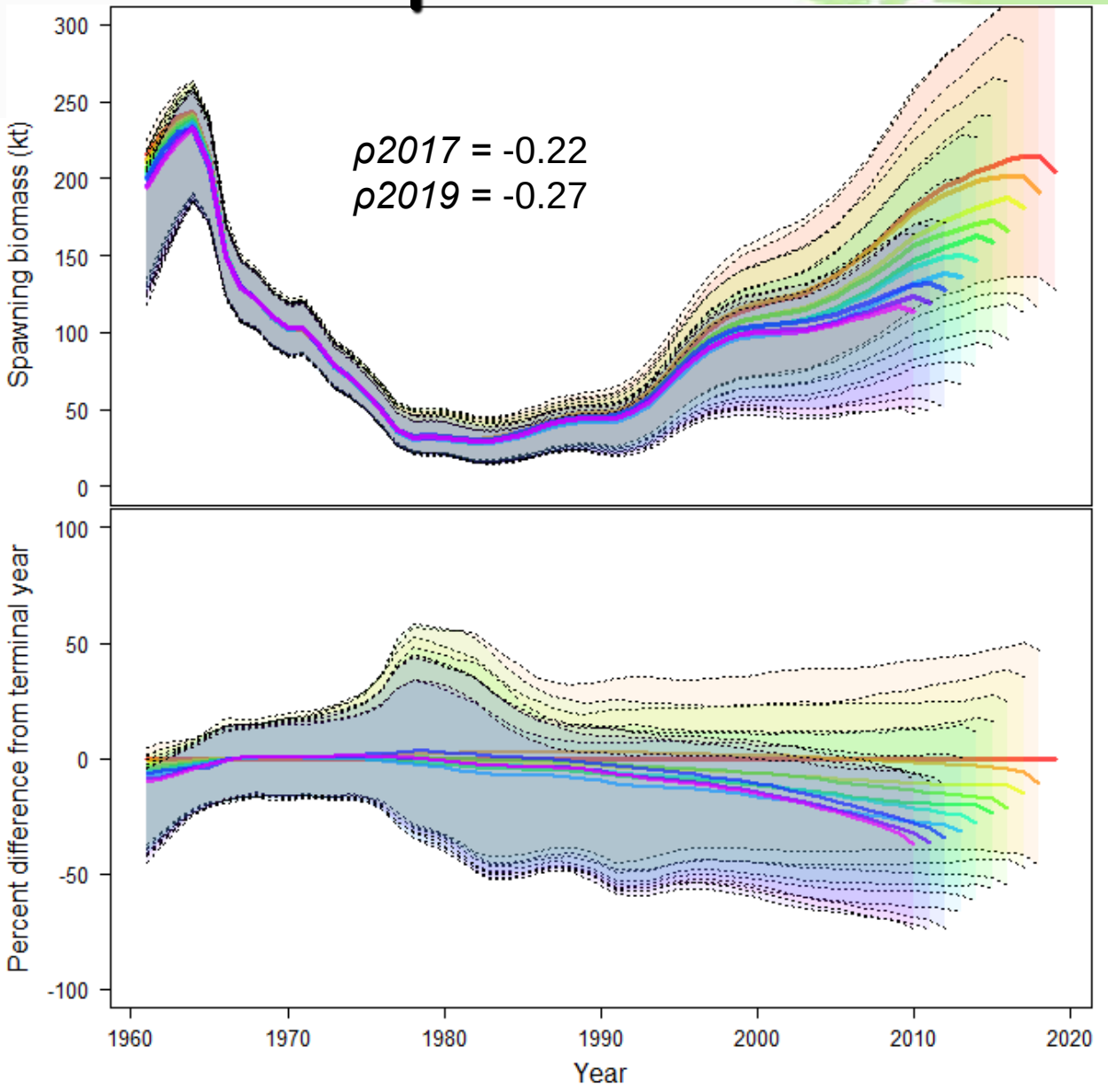
9. GOA Pacific ocean perch

NMFS trawl survey biomass

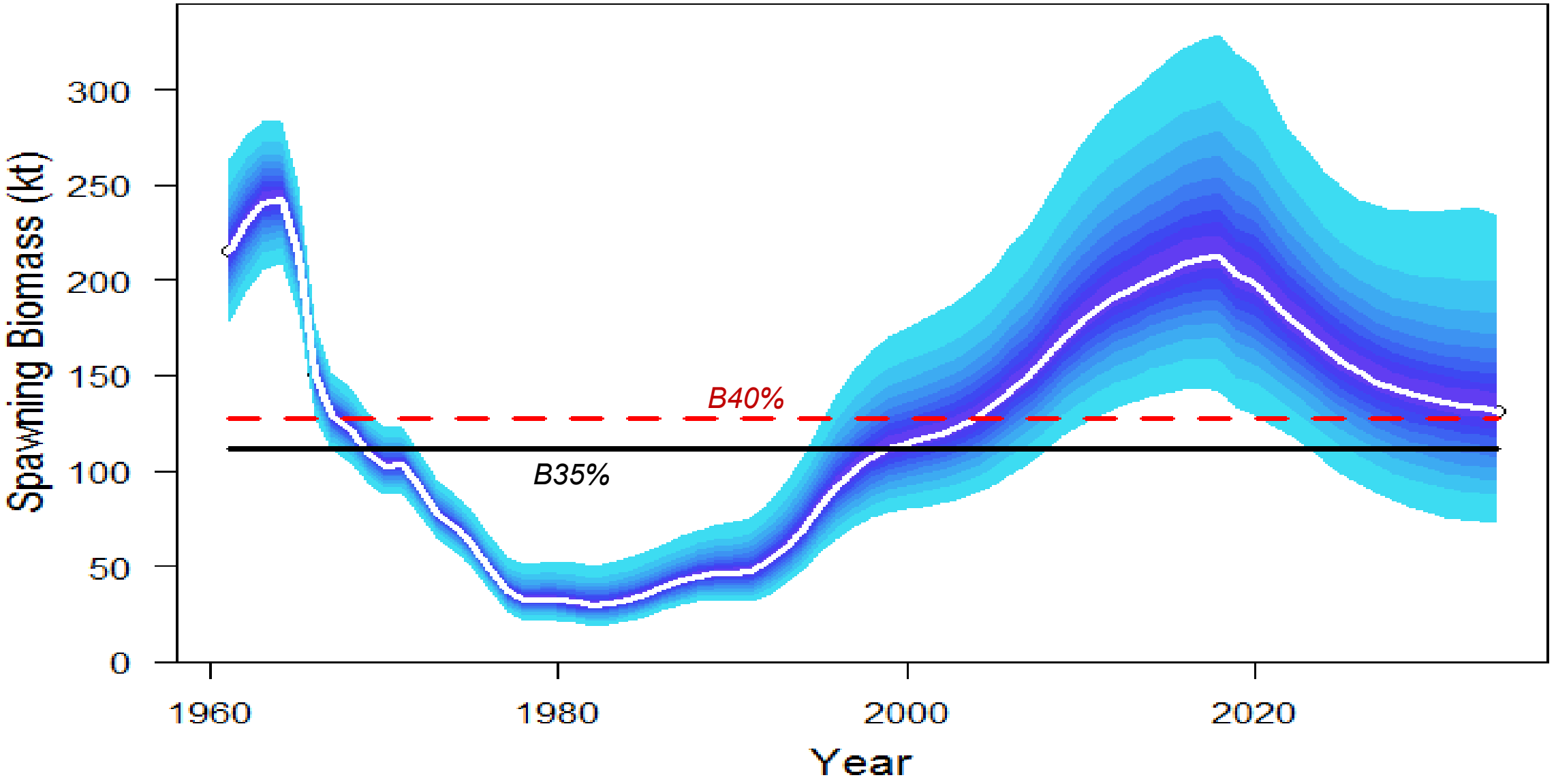


9. GOA Pacific ocean perch

Retrospective biomass



9. GOA Pacific ocean perch projections

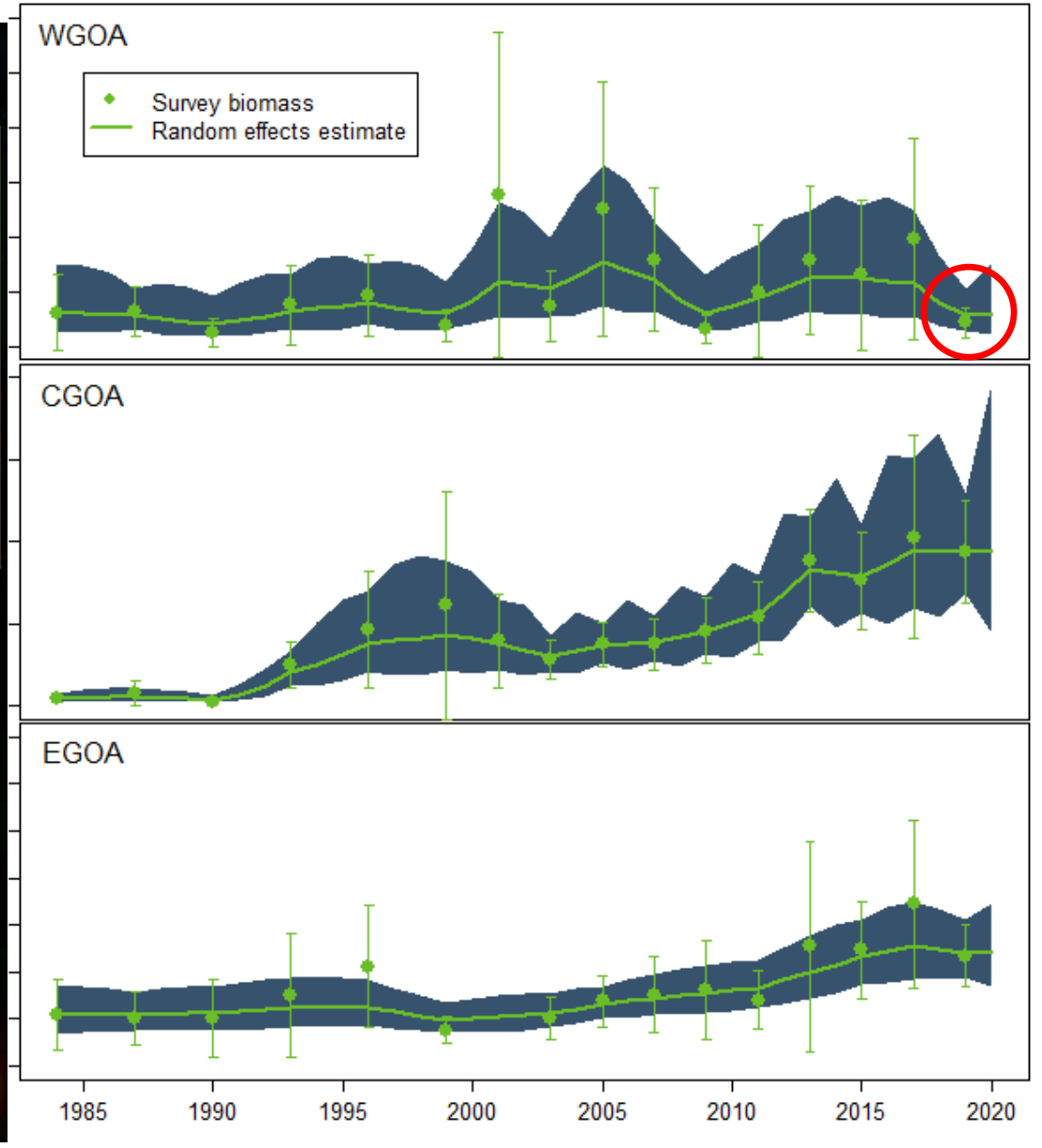


9. GOA Pacific ocean perch apportionment

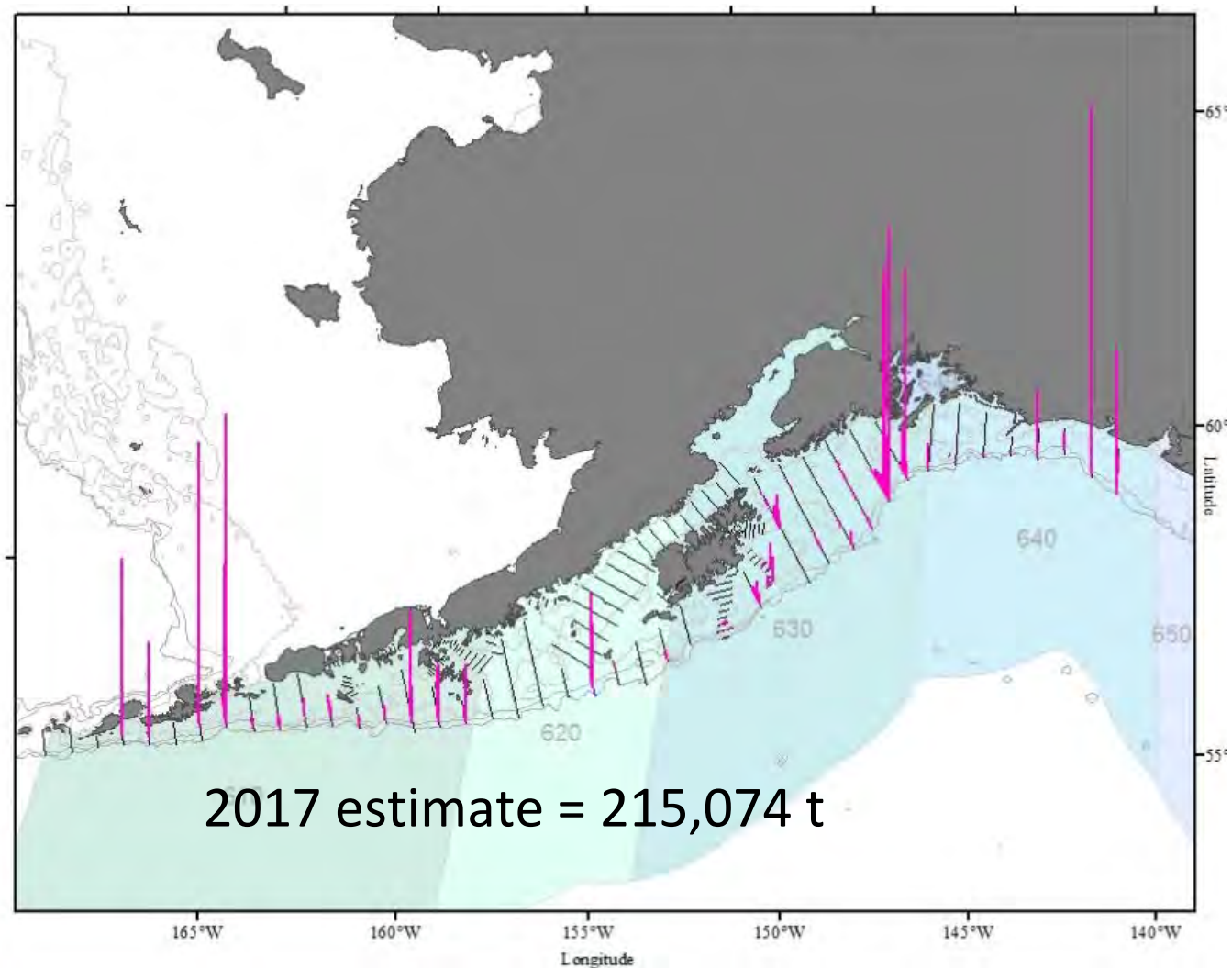
Apportionment – ABC

	Western	Central	Eastern	Total
2019 ABC	3,240	19,678	5,687	28,605
2020 ABC	**1,437**	**23,678**	**6,123**	**31,238**
2021 ABC	**1,379**	**22,727**	**5,877**	**29,983**

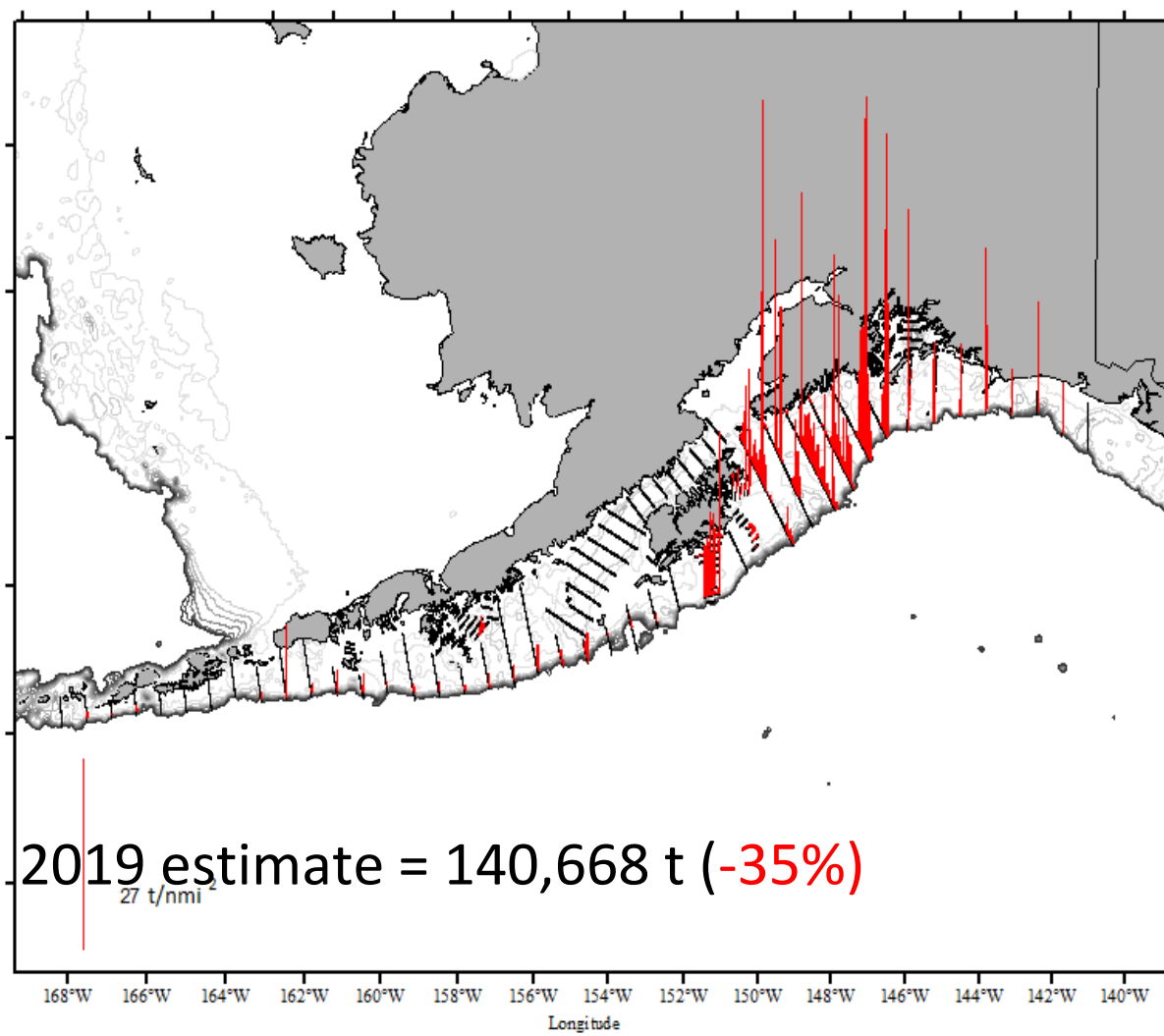
	WYAK (24%)	EYAK/SE (72%)	Total
2019 ABC	3,298	2,389	5,687
2020 ABC	**1,470**	**4,653**	**6,123**
2021 ABC	**1,410**	**4,467**	**5,888**



9. GOA Pacific ocean perch Acoustic survey



2017 estimate = 215,074 t



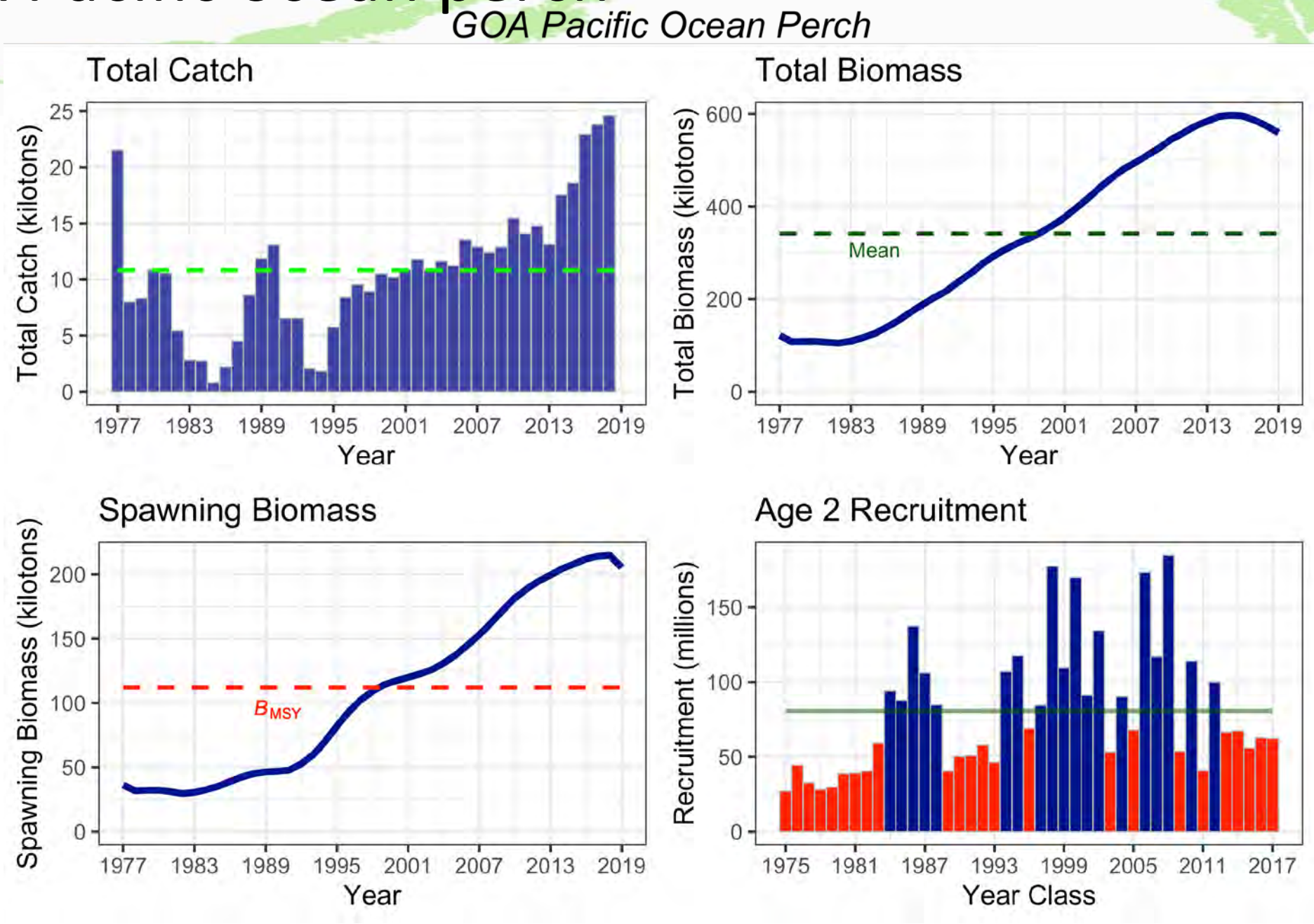
2019 estimate = 140,668 t (-35%)

9. GOA Pacific ocean perch risk table

Assessment-related	***Population dynamics***	***Environmental/ ecosystem***	***Fishery Performance***	***Overall score***
Level 2: Substantially increased concerns	Level 2: Substantially increased concerns	Level 1: No apparent concern	Level 1: No apparent concern	Level 2: Substantially increased concerns

- Overall, level 2, but no recommendation for decrease
- Healthy pop'n, not driven by single year class, biomass underestimated
- Highlights case of risk matrix usage that could indicate increasing rather than decreasing ABC

9. GOA Pacific ocean perch



Rockfish ABC Summary

Species	2019	2020	Change
POP	28,555	31,238	up 2,683 (9%)
northern rockfish	4,529	4,312	down 217 (5%)
Shortraker Rockfish	863	708	down 155 (18%)
Dusky	3,700	3,676	down 24 (1%)
Rougheye and Blackspotted Rockfish	1,428	1,209	down 219 (15%)
Demersal shelf rockfish	261	238	down 23 (9%)
Thornyhead	2,016	2,016	same (0%)
Other rock	5,594	4,053	down 1,541 (28%)
Sub Total	46,946	47,450	up 504 (1%)

10. Northern rockfish

Partial Assessment, Tier 3a

- 2019 model based survey estimate up 1.3%
- Design based down 42% from 2017
- 2020 ABC 4,312 t, down 5% from 2018
- Apportionment from last full assessment

In 2020 authors will investigate weighting of composition data, exploring covariance matrix, VAST vs design-based

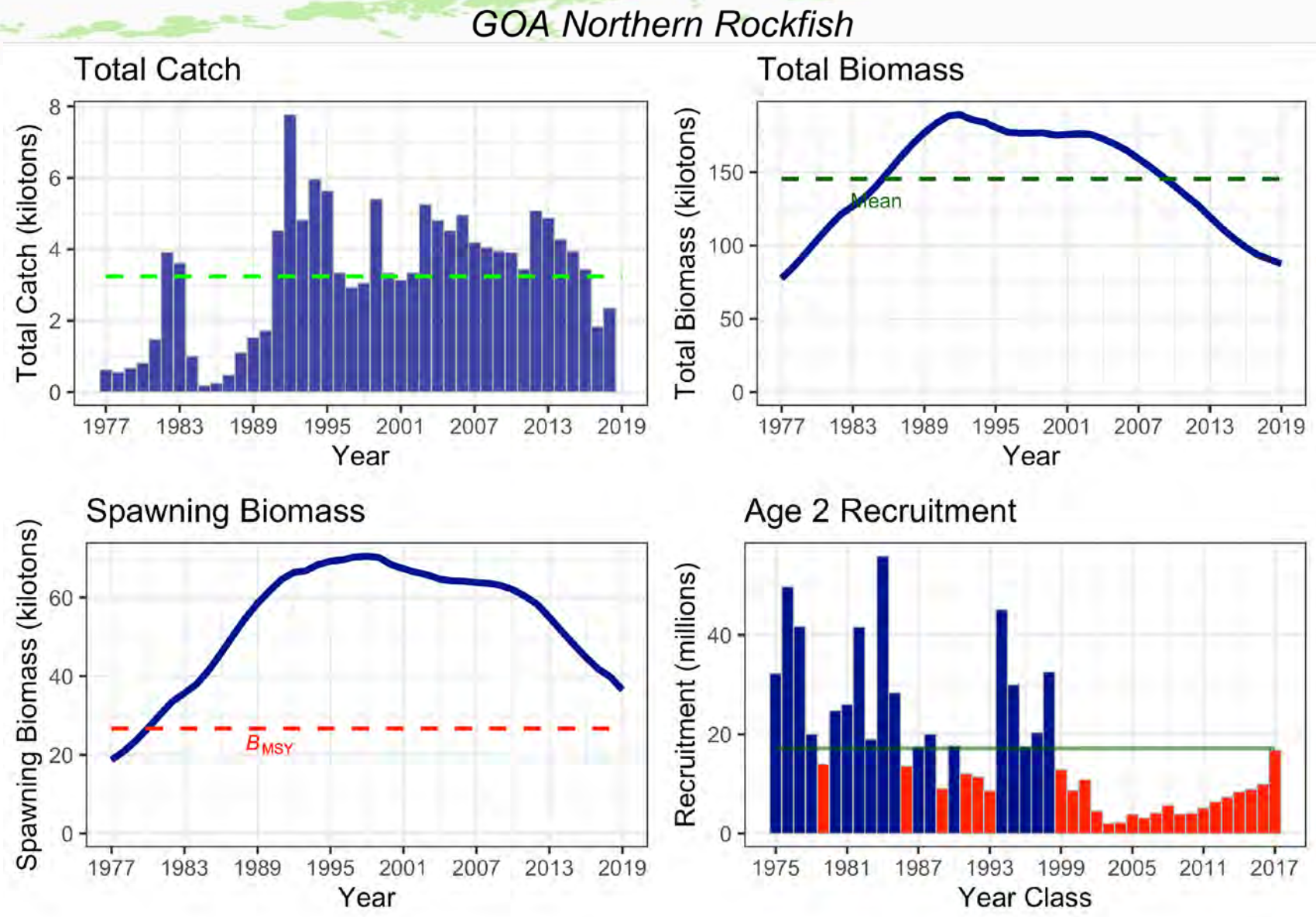
10. Northern rockfish: Team discussions

In 2018 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).**

This year the Team noted that the final catch for 2018 (2,354 t) was substantially different from the value predicted in 2018 (3,219 t), and recommends the authors investigate the source of this difference and whether more accurate catch projections can be produced in the future.

10. Northern rockfish



Full assessment done in 2018

Rockfish ABC Summary

Species	2019	2020	Change
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northern rockfish	4,529	4,312	down 217 (5%)
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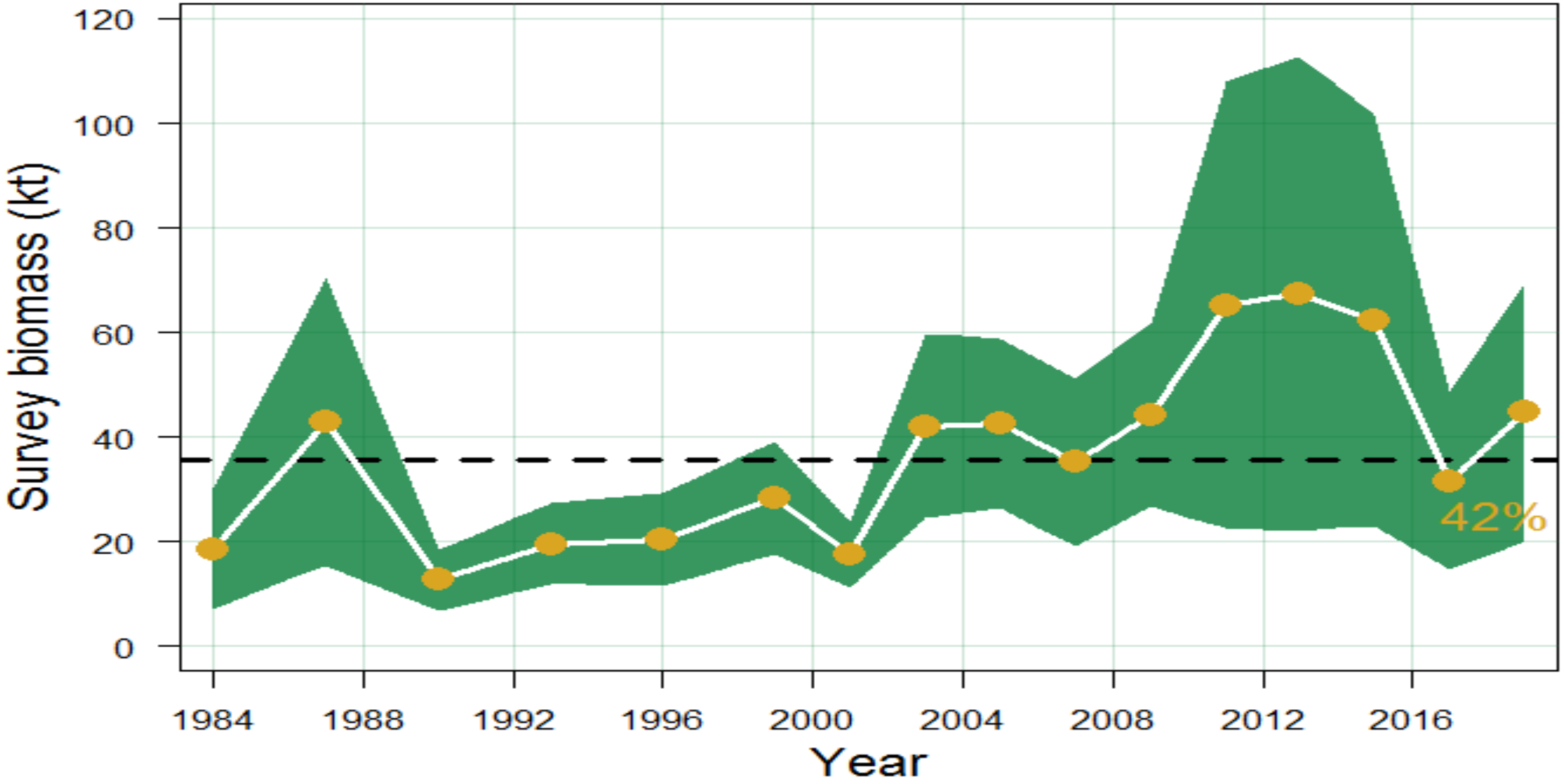
Other rock	5,594	4,053	down 1,541 (28%)
Sub Total	46,946	47,450	up 504 (1%)

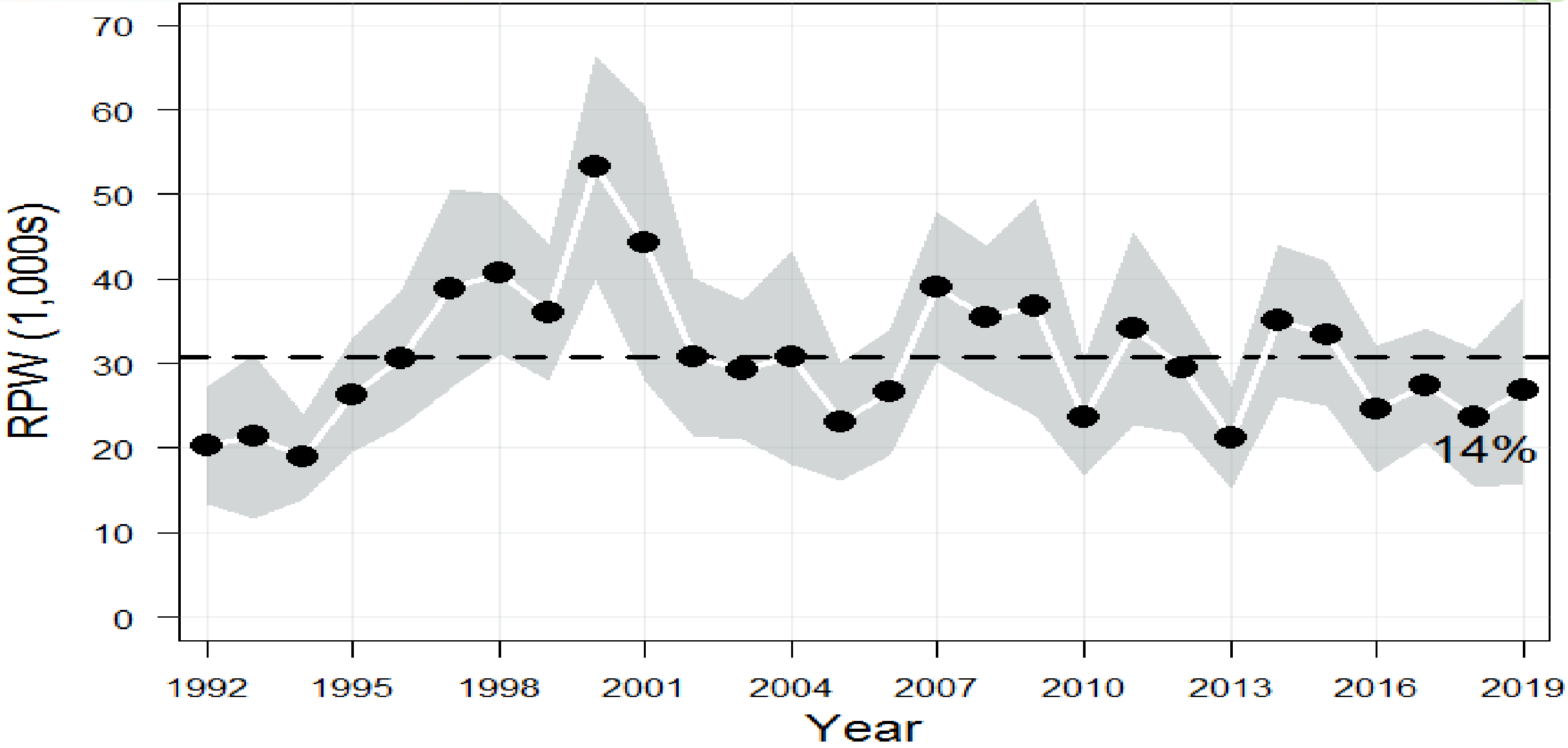
11. GOA Shortraker rockfish

- Tier 5
- Recommended model change: include LL survey RPW index into RE model

11. GOA Shortraker rockfish trawl survey



11. GOA Shortraker rockfish AFSC longline survey



GOA Shortraker

- 4 model scenarios evaluated this year:
  - Stepwise evaluation of results

Model	Description
15.1	2015 model with data updated through 2019
19.1	15.1 with AFSC longline survey RPWs from 1992-2019 included as an additional population index
19.2	19.1 with relative catchability coefficients between the AFSC bottom trawl survey biomass and longline survey RPWs estimated by region
19.2a	**19.2 with the AFSC longline survey RPW index weighted at 0.5 compared to the bottom trawl survey biomass**

GOA Shortraker apportionment

Apportionment is based on random effects estimation of biomass by region, fit to 1984-2019 trawl survey biomass and 1992-2019 longline survey RPWs

- Western: 52 t (↑18%)
- Central: 284 t (↓7%)
- Eastern: 372 t (↓28%)

GOA Shortraker

- Risk table score 1
  - No need to reduce ABC from max ABC.
  - Noted a disconnect between the survey biomass increasing and the model biomass decreasing.

Rockfish ABC Summary

Species	2019	2020	Change
POP	28,555	31,238	up 2,683 (9%)
northern rockfish	4,529	4,312	down 217 (5%)
Shortraker Rockfish	863	708	down 155 (18%)
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Other rock	5,594	4,053	down 1,541 (28%)
Sub Total	46,946	47,450	up 504 (1%)

12. GOA Dusky Rockfish

Partial assessment, 3a

- Model based survey up 42% design based up 72% from 2017

- Apportionment same as last full assessment

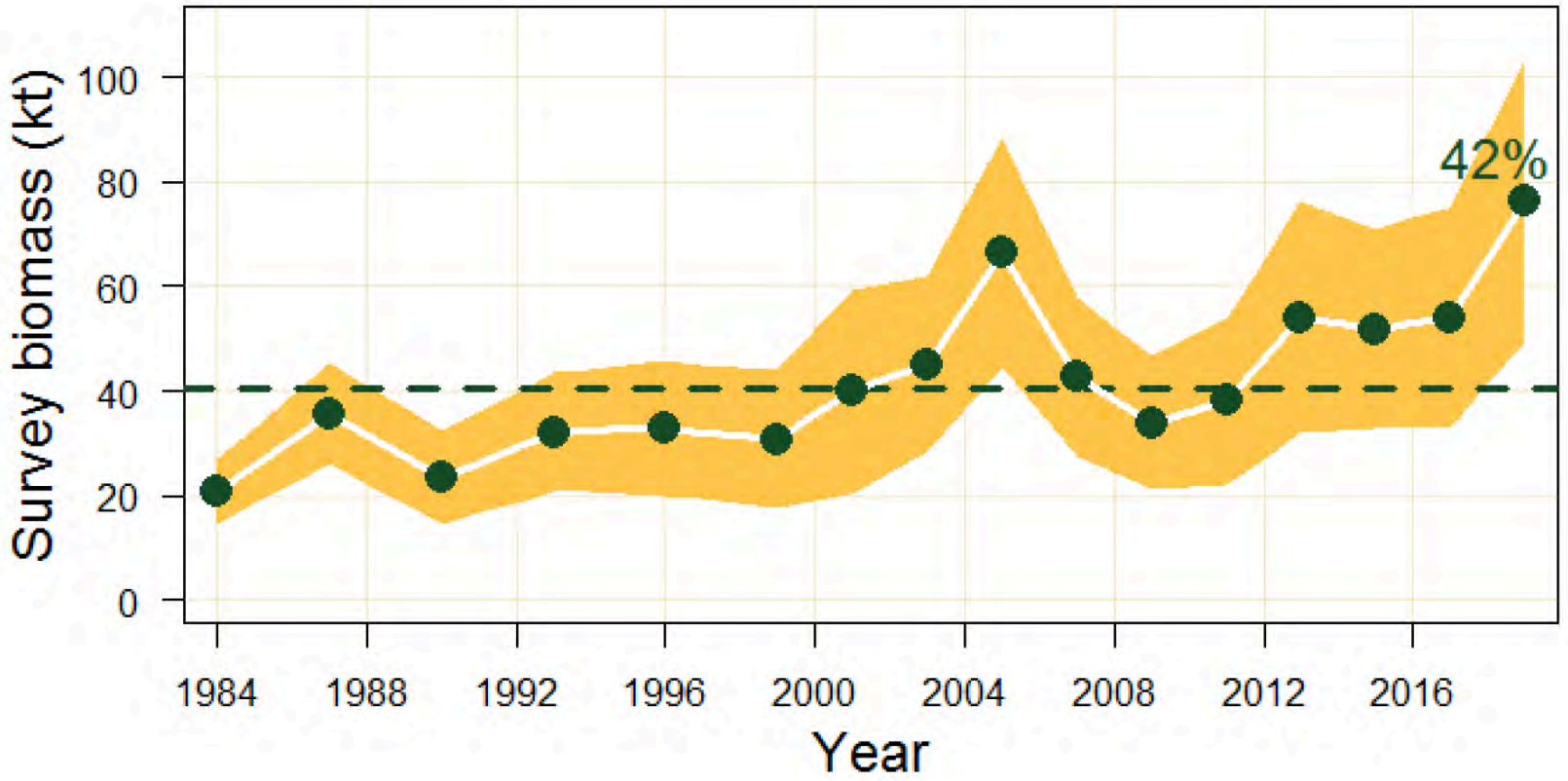
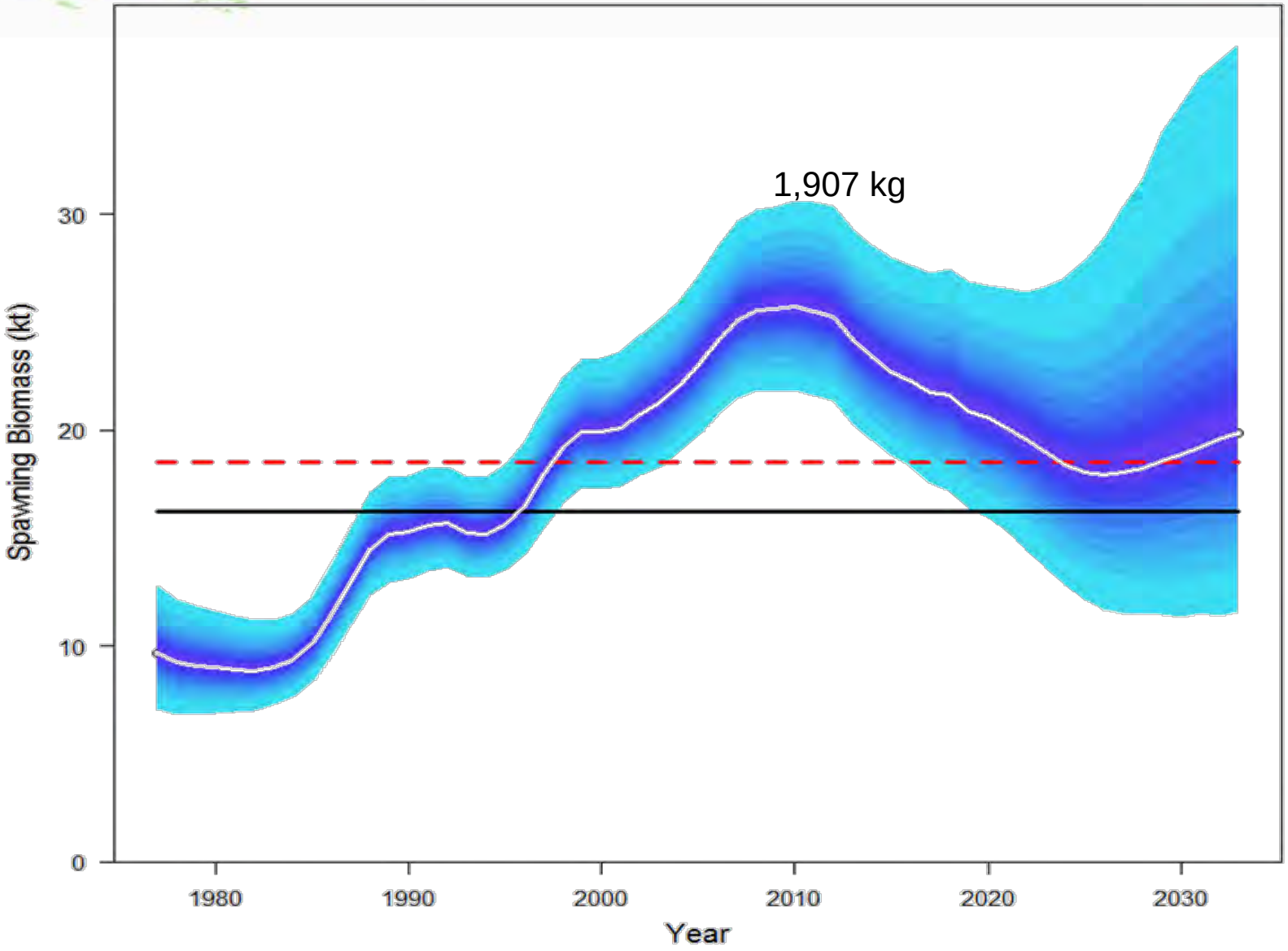


Figure 12-2. Model-based biomass index for GOA dusky rockfish from the NMFS bottom trawl survey, point estimates (in dark green circles) with 95% sampling error confidence intervals (shaded area), from 1984-2019. Dashed line is long-term average for the time series. Text percentage is the change of the 2019 index from the 2017 index.

Dusky rockfish spawning biomass

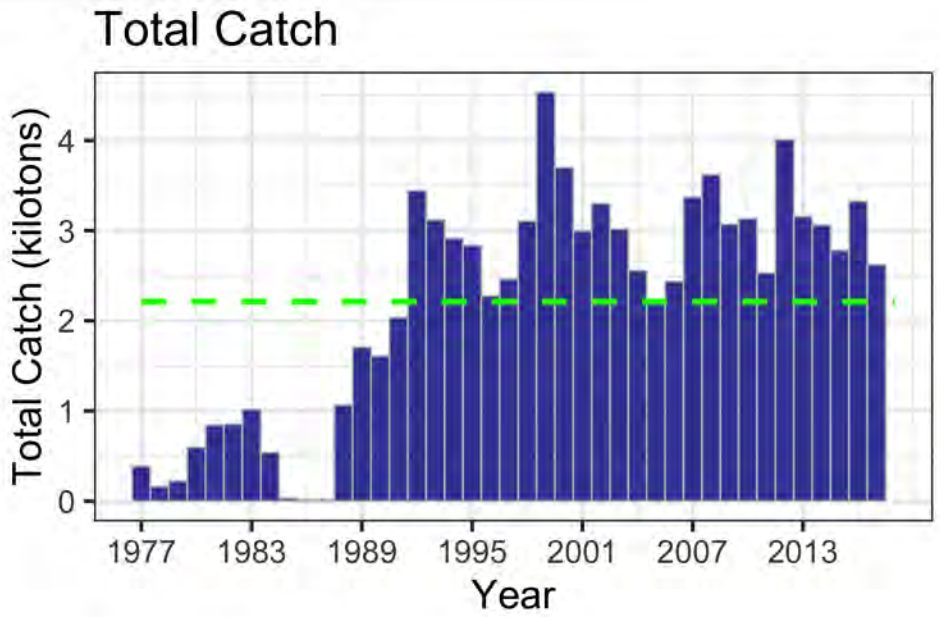


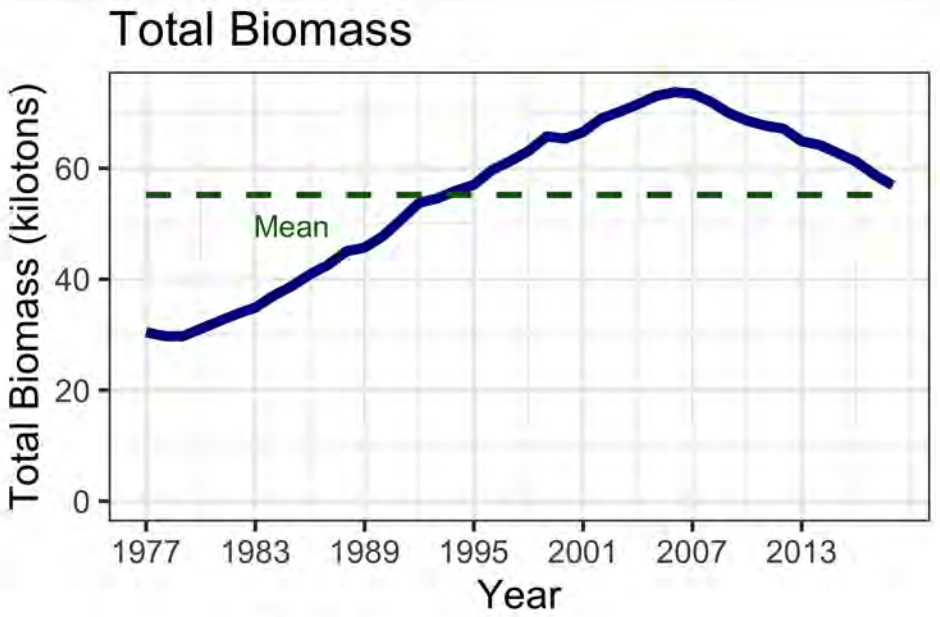
Dusky rockfish

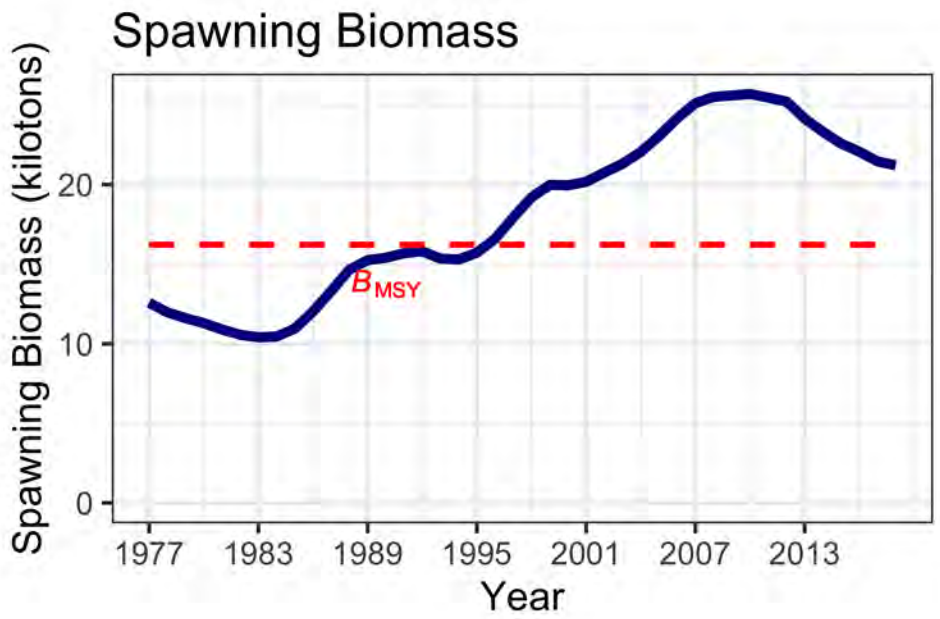
In 2018 the Team recommended:

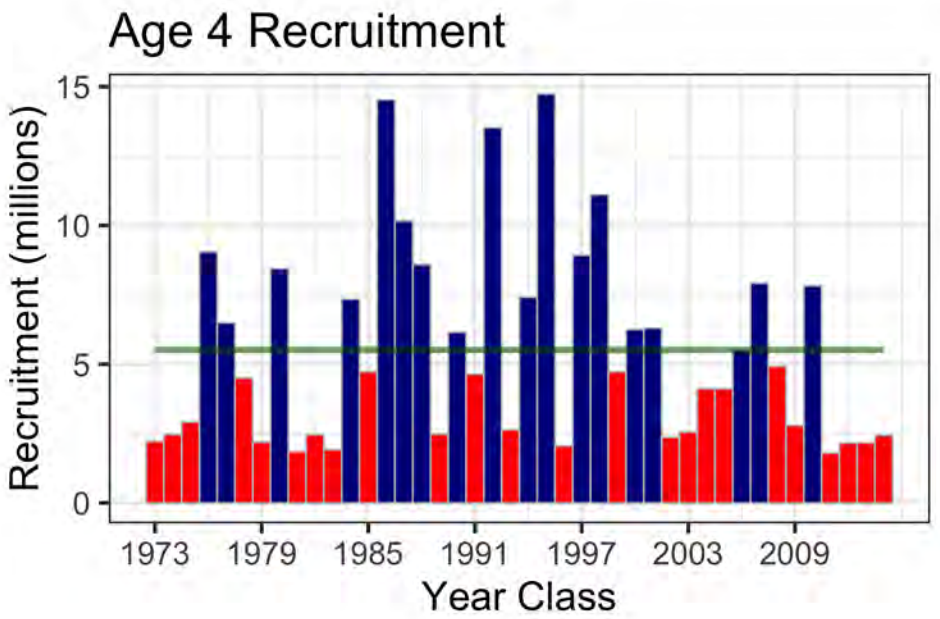
- **That the authors examine the impact of including the 1984 and 1987 survey data, and**
- **That the use of the VAST approach for spatial apportionment and for projections (similar to the one-dimensional random effects model) be investigated.**

GOA Dusky Rockfish









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Sub Total	46,946	47,450	up 504 (1%)

13. GOA Blackspotted/Rougheye Rockfish

Full assessment

Catches low relative to total biomass

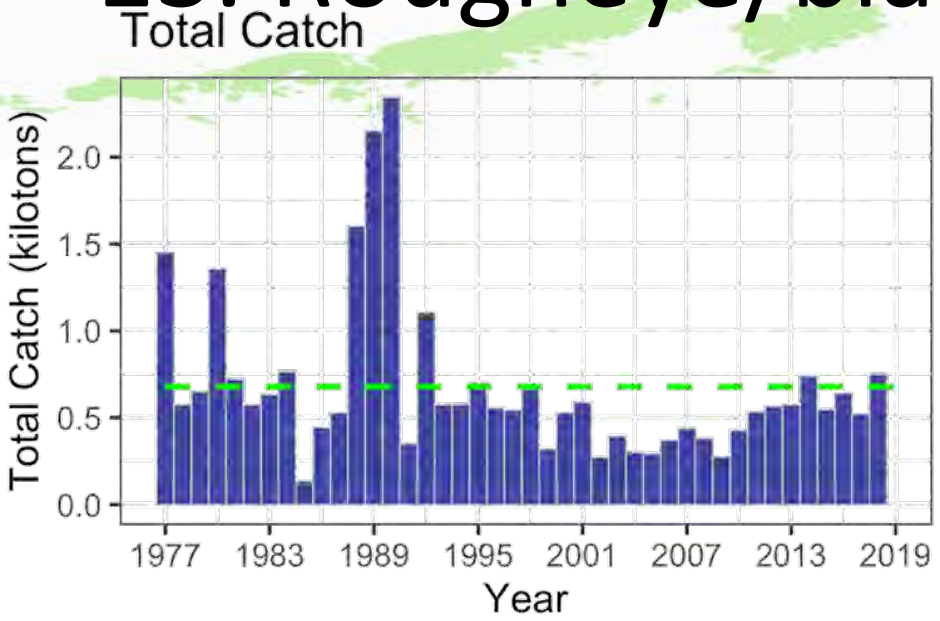
- Range 0.6% to 2%

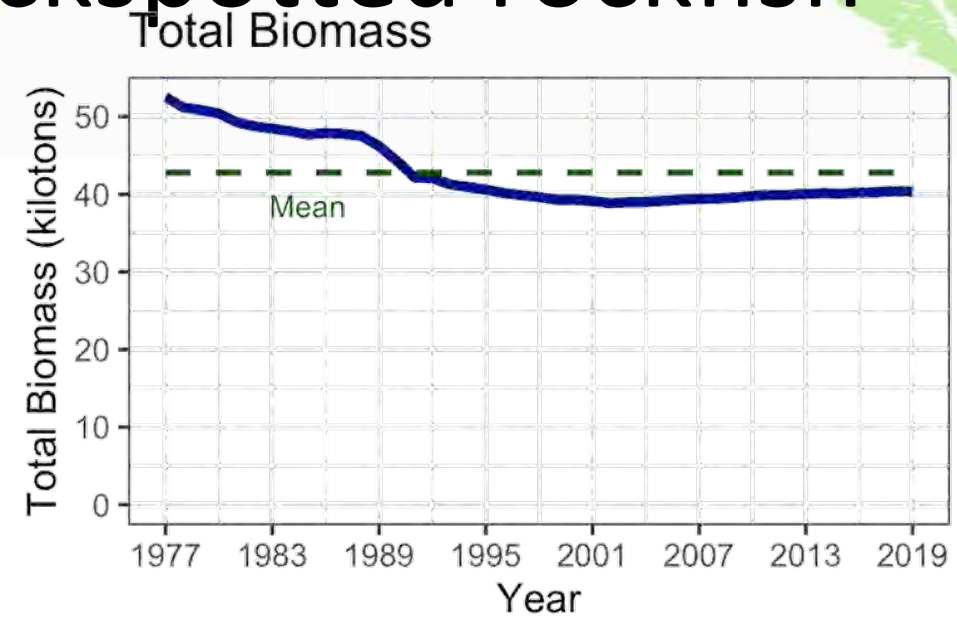
13. GOA Blackspotted/Rougheye Rockfish

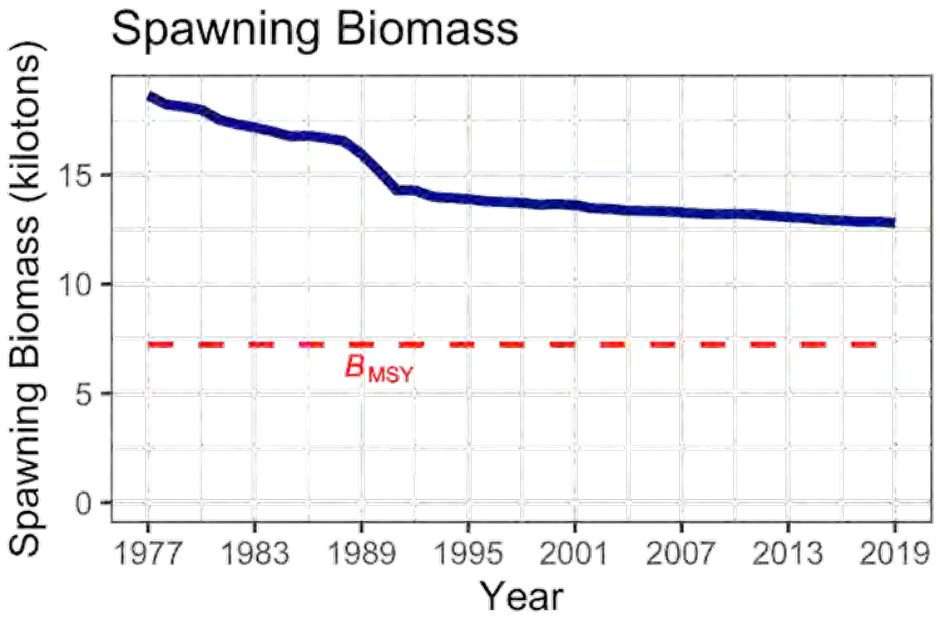
The Team recommended

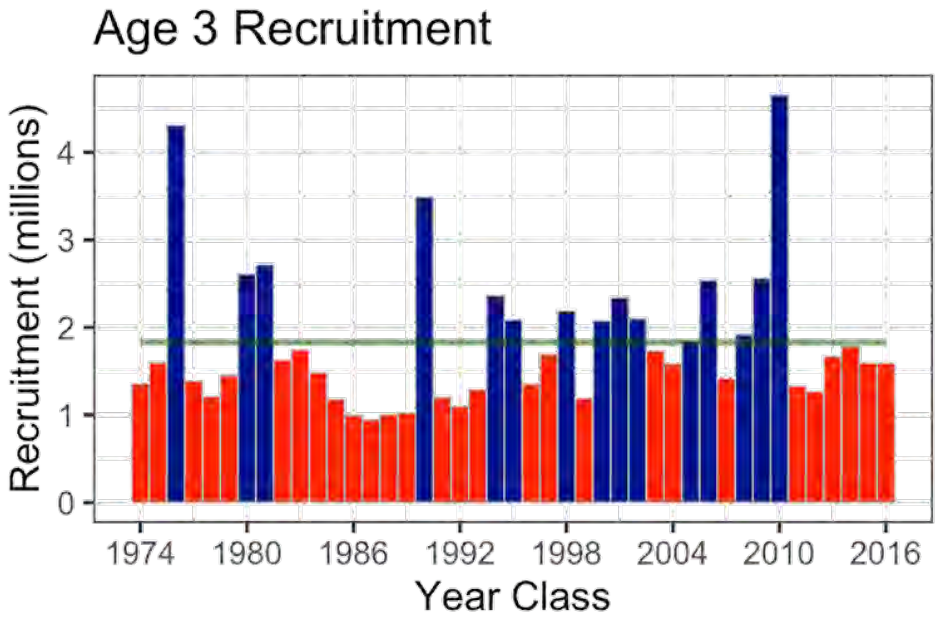
- **incorporating additional information about species identification obtained through otolith morphology in future assessments**
- **investigating how selectivity is modeled. In particular, there were some abrupt changes between ages in the average fishery selectivity**
- **using the new apportionment method going forward (in addition to this year)**

13. Rougheye/blackspotted rockfish







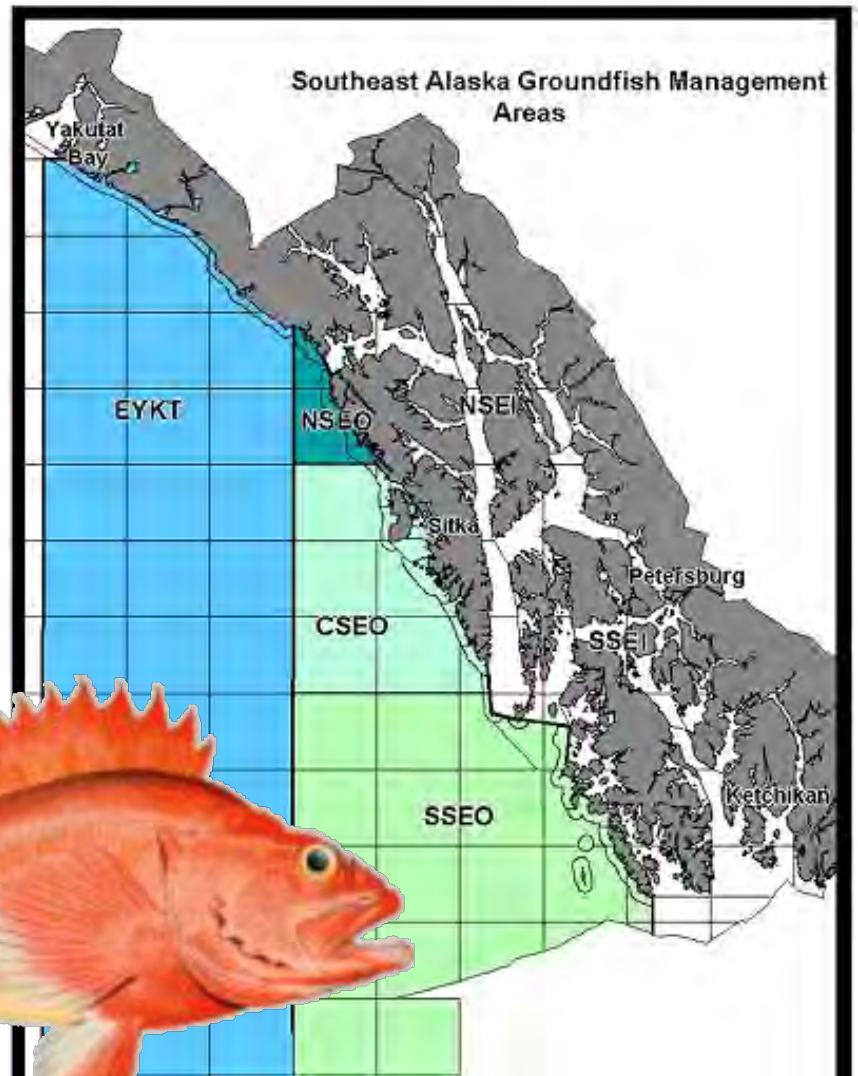


Rockfish ABC Summary

Species	2019	2020	Change
POP	28,555	31,238	up 2,683 (9%)
northern rockfish	4,529	4,312	down 217 (5%)
Shortraker Rockfish	863	708	down 155 (18%)
Dusky	3,700	3,676	down 24 (1%)
Rougheye and Blackspotted Rockfish	1,428	1,209	down 219 (15%)
Demersal shelf rockfish	261	238	down 23 (9%)
Thornyhead	2,016	2,016	same (0%)
Other rock	5,594	4,053	down 1,541 (28%)
Sub Total	46,946	47,450	up 504 (1%)

14. Demersal shelf rockfish

- Partial Assessment, Tier 4 (yelloweye) and Tier 6 (6 other species)
- Three areas (SSEO, CSEO, and NSEO) surveyed by ROV in 2018
- Yelloweye biomass estimate decreased from 12,029 t to 10,903 t (lower CI)
- The authors looked for guidance to complete risk table given this stock is not age-structured



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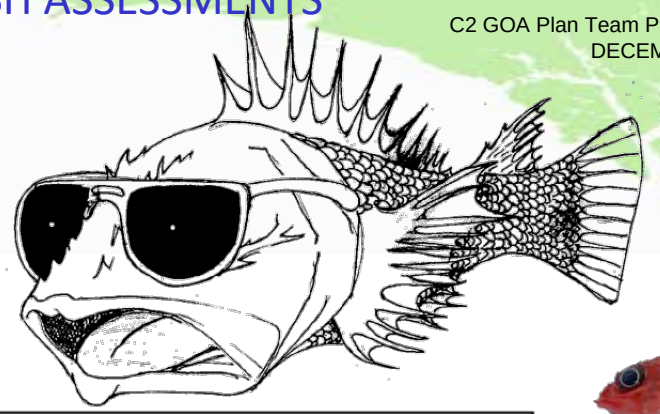
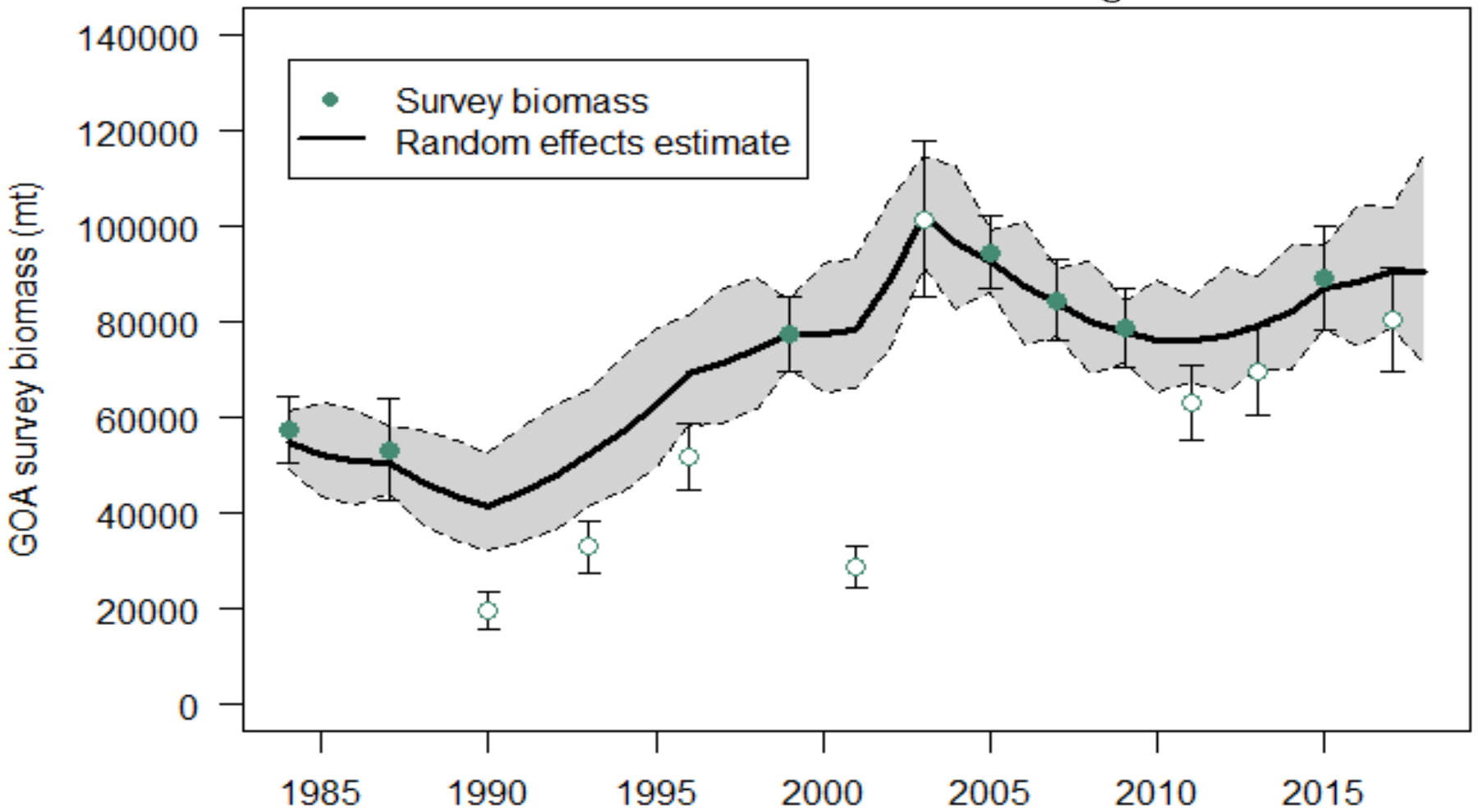
Sub Total	46,946	47,450	up 504 (1%)

15. Shortspine thornyheads



No assessment

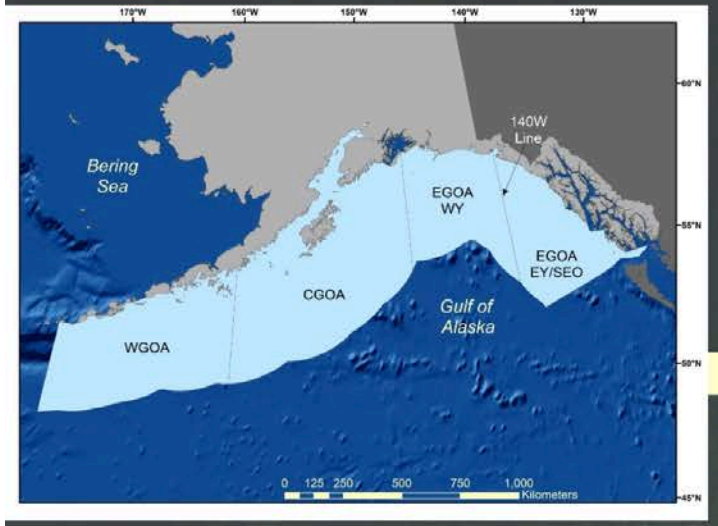
Tier 5



15. Other rockfish

Full assessment

Tier 5



WGOA & CGOA	EGOA (WY)	EGOA (EY/SEO)
Aurora rockfish	Aurora rockfish	Aurora rockfish
Blackgill rockfish	Blackgill rockfish	Blackgill rockfish
Bocaccio	Bocaccio	Bocaccio
Canary rockfish	Canary rockfish	
Chilipepper rockfish	Chilipepper rockfish	Chilipepper rockfish
China rockfish	China rockfish	
Copper rockfish	Copper rockfish	
Darkblotched rockfish	Darkblotched rockfish	Darkblotched rockfish
Greenstriped rockfish	Greenstriped rockfish	Greenstriped rockfish
Harlequin rockfish	Harlequin rockfish	Harlequin rockfish
	Northern rockfish	Northern rockfish
Pygmy rockfish	Pygmy rockfish	Pygmy rockfish
Quillback rockfish	Quillback rockfish	
Redbanded rockfish	Redbanded rockfish	Redbanded rockfish
Redstripe rockfish	Redstripe rockfish	Redstripe rockfish
Rosethorn rockfish	Rosethorn rockfish	
Sharpchin rockfish	Sharpchin rockfish	Sharpchin rockfish
Shortbelly rockfish	Shortbelly rockfish	Shortbelly rockfish
Silvergray rockfish	Silvergray rockfish	Silvergray rockfish
Splitnose rockfish	Splitnose rockfish	Splitnose rockfish
Stripetail rockfish	Stripetail rockfish	Stripetail rockfish
Tiger rockfish	Tiger rockfish	
Vermilion rockfish	Vermilion rockfish	Vermilion rockfish
Widow rockfish	Widow rockfish	Widow rockfish
Yelloweye rockfish	Yelloweye rockfish	
Yellowmouth rockfish	Yellowmouth rockfish	Yellowmouth rockfish
Yellowtail rockfish	Yellowtail rockfish	Yellowtail rockfish
26 Species	27 Species	20 Species

15. Other rockfish

Full assessment

Tier 5

Risk Matrix

Assessment-related considerations	Population dynamics considerations	Environmental/ ecosystem considerations	Fishery Performance considerations	**Overall score (highest of the individual scores)**
Level 1: Typical to moderately increased uncertainty/minor unresolved issues in assessment.	Level 1: Stock trends are typical for the stock; recent recruitment is within normal range.	Level 1: No apparent environmental/ecosystem concerns	Level 1: No apparent fishery/resource-use performance and/or behavior concerns	**Level 1: Normal**

15. Other rockfish

Area Allocation

Current

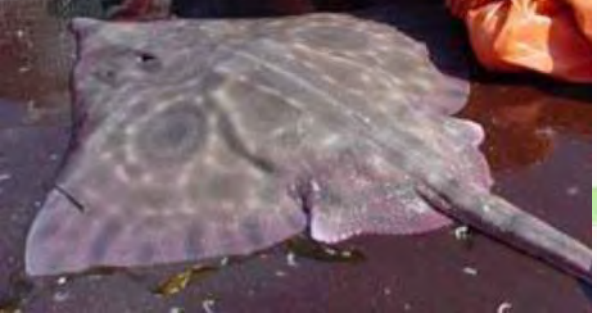
Full Complex	W GOA	Central GOA	Eastern GOA		Total
			West Yakutat	E Yakutat/ Southeast	
Area ABC (t)	940		369	2,744	4,053
OFL (t)					5,320

Previous

Full Complex	W GOA	Central GOA	Eastern GOA		Total
			West Yakutat	E Yakutat/ Southeast	
Area ABC (t)	1,737		368	3,489	5,594
OFL (t)					7,365

15. Other rockfish Team discussions

- **The Team recommended, as new data is collected based on the 2020 full retention mandate and new EM data, the author may provide an update to the Team in September, especially if there are concerns bycatch amounts approaching ABC levels.**
  - The Team also expressed concern about the disconnect between the survey findings (sporadic catches) and the fleet reports of increasing harlequin numbers.
- **The Team continues to recommend the Council move forward with Step 2 of the Spatial Management Policy for this complex and cautions potential changes in catch estimates may occur in 2020 due to full retention regulations and the incorporation of EM data.**



ABCs for remaining GOA species

Species	2019 Catch	2019	2020	Change
Pollock	117,019	144,623	118,642	down 25,981 (18%)
Pacific Cod	10,909	17,000	14,621	down 2,379 (14%)
Sablefish	12,219	11,571	14,393	up 2,822 (24%)
Flatfish	27,638	116,562	114,567	down 1,995 (2%)
Arrowtooth flounder	2,553	145,841	128,060	down 17,781 (12%)
Rockfish	32,730	46,946	47,450	up 504 (1%)
Atka mackerel	1,254	4,700	4,700	same (0%)
Skates	3,042	7,804	6,670	down 1,134 (15%)
Other Species	2,618	14,460	14,363	down 97 (1%)
Total	209,982	509,507	463,466	down 46,041 (9%)

Other species…

Species	2019 Catch	2019	2020	Change
Atka mackerel	1,254	4,700	4,700	same(0%)
Big skate	1,192	2,848	3,208	up 360(13%)
Longnose skate	983	3,572	2,587	down 985(28%)
Other skates	867	1,384	875	down 509(37%)
Sculpins	574	5,301	5,199	down 102(2%)
Sharks	1,728	8,184	8,184	same(0%)
Squid	-	-	-	--
Octopus	316	975	980	up 5(1%)

17. GOA Atka mackerel

- Full assessment

18. GOA Skates

Species	2019 Catch	2019	2020	Change
Big skate	1,192	2,848	3,208	up 360 (13%)
Longnose skate	983	3,572	2,587	down 985 (28%)
Other skate	867	1,384	875	down 509 (37%)
All skates	3,042	7,804	6,670	down 1,134 (15%)

Full Assessment, Tier 5 complex

- Big Skate survey biomass increased relative 2017
- Longnose skate decreased relative to 2017
- "Other" skate biomass decreased relative to 2017
  - Bathyraja showing significant biomass declines consistent to levels seen in 1990's
  - 2020 ABC is 1,166
- Four additional surveys examined
  - (AFSC and IPHC longline and ADF&G trawl survey in Kodiak and Prince William Sound)
- Risk Table was scored Level 1 for all categories – no reduction to maxABC

19. GOA Sculpins

- Partial Assessment, Tier 5 complex
- Sculpin complex biomass 33,010 t (random effects model)

Sculpins last year as a “target” species complex!

- moving to the ecosystem component category

20. GOA Sharks

- No assessment this year

21. GOA Octopus

- Full assessment, Tier 6
- **The Team recommended that the author investigate bottom trawl survey catch by numbers as well as frequency of occurrence in hauls.**
- **The Team recommended that the period for which maximum catch is computed be fixed.**
- Using the risk table, the author ranked the octopus complex as a level of 1 and noted the difficulty in applying the risk table to Tier 6 stocks such as this one