BSAI Plan Team report

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NOAA FISHERIES
Alaska Fisheries Science Center

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Team members

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- Mary Furuness (NMFS AKRO)
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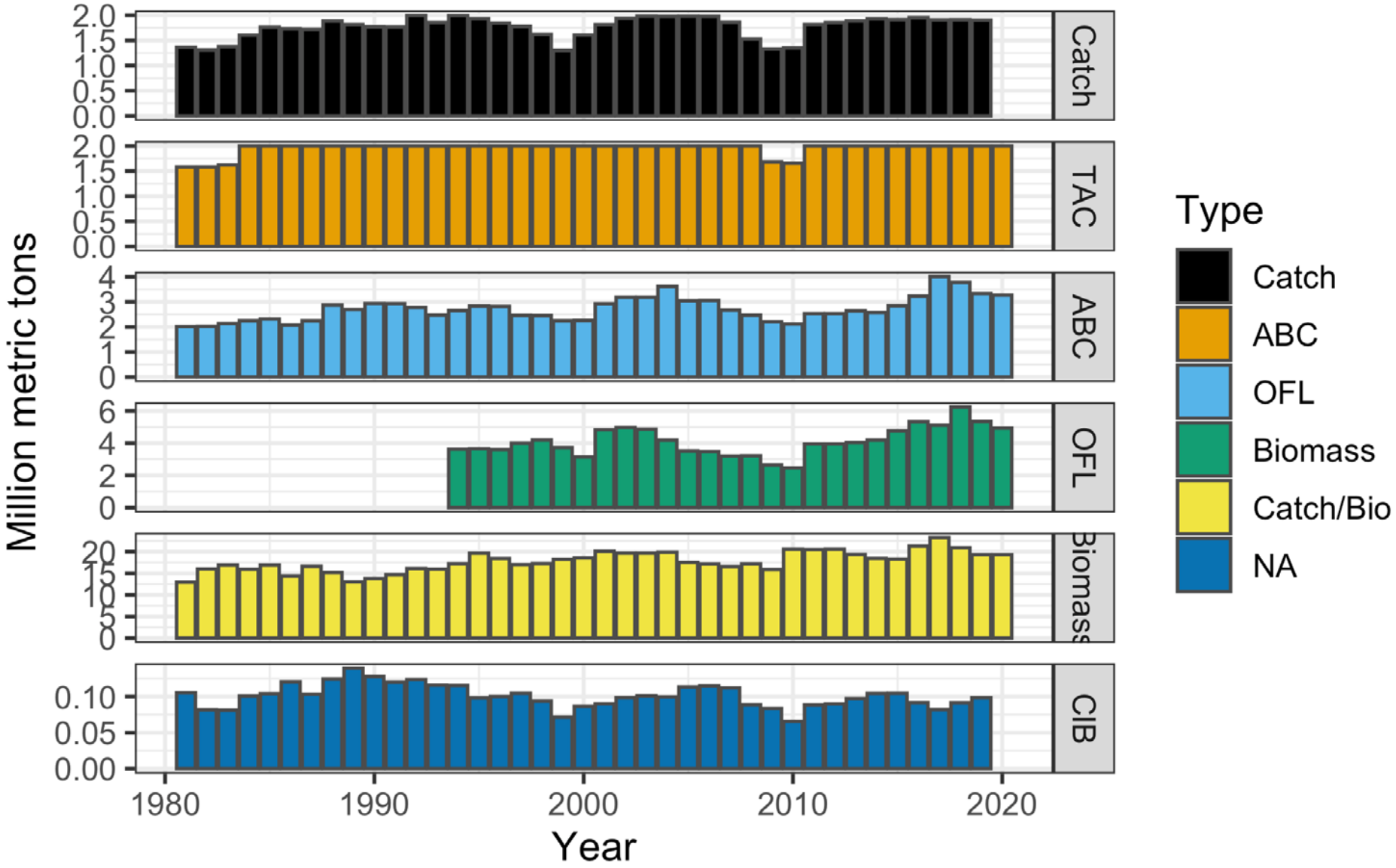
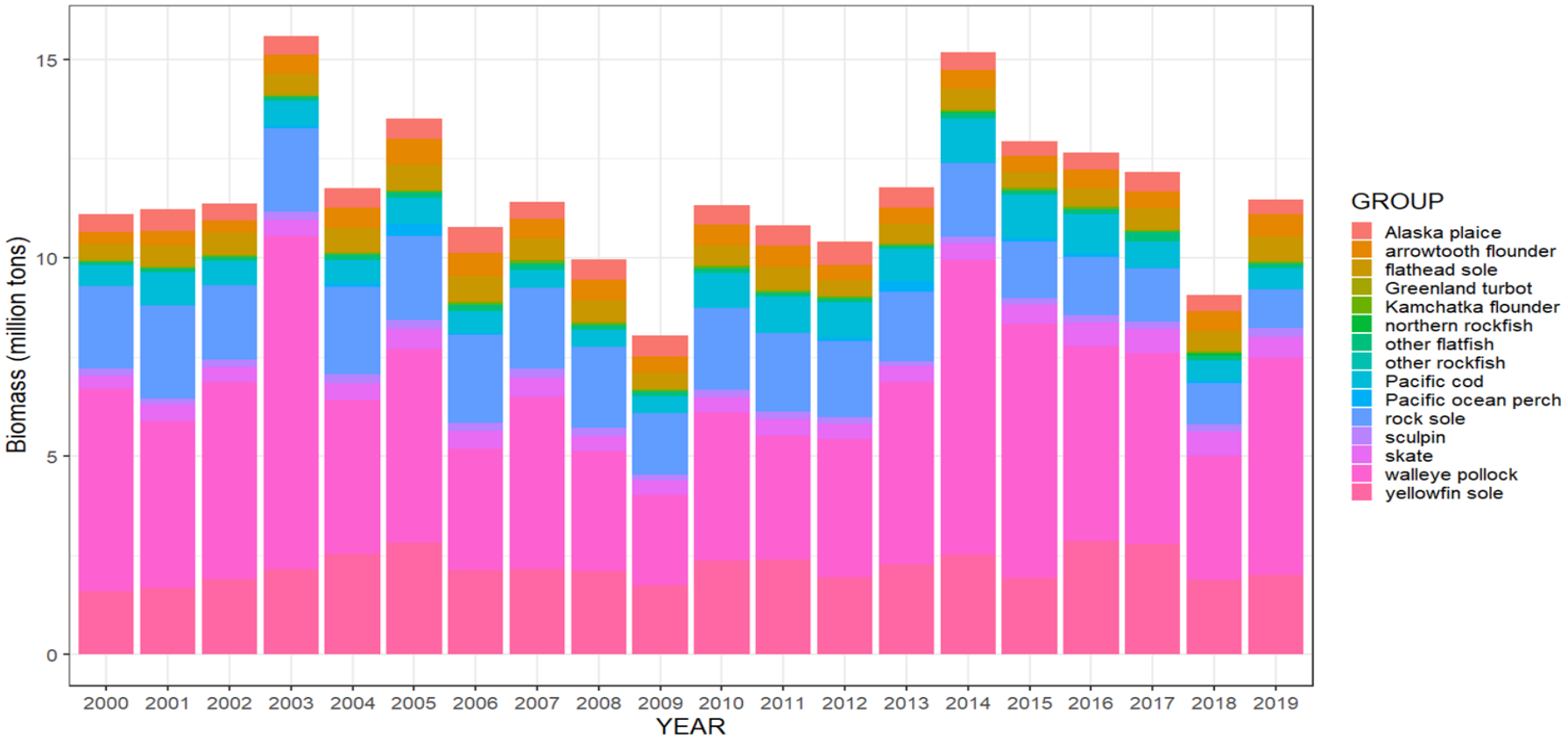
- Andy Kingham (AFSC FMA)
- Brenda Norcross (UAF)
- Kalei Shotwell (AFSC ABL)
- Chris Siddon (ADF&G)
- Jane Sullivan (ADF&G)
- Cindy Tribuzio (AFSC ABL)

“Big picture” overview

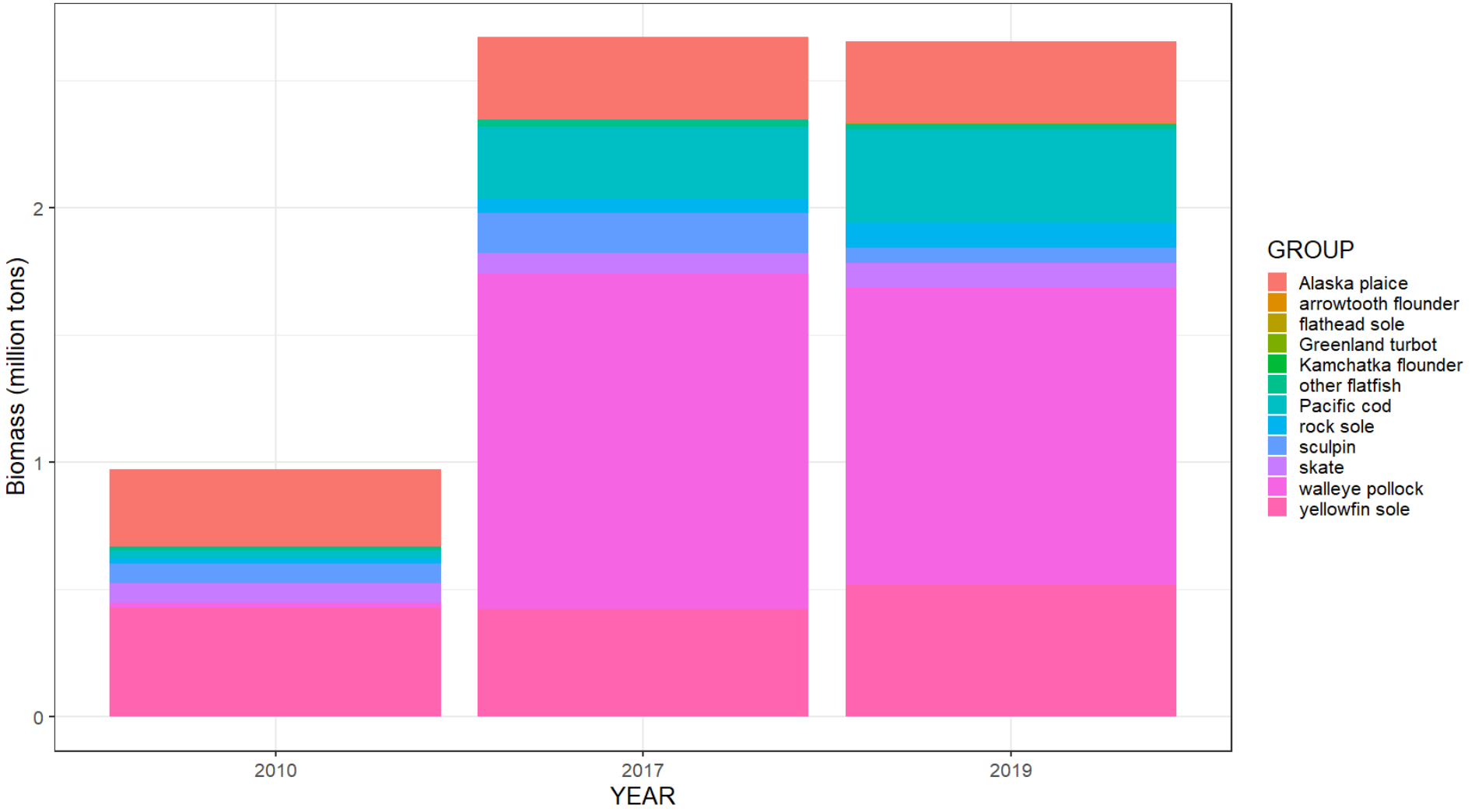
Big picture over time



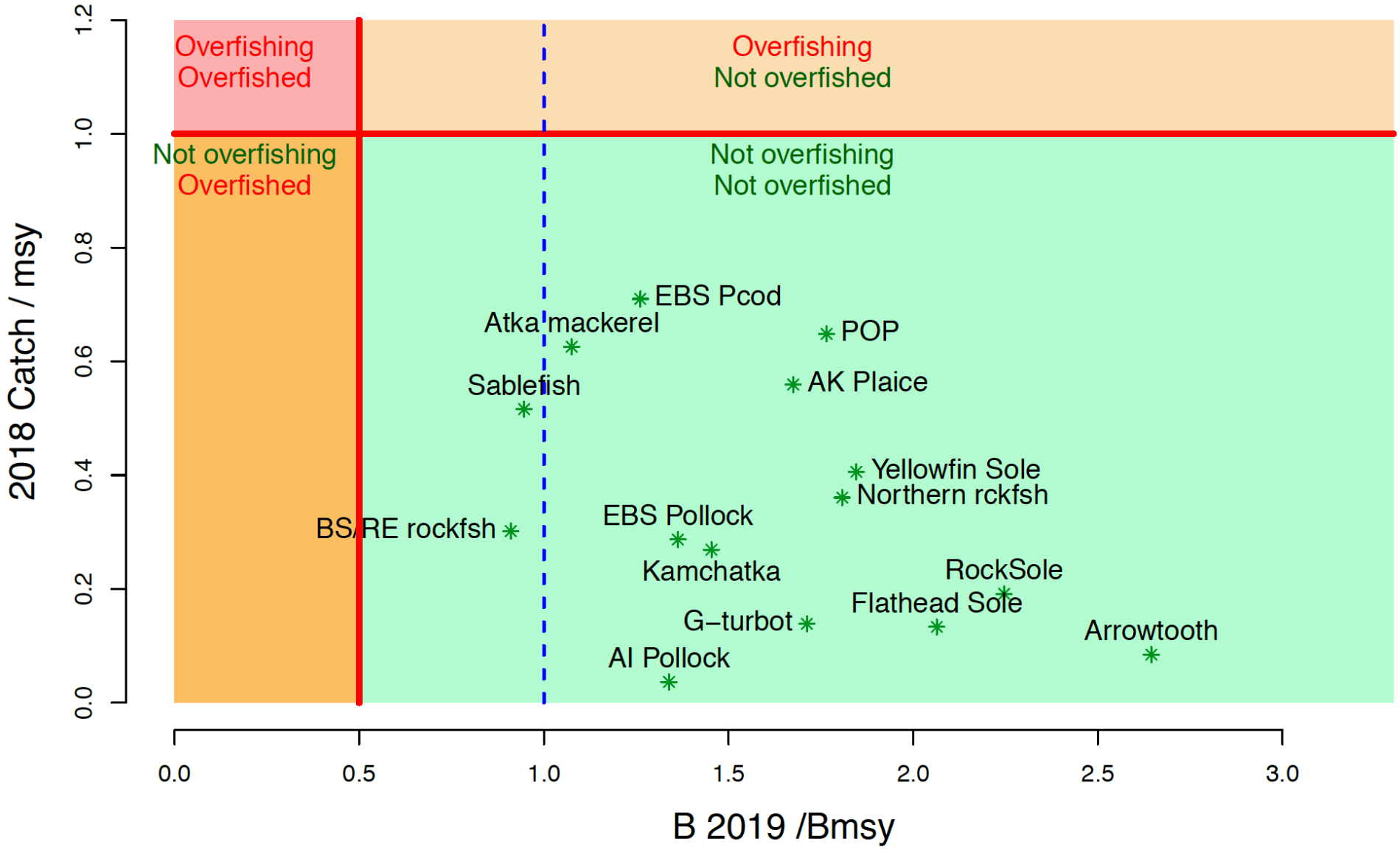
Changes in EBS shelf biomass, 2000-2019



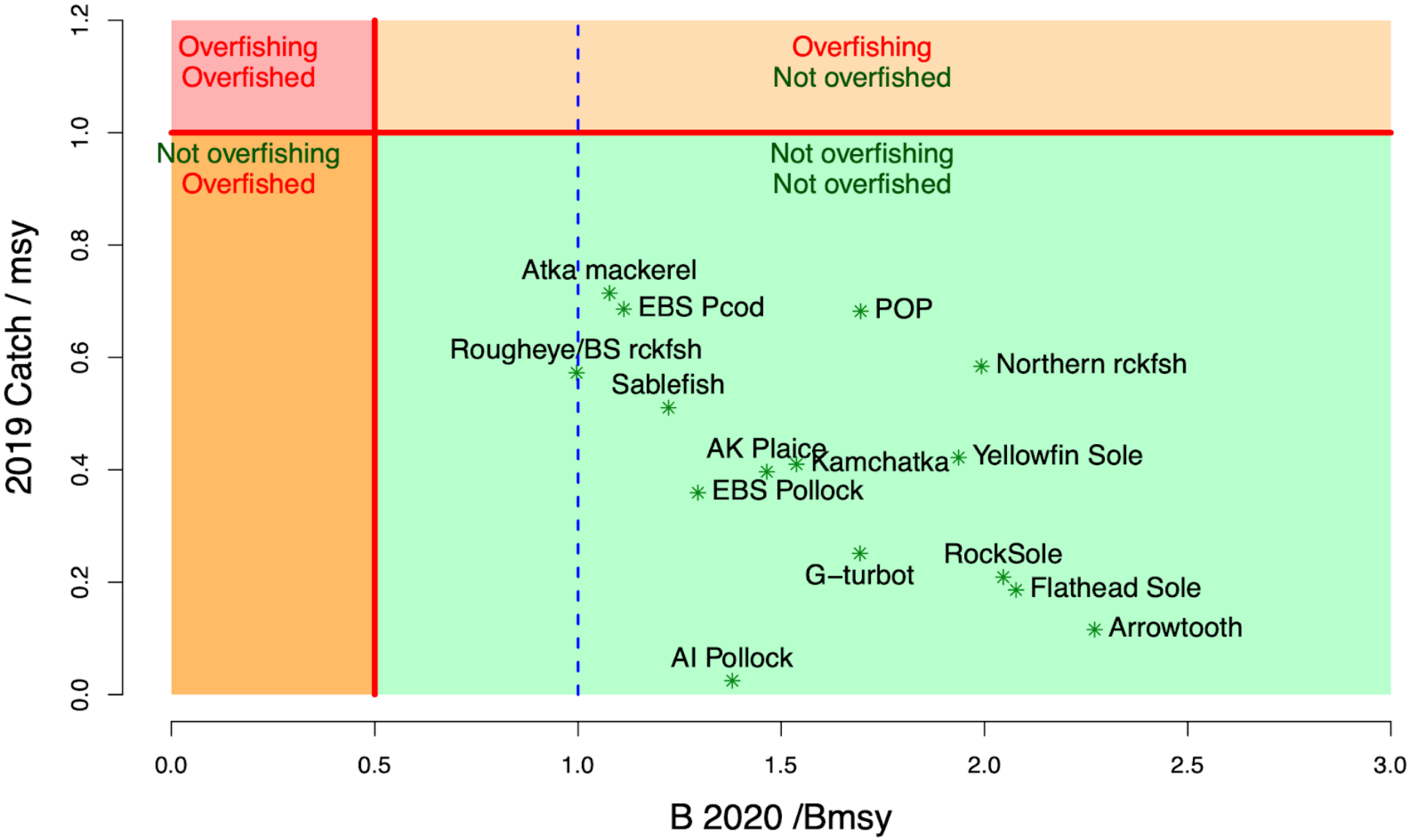
Changes in NBS biomass 2010-2019



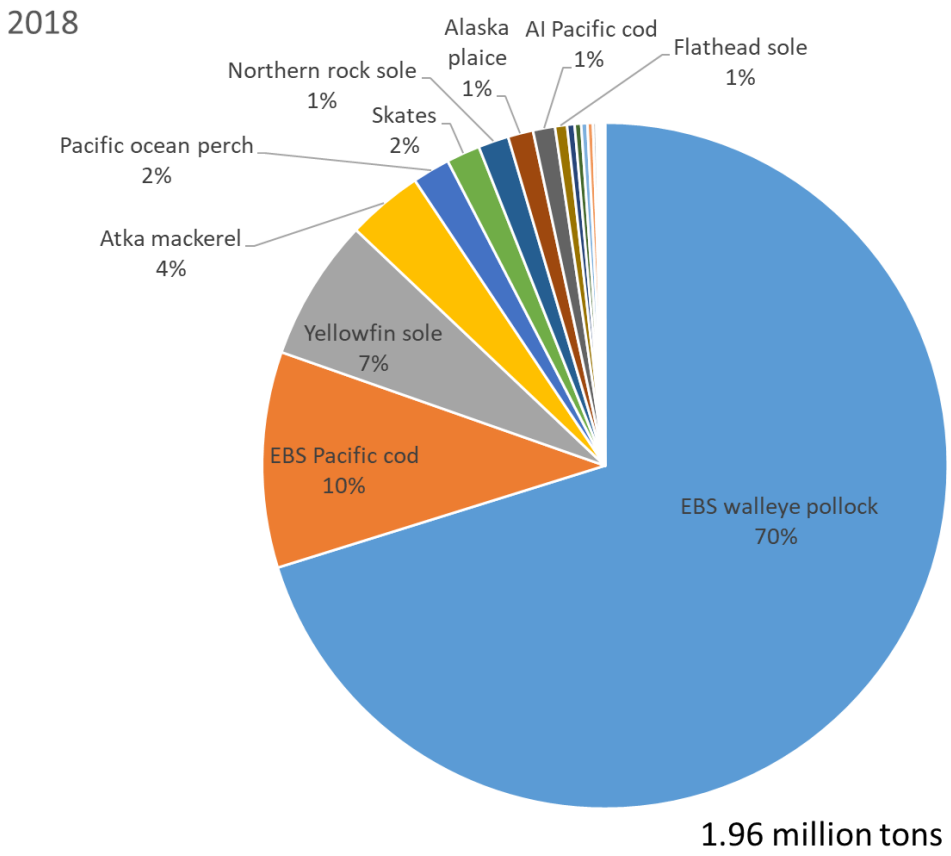
Stock status 2018

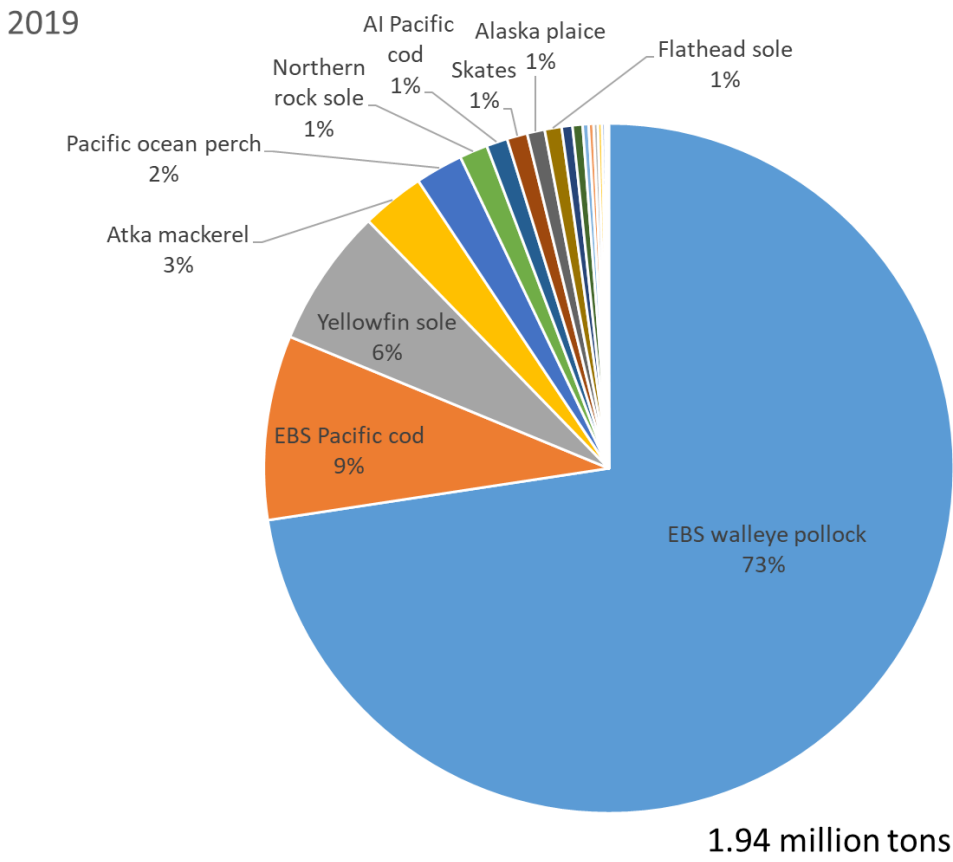


Stock status 2019

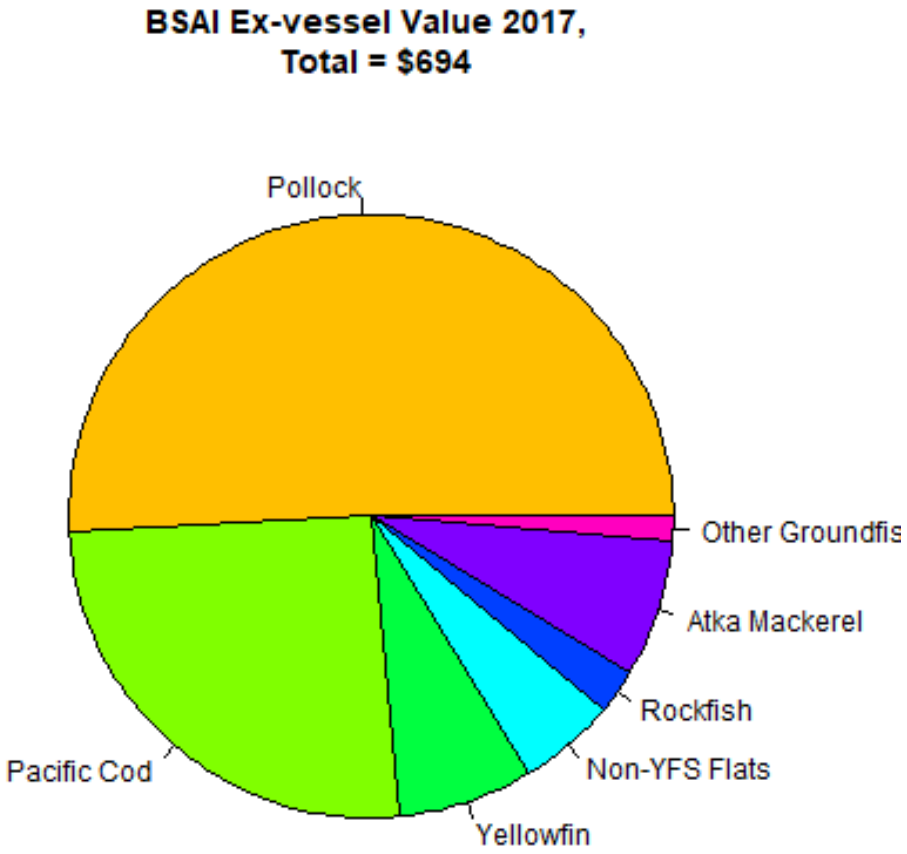


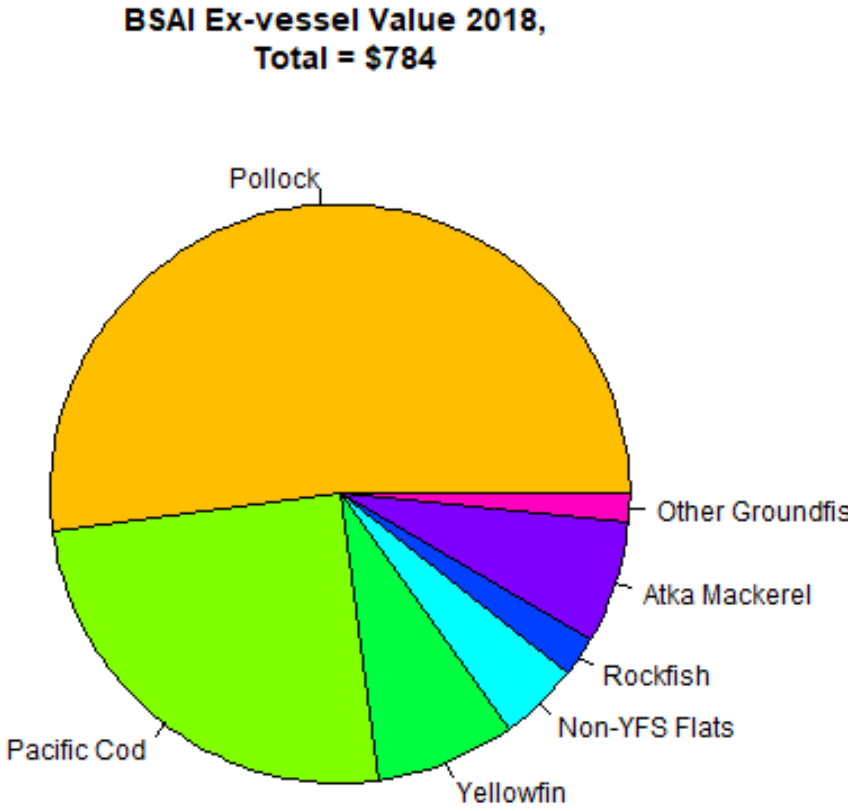
BSAI Catches





BSAI Ex-vessel Value





Big picture (with big font)

- Assessment counts:
  - 8 full
  - 10 partial
  - 6 “none”
- Models:
  - Counts (not counting Tier 5 random effects models):
    - 16 base models (same number as last year)
    - 18 new models (down from 31 last year)
      - 11 of these are found in a single assessment
  - Changes:
    - 3 recommended by authors (EBS Pcod, YFS, northern rockfish)
    - 2 recommended by Team (EBS Pcod, ~~YFS~~, northern rockfish)

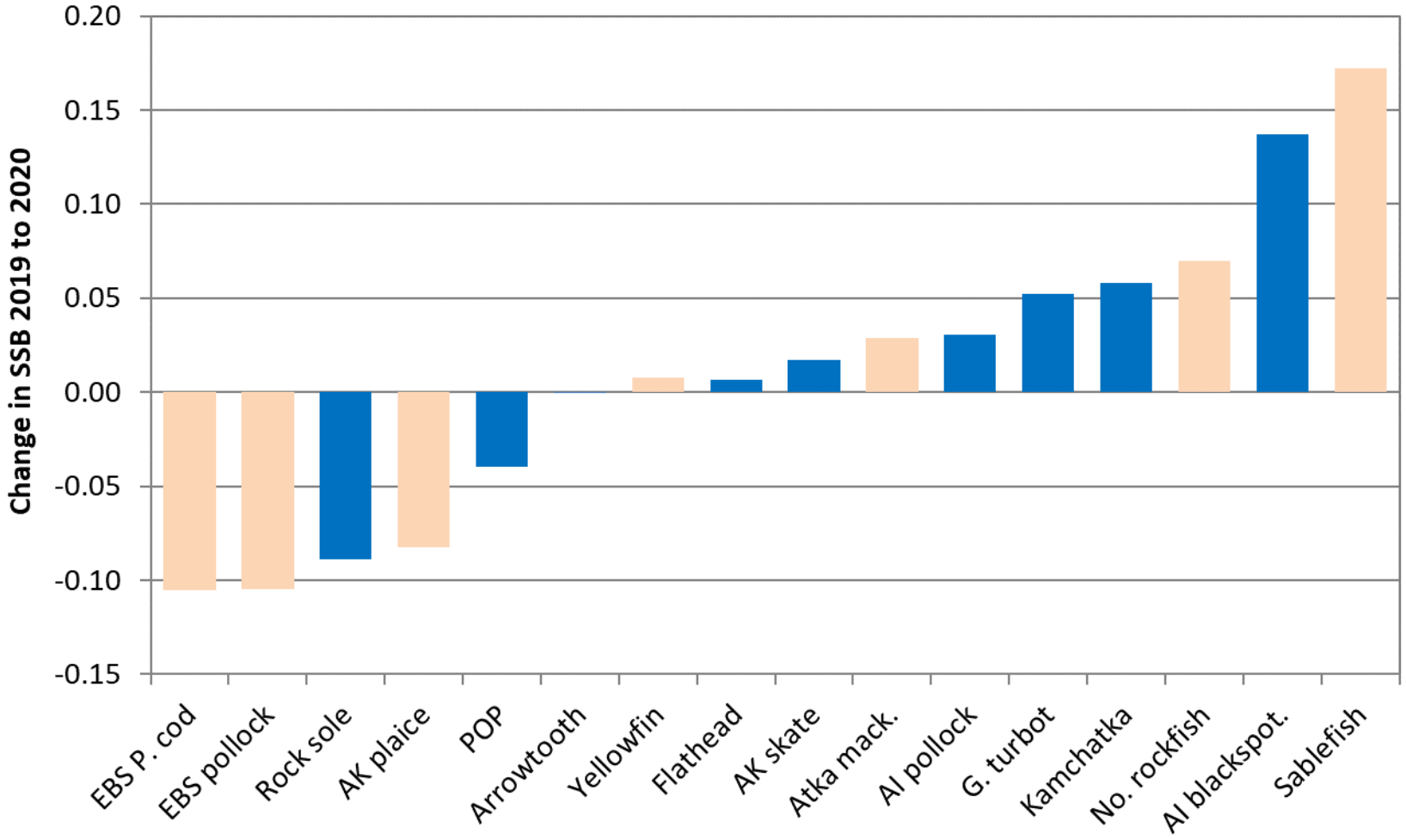
A few more “big picture” items

- Team agreed with authors’ ABC recommendations in all cases except BSAI Yellowfin sole
- ABC recommendations correspond to maximum permissible values in all cases except EBS pollock and sablefish
- Of the 16 stocks/complexes in Tiers 1-3, none are in Tier 1b and only three (AI pollock, sablefish, and blackspotted/rougheye) are in Tier 3b
- No stocks/complexes were subjected to overfishing in 2018, and no stocks/complexes are overfished or approaching a condition of being overfished as of 2019

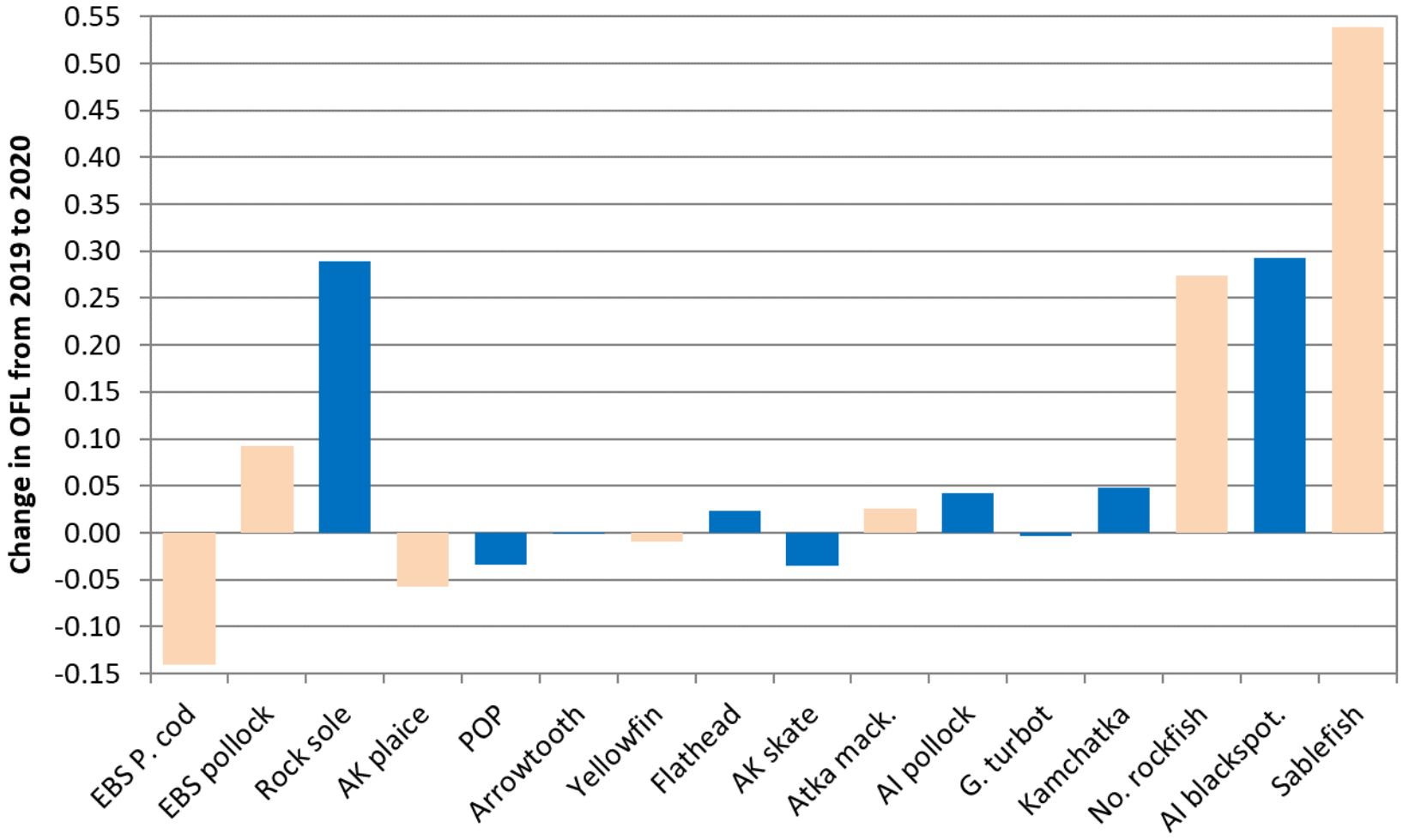
Big picture (with small font)

Ch.	Assessment	Lead author	2019 tier	Type	Numbered models (or Tier 5)	2020 tier change?		Risk table	
						From 2019	From proj.	Level	% Red.
1	EBS pollock	Ianelli	1a	Full	**16.1 (base)**, 16.2	none	none	2	**43%**
1A	AI pollock	Barbeaux	3a	Partial	15.1 (base)	none	none	n/a	0
1B	Bogoslof pollock	Ianelli	5	None	n/a	n/a	n/a	n/a	n/a
2	EBS Pacific cod	Thompson	3a	Full	16.6i (base), 19.7-19.15, **weighted ensemble**, unweighted ensemble	**3a to 3b**	none	2	TBD
2A	AI Pacific cod	Thompson	5	Full	**Tier 5**, 19.0, 19.0a, 19.0b, 19.0c	none	none	2	TBD
3	Sablefish	Hanselman	3b	Full	16.5 (base)	**3b to 3a**	none	3	**57%**
4	Yellowfin sole	Spies	1a	Full	**18.1a (base)**, **18.2 (author)**	none	none	1	0
5	Greenland turbot	Bryan	3a	Partial	16.1b (base)	none	none	n/a	0
6	Arrowtooth flounder	Spies	3a	Partial	18.9 (base)	none	none	n/a	0
7	Kamchatka flounder	Bryan	3a	Partial	16.0a (base)	none	none	n/a	0
8	Northern rock sole	Wilderbuer	1a	Partial	15.1 (base)	none	none	n/a	0
9	Flathead sole	McGilliard	3a	Partial	18.2c (base)	none	none	n/a	0
10	Alaska plaice	Wilderbuer	3a	Full	11.1 (base)	none	none	1	0
11	Other flatfish	Wilderbuer	5	None	n/a	n/a	n/a	n/a	n/a
12	Pacific ocean perch	Spencer	3a	Partial	16.3a (base)	none	none	n/a	0
13	Northern rockfish	Spencer	3a	Full	16.1 (base), **16.1a**	none	none	2	0
14	Blackspot/rougheye	Spencer	3b/5	Partial	18.1 (base)	none	none	n/a	0
15	Shortraker rockfish	Spies	5	None	n/a	n/a	n/a	n/a	0
16	Other rockfish	Spies	5	None	n/a	n/a	n/a	n/a	0
17	Atka mackerel	Lowe	3b	Full	16.0b (base)	none	none	1	0
18	Skates	Ormseth	3a/5	Partial	14.2 (base)	none	none	n/a	0
19	Sculpins	Spies	5	Partial	Tier 5	none	none	n/a	0
20	Sharks	Tribuzio	6	None	n/a	n/a	n/a	n/a	0
21	Octopus	Ormseth	6	None	n/a	n/a	n/a	n/a	0
22	Forage species	Ormseth	n/a	Report	n/a	n/a	n/a	n/a	n/a

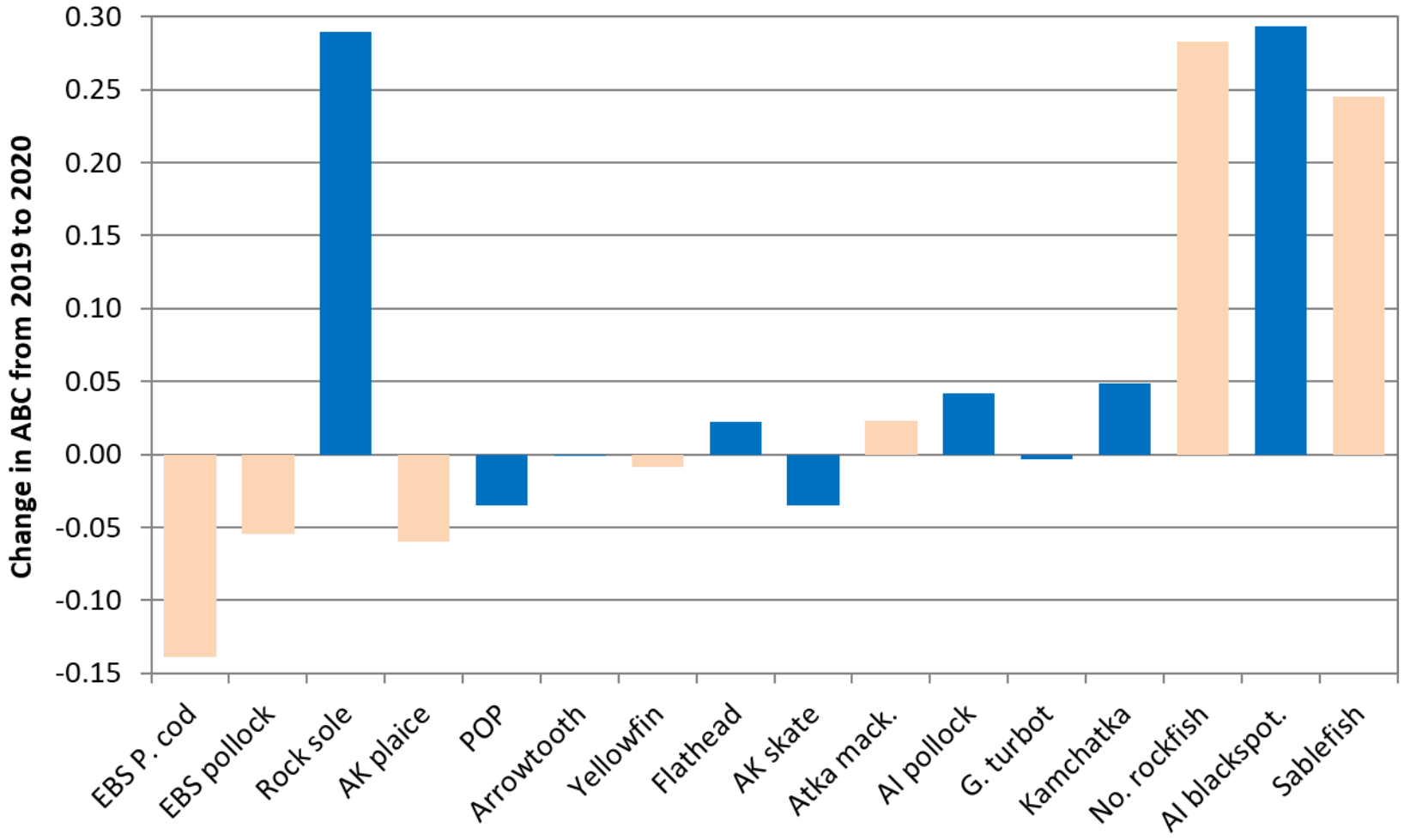
Changes in spawning biomass 2019 to 2020 (Tier 1-3)



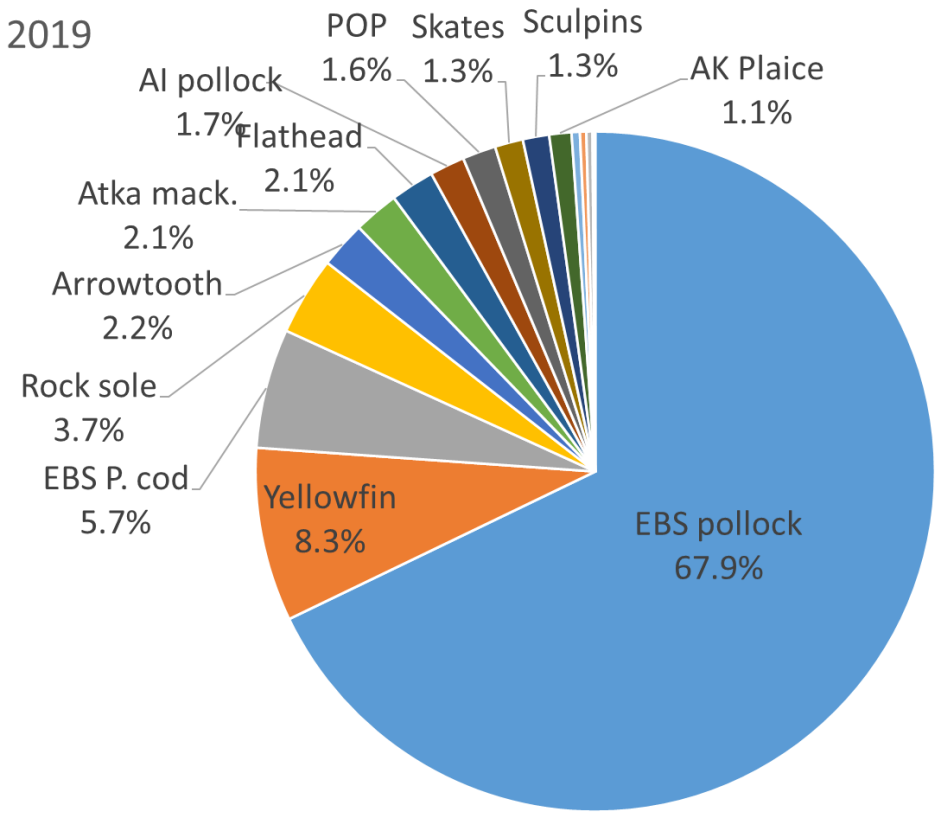
Changes in OFL 2019 to 2020 (Tier 1-3)



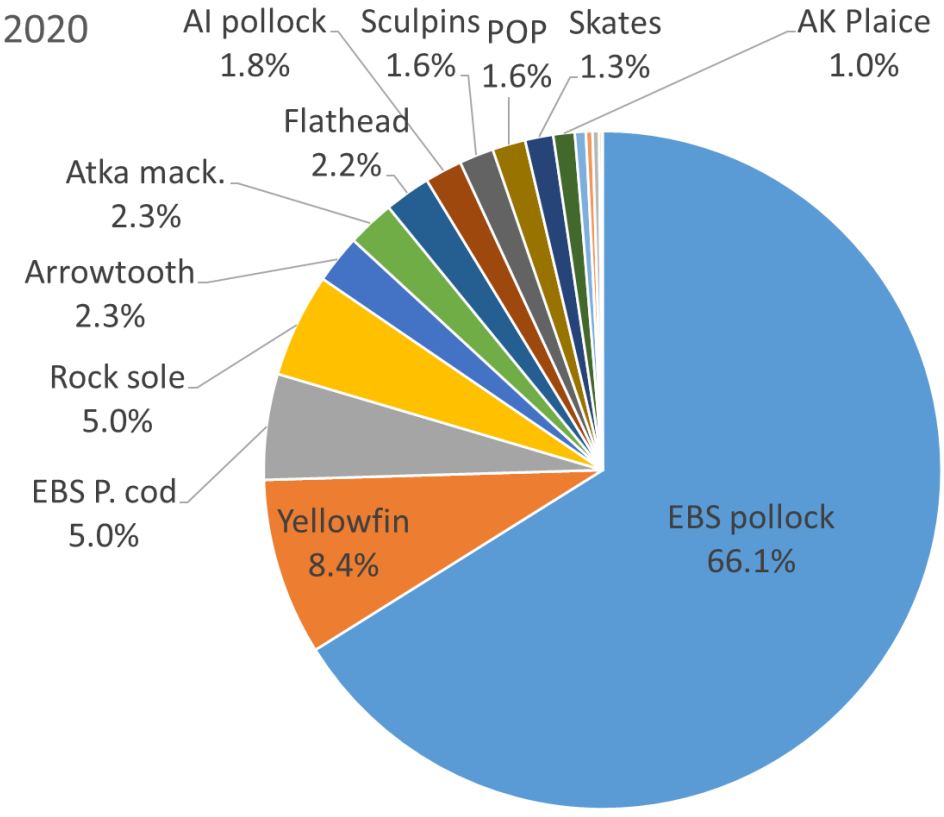
Changes in ABC 2019 to 2020 (Tier 1-3)



BSAI Plan Team ABCs



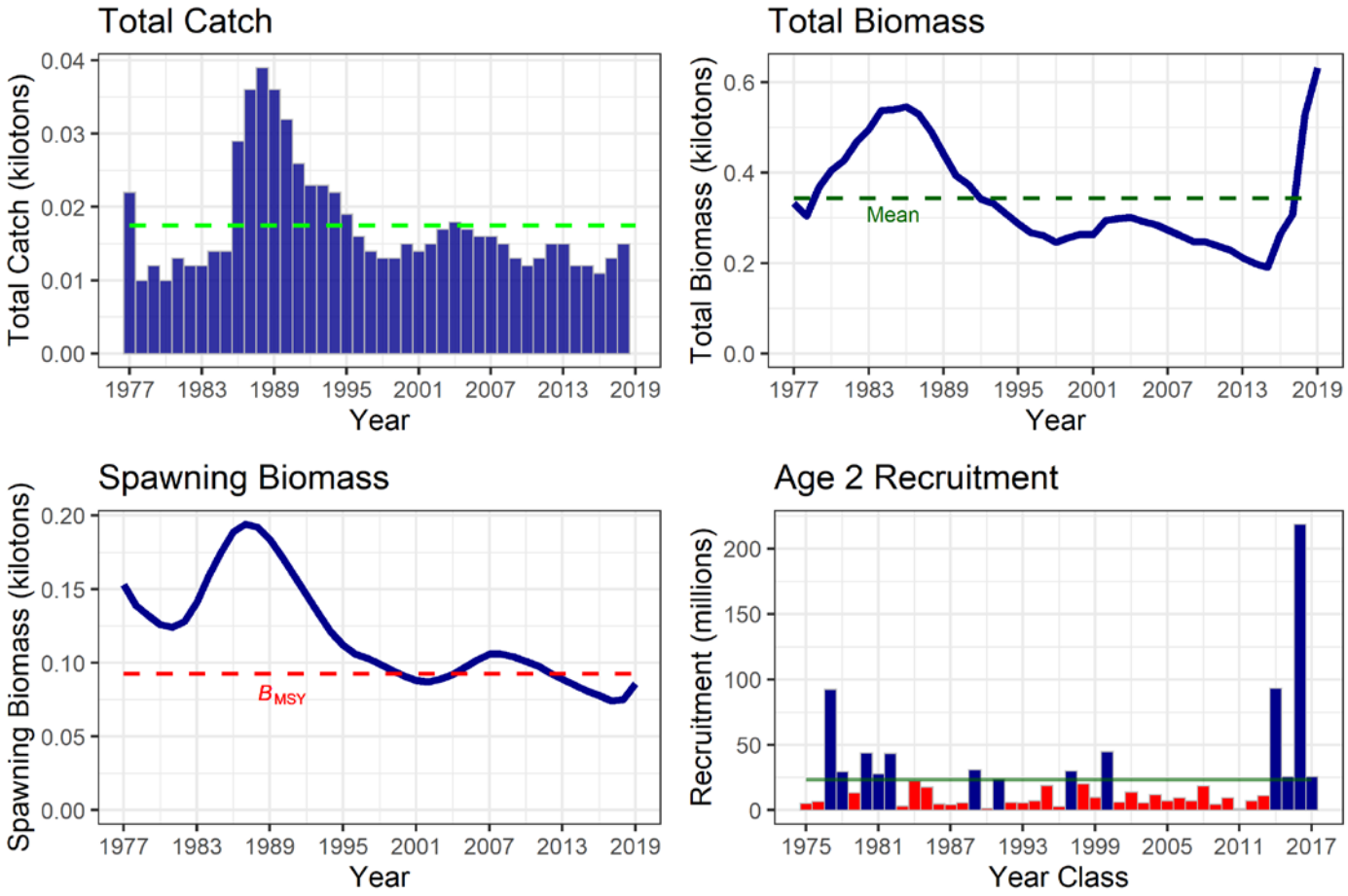
Total = 3.19 million t



Total = 3.09 million t

Chapter summaries

Graphs for Tiers 1-3 full assessments



Reference point comparisons (all chapters)

Quantity	Last asmt.	This asmt.	Change
M	0.100	0.105	0.05
2019 tier	3b	n/a	↑
2020 tier	3a	3a	none
2019 age+ biomass	488,273	n/a	0.44
2020 age+ biomass	513,502	704,683	0.37
2019 spawning biomass	96,687	n/a	0.17
2020 spawning biomass	129,204	113,368	-0.12
B100%	291,845	264,940	-0.09
B40%	116,738	105,976	-0.09
B35%	102,146	92,729	-0.09
2020 FOFL	0.117	0.121	0.03
2020 FABC	0.051	0.044	-0.14
2019 OFL	32,798	n/a	0.54
2020 OFL	45,220	50,481	0.12
2019 ABC	15,068	n/a	0.25
2020 ABC	20,144	18,763	-0.07

Not shaded, "change" is difference between *this assessment's value* and *last assessment's value* for the same quantity.

Where shaded, "change" is difference between *this assessment's value for 2020* and *last assessment's value for 2019*.

Tier 1-3 full assessments

Quantity	EBS pollock	Yellowfin	EBS P. cod	Sablefish	AK plaice	No. rockfish	Atka mack.
M	0.00	0.00	0.03	0.05	0.00	0.04	0.00
2019 age+ biomass	-0.06	0.00	-0.09	0.44	0.07	0.02	0.04
2020 age+ biomass	0.05	0.02	0.10	0.37	0.09	0.03	0.00
2019 spawning biomass	-0.10	0.01	-0.11	0.17	-0.08	0.07	0.03
2020 spawning biomass	0.02	0.04	0.05	-0.12	0.00	0.09	0.07
2020 FOFL	-0.18	-0.01	0.17	0.03	0.01	-0.06	-0.09
2020 FABC	-0.13	-0.01	0.17	-0.14	0.01	-0.06	-0.07
2019 OFL	0.09	-0.01	-0.14	0.54	-0.06	0.27	0.03
2020 OFL	0.39	0.01	0.13	0.12	-0.01	0.30	0.11
2019 ABC	-0.05	-0.01	-0.14	0.25	-0.06	0.28	0.02
2020 ABC	0.14	0.01	0.14	-0.07	-0.01	0.31	0.11

Tier 3 partial assessments

Quantity	AI pollock	G. turbot	Arrowtooth	Kamchatka	Rock sole	Flathead	POP	AI blackspot.	AK skate
M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019 age+ biomass	0.06	0.00	0.00	0.05	0.29	0.02	-0.03	0.05	-0.02
2020 age+ biomass	0.00	0.07	-0.04	0.02	0.07	0.00	-0.01	0.00	0.02
2019 spawning biomass	0.03	0.05	0.00	0.06	-0.09	0.01	-0.04	0.14	0.02
2020 spawning biomass	0.00	0.08	0.02	0.02	0.13	-0.01	-0.01	0.00	0.03
B100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bmsy (T1) or B35% (T3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020 FOFL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020 FABC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019 OFL	0.04	0.00	0.00	0.05	0.29	0.02	-0.03	0.29	-0.03
2020 OFL	0.00	0.08	-0.01	0.02	0.07	0.00	-0.01	-0.01	0.02
2019 ABC	0.04	0.00	0.00	0.05	0.29	0.02	-0.03	0.29	-0.03
2020 ABC	0.00	0.08	-0.01	0.02	0.07	0.00	-0.01	-0.01	0.02

Chapter 5: Greenland turbot (partial)

- The Team recommended that the authors report on efforts to quantify impacts to this assessment of the loss of the slope survey at the September 2020 meeting

Chapter 8: northern rock sole (partial)

- The fishery developed much more slowly in 2019 than in previous years
- Avoidance of Pacific cod has affected the distribution of the fishery
- It was hypothesized that the recent warm trend may have changed the spatial distribution of Pcod and rock sole, resulting in increased overlap
- The Team recommended that the Bering Sea survey group conduct a spatial analysis looking specifically at the spatial overlap of this species (and other commercially important flatfish species) with Pacific cod

Tier 5 assessments

Quantity	Bog. pollock	AI P. cod	O. flatfish	Shortraker	O. rockfish	EBS blackspot.	O. skates	Sculpins
M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
2020 FOFL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020 FABC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.002
2019 OFL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
2020 OFL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
2019 ABC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
2020 ABC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27

Changes in reference points (Tier 6)

Quantity	Sharks	Octopus
2018 OFL	0.00	0.00
2019 OFL	0.00	0.00
2018 ABC	0.00	0.00
2019 ABC	0.00	0.00

- Note that squid has been moved to the “ecosystem component”

Full assessment chapter summaries

EBS walleye pollock
EBS Pacific cod
AI Pacific cod
Sablefish
Yellowfin sole
Alaska plaice
Northern rockfish
Atka mackerel

Forage fish (biennial report)

Chapter 1: EBS walleye pollock (full)

- Switch to author's presentation (Team comments will follow)

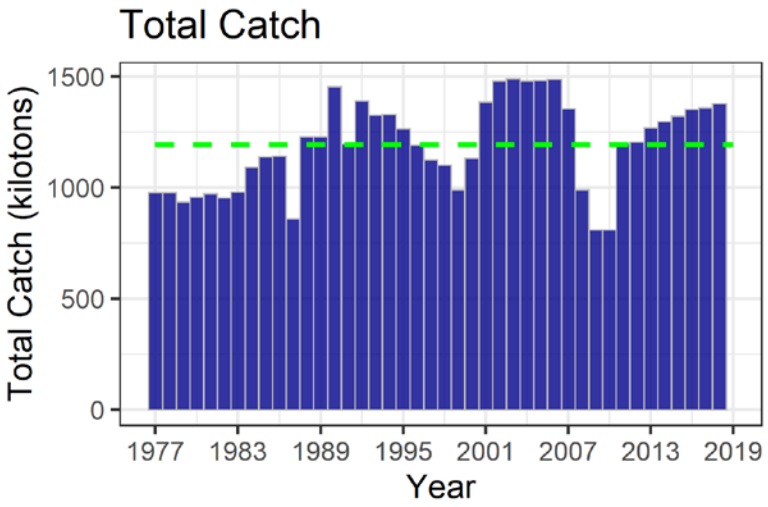
Chapter 1: EBS walleye pollock (full)

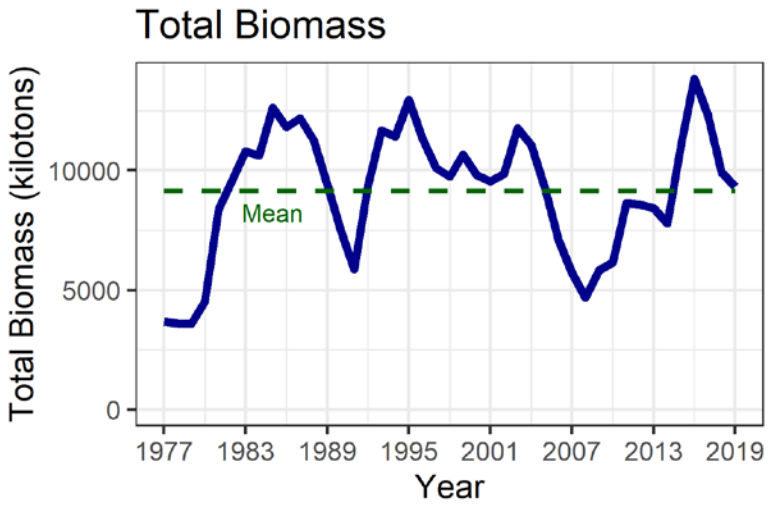
- The Team accepted the recommendations of the authors in use of model 16.1
- The Team also agreed with the author in the use of Tier 3 ABC as a reduction from max ABC as has been used since 2014.

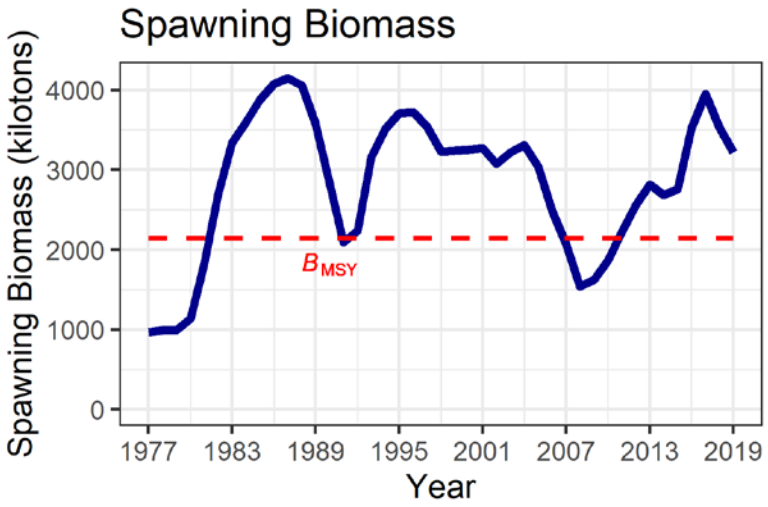
- There was a single minor technical recommendations on the stock assessment model

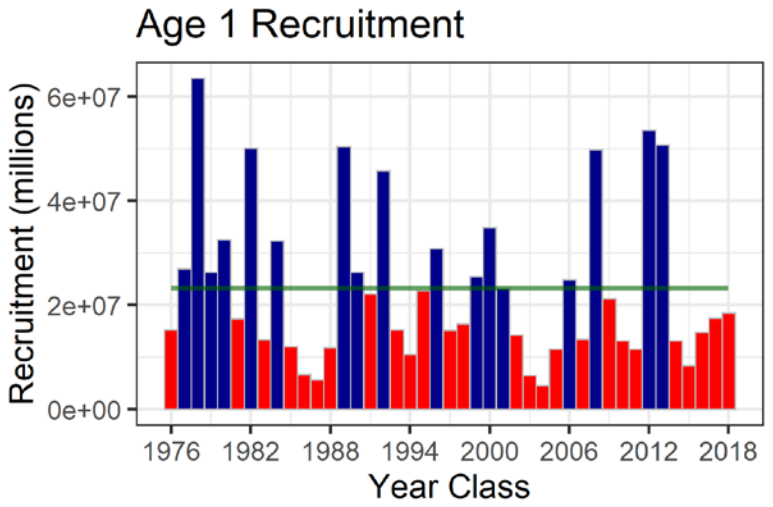
- The Team commended the authors for developing the new index of spatial effort concentration, and recommended continued development of such metrics.

EBS walleye pollock, continued







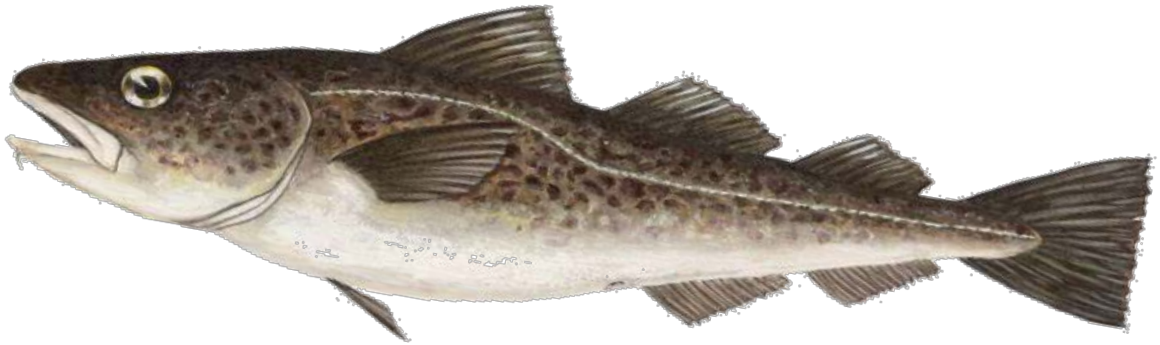


EBS walleye pollock, continued

Quantity	Last asmt.	This asmt.	Change
M	0.30	0.30	0.00
2019 tier	1a	n/a	none
2020 tier	1a	1a	none
2019 age+ biomass	9,110,000	n/a	-0.06
2020 age+ biomass	8,156,000	8,580,000	0.05
2019 spawning biomass	3,107,000	n/a	-0.10
2020 spawning biomass	2,725,000	2,781,000	0.02
B0	5,866,000	5,748,000	-0.02
Bmsy	2,280,000	2,147,000	-0.06
2020 FOFL	0.645	0.528	-0.18
2020 FABC	0.375	0.442	0.18
2019 OFL	3,913,000	n/a	0.09
2020 OFL	3,082,000	4,273,000	0.39
2019 ABC	2,163,000	n/a	-0.05
2020 ABC	1,792,000	2,045,000	0.14

Chapter 2: EBS Pacific cod

Grant Thompson and James Thorson

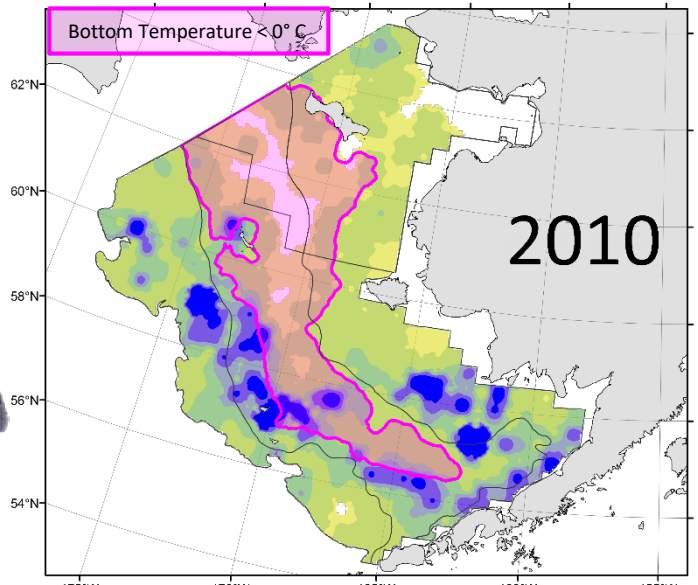


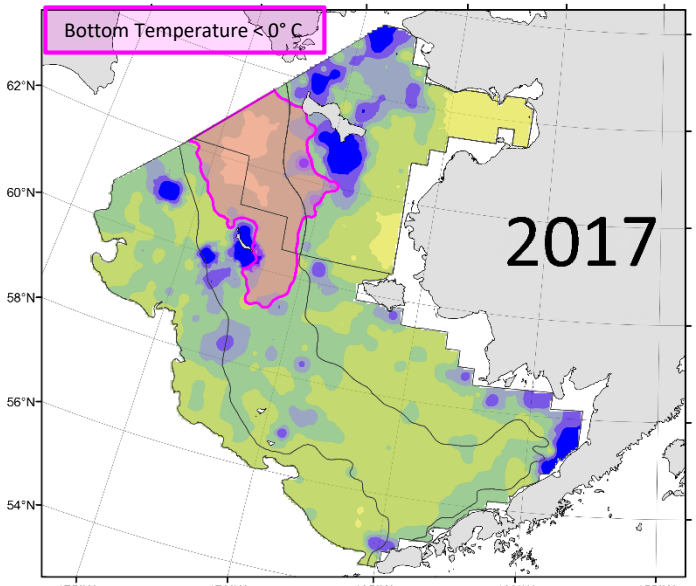
Bering Sea Pacific Cod Distribution

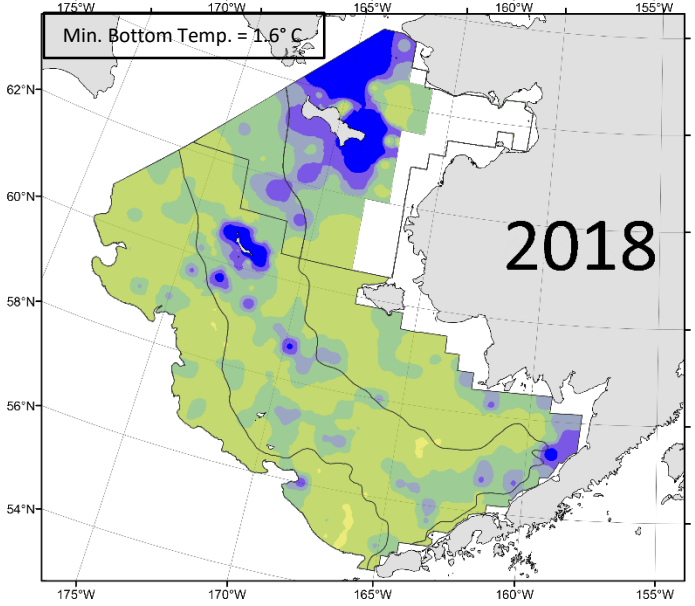
Pacific Cod

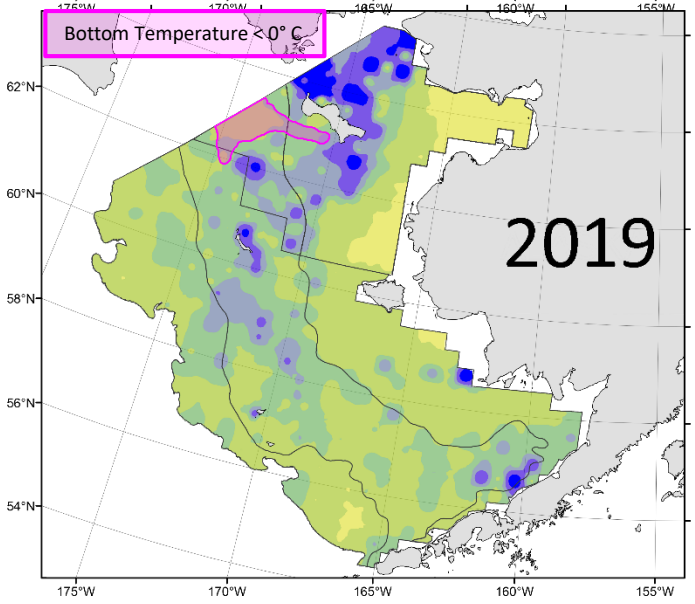
(kg/ha)

- no catch
- > 0 - 1
- > 1 - 10
- > 10 - 20
- > 20 - 30
- > 30 - 40
- > 40

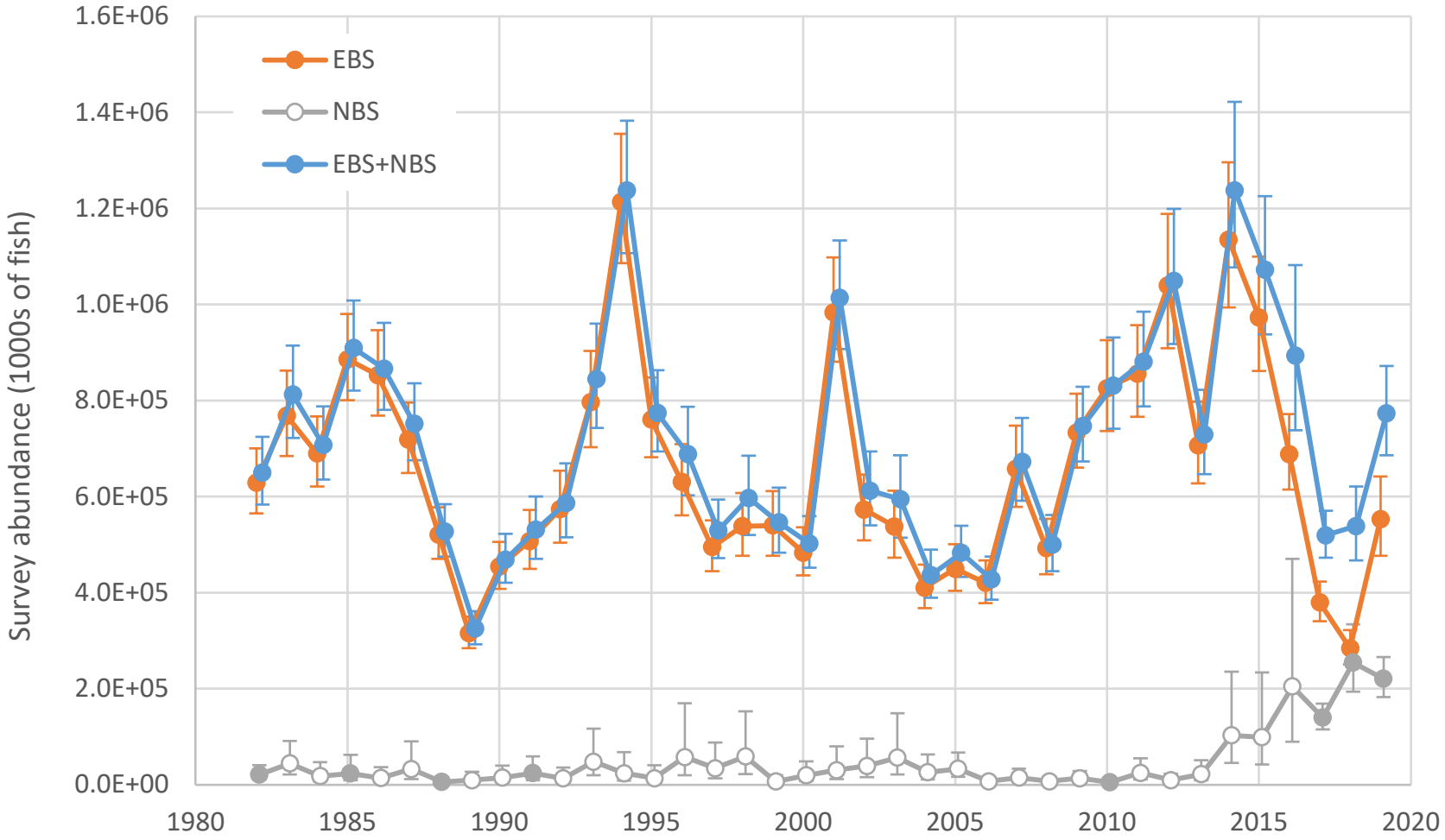




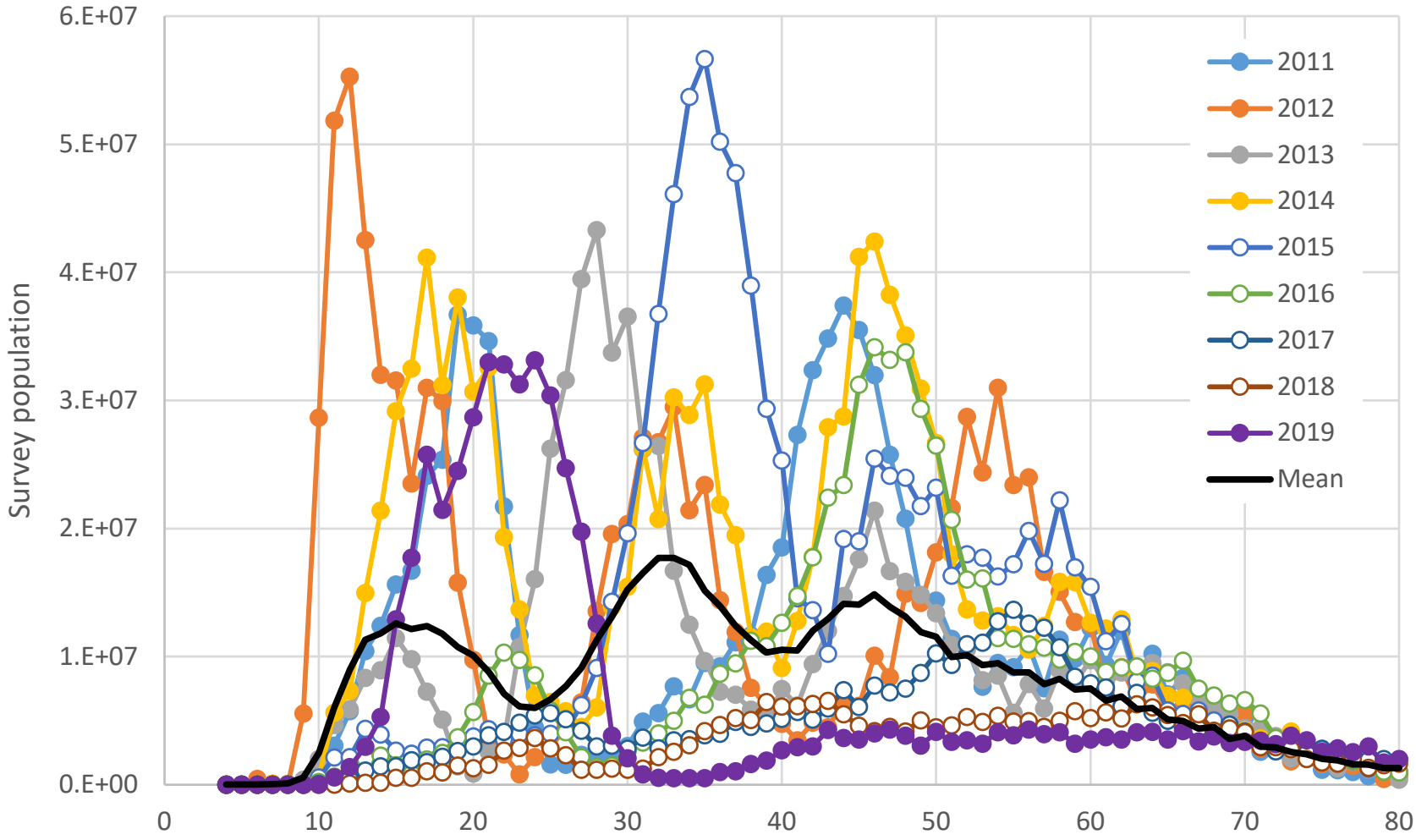




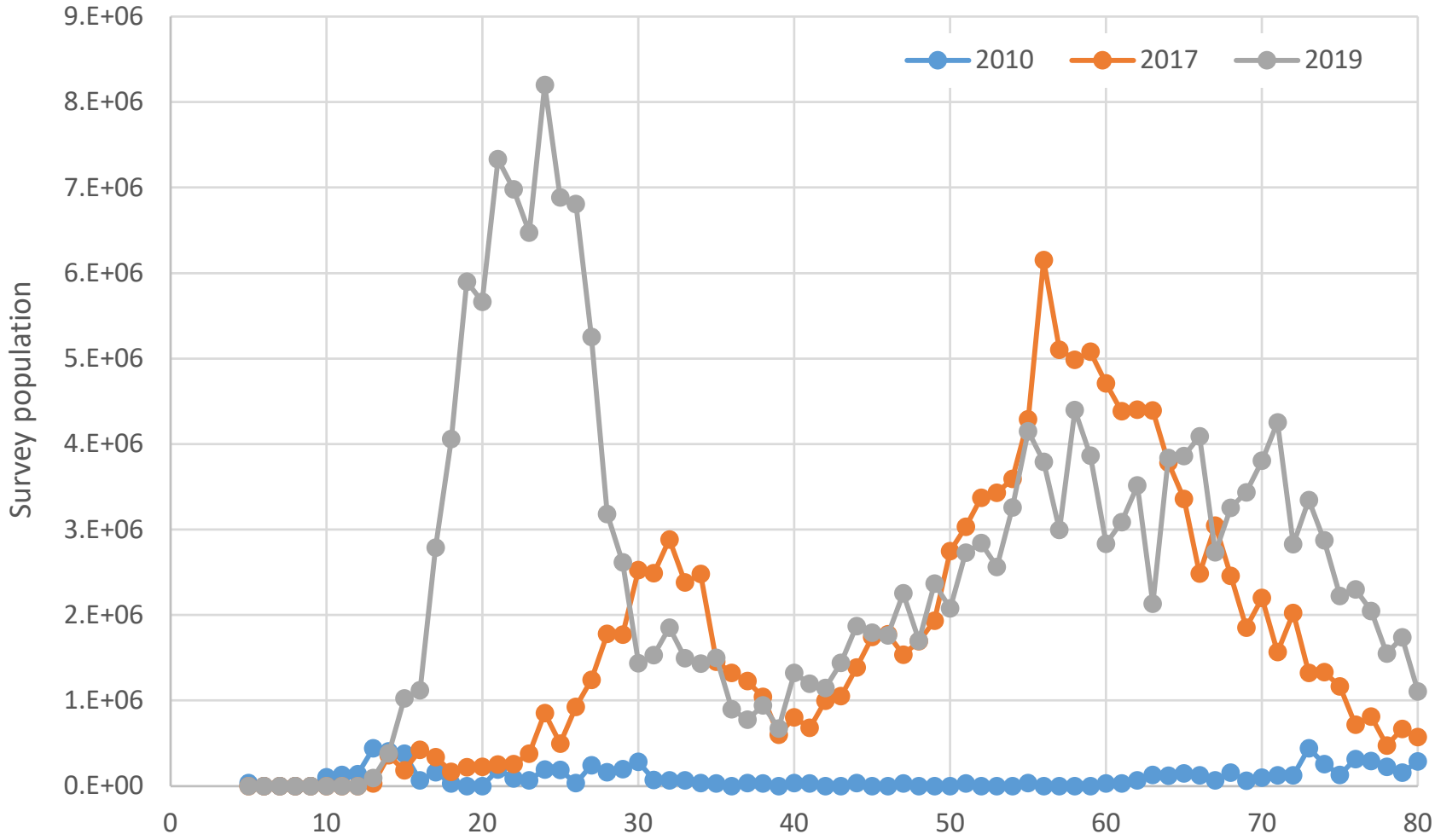
Trawl survey abundance (VAST)



Recent survey sizecomps, to 80 cm (EBS)

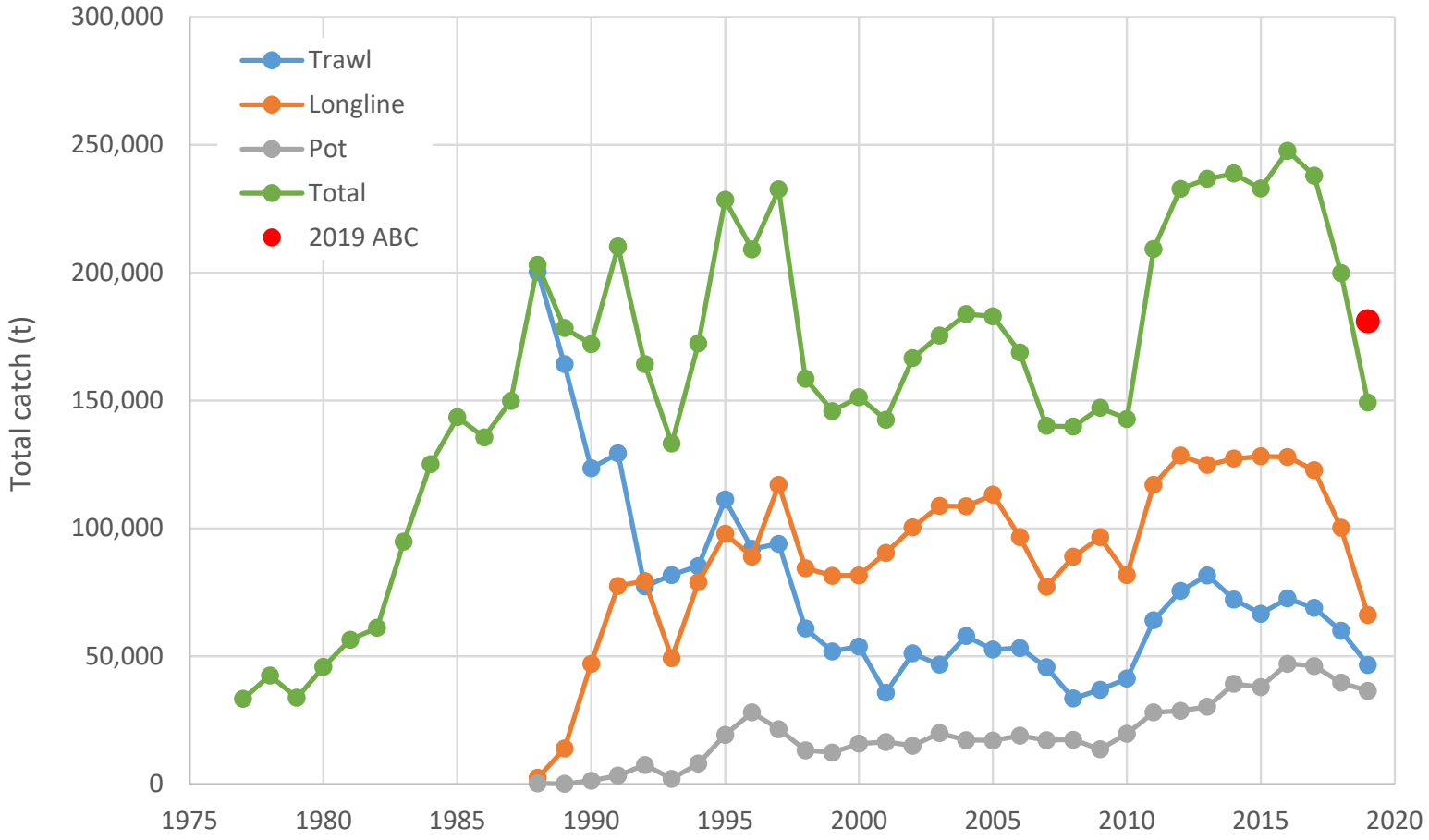


Recent survey sizecomps, to 80 cm (NBS)

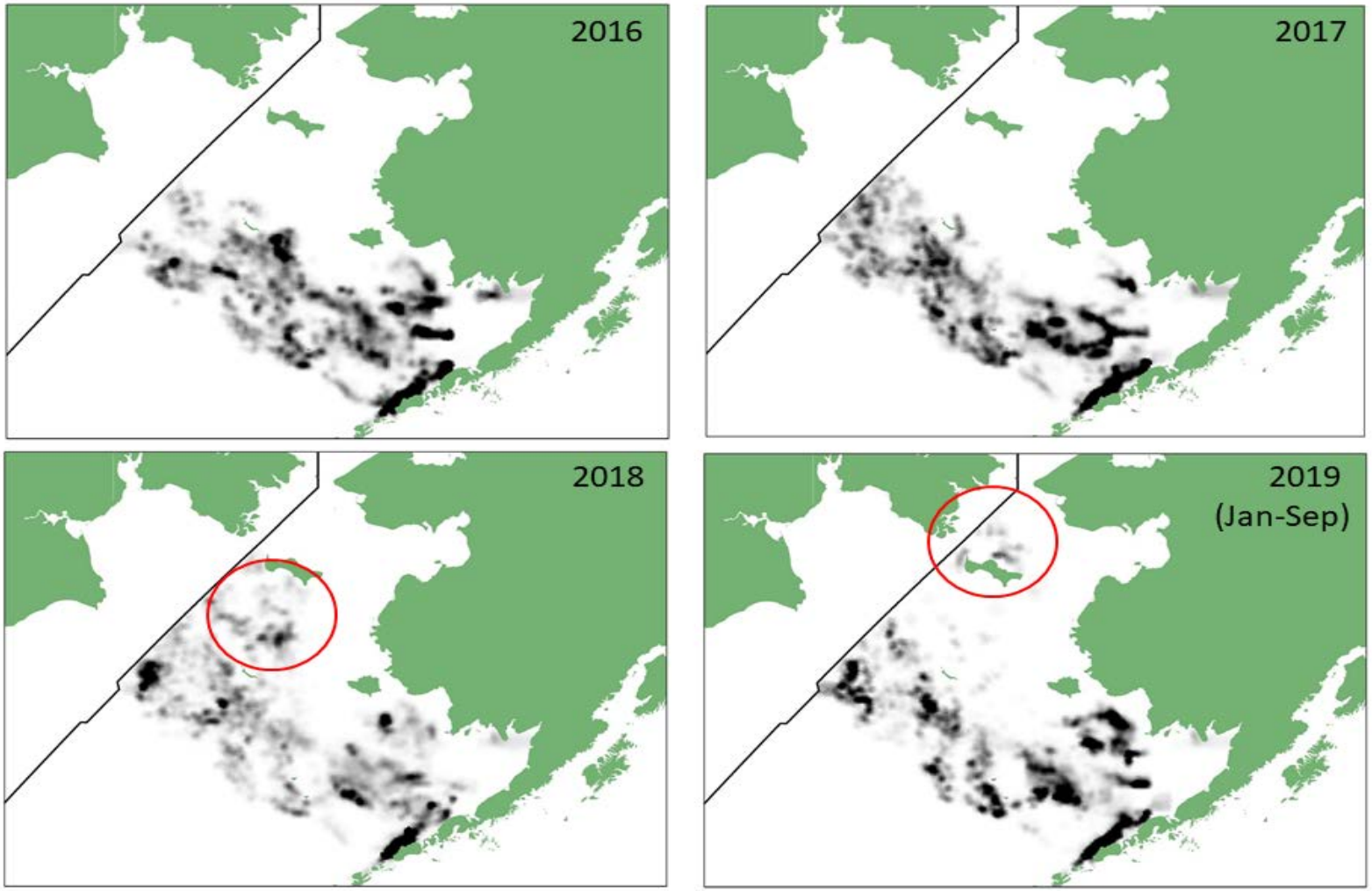


Total catch

- 2019 current through October 27



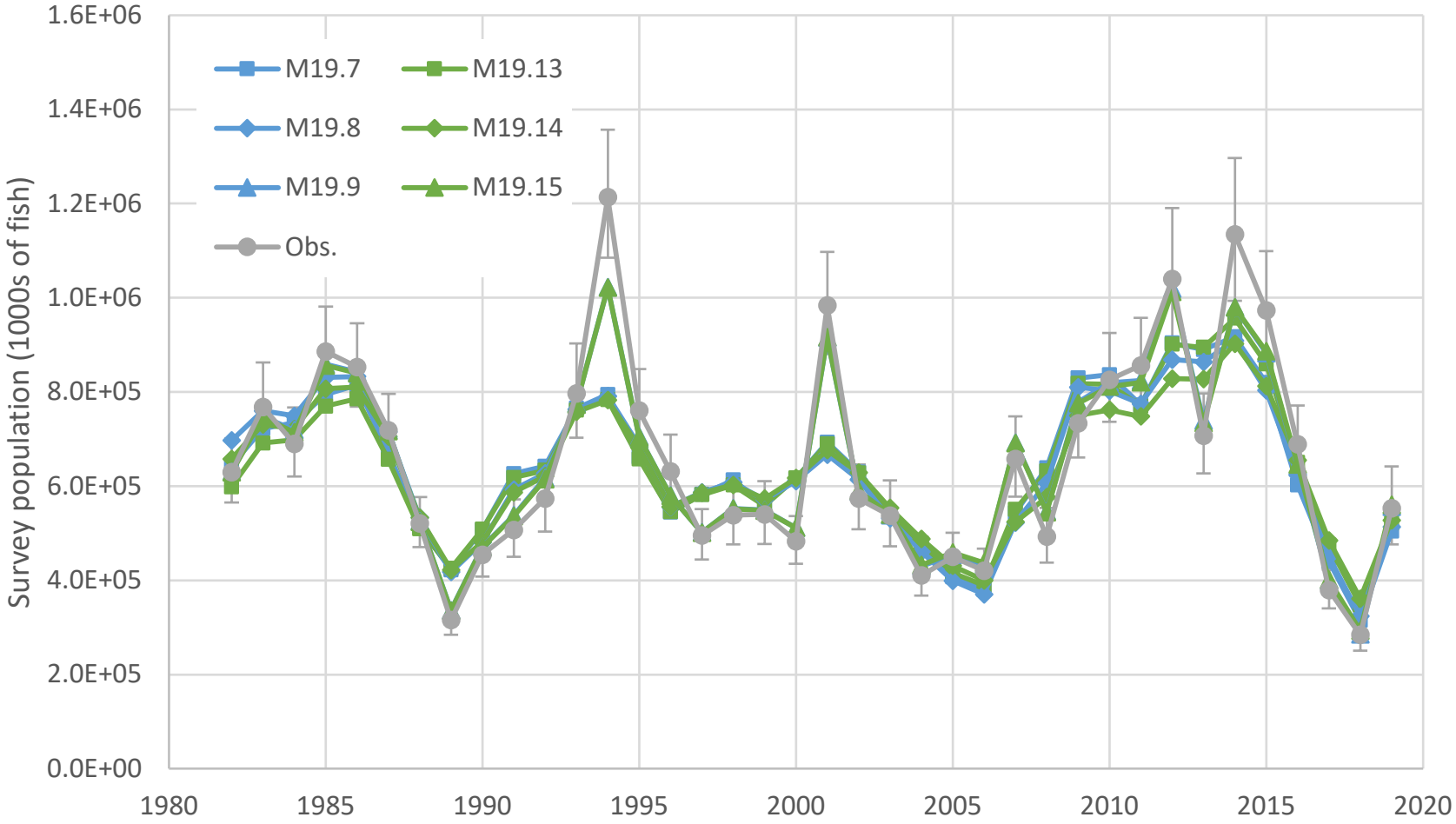
Spatial distribution of observed catch 2016-19



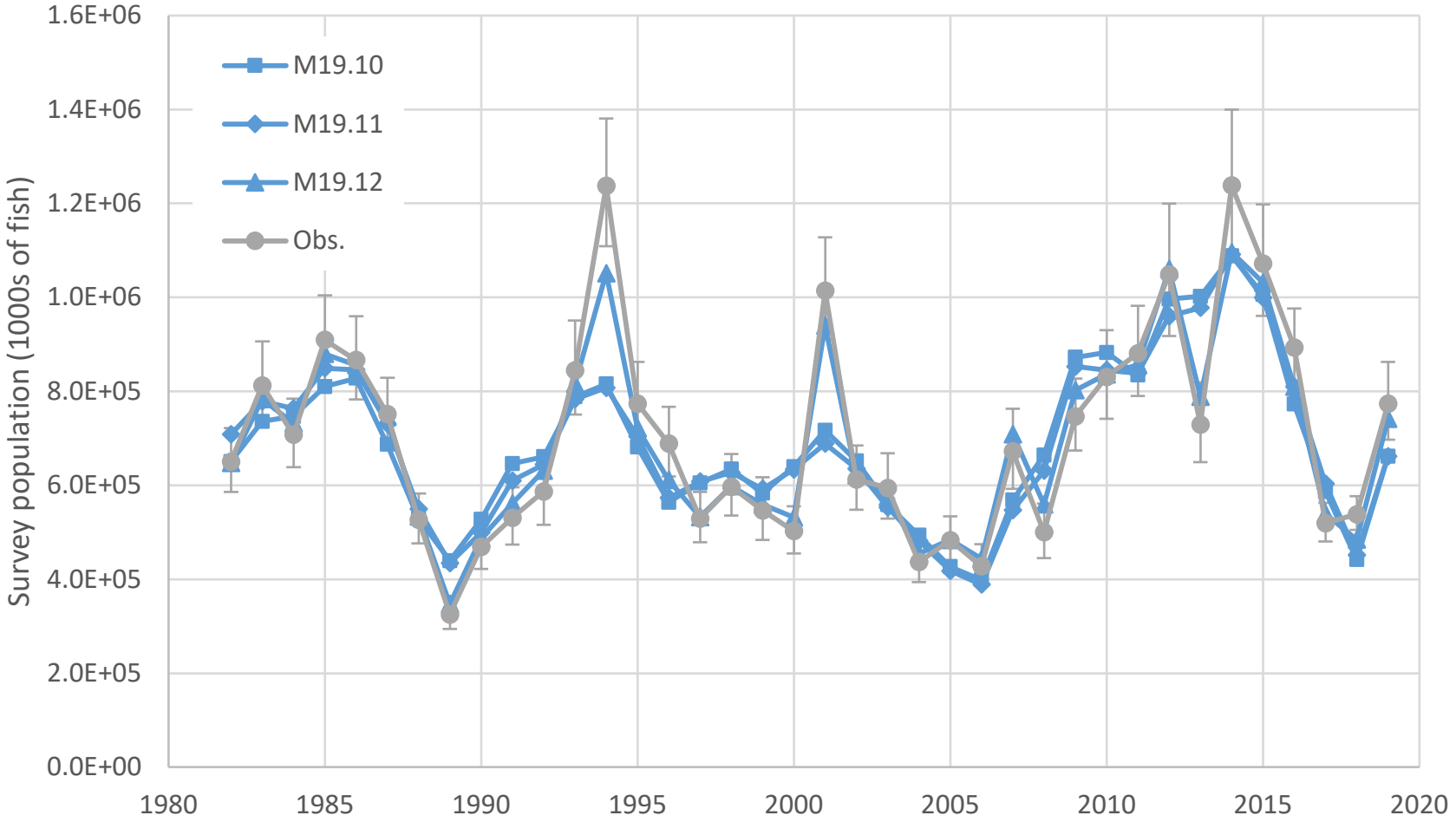
Factorial design of models

Hypothesis	Structure	Preliminary	Final	Changes (from preliminary to final)
2: EBS+NBS	Basic	M16.6i	M16.6i	none
1: EBS only	Basic	n/a	M19.7	n/a
	Simple	M19.1	M19.8	fishery: no agecomps
	Complex	M19.2	M19.9	fishery: no agecomps, downweighted sizecomps
2: EBS and NBS combined	Basic	n/a	M19.10	n/a
	Simple	M19.3	M19.11	fishery: no agecomps
	Complex	M19.4	M19.12	fishery: no agecomps, downweighted sizecomps
3: EBS and NBS separated	Basic	n/a	M19.13	n/a
	Simple	M19.5	M19.14	fishery: no agecomps
	Complex	M19.6	M19.15	fishery: no agecomps, downweighted sizecomps

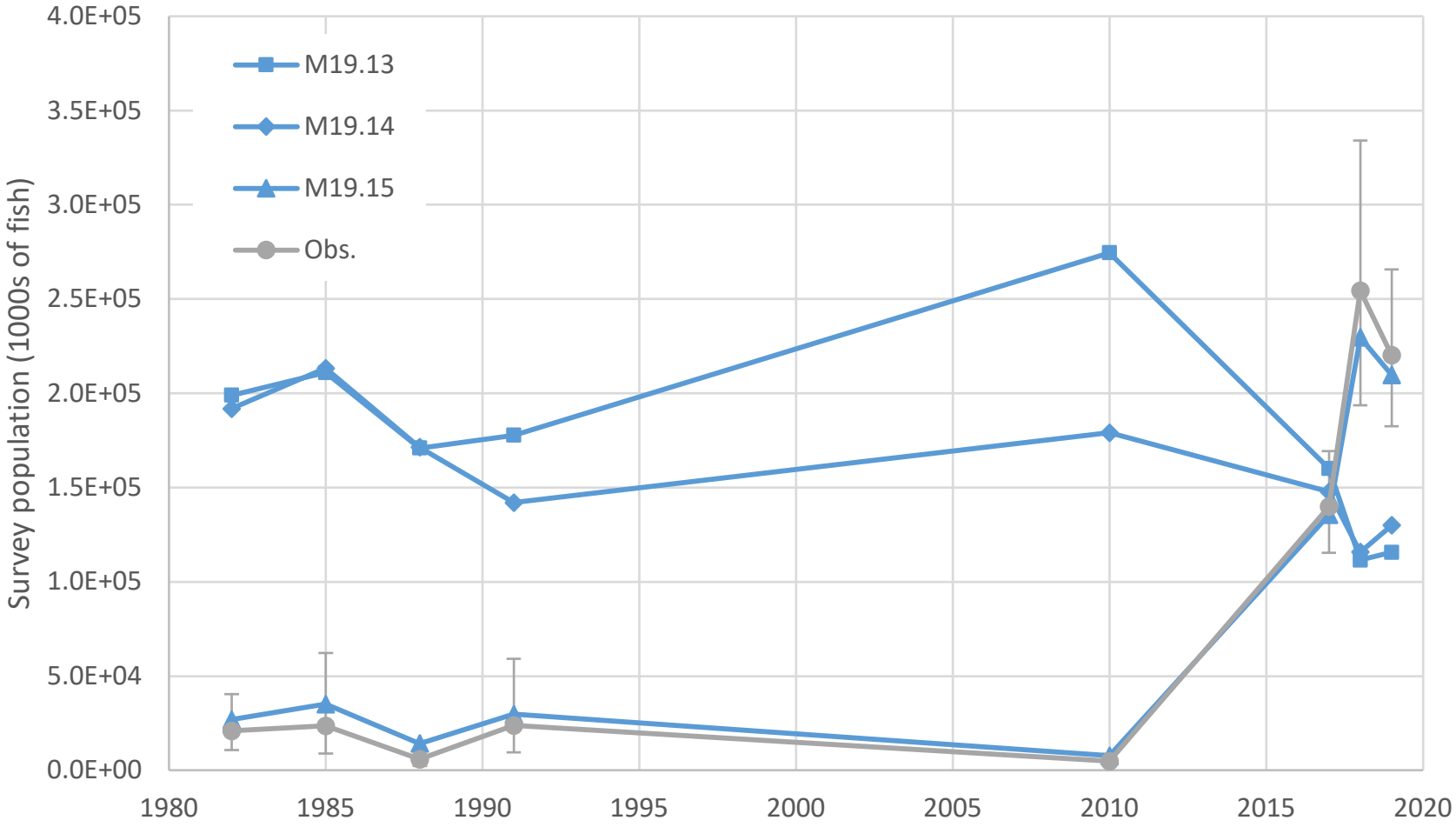
Fit to survey index: EBS only (VAST)



Fit to survey index: EBS+NBS (VAST)



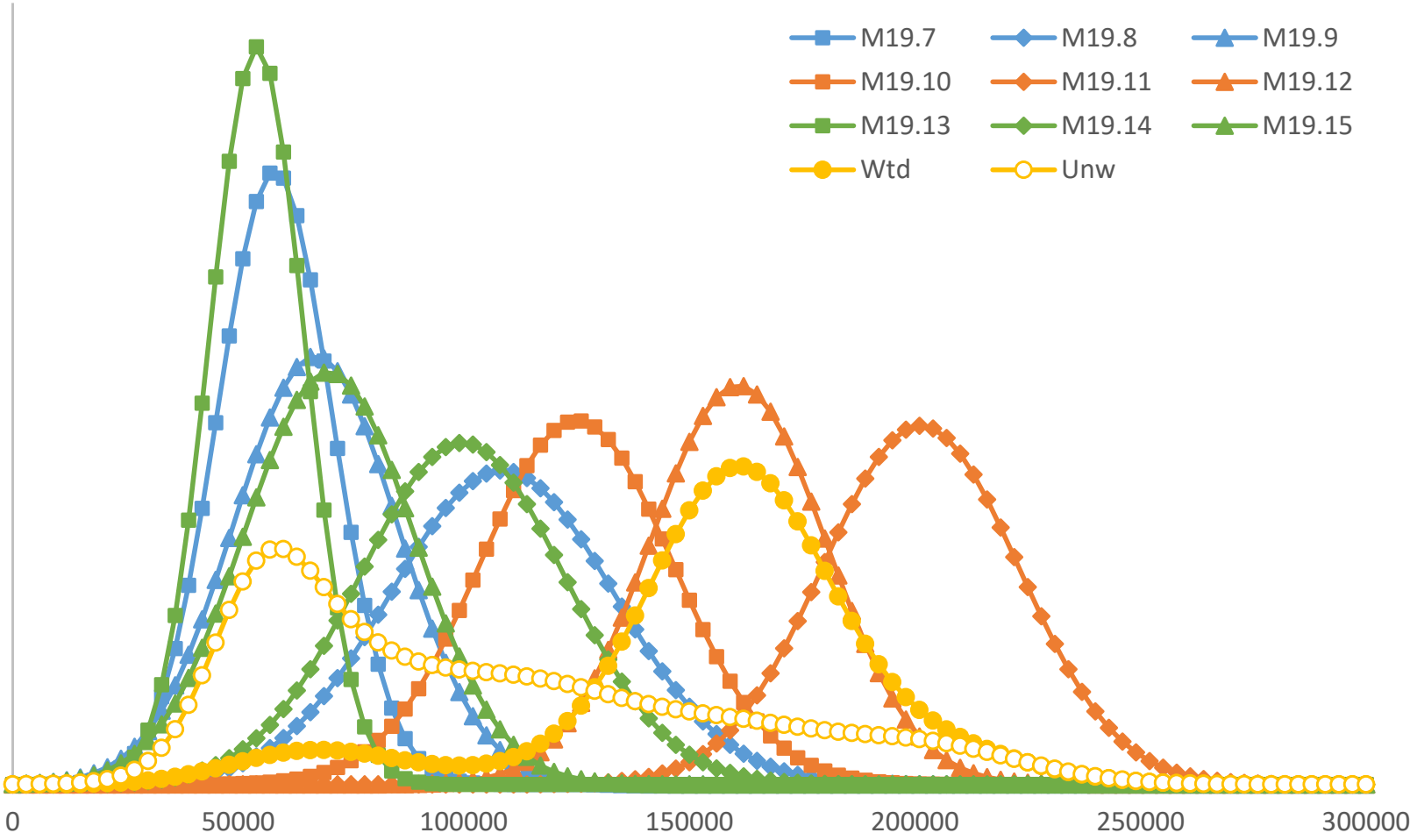
Fit to survey index: NBS (VAST)



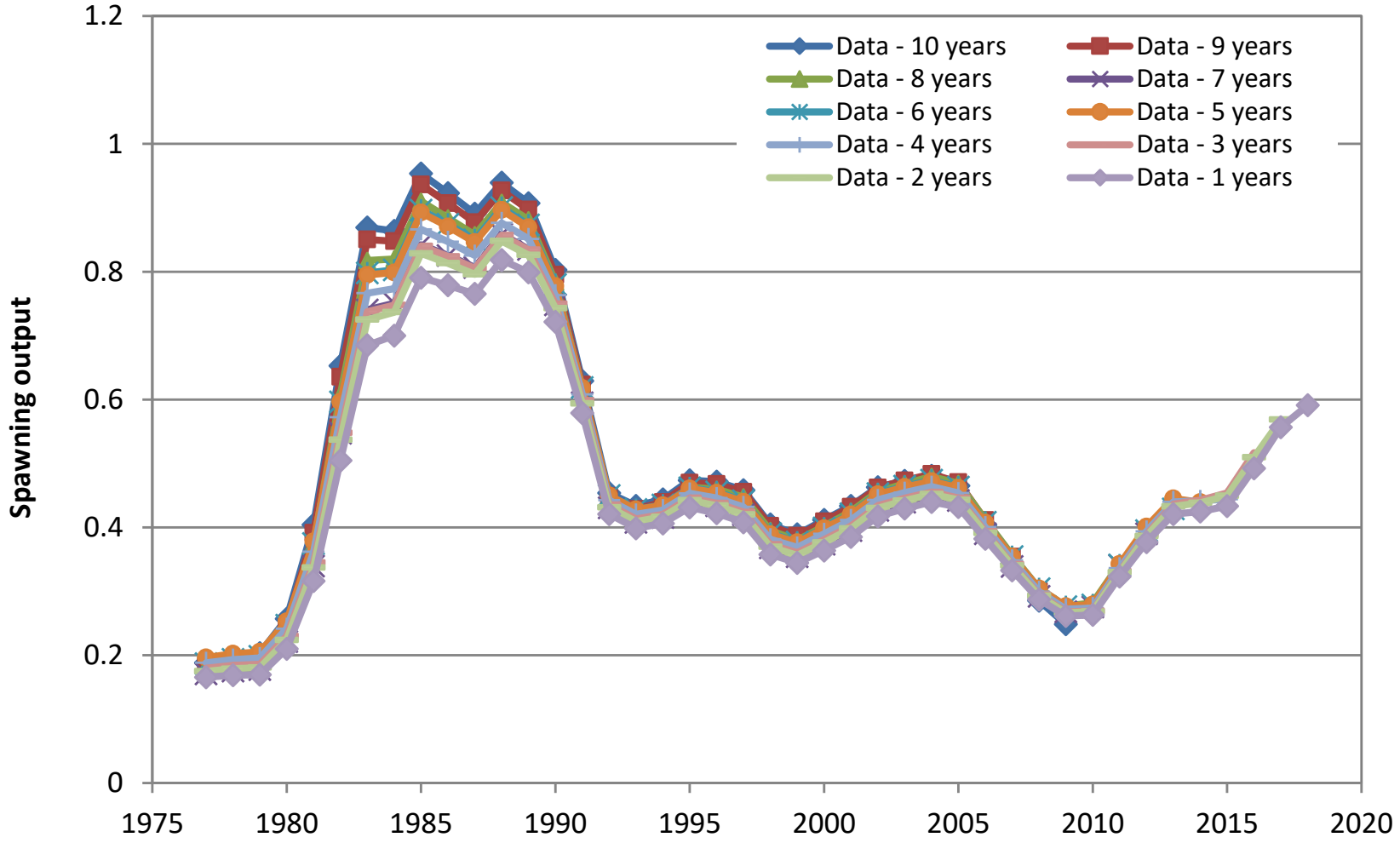
Choice of ensemble and model weights

Criterion	Emphasis	Hypothesis 1			Hypothesis 2			Hypothesis 3		
		Basic	Simple	Complex	Basic	Simple	Complex	Basic	Simple	Complex
		M19.7	M19.8	M19.9	M19.10	M19.11	M19.12	M19.13	M19.14	M19.15
Plausible hypothesis	3	0	0	0	1	1	1	1	1	1
Plausible catchability	3	1	1	1	1	1	1	0	0	0
Acceptable retrospective bias	3	1	1	1	1	1	1	1	0	1
Comparable complexity	2	1	1	0	1	1	0	1	1	0
Dev sigmas estimated appropriately	2	0	1	1	0	1	1	0	1	1
Fits consistent with variances	2	0	0	1	0	0	1	0	0	1
Incremental changes	1	1	0	0	1	0	0	1	0	0
Objective criterion for sample sizes	1	0	0	1	0	0	1	0	0	1
Change in ageing criteria addressed	1	0	0	1	0	0	1	0	0	1
Exponential average emphasis:		0.0001	0.0003	0.0025	0.0025	0.0067	0.0498	0.0001	0.0000	0.0025
Model weight:		0.0019	0.0052	0.0384	0.0384	0.1044	0.7712	0.0019	0.0003	0.0384

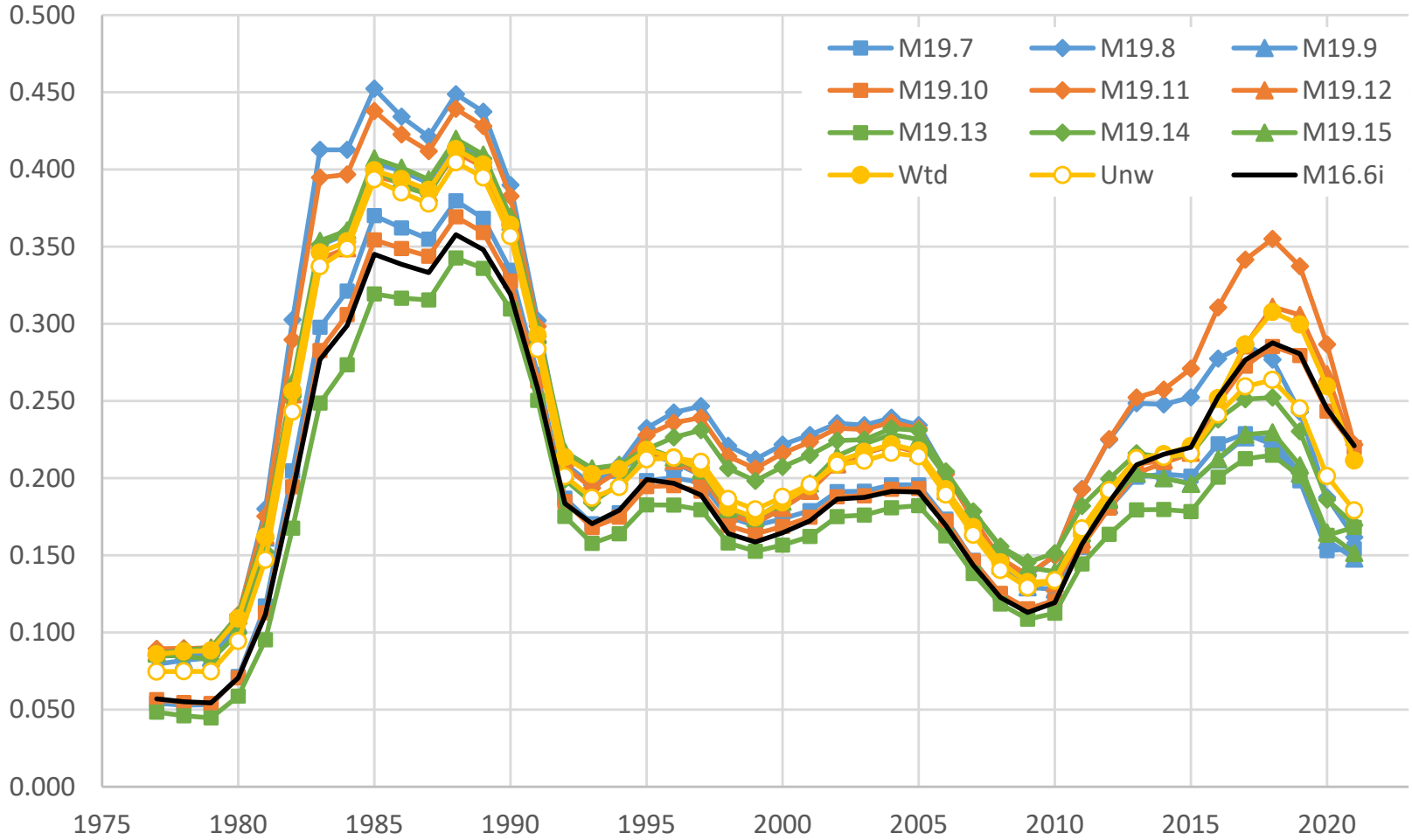
Constructing the 2020 ABC distribution



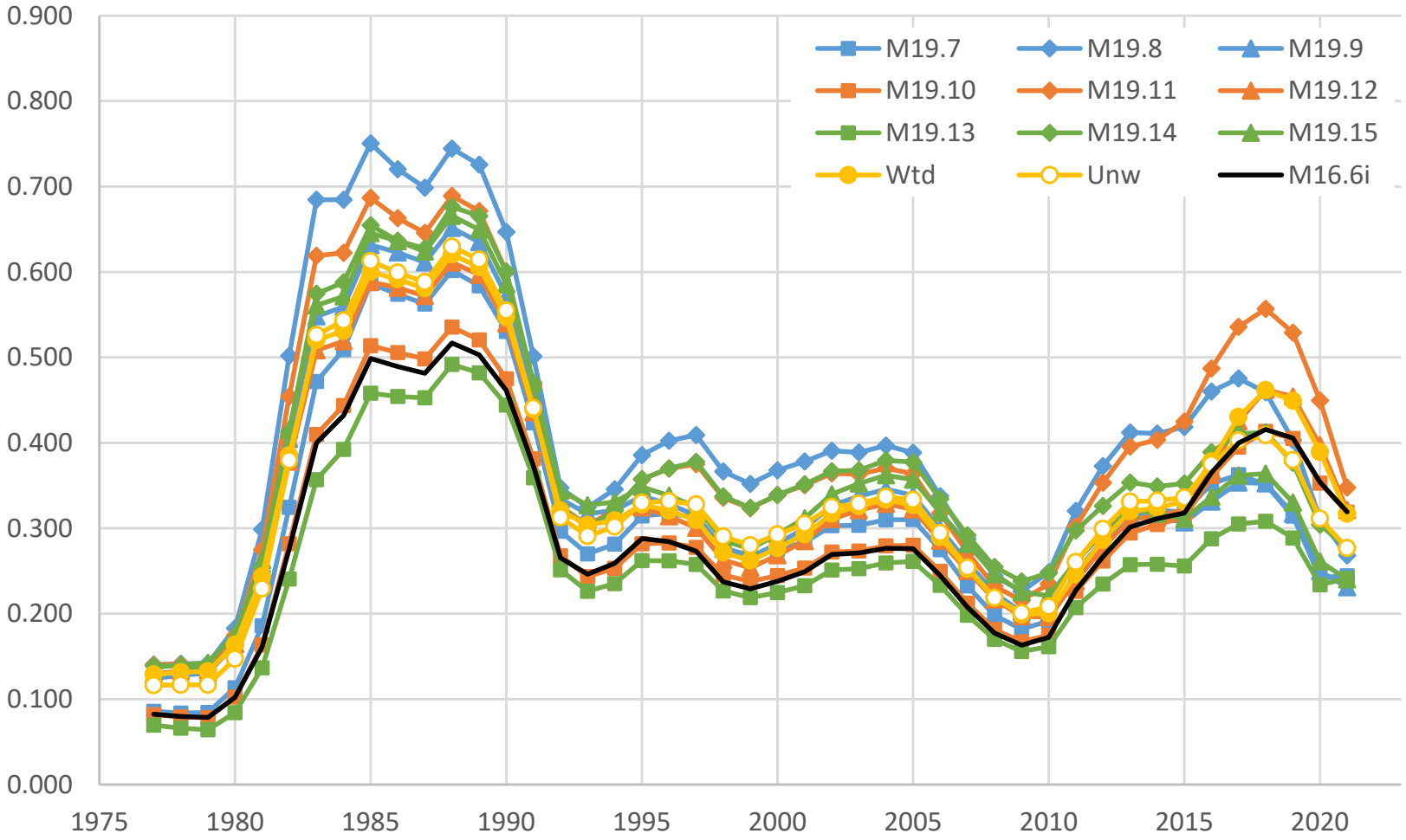
Retrospective: ensemble wtd. ave. (ρ = **-0.02**)



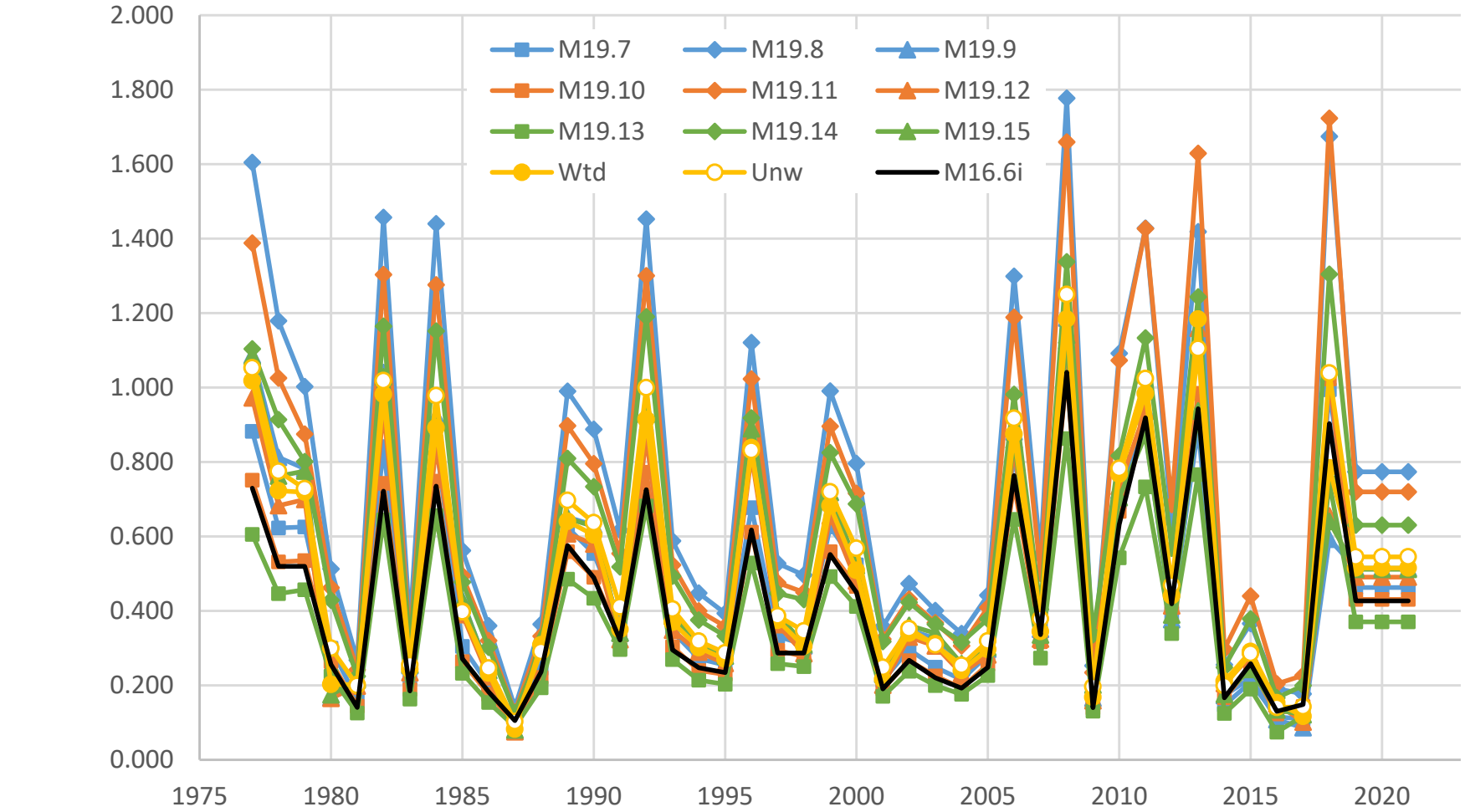
Female spawning biomass (millions of t)



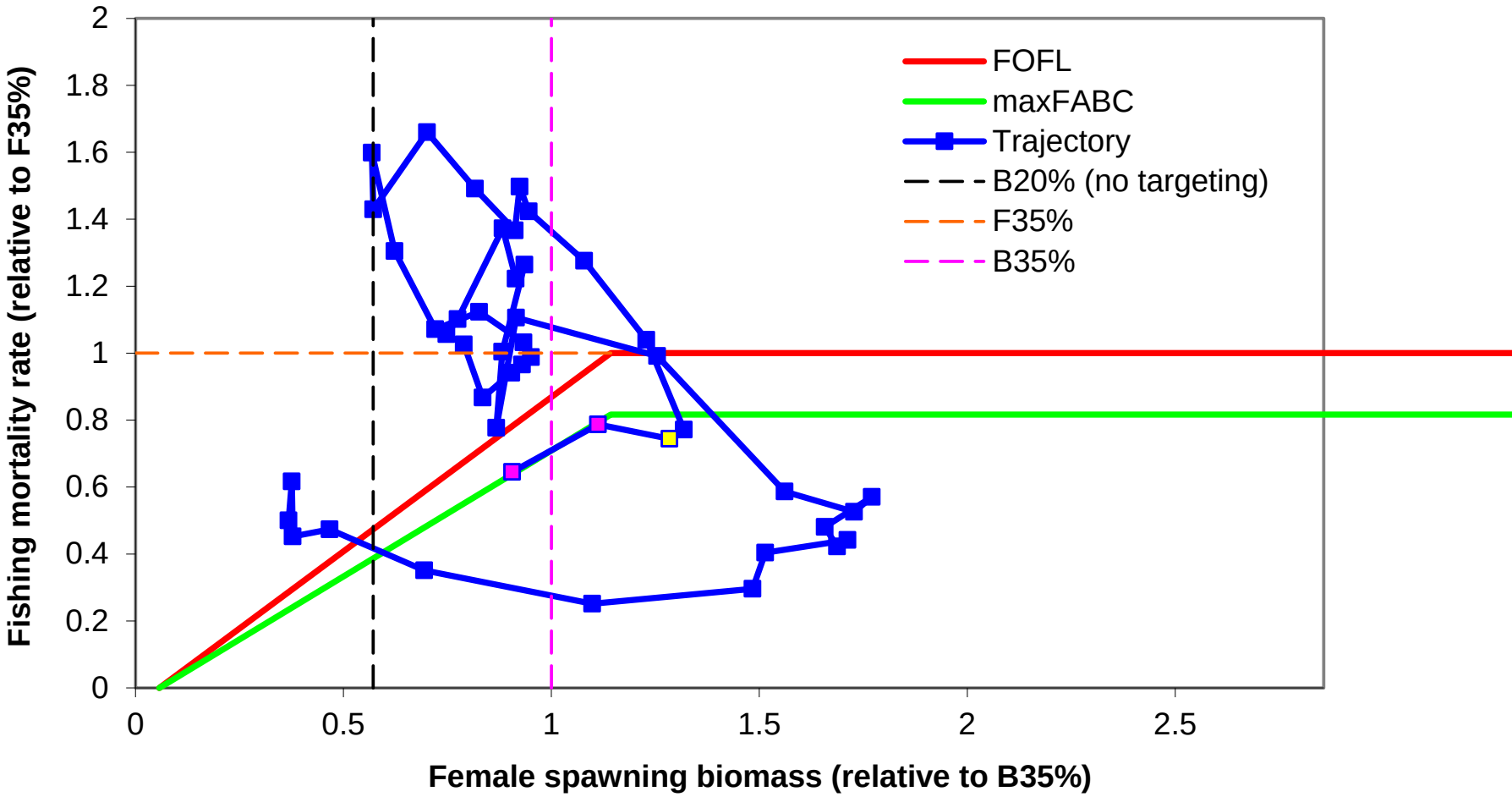
Spawning biomass relative to $B_{100\%}$



Age 0 recruitment (billions of fish)



Phase plane: weighted average ensemble



Risk table: environmental/ecosystem

- Summary of Appendix 2.6 (by Elizabeth Siddon):
  - Pacific cod continue to expand their range into the NBS
  - Condition factor is positive in both EBS and NBS
  - However, low abundances of euphausiids were observed in 2018 (MACE acoustic survey) and 2019 (RPA RZA)
  - Effects of cannibalism might be mediated by spatial mismatch between juvenile and adult cod
  - The 2019 gray whale unusual mortality event reflects poor 2018 NBS feeding conditions
  - Shearwater die-off events in 2019 could also reflect feeding conditions in the NBS in 2018
  - The abundance time series for Pacific cod and walleye pollock appear to decouple after 2010, suggesting a shift in drivers of survival
- Environmental/ecosystem considerations were rated as level 2

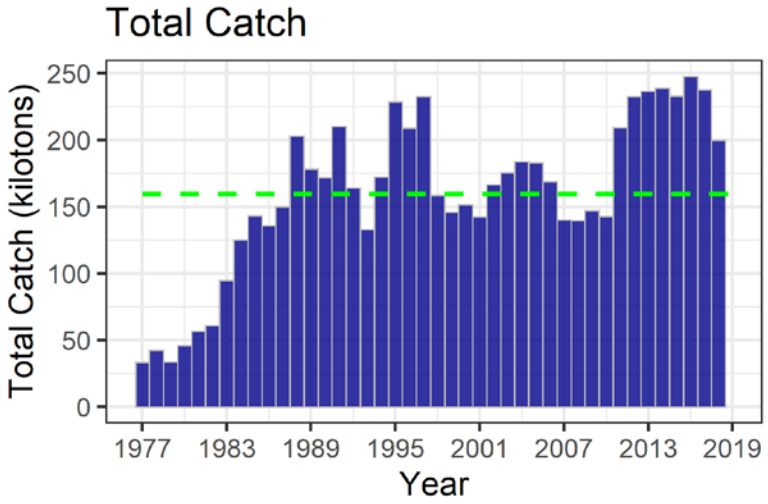
EBS Pacific cod, Recommendations

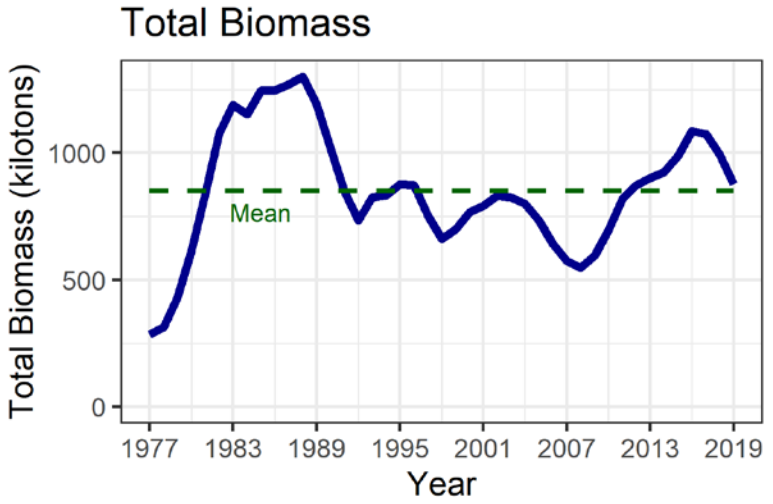
- The Team recommended using VAST for survey data and also recommended that the survey team investigate the efficacy of VAST estimates using methods such as cross-validation

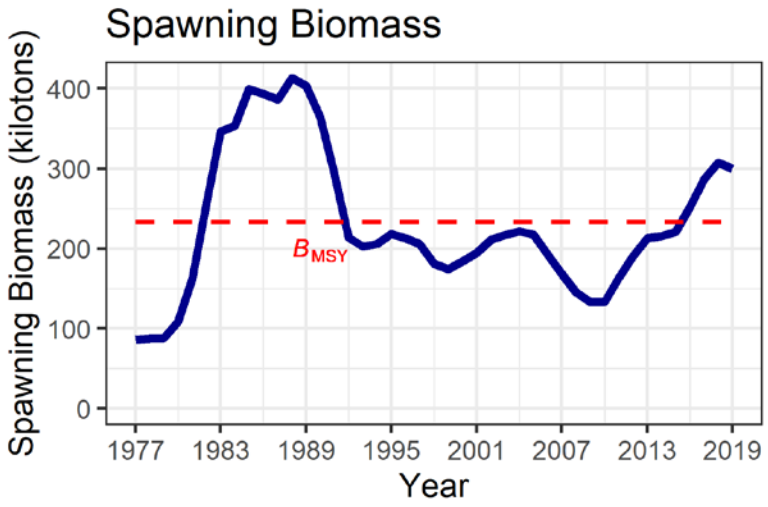
- The Team agreed with the author in recommending the 3x3 factorial design for defining models in the ensemble and that the current 9 models should be used for management advice using the devised weighting criteria.

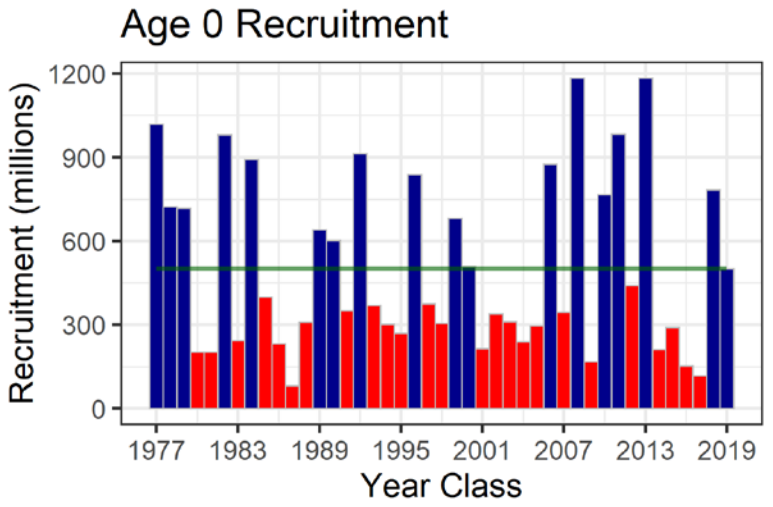
- The Team supported continued research into the abundance and mortality of Pacific cod outside of U.S. waters for inclusion in the stock assessment

EBS Pacific cod, continued









EBS Pacific cod, continued

Quantity	Last asmt.	This asmt.	Change
M	0.34	0.35	0.03
2019 tier	3a	n/a	↓
2020 tier	3b	3b	none
2019 age+ biomass	824,000	n/a	-0.09
2020 age+ biomass	683,000	751,708	0.10
2019 spawning biomass	290,000	n/a	-0.11
2020 spawning biomass	246,000	259,509	0.05
B100%	658,000	666,506	0.01
B40%	263,000	266,602	0.01
B35%	230,000	233,277	0.01
2020 FOFL	0.35	0.41	0.17
2020 FABC	0.29	0.34	0.17
2019 OFL	216,000	n/a	-0.14
2020 OFL*	183,000	185,650	0.01
2019 ABC	181,000	n/a	-0.14
2020 ABC	137,000	155,873	0.14

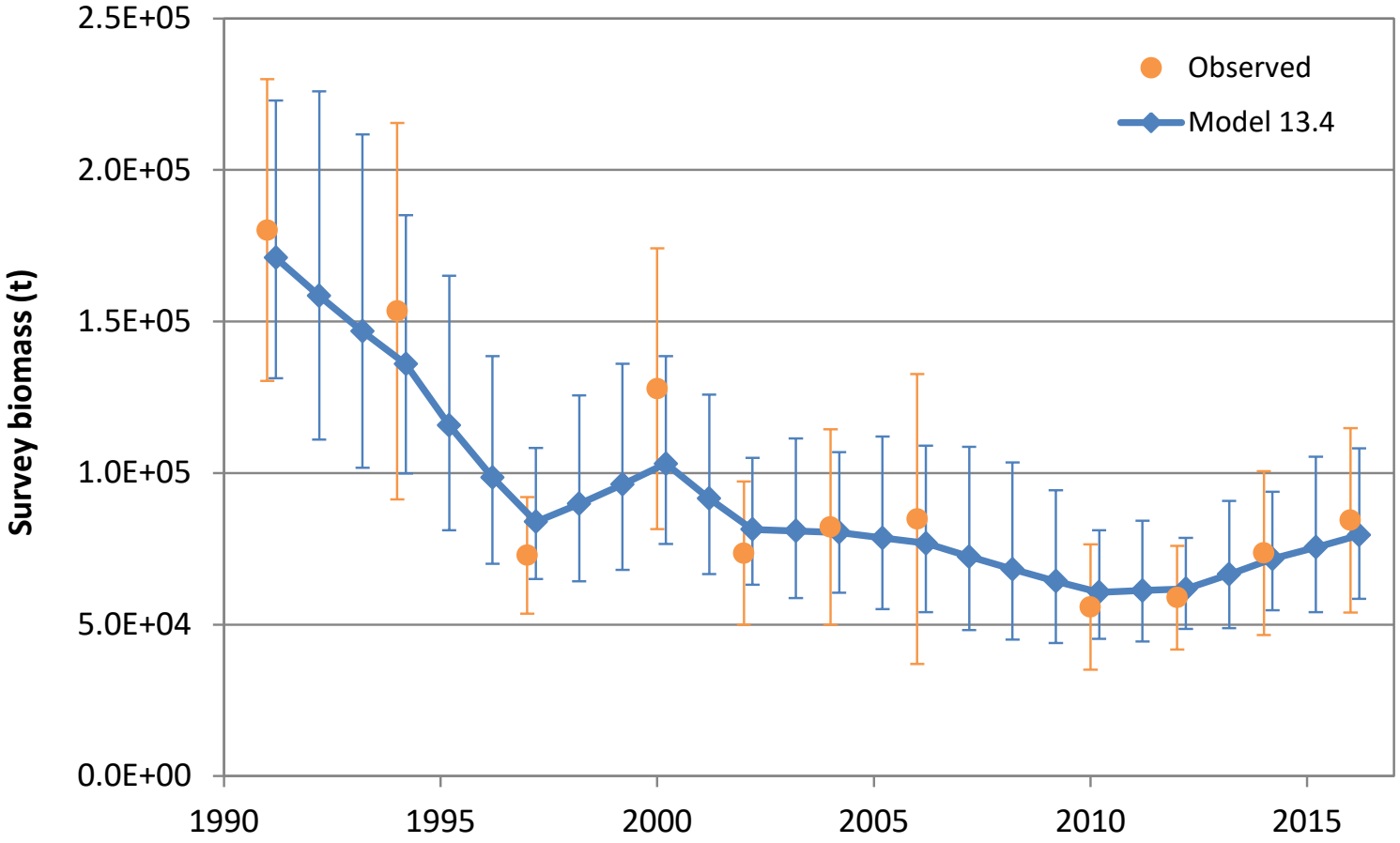
* 2020 OFL from last year's accepted model was 164,000

Chapter 2A: AI Pacific cod (full)

- Standard Tier 5 random effects model used for management
- Model alternatives:
  - Four age-structured models presented by Ingrid Spies, but not considered for management at this time.
- Tier 5 RE model estimates that survey biomass has increased continuously since the all-time low observed in 2010
    - 2018 estimate is 32% higher than 2010 estimate
    - 2018 estimate is 11% lower than time series average
- Risk level: max(1,1,2,1)=2; ABC reduction deferred to SSC

AI Pacific cod, continued

- Survey biomass



AI Pacific cod, continued

Quantity	Last asmt.	This asmt.	Change
M	0.34	0.34	0.00
2019 tier	5	n/a	none
2020 tier	5	5	none
Biomass	80,700	80,700	0.00
2020 FOFL	0.34	0.34	0.00
2020 FABC	0.255	0.255	0.00
2019 OFL	27,400	n/a	0.00
2020 OFL	27,400	27,400	0.00
2019 ABC	20,600	n/a	0.00
2020 ABC	20,600	20,600	0.00

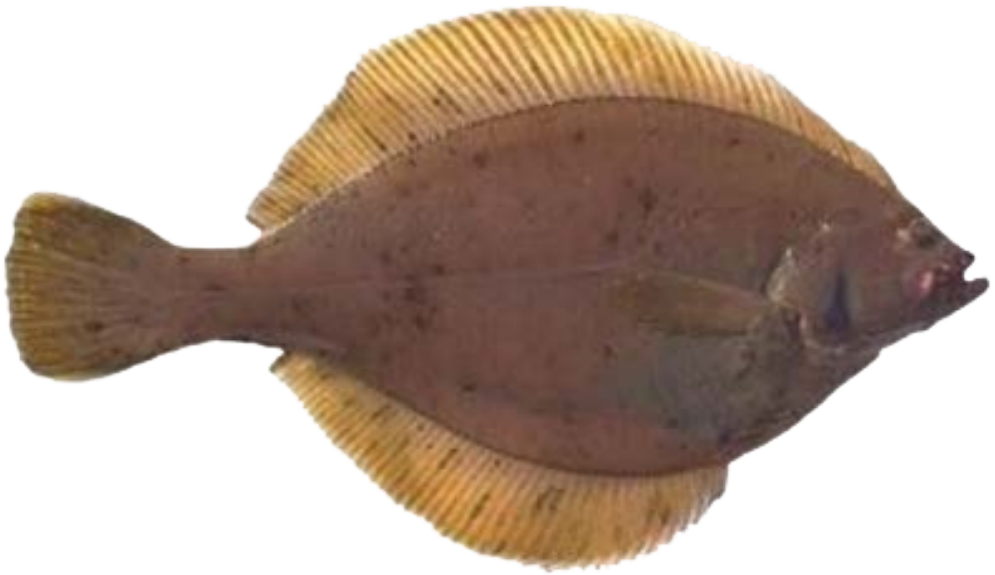
Chapter 3: sablefish (full)

- Covered in Joint Team presentation

Quantity	Last asmt.	This asmt.	Change
M	0.100	0.105	0.05
2019 tier	3b	n/a	↑
2020 tier	3a	3a	none
2019 age+ biomass	488,273	n/a	0.44
2020 age+ biomass	513,502	704,683	0.37
2019 spawning biomass	96,687	n/a	0.17
2020 spawning biomass	129,204	113,368	-0.12
B100%	291,845	264,940	-0.09
B40%	116,738	105,976	-0.09
B35%	102,146	92,729	-0.09
2020 FOFL	0.117	0.121	0.03
2020 FABC	0.051	0.044	-0.14
2019 OFL	32,798	n/a	0.54
2020 OFL	45,220	50,481	0.12
2019 ABC	15,068	n/a	0.25
2020 ABC	20,144	18,763	-0.07

Chapter 4 : Yellowfin sole (full)

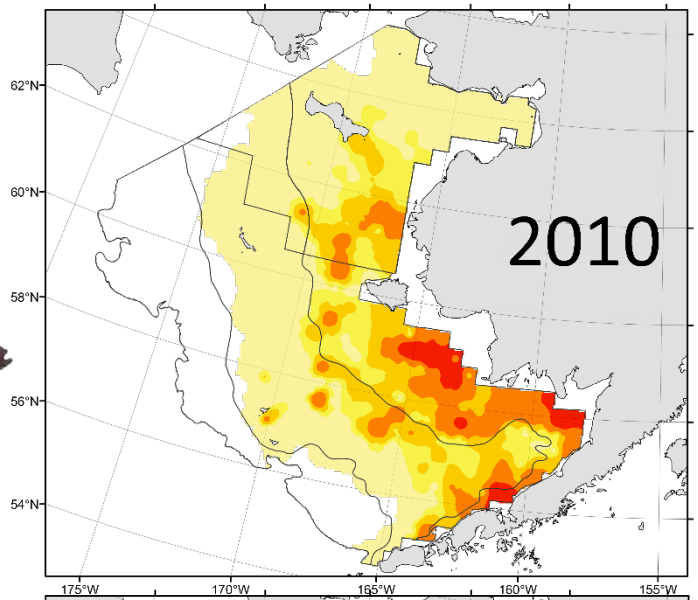
Ingrid Spies, Thomas K. Wilderbuer,
Daniel G. Nichol, and James Ianelli

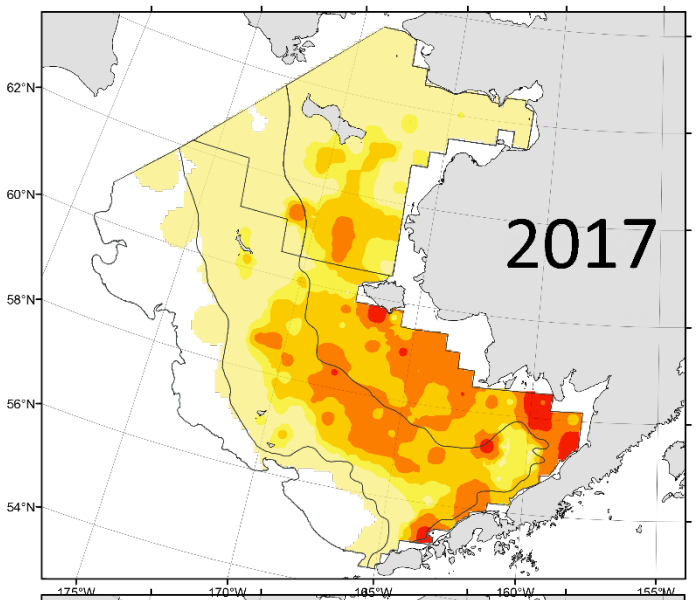


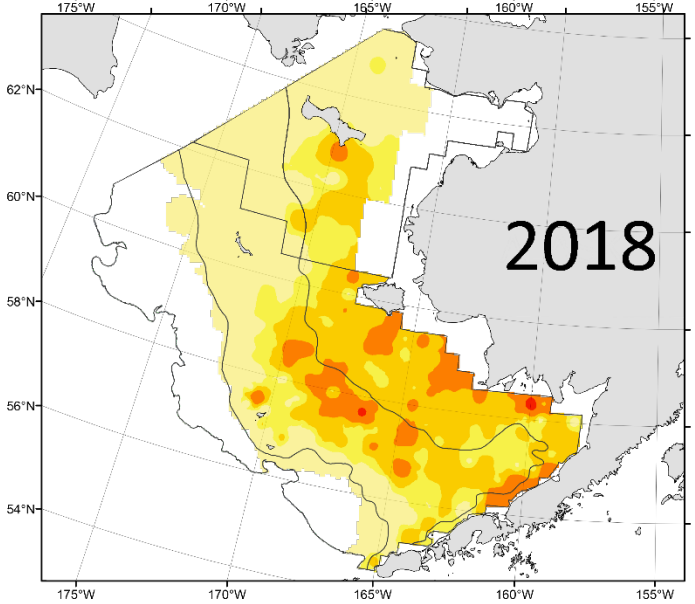
Bering Sea Yellowfin Sole Distribution

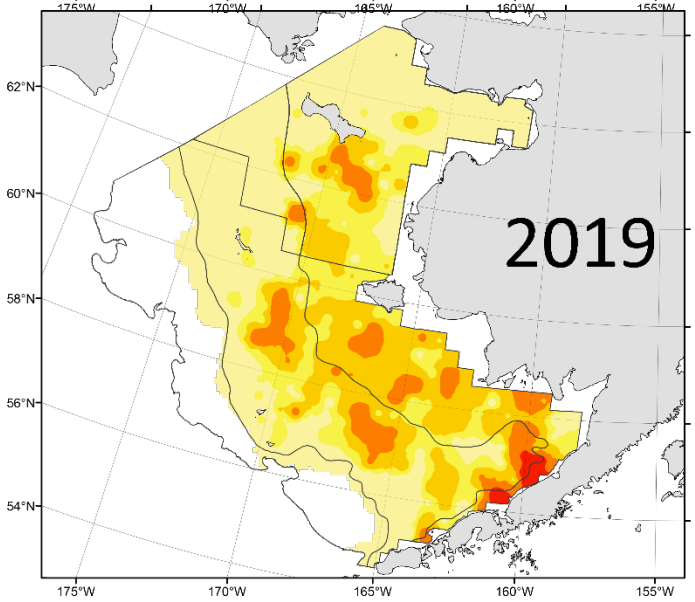
Yellowfin Sole
(kg/ha)

- 0
- > 0 - 25
- > 25 - 50
- > 50 - 100
- > 100 - 300
- > 300









Chapter 4: yellowfin sole

- New data:
  - Fishery and survey agecomps for 2018
  - EBS shelf survey biomass estimate for 2019, up 6% from 2018
- Model changes/alternatives:
  - Model 18.1a was the base model
  - Model 18.2 fixes female M=0.12, but estimates male M=0.135
  - Authors recommend Model 18.2, Team recommends Model 18.1a

Yellowfin sole, continued

- Stock status and trend:
  - 2003, 2009, and 2014 cohorts are 47%, 43%, and 52% above ave.
  - Spawning biomass has declined almost continuously since 2007
  - 2020 spawning biomass is 69% of B_0 and 86% above B_{MSY}

- Risk level: max(1,1,1,1)=1; no ABC reduction

Yellowfin sole, continued

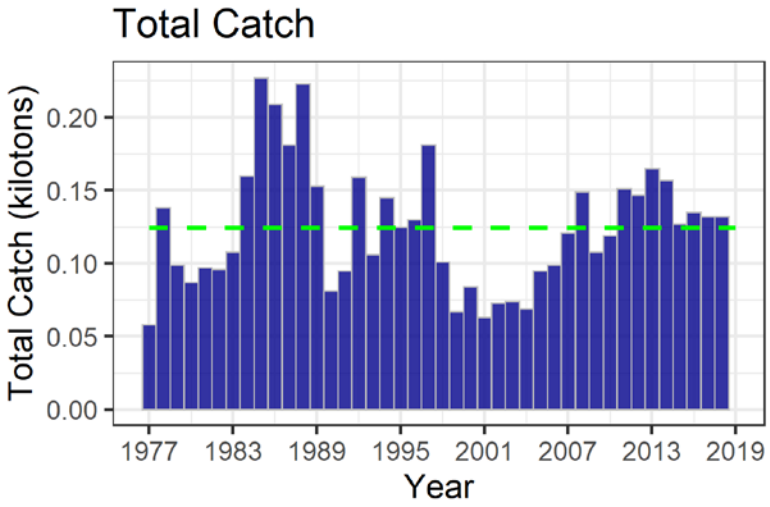
- Model fits to survey biomass

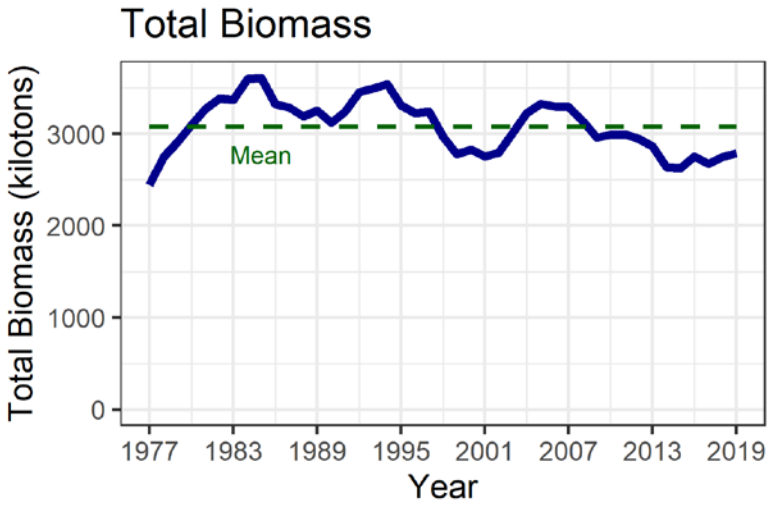
Yellowfin sole, Recommendations

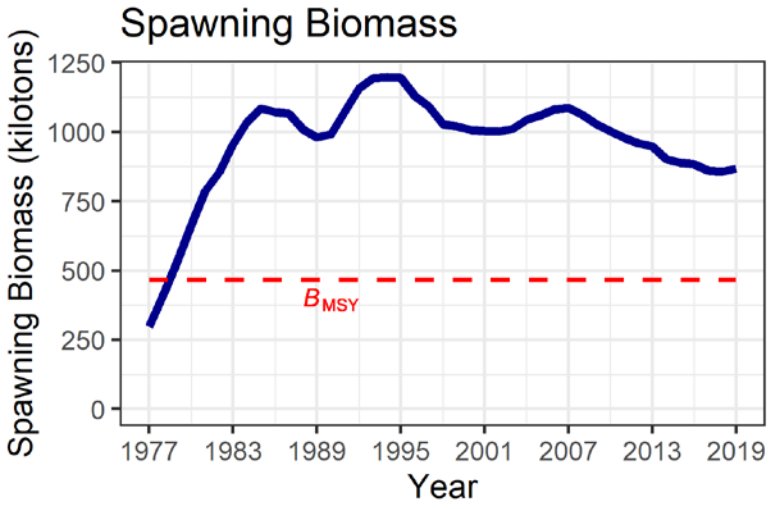
- Although Model 18.2 was the authors' preferred model and appeared to provide a better fit to the data, the Team recommended using Model 18.1a for management in 2020, as Model 18.2 had not received thorough review and there are no conservation or other concerns indicating that a switch to Model 18.2 is necessary this year

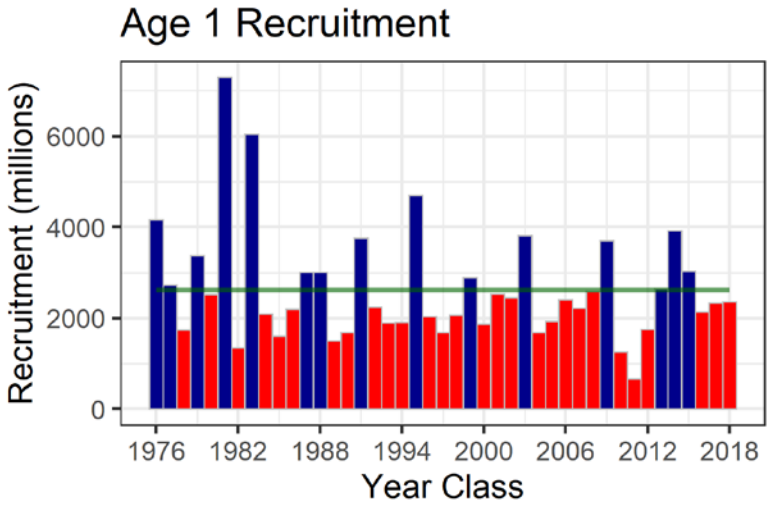
- The Team commended the author on her work on Model 18.2 and the Team recommended this model be presented for consideration in next year's cycle

Yellowfin sole, continued









Yellowfin sole, continued

Quantity	Last asmt.	This asmt.	Change
M	0.12	0.12	0.00
2019 tier	1a	n/a	none
2020 tier	1a	1a	none
2019 age+ biomass	2,462,400	n/a	0.00
2020 age+ biomass	2,411,700	2,461,850	0.02
2019 spawning biomass	850,600	n/a	0.01
2020 spawning biomass	821,500	857,187	0.04
B0	1,245,400	1,245,400	0.00
Bmsy	460,800	460,800	0.00
2020 FOFL	0.118	0.117	-0.01
2020 FABC	0.107	0.106	-0.01
2019 OFL	290,000	n/a	-0.01
2020 OFL	284,000	287,307	0.01
2019 ABC	263,200	n/a	-0.01
2020 ABC	257,800	260,918	0.01

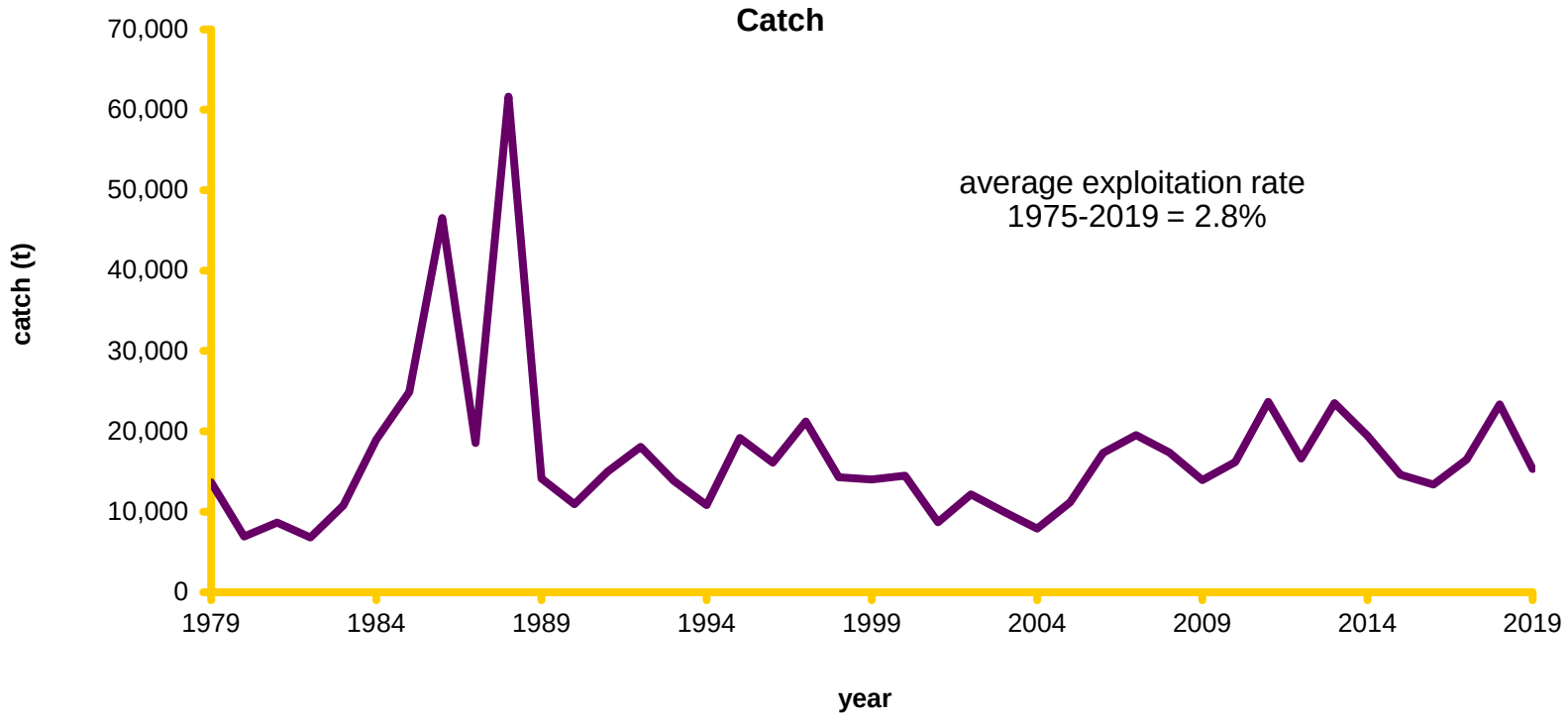
Chapter 10 : Alaska plaice

Thomas K. Wilderbuer and Daniel G. Nichol

Chapter 10: Alaska plaice (full)

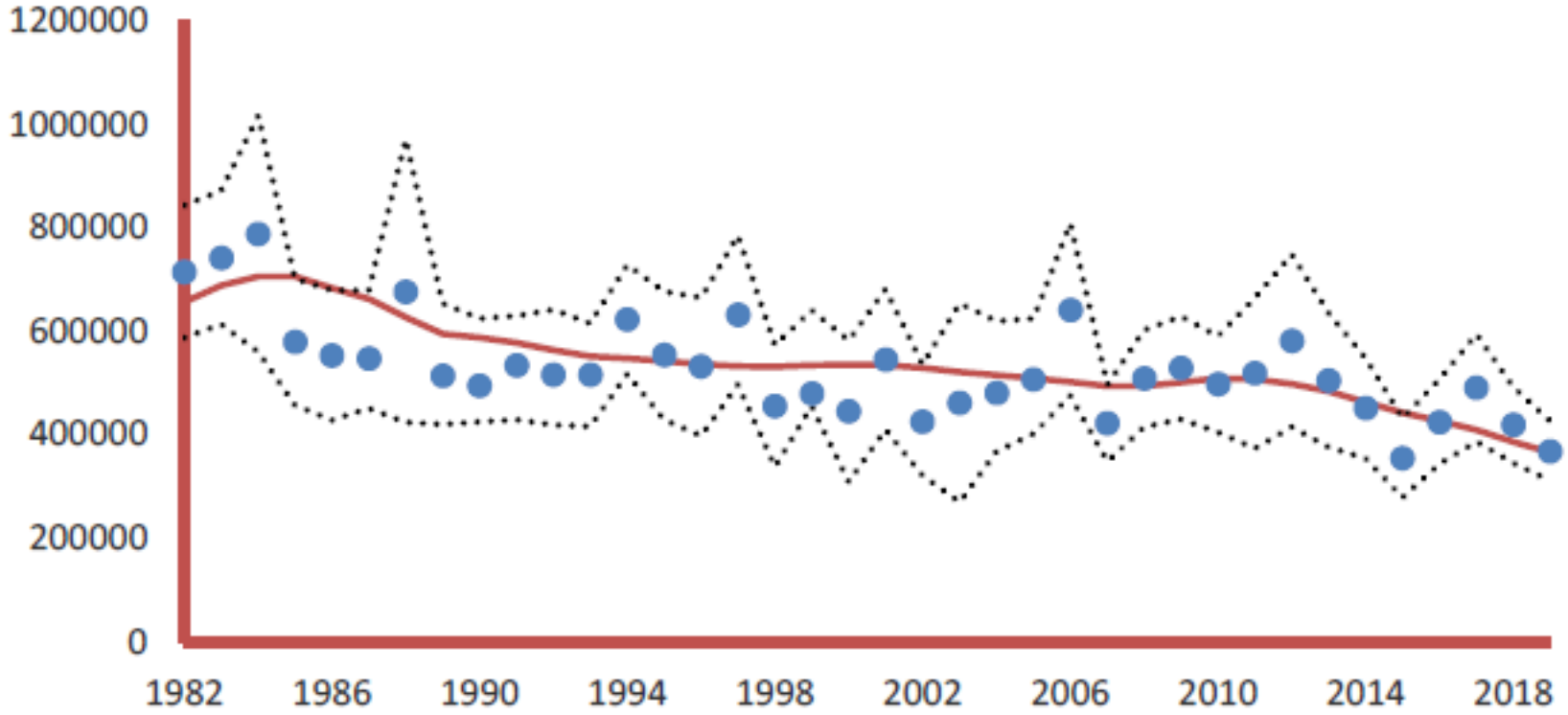
- New data:
  - 2018 and 2019 EBS shelf survey biomass down 15% and 12% from 2017 and 2018, respectively
  - 2017 and 2018 survey and fishery agecomps
- Model changes/alternatives: none
- Stock status and trend:
  - 2001, 2002, 2014, and 2016 cohorts are 66%, 94%, 85%, and 108% above average
    - However, 1994-2000 and 2003-2013 cohorts were all below ave.
  - Spawning biomass has been declining since 2013
  - 2020 spawning biomass is 51% of $B_{100\%}$
- Mohn's $\rho = -0.02$
- Risk level: max(1,1,1,1)=1; no ABC reduction

2019 catch = 15,812 t (11/2/2019)
average 1975-2019 exploitation rate = 2.8%

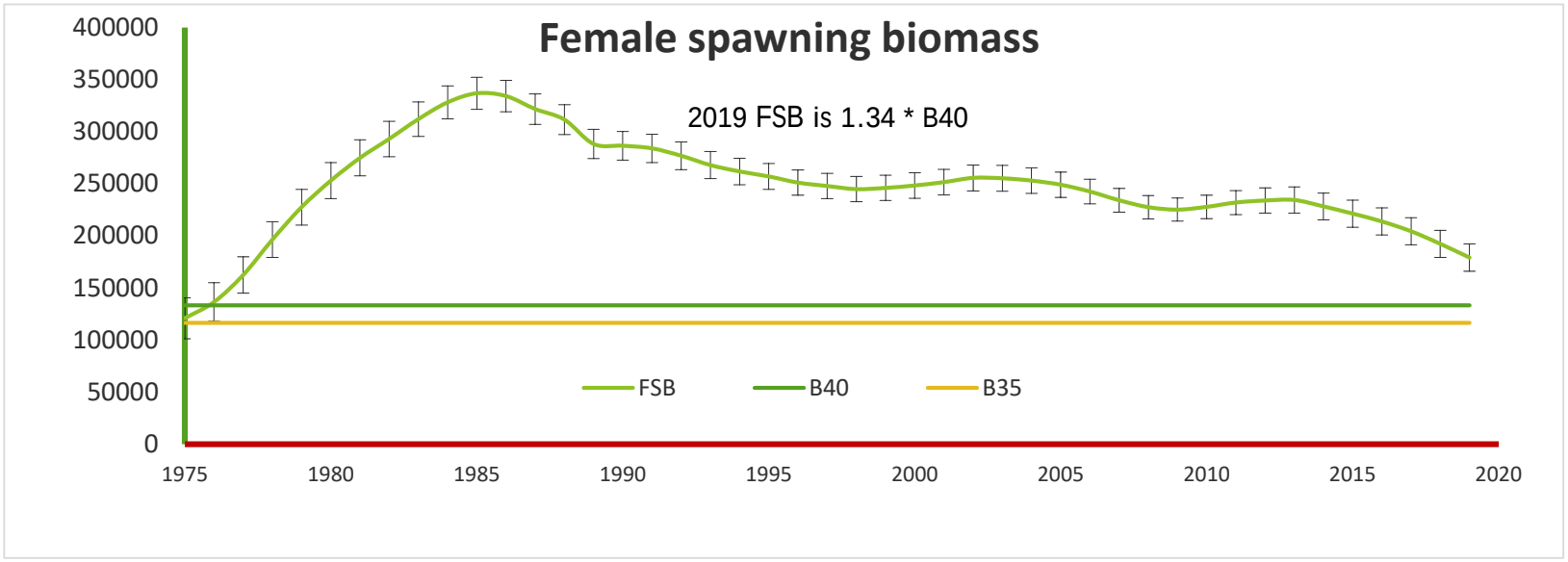


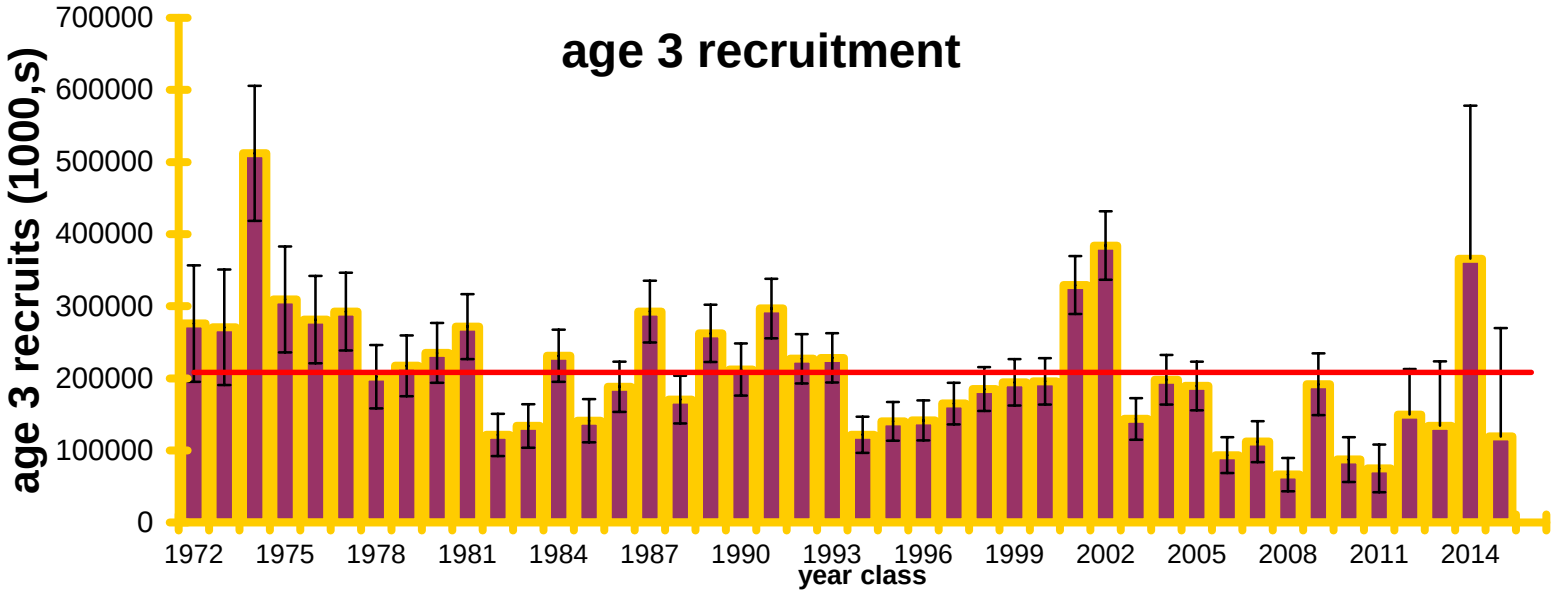
Alaska plaice, continued

- Fit to survey

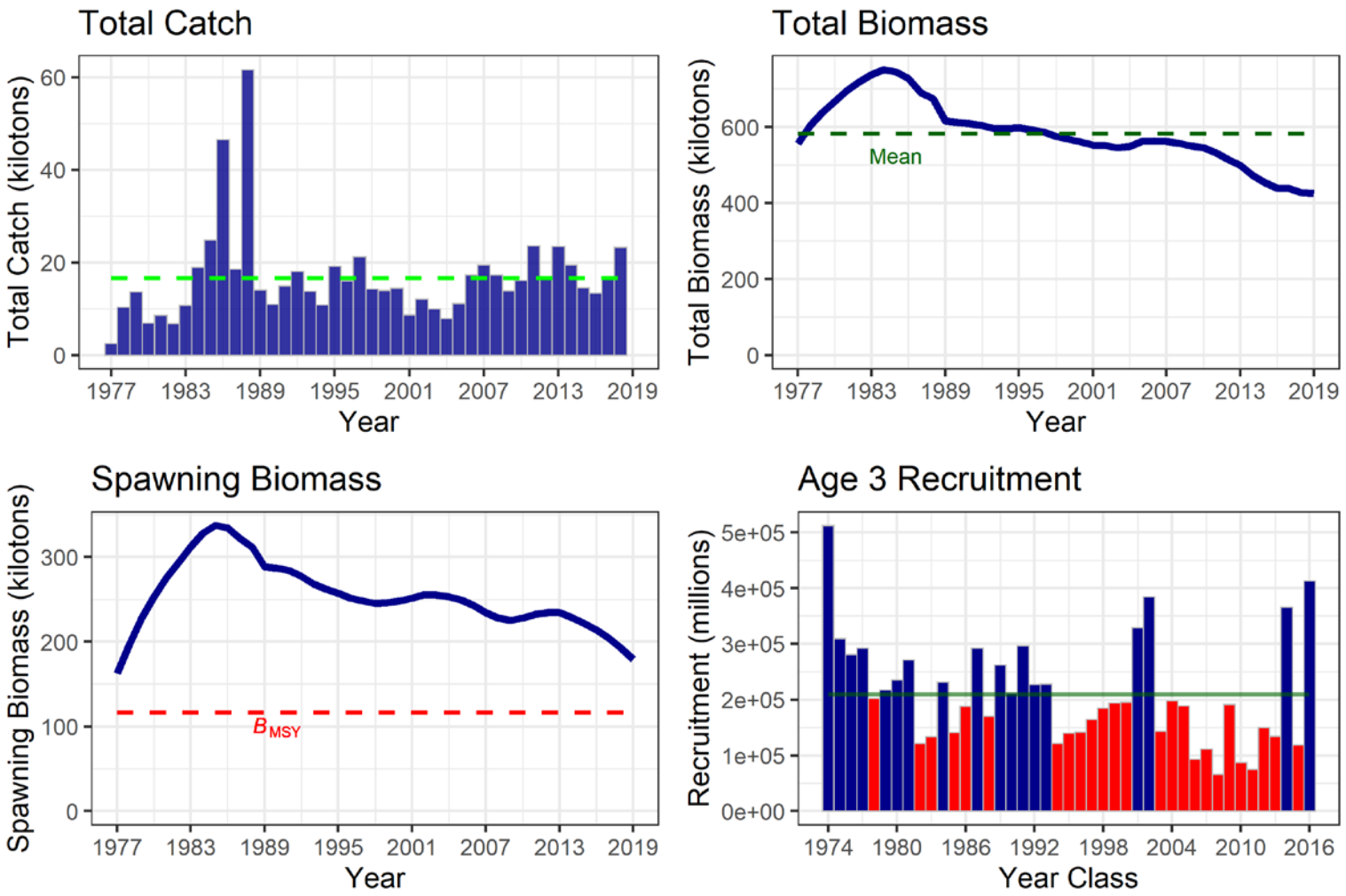


Model results





Alaska plaice, continued

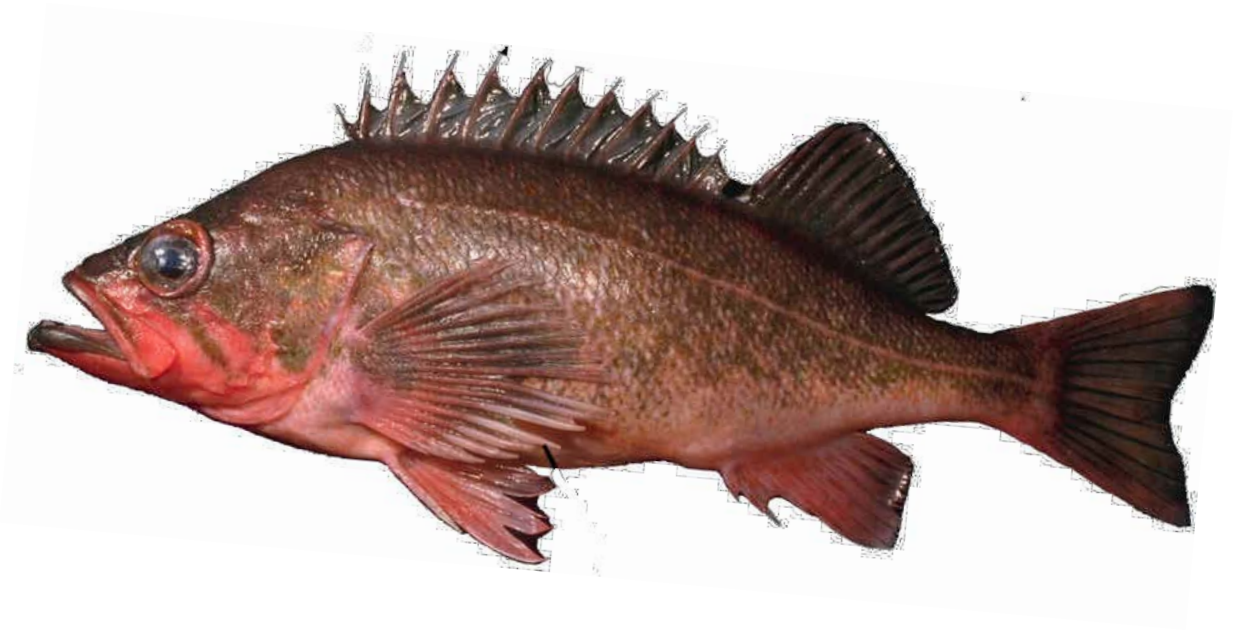


Alaska plaice, continued

Quantity	Last asmt.	This asmt.	Change
M	0.13	0.13	0.00
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	400,700	n/a	0.07
2020 age+ biomass	394,700	428,800	0.09
2019 spawning biomass	186,100	n/a	-0.08
2020 spawning biomass	171,100	170,800	0.00
B100%	317,360	333,300	0.05
B40%	126,900	133,300	0.05
B35%	111,100	116,600	0.05
2020 FOFL	0.149	0.150	0.01
2020 FABC	0.124	0.125	0.01
2019 OFL	39,880	n/a	-0.06
2020 OFL	37,860	37,600	-0.01
2019 ABC	33,600	n/a	-0.06
2020 ABC	31,900	31,600	-0.01

Chapter 13 : Northern rockfish (full)

Paul D. Spencer and James N. Ianelli



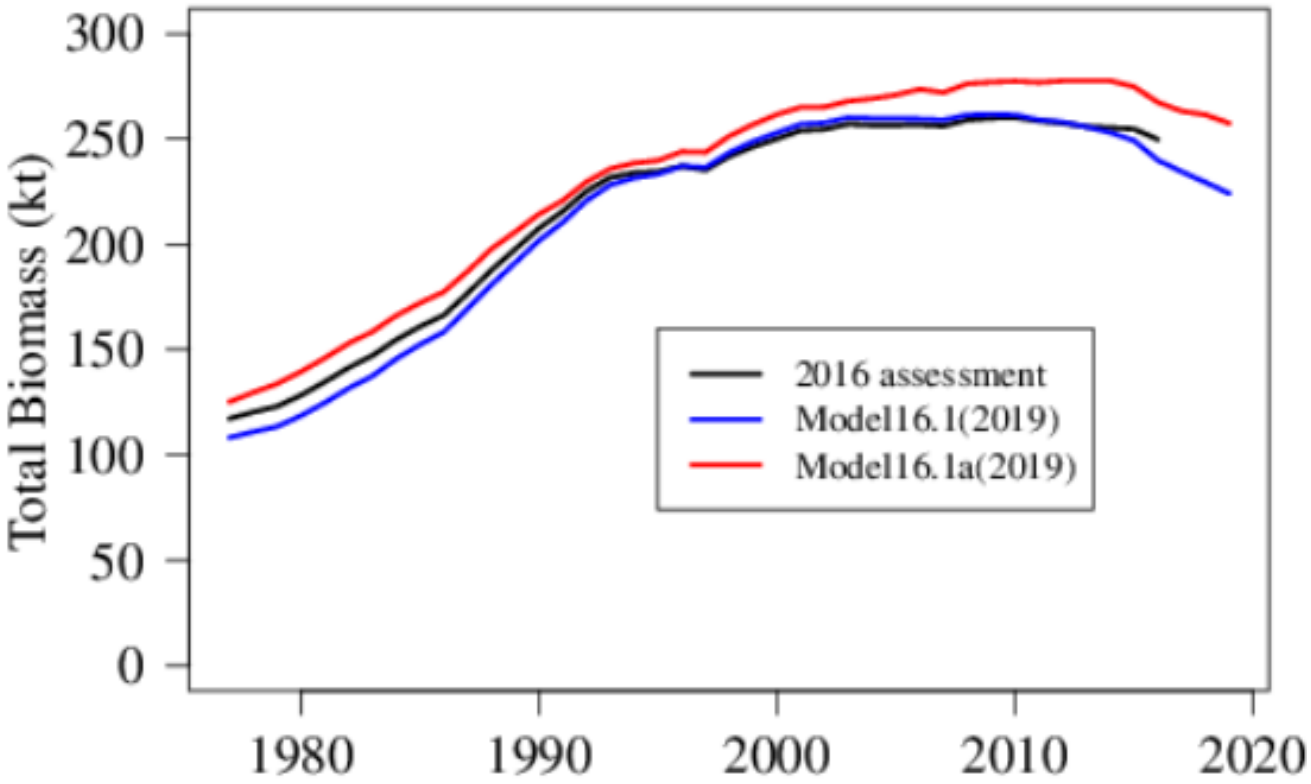
Northern rockfish, continued

- Stock status and trend:
  - 1995-1997 and 2005 cohorts all >160% of average
    - 1995 and 2005 cohorts are >250% of average
    - However, all cohorts after 2005 are below average
  - Spawning biomass increased almost continuously from 47 kt in 1977 to 125 kt in 2014, decreasing since
  - 2020 spawning biomass is 70% of $B_{100\%}$
- New model
  - Applying area specific survey and fishery age compositions
  - Weight-at age-curves were computed for the fishery and population by subarea

- Risk level: max(2,1,2,1)=2; no ABC reduction
  - Author was concerned that key parameters for the model are strongly constrained by priors and there is a large negative retrospective bias
  - Fish condition has been declining notably since 2010, perhaps due to a lack of forage fish in the system
  - However, since stock biomass is high and fishing rates are low, a reduction from maxABC was not recommended despite the increased level of concern

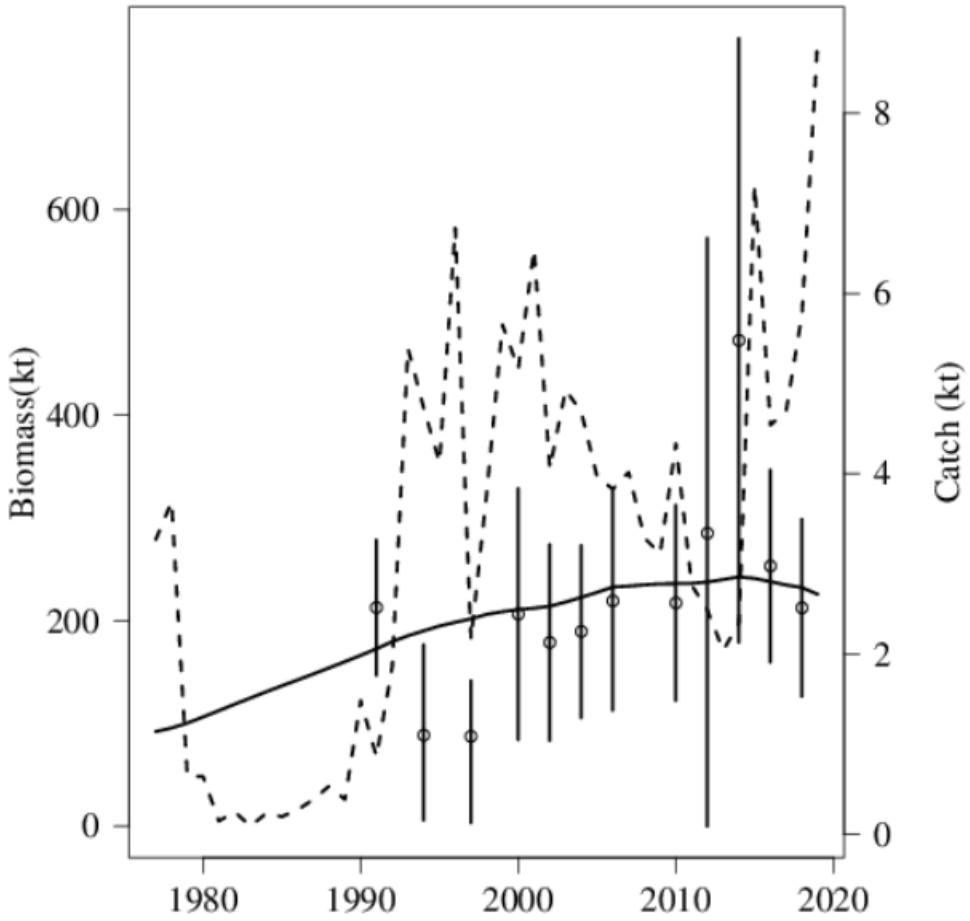
Northern rockfish, continued

- Total biomass time series

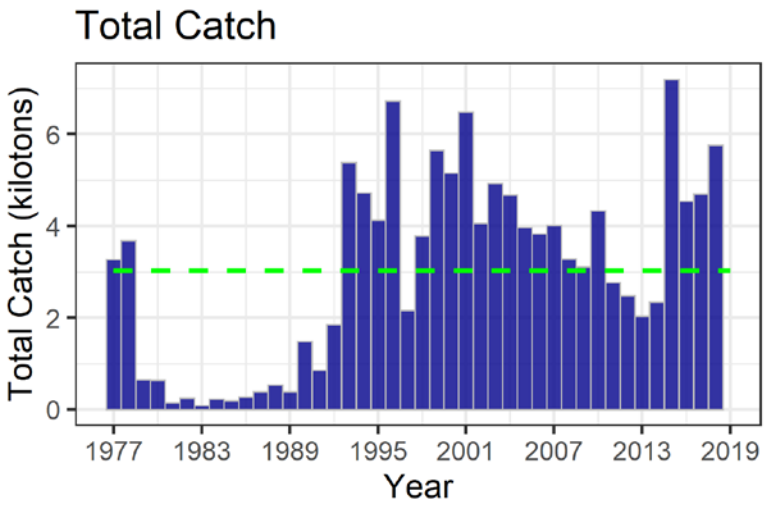


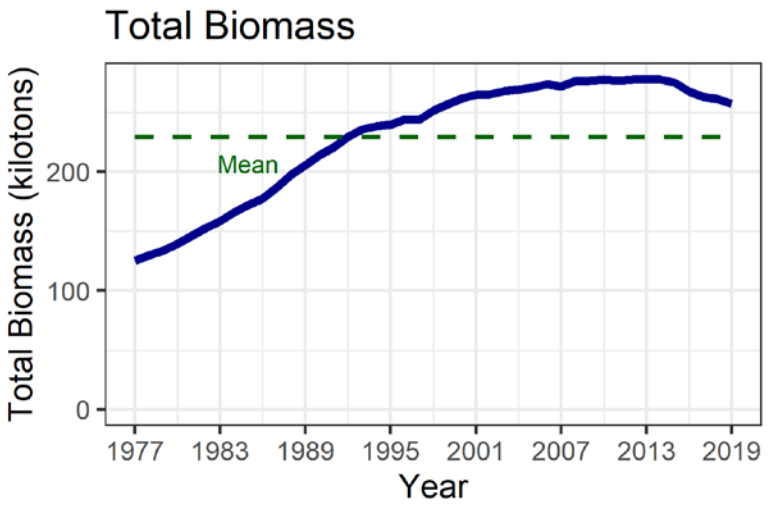
Northern rockfish, continued

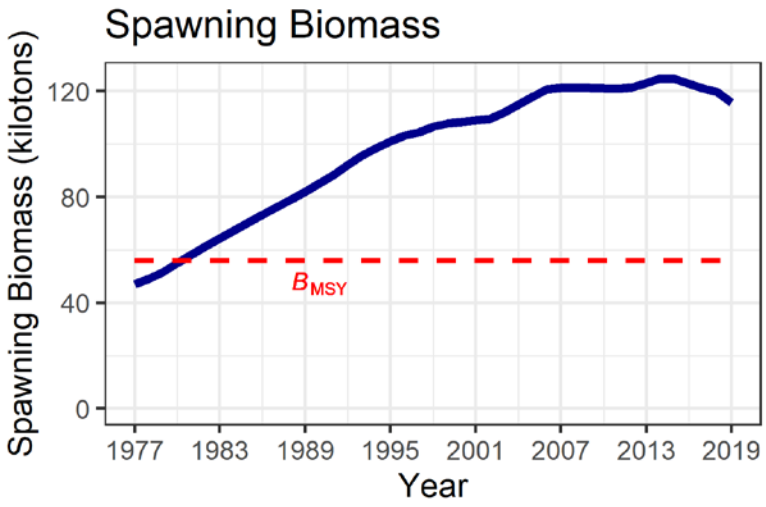
- Catch and Model 16.1a fit to survey biomass

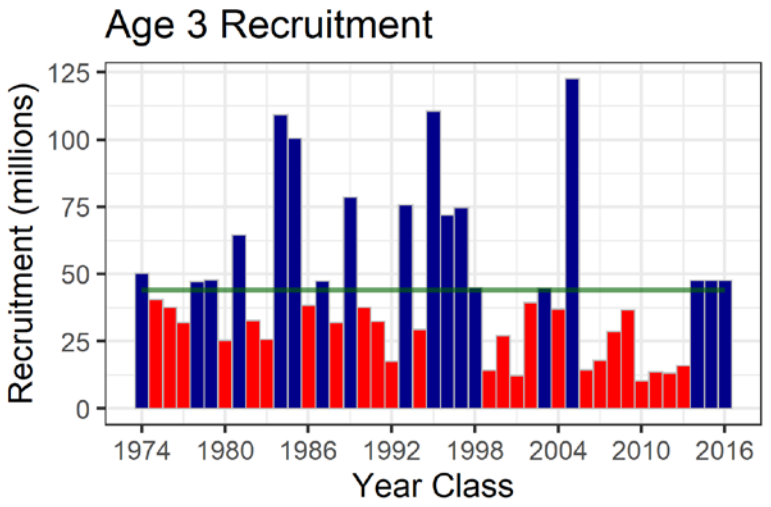


Northern rockfish, continued







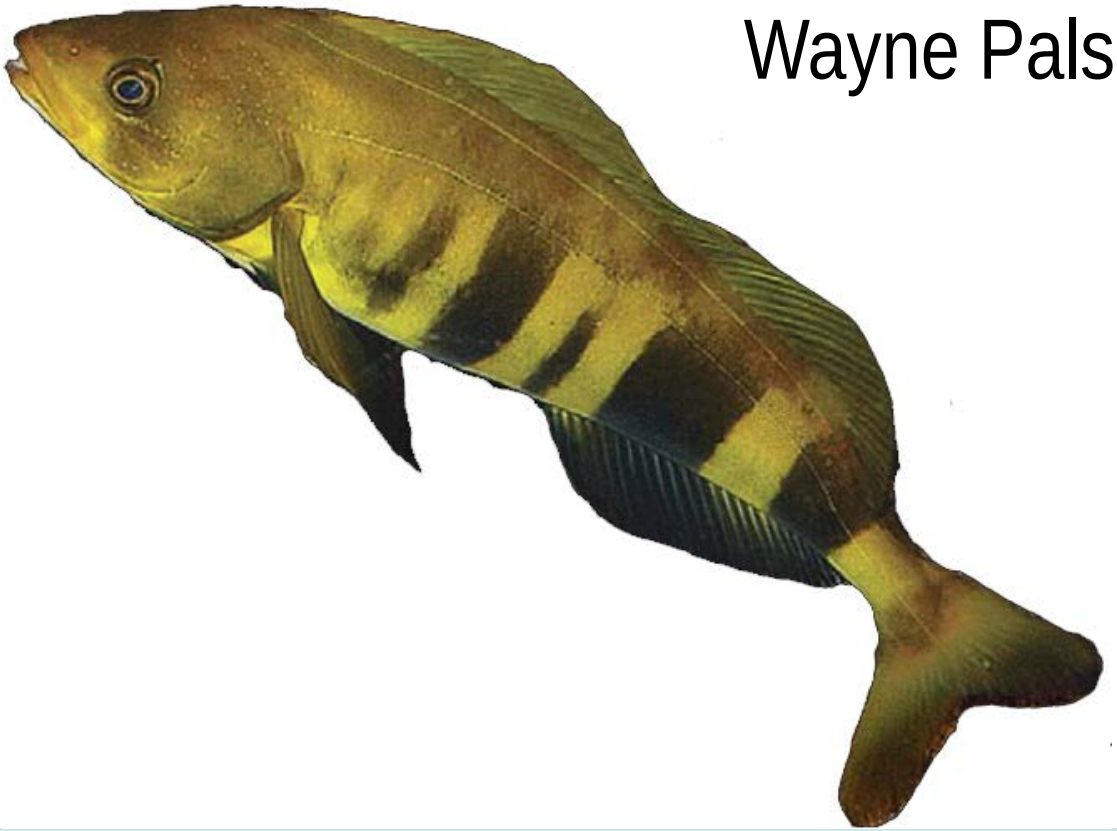


Northern rockfish, continued

Quantity	Last asmt.	This asmt.	Change
M	0.046	0.048	0.04
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	244,196	n/a	0.02
2020 age+ biomass	242,426	250,235	0.03
2019 spawning biomass	104,201	n/a	0.07
2020 spawning biomass	102,480	111,476	0.09
B100%	164,674	159,850	-0.03
B40%	65,870	63,940	-0.03
B35%	57,636	55,947	-0.03
2020 FOFL	0.080	0.075	-0.06
2020 FABC	0.065	0.061	-0.06
2019 OFL	15,507	n/a	0.27
2020 OFL	15,180	19,751	0.30
2019 ABC	12,664	n/a	0.28
2020 ABC	12,396	16,243	0.31

Chapter 13 : Atka mackerel (full)

Sandra Lowe, James Ianelli,
Wayne Palsson, and Ben Fissel



Chapter 17: Atka mackerel (full)

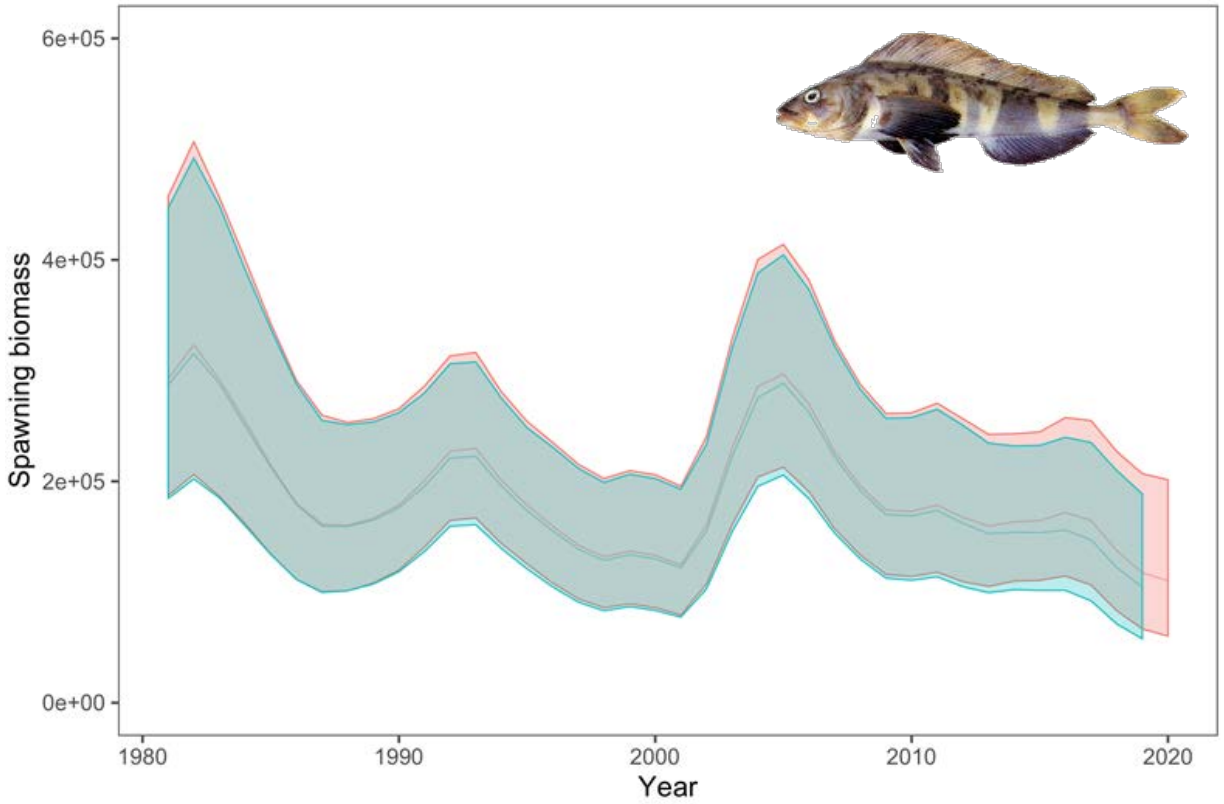
- No new models

- Stock status and trend:
  - 2006, 2007, and 2012 cohorts are 56%, 34%, and 39% above ave.
  - However, these cohorts do not compensate for the below-average cohorts from all other years since 2001
  - 2005 spawning biomass was highest since 1982; 2019 is lowest ever
  - 2020 spawning biomass is 38% of $B_{100\%}$

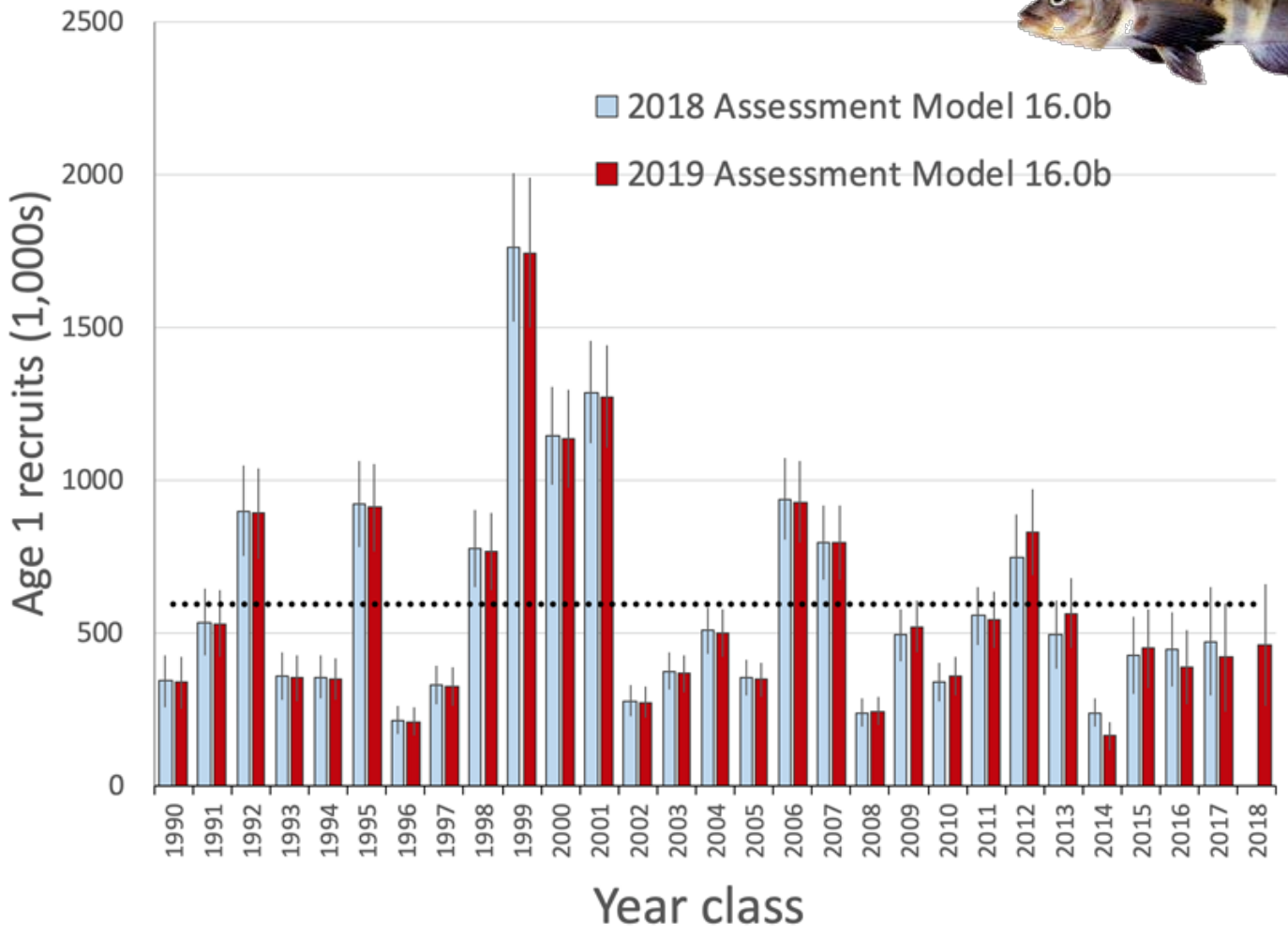
- Risk level: max(1,1,1,1)=1; no ABC reduction

Atka mackerel, continued

- Fit to survey biomass



Time series of the current assessment (Model 16.0b) estimated AI Atka mackerel spawning biomass (t) with approximate 95% confidence bounds, compared to last year's Model 16.0b estimates (2018 assessment). Changes include 2018 fishery and survey age composition data in the current assessment.



Age 1 recruitment from the current assessment (2019) with the dashed line indicating average recruitment (599 million) from the 1977-2017 year classes, and age 1 recruitment as estimated from the 2018 assessment

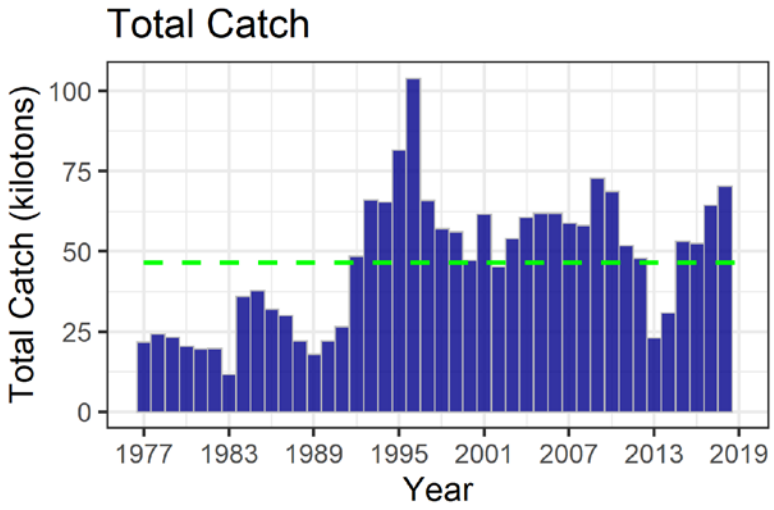
Atka mackerel, continued

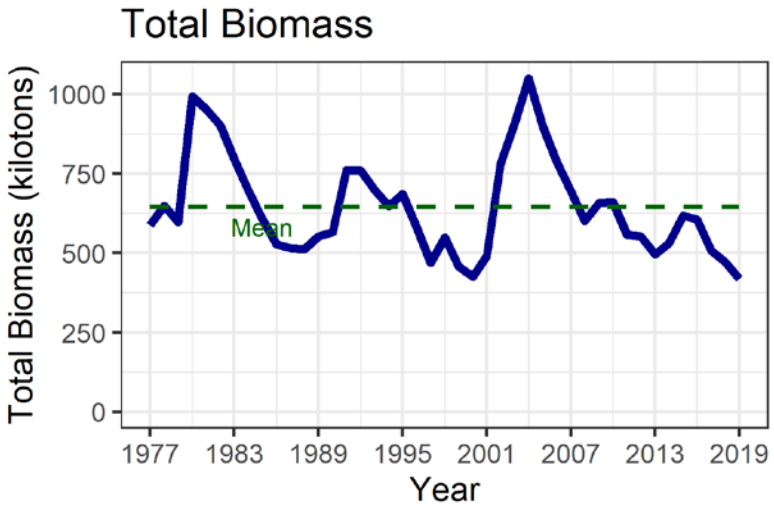
BSAI Atka Mackerel Apportionment

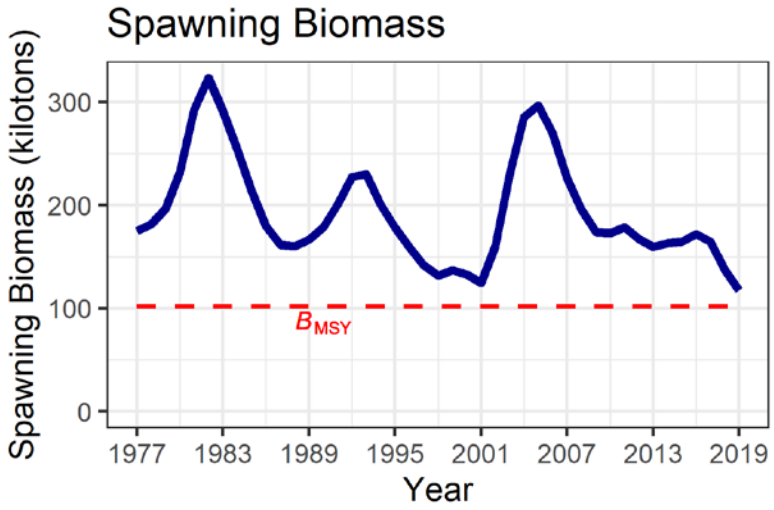
4-Survey Weighted Average

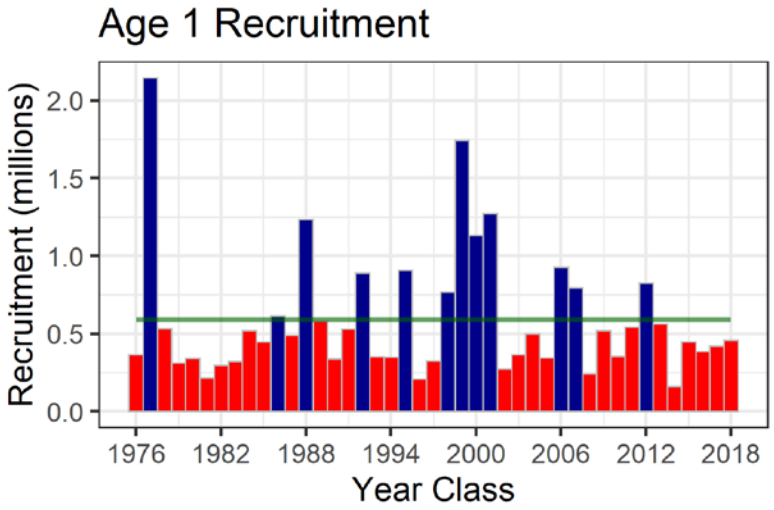
	Survey Year				2020 & 2021	**2020**	**2021**
	2012	2014	2016	2018	Apportionment	**ABC**	**ABC**
541+SBS	12%	42%	35%	38%	0.35	**24,535**	**22,540**
542	39%	28%	30%	7%	0.21	**14,721**	**13,524**
543	48%	30%	35%	55%	0.44	**30,844**	**28,336**
Weights	8	12	18	27	1.00	**70,100**	**64,400**
Total ABC						**70,100**	**64,400**

Atka mackerel, continued









Atka mackerel, continued

Quantity	Last asmt.	This asmt.	Change
M	0.30	0.30	0.00
2019 tier	3b	n/a	none
2020 tier	3b	3b	none
2019 age+ biomass	498,320	n/a	0.04
2020 age+ biomass	514,400	515,890	0.00
2019 spawning biomass	106,800	n/a	0.03
2020 spawning biomass	102,700	109,900	0.07
B100%	283,780	291,780	0.03
B40%	113,510	116,600	0.03
B35%	99,320	102,020	0.03
2020 FOFL	0.53	0.48	-0.09
2020 FABC	0.44	0.41	-0.07
2019 OFL	79,200	n/a	0.03
2020 OFL	73,400	81,200	0.11
2019 ABC	68,500	n/a	0.02
2020 ABC	63,400	70,100	0.11

BSAI forage species report

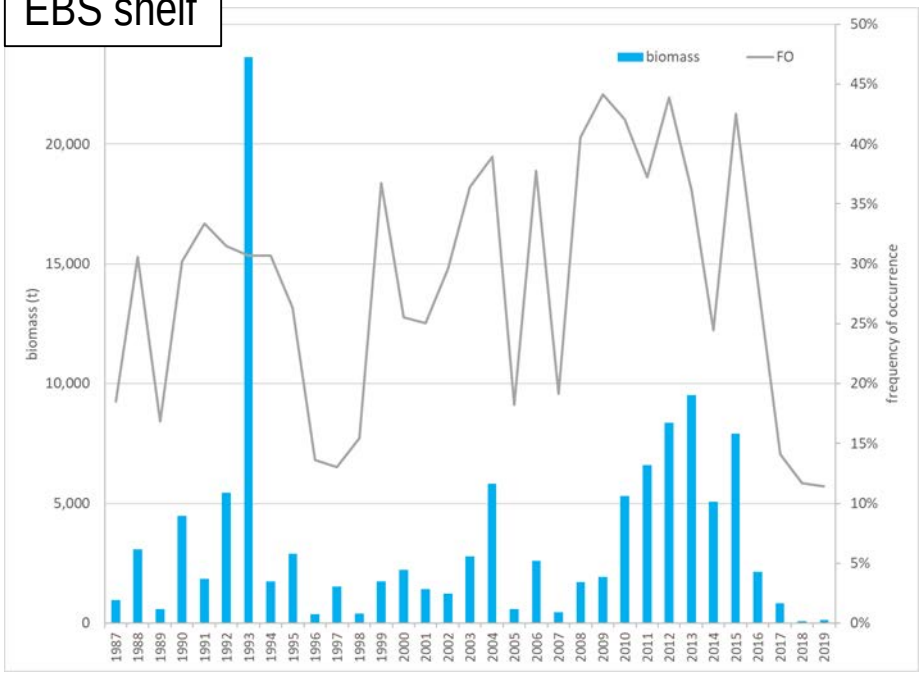
Olav A. Ormseth, AFSC

forage species overview

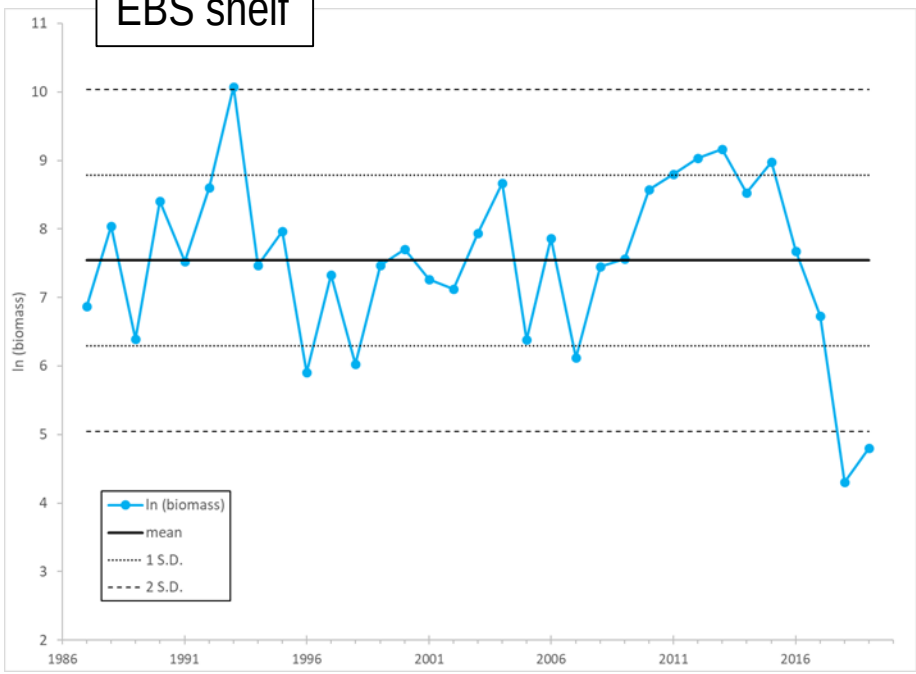
- members of the “forage fish group” listed in the BSAI Fishery Management Plan (FMP)
- Pacific herring *Clupea pallasii*
- juvenile groundfishes and salmon
- shrimps
- squids (now part of forage report)
- Arctic cod *Boreogadus saida*

capelin abundance

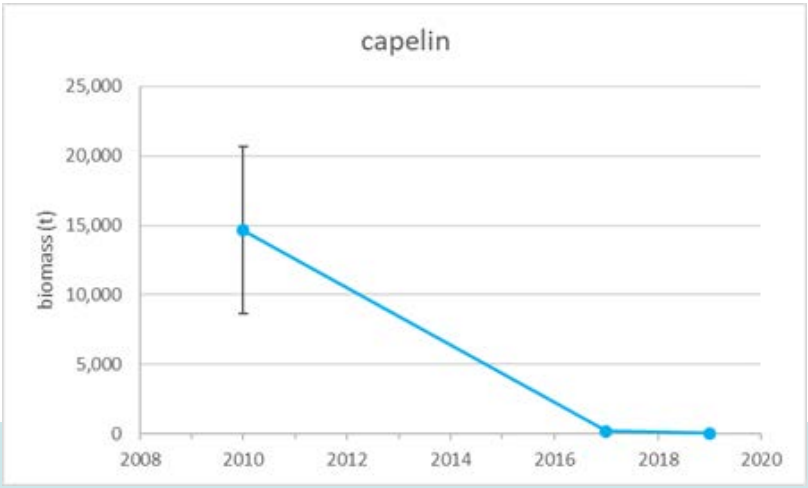
EBS shelf



EBS shelf

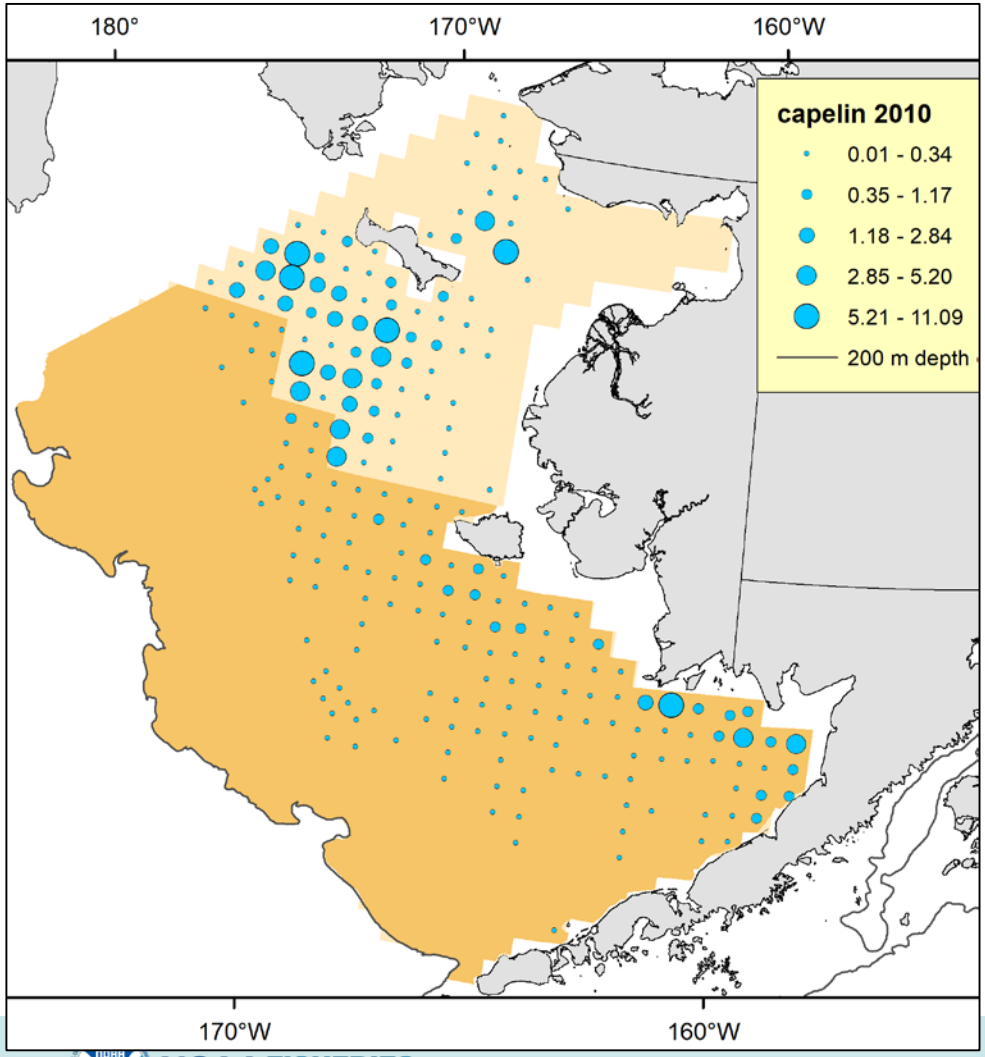


NBS

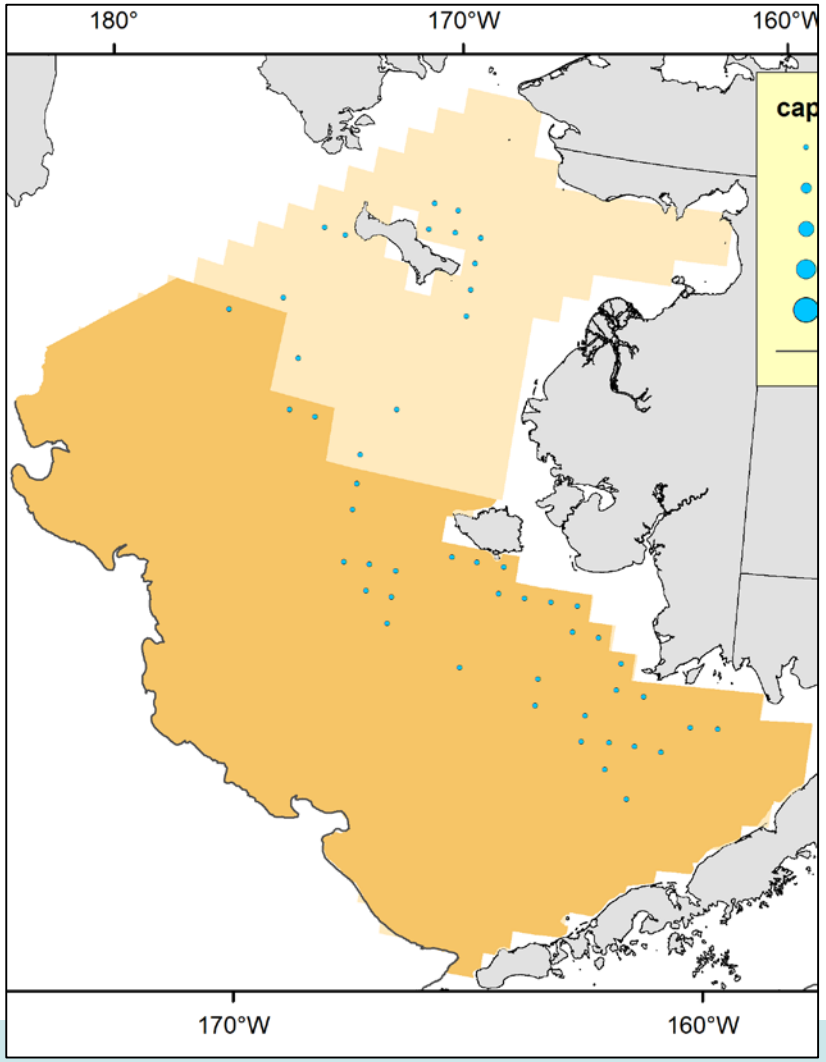


capelin distribution 2010 vs 2019

2010



2019



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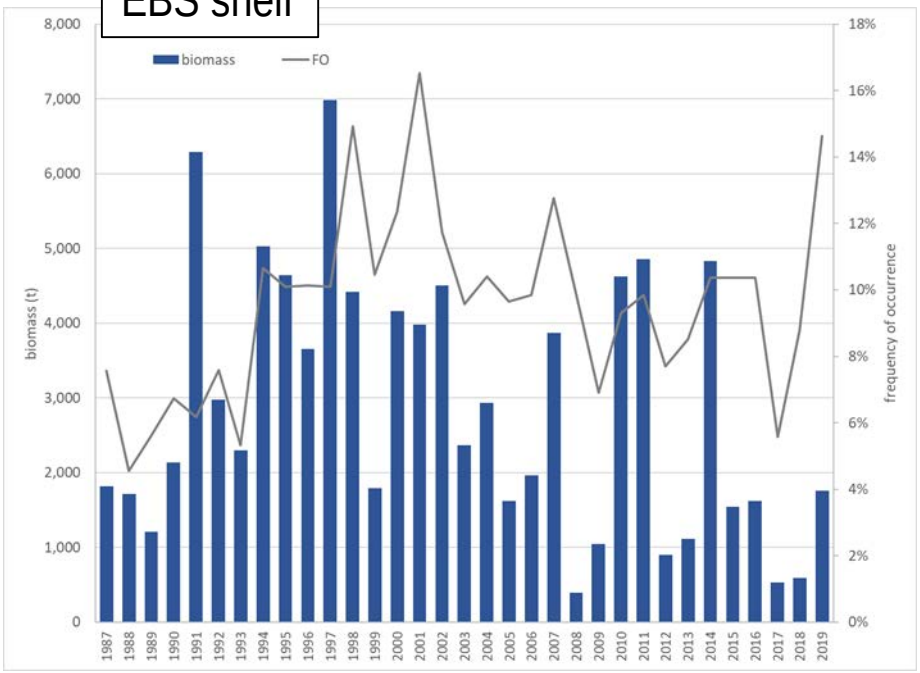
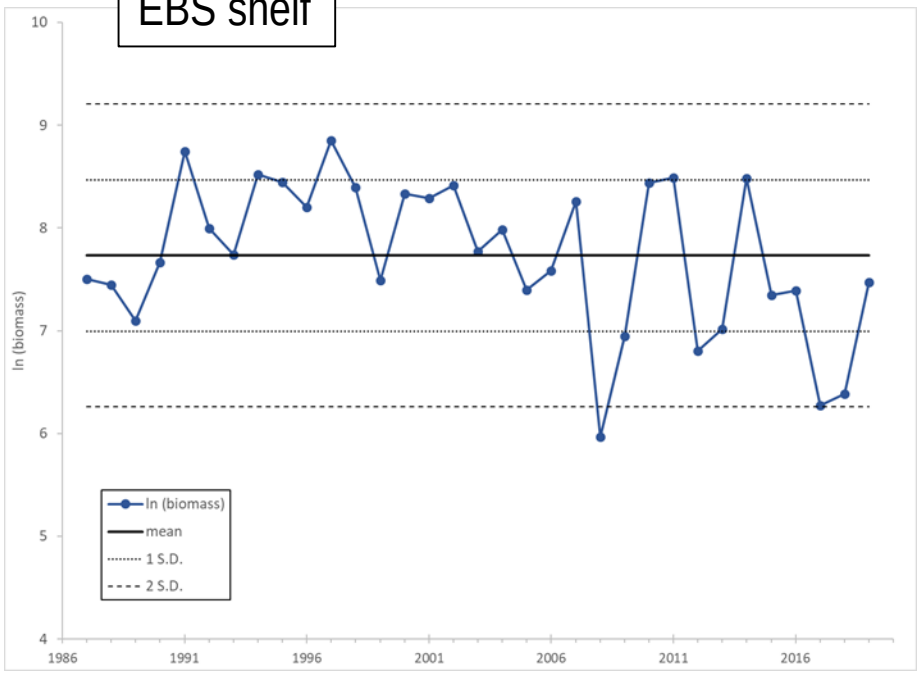
eulachon abundance

EBS shelf

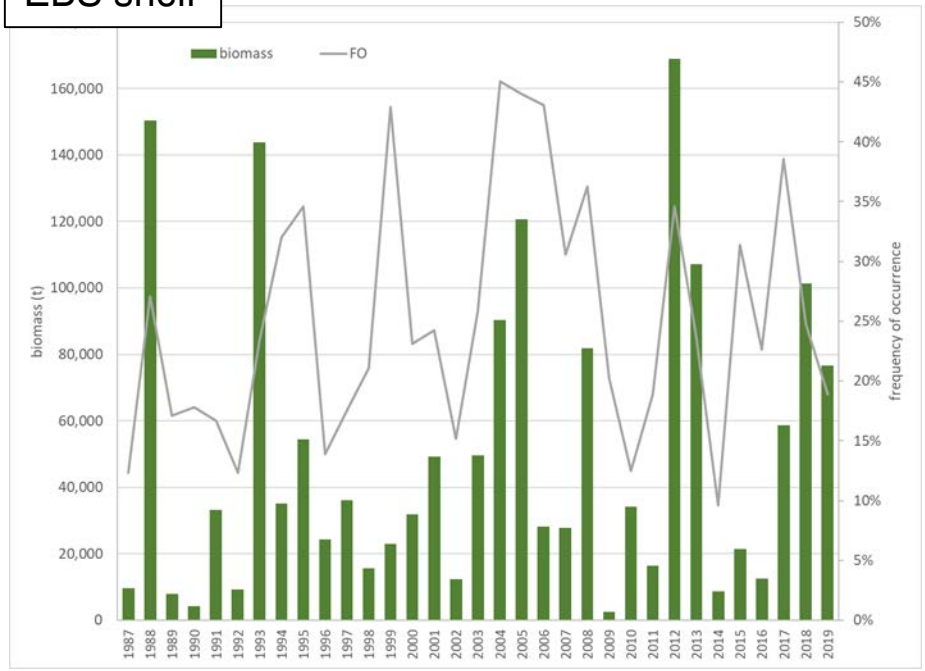


EBS shelf

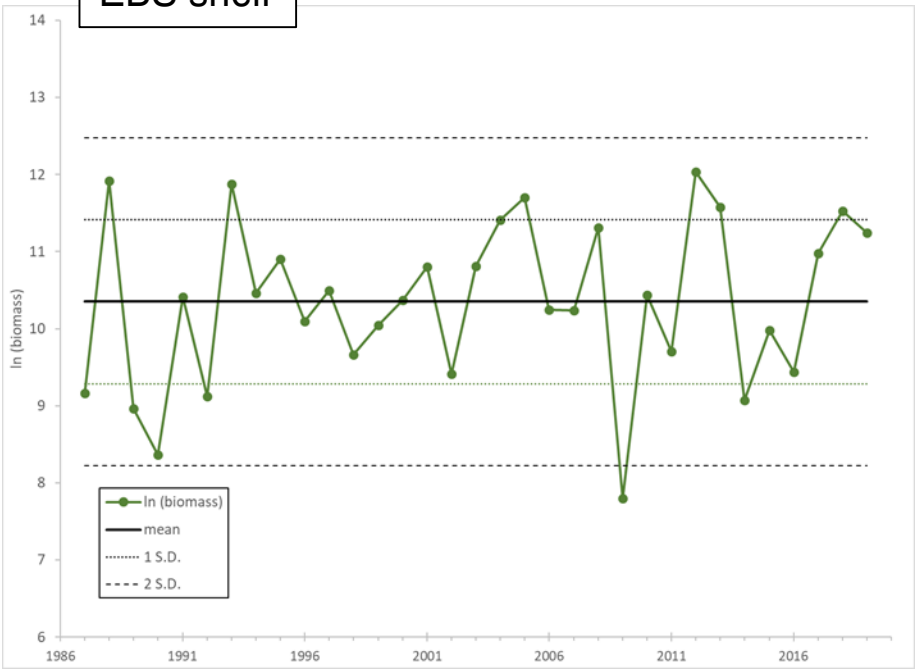


herring abundance

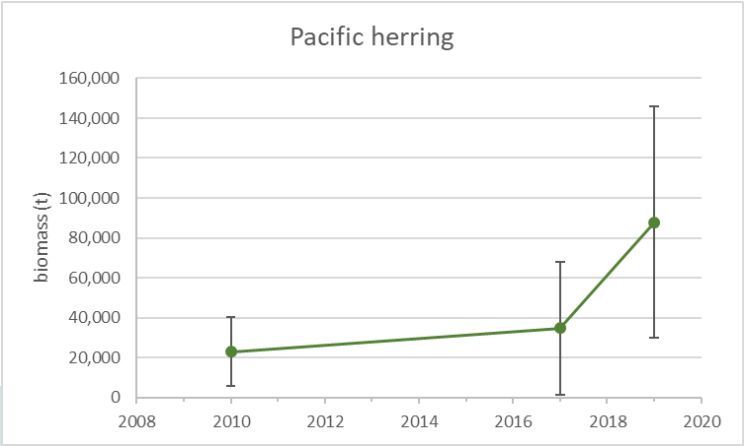
EBS shelf



EBS shelf



NBS



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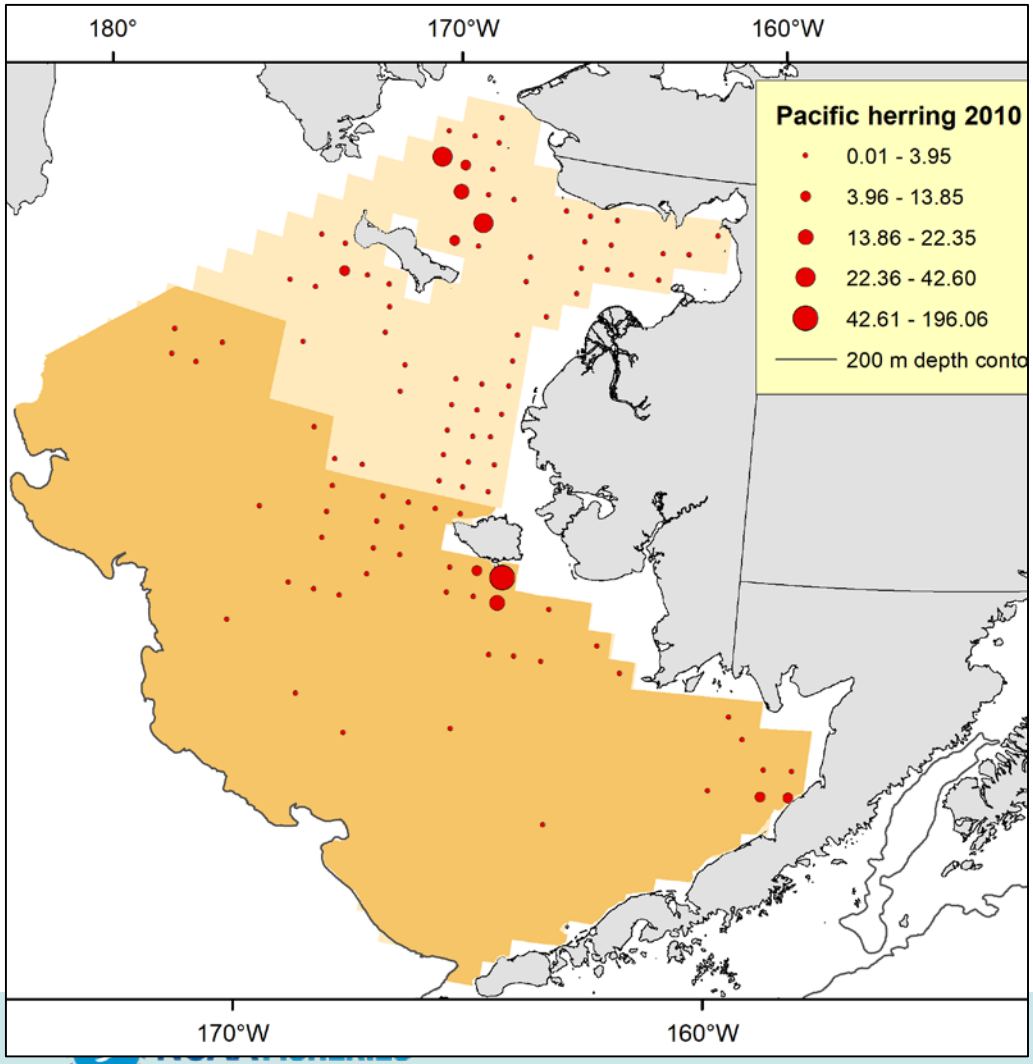
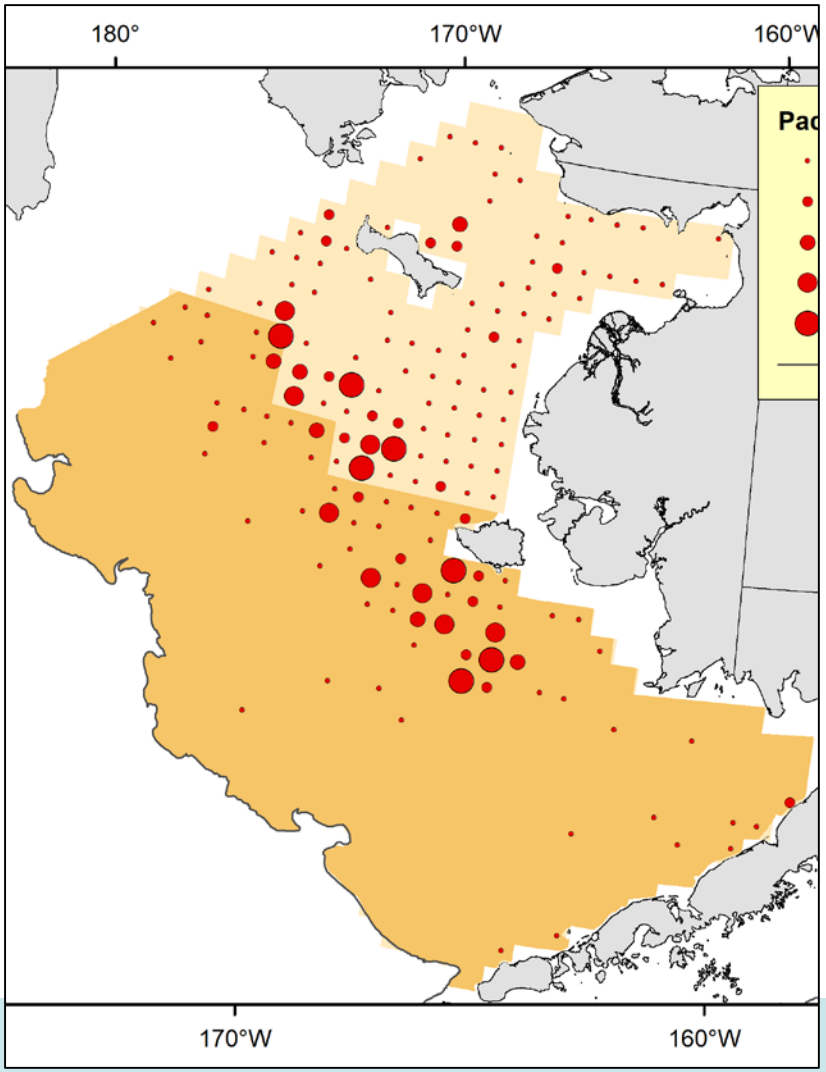
herring distribution 2010 vs 2019

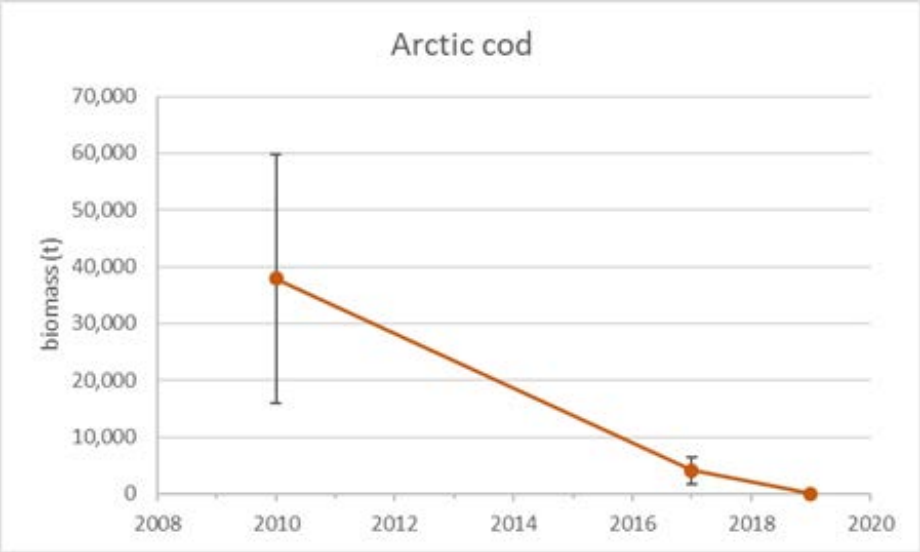
2010

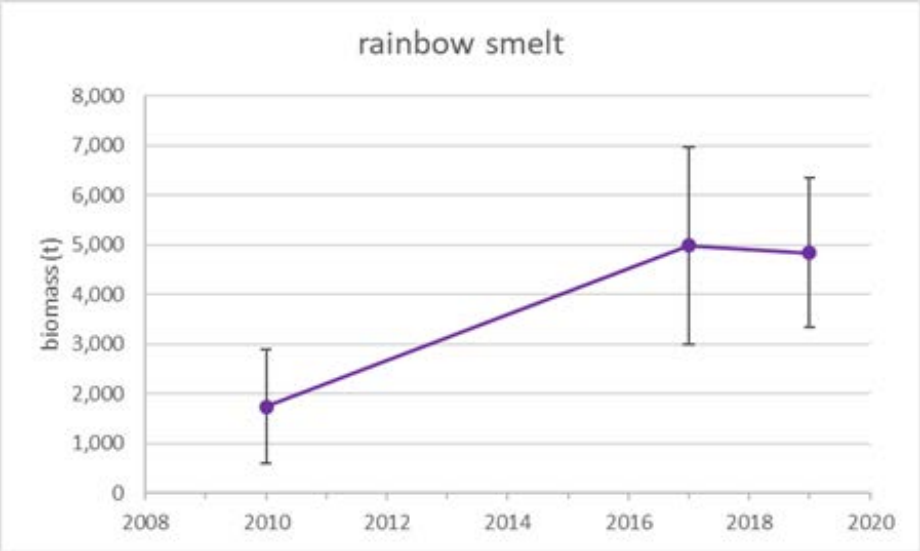


2019



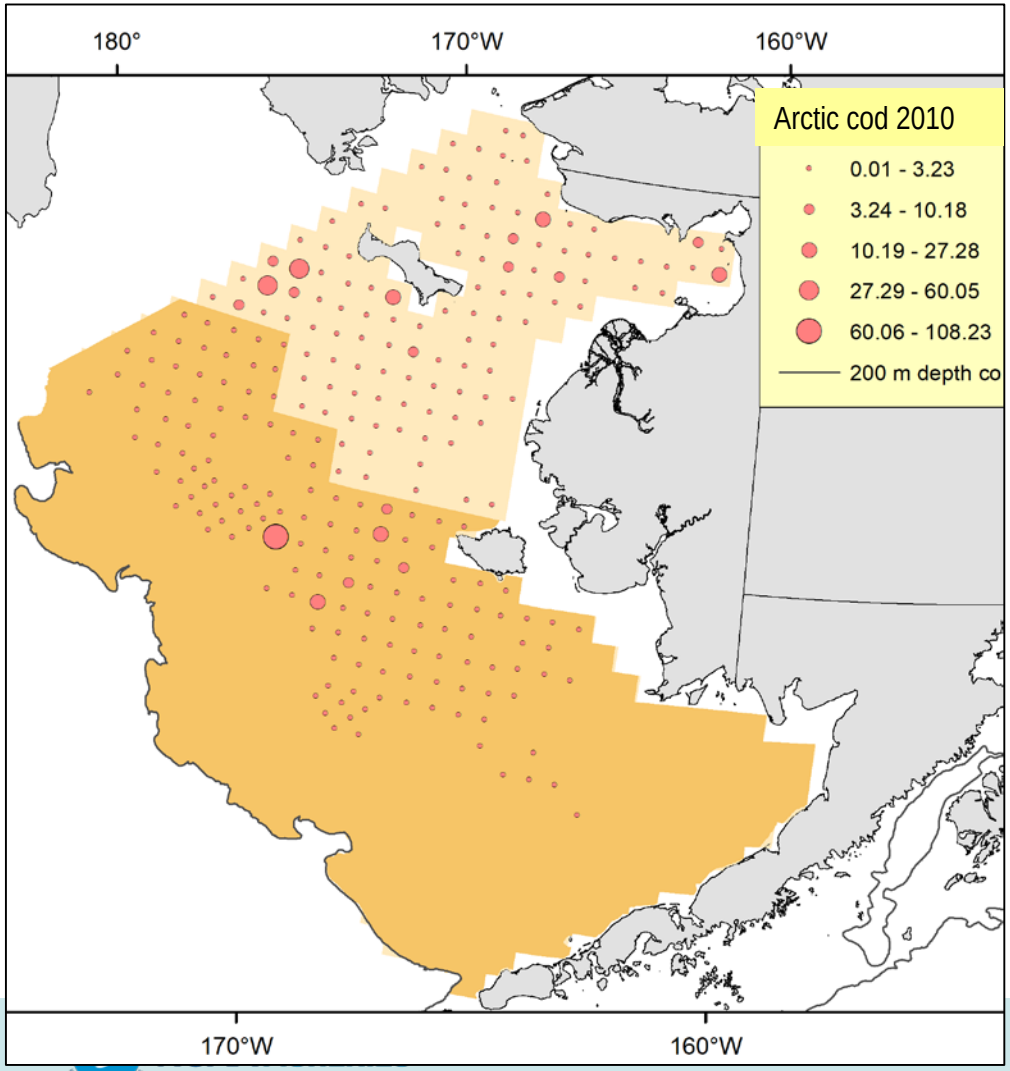
NBS survey trends – Arctic cod & rainbow smelt



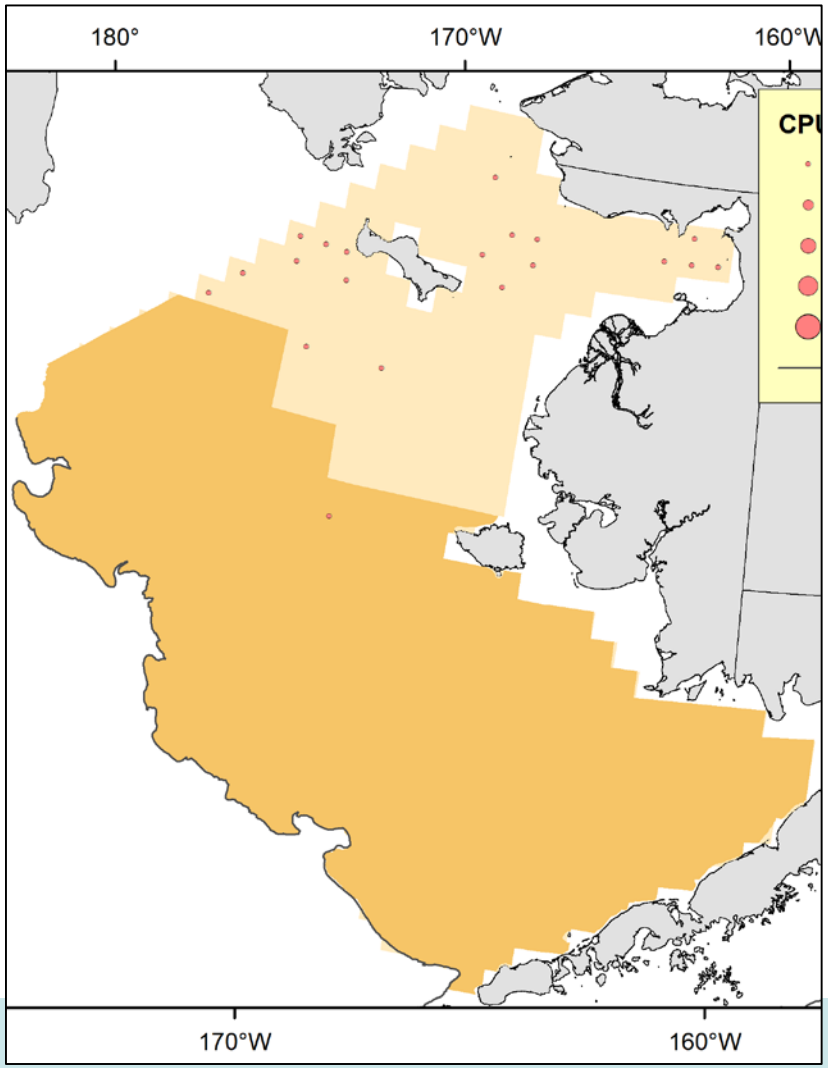


Arctic cod distribution 2010 vs 2019

2010

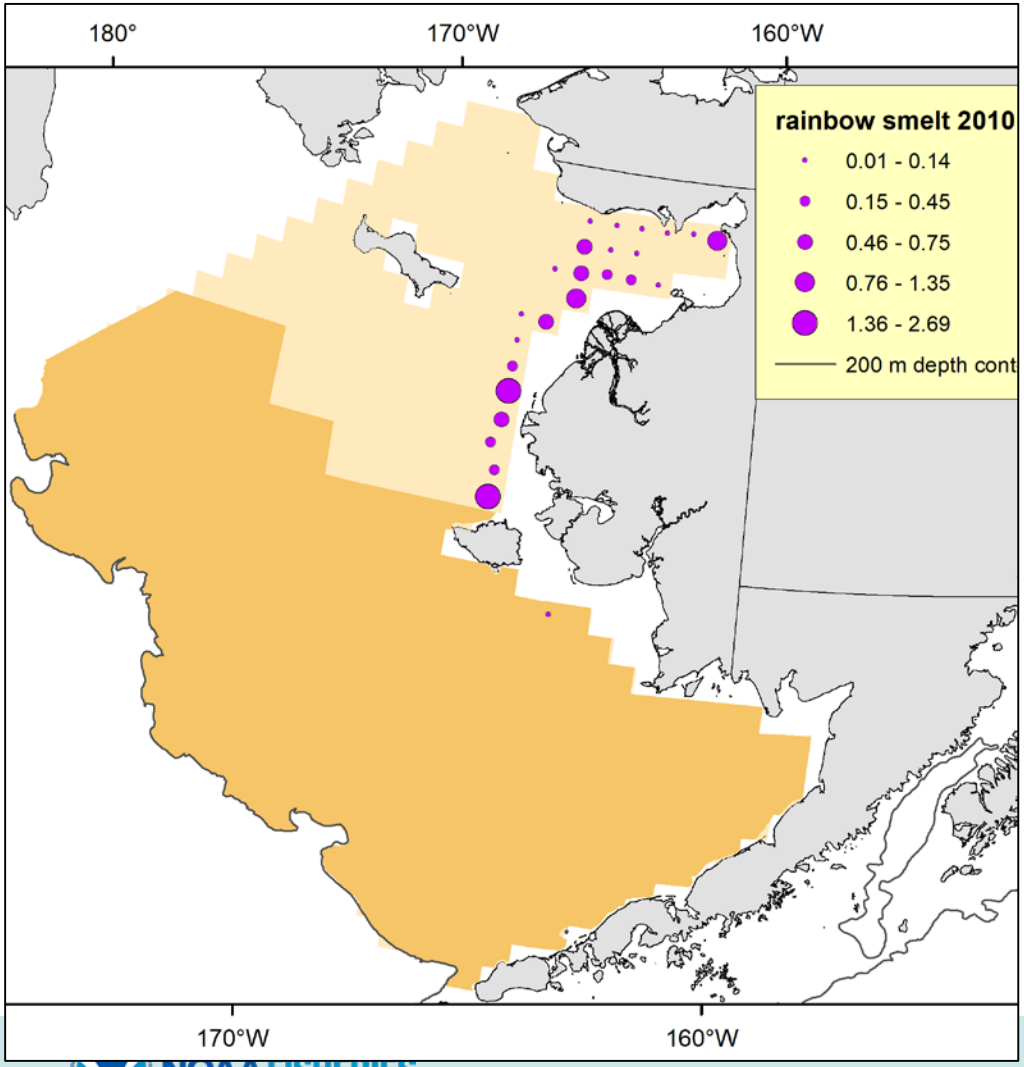


2019

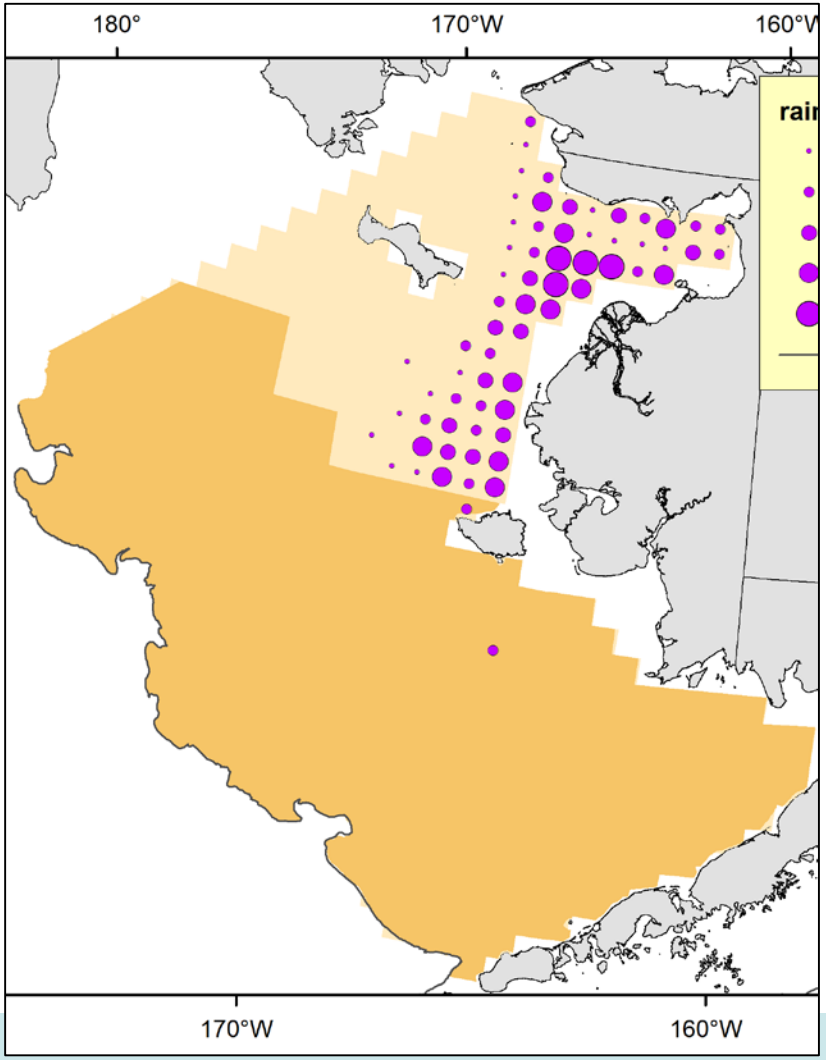


rainbow smelt distribution 2010 vs 2019

2010



2019



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summary - trends

1) Capelin and Arctic cod seem to have almost disappeared from the BTS (capelin data supported by surface trawl results).

2) Eulachon abundance lower than average.

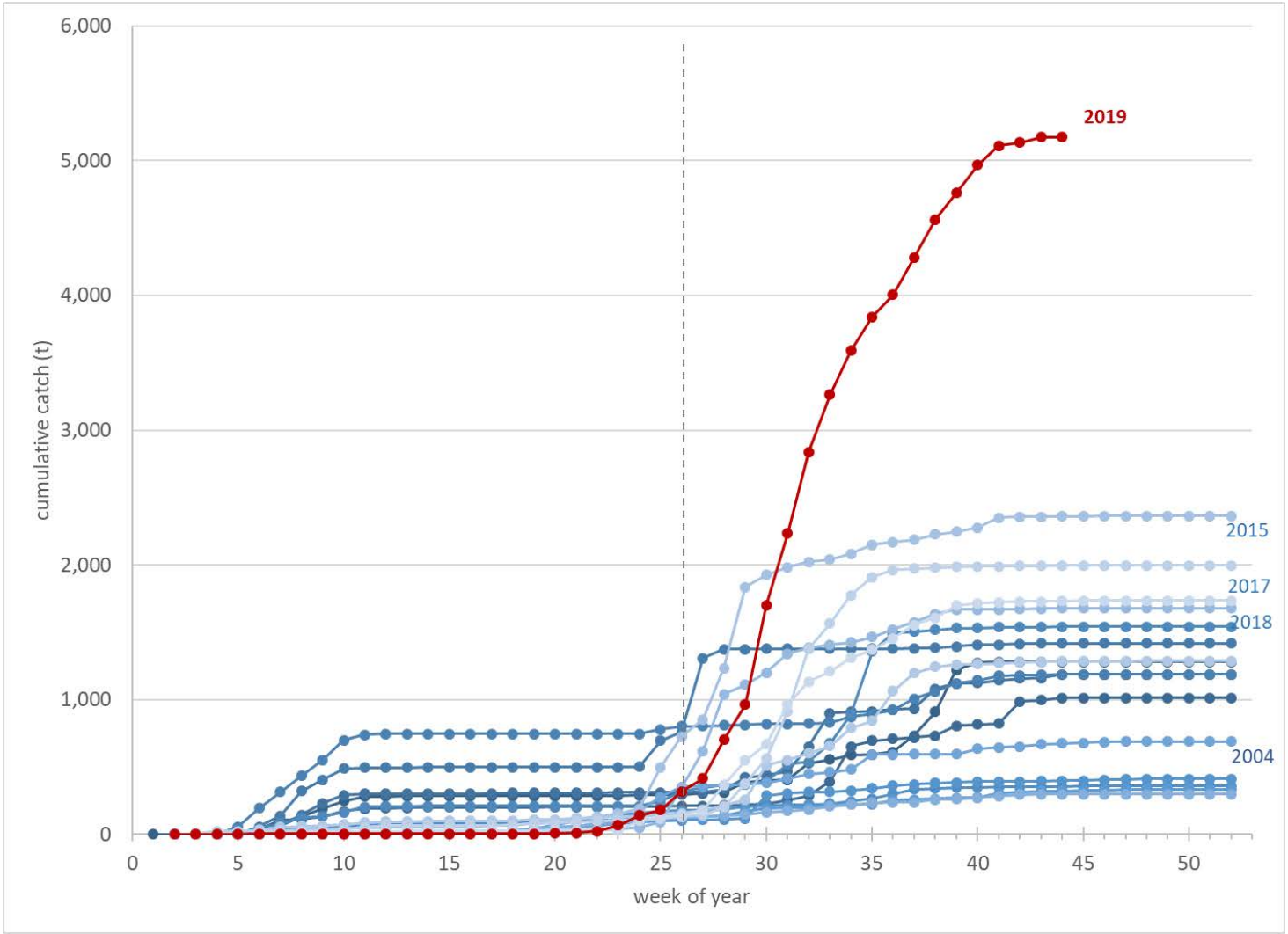
3) Herring abundance above average, but highly variable.

4) Rainbow smelt more abundant offshore?

EC squid management measures

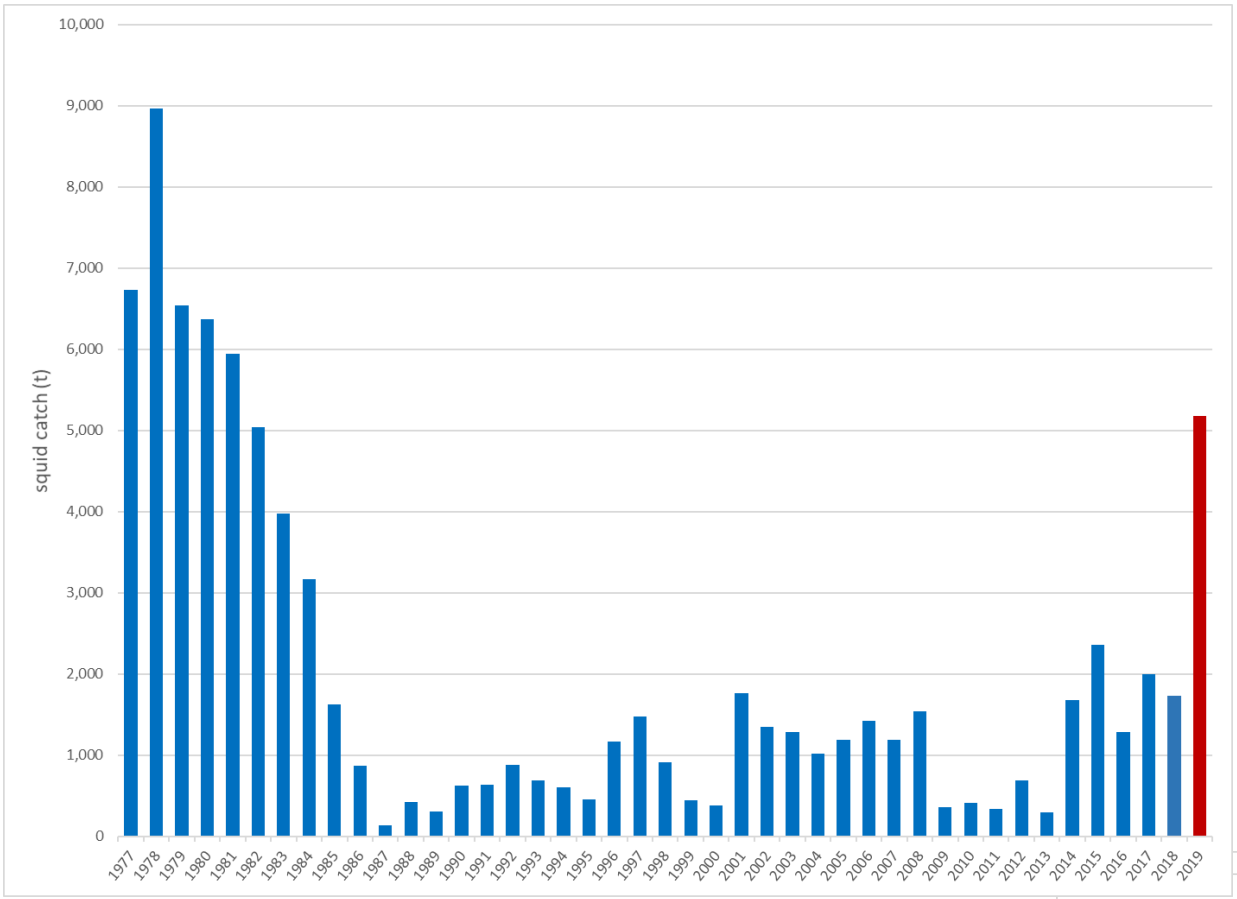
- Place squids in the Ecosystem Component category of the FMP
- Prohibit directed fishing for squid
- Establish a 20% maximum retention allowance (MRA)
- Limit processing to fishmeal production
- Retain recordkeeping and recording requirements

squid bycatch

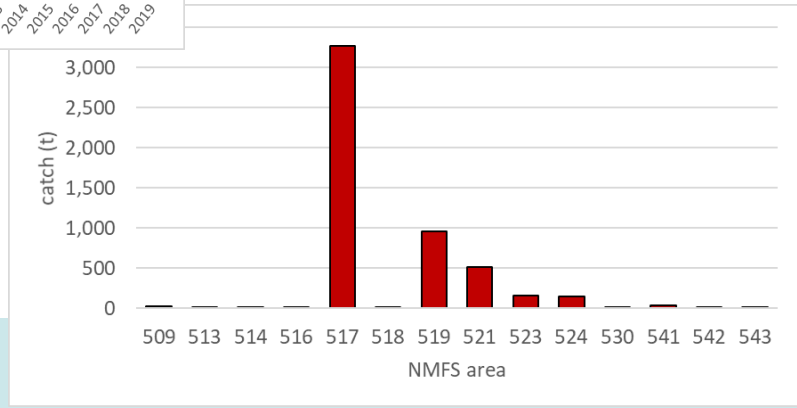


- pollock fishery under pressure to avoid salmon, sablefish
- fishery processed squid for bait, against regs

squid bycatch



- 2019 highest catch since 1981



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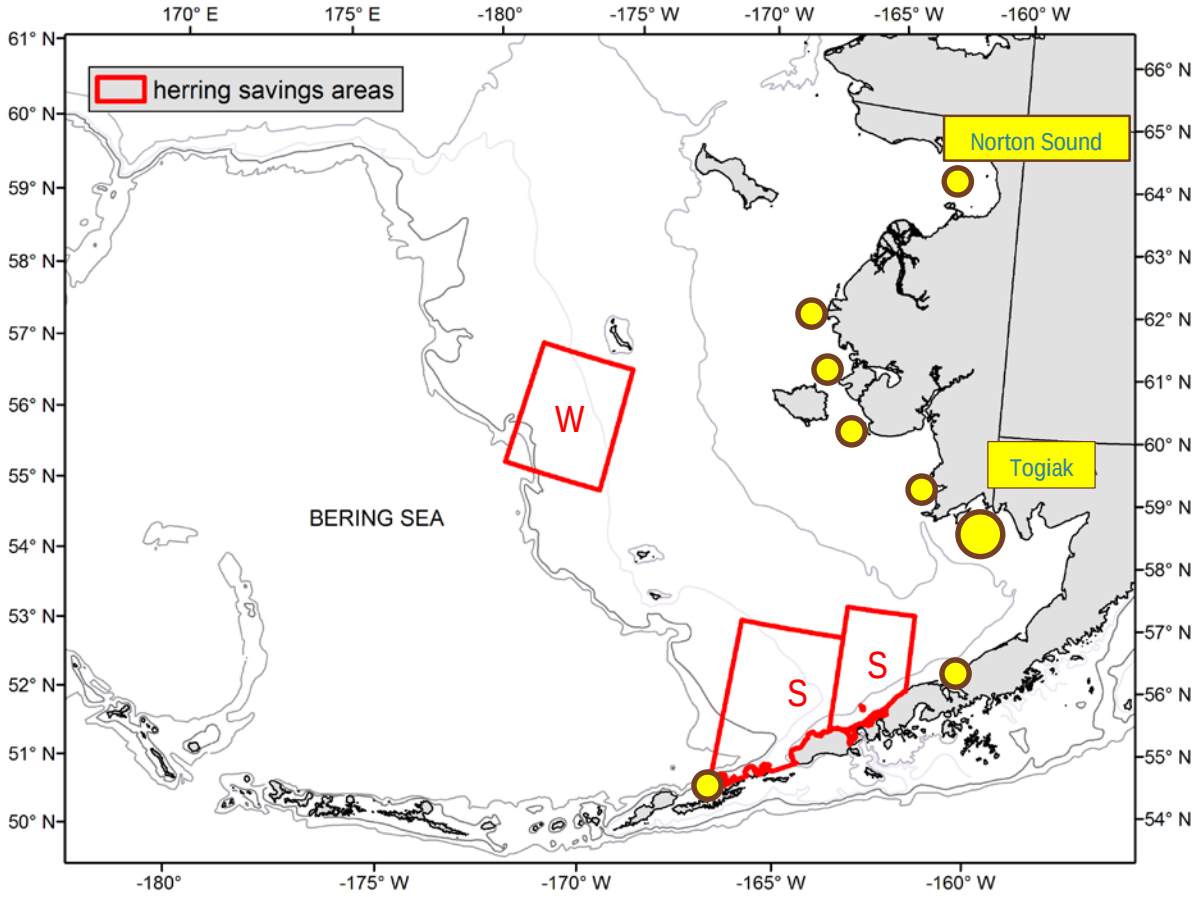
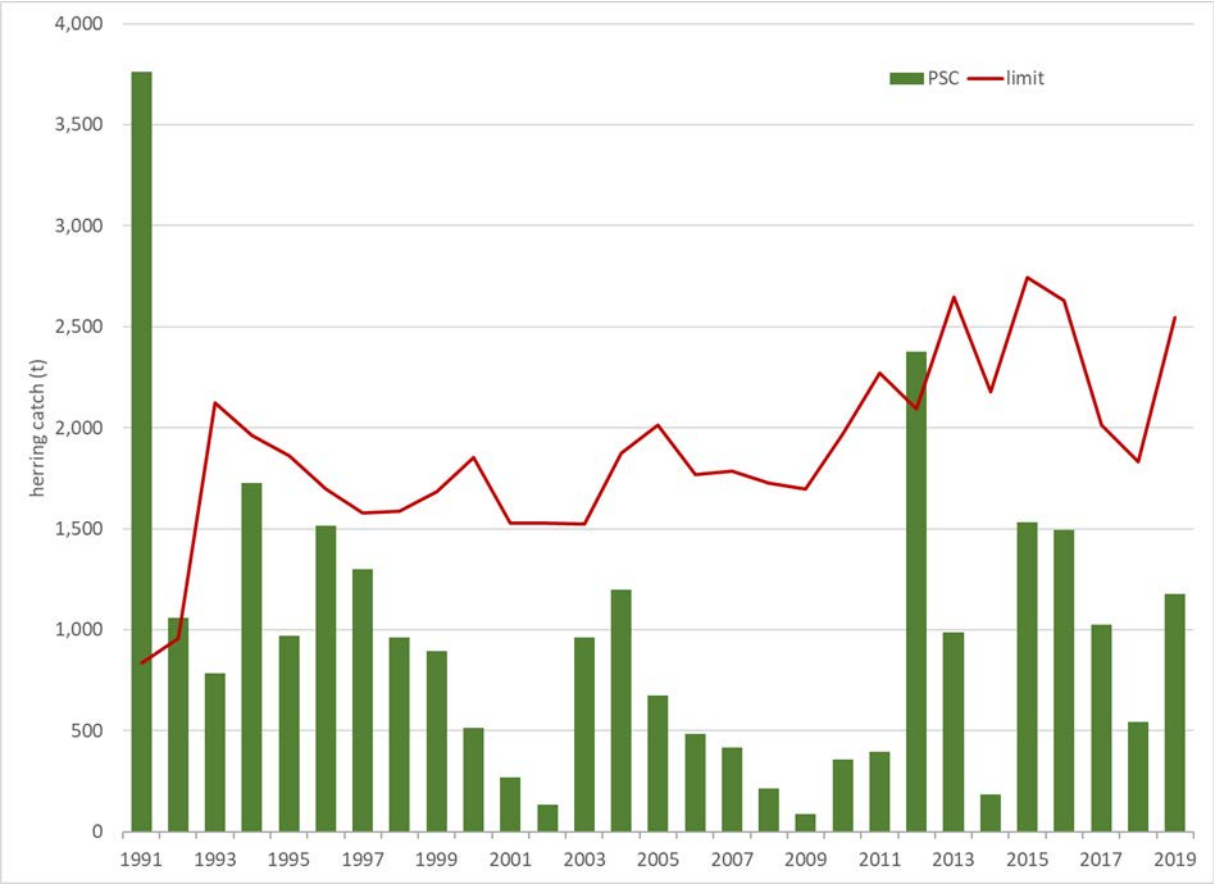
herring: fisheries & savings areas



herring bycatch



Forage species (biennial report)

- Capelin and arctic cod have almost disappeared from the bottom trawl survey, while rainbow smelt have expanded offshore in the NBS
- In order to verify FO trends, patterns in abundance, and spatial distribution, the Team recommended that the author investigate survey gear and timing consistency

Forage species, continued

- The Team remains uncertain about the reasons for increased bycatch in 2019 and is unsure if the increase is population related or due to the first year of the implementation of squids as an ecosystem component

Forage species, continued

- There was also discussion by the Team about the proposal in front of the Council to allow the processing and selling of squid despite its inclusion as an ecosystem component
- Although the Team recognized that this was likely not currently a conservation concern for the complex, the Team remained concerned that this sets a precedent for allowing ecosystem component species to be commercially processed and sold
- A concern was voiced about the need to have a clear path for reinstating this species under the FMP if management or conservation concerns arise with any future expansion in harvesting and marketing

Forage species, continued

- The Team discussed the herring savings area closures and noted that a review of the herring savings areas would be a good candidate for a case study for ecosystem management in the new Fishery Ecosystem Plan Climate Action module on Evaluating Climate Change Effects in the Bering Sea.

Remaining slides are for reference on partial and off year stocks and stock complexes

Chapter 1A: AI walleye pollock

Quantity	Last asmt.	This asmt.	Change
M	0.20	0.20	0.00
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	319,892	n/a	0.06
2020 age+ biomass	340,680	340,680	0.00
2019 spawning biomass	95,253	n/a	0.03
2020 spawning biomass	98,182	98,172	0.00
B100%	203,279	203,279	0.00
B40%	81,312	81,312	0.00
B35%	71,147	71,147	0.00
2020 FOFL	0.415	0.415	0.00
2020 FABC	0.331	0.331	0.00
2019 OFL	64,240	n/a	0.04
2020 OFL	66,981	66,973	0.00
2019 ABC	52,887	n/a	0.04
2020 ABC	55,125	55,120	0.00

Chapter 1B: Bogoslof walleye pollock (none)

Quantity	Last asmt.	This asmt.	Change
M	0.30	0.30	0.00
2019 tier	5	n/a	none
2020 tier	5	5	none
Biomass	610,267	610,267	0.00
2020 FOFL	0.300	0.300	0.00
2020 FABC	0.225	0.225	0.00
2019 OFL	183,080	n/a	0.00
2020 OFL	183,080	183,080	0.00
2019 ABC	137,310	n/a	0.00
2020 ABC	137,310	137,310	0.00

Chapter 5: Greenland turbot (partial)

Quantity	Last asmt.	This asmt.	Change
M	0.112	0.112	0.00
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	105,930	n/a	0.00
2020 age+ biomass	98,876	106,101	0.07
2019 spawning biomass	54,244	n/a	0.05
2020 spawning biomass	52,743	57,094	0.08
B100%	90,534	90,534	0.00
B40%	36,213	36,213	0.00
B35%	31,687	31,687	0.00
2020 FOFL	0.21	0.21	0.00
2020 FABC	0.18	0.18	0.00
2019 OFL	11,362	n/a	0.00
2020 OFL	10,476	11,319	0.08
2019 ABC	9,658	n/a	0.00
2020 ABC	8,908	9,625	0.08

Chapter 6: Arrowtooth flounder (partial)

Quantity	Last asmt.	This asmt.	Change
M	0.35/0.20	0.35/0.20	0.00
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	892,591	n/a	0.00
2020 age+ biomass	932,024	891,959	-0.04
2019 spawning biomass	482,174	n/a	0.00
2020 spawning biomass	472,507	481,845	0.02
B100%	606,237	606,237	0.00
B40%	242,495	242,495	0.00
B35%	212,183	212,183	0.00
2020 FOFL	0.161	0.161	0.00
2020 FABC	0.136	0.136	0.00
2019 OFL	82,939	n/a	0.01
2020 OFL	83,814	84,057	0.00
2019 ABC	70,673	n/a	0.01
2020 ABC	71,411	71,618	0.00

Chapter 7: Kamchatka flounder (partial)

Quantity	Last asmt.	This asmt.	Change
M	0.11	0.11	0.00
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	155,251	n/a	0.05
2020 age+ biomass*	160,178	162,709	0.02
2019 spawning biomass	54,779	n/a	0.06
2020 spawning biomass	56,675	57,948	0.02
B100%	107,673	107,673	0.00
B40%	43,069	43,069	0.00
B35%	37,685	37,685	0.00
2020 FOFL	0.108	0.108	0.00
2020 FABC	0.090	0.090	0.00
2019 OFL	10,965	n/a	0.05
2020 OFL	11,260	11,495	0.02
2019 ABC	9,260	n/a	0.05
2020 ABC	9,509	9,708	0.02

*Last year's published value of 156,450 has been corrected

Chapter 8: Northern rock sole (partial)

Quantity	Last asmt.	This asmt.	Change
M	0.15	0.15	0.00
2019 tier	1a	n/a	none
2020 tier	1a	1a	none
2019 age+ biomass	828,000	n/a	0.29
2020 age+ biomass	1,001,400	1,068,000	0.07
2019 spawn. Biomass	417,800	n/a	-0.09
2020 spawning bio.*	338,300	380,600	0.13
B0	515,680	515,680	0.00
Bmsy	186,000	186,000	0.00
2020 FOFL	0.147	0.147	0.00
2020 FABC	0.144	0.144	0.00
2019 OFL	122,000	n/a	0.29
2020 OFL*	147,500	157,300	0.07
2019 ABC	118,900	n/a	0.29
2020 ABC*	143,700	153,300	0.07

*Last year's published values are "corrected" in chapter

Chapter 9: Flathead sole (partial)

Quantity	Last asmt.	This asmt.	Change
M	0.20	0.20	0.00
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	673,718	n/a	0.02
2020 age+ biomass	686,431	684,768	0.00
2019 spawning biomass	153,203	n/a	0.01
2020 spawning biomass	155,032	154,195	-0.01
B100%	212,060	212,060	0.00
B40%	84,824	84,824	0.00
B35%	74,221	74,221	0.00
2020 FOFL	0.47	0.47	0.00
2020 FABC	0.38	0.38	0.00
2019 OFL	80,918	n/a	0.02
2020 OFL	83,190	82,810	0.00
2019 ABC	66,625	n/a	0.02
2020 ABC	68,448	68,134	0.00

Chapter 11: other flatfish (none)

Quantity*	Last asmt.	This asmt.	Change
M	0.154	0.154	0.00
2019 tier	5	n/a	none
2020 tier	5	5	none
Biomass	141,325	141,325	0.00
2020 FOFL	0.154	0.154	0.00
2020 FABC	0.116	0.116	0.00
2019 OFL	21,824	n/a	0.00
2020 OFL	21,824	21,824	0.00
2019 ABC	16,368	n/a	0.00
2020 ABC	16,368	16,368	0.00

*Instantaneous rates are biomass-weighted averages

Chapter 12: Pacific ocean perch (partial)

Quantity	Last asmt.	This asmt.	Change
M	0.056	0.056	0.00
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	934,293	n/a	-0.03
2020 age+ biomass	914,577	908,529	-0.01
2019 spawning biomass	399,024	n/a	-0.04
2020 spawning biomass	386,835	383,178	-0.01
B100%	645,738	645,738	0.00
B40%	258,295	258,295	0.00
B35%	226,008	226,008	0.00
2020 FOFL	0.095	0.095	0.00
2020 FABC	0.079	0.079	0.00
2019 OFL	61,067	n/a	-0.03
2020 OFL	59,396	58,956	-0.01
2019 ABC	50,594	n/a	-0.03
2020 ABC	49,211	48,846	-0.01

Chapter 14: Blackspotted/rougheye

Quantity **(AI portion)**	Last asmt	This asmt	Change
M	0.032	0.032	0.00
2019 tier	3b	n/a	none
2020 tier	3b	3b	none
2019 age+ biomass	46,482	n/a	0.05
2020 age+ biomass	49,141	49,005	0.00
2019 spawning biomass	8,980	n/a	0.14
2020 spawning biomass	10,260	10,213	0.00
B100%	29,287	29,287	0.00
B40%	11,715	11,715	0.00
B35%	10,250	10,250	0.00
2020 FOFL	0.042	0.042	0.00
2020 FABC	0.034	0.034	0.00
2019 OFL	632	n/a	0.29
2020 OFL	824	817	-0.01
2019 ABC*	522	n/a	0.29
2020 ABC	682	675	-0.01

* Note that the WAI MSSC was exceeded again in 2019

Blackspotted/rougheye, continued

Quantity **(EBS portion)**	Last asmt.	This asmt.	Change
M	0.032	0.032	0.00
2019 tier	5	n/a	none
2020 tier	5	5	none
Biomass	1,371	1,371	0.00
2020 FOFL	0.032	0.032	0.00
2020 FABC	0.024	0.024	0.00
2019 OFL	44	n/a	0.00
2020 OFL	44	44	0.00
2019 ABC	33	n/a	0.00
2020 ABC	33	33	0.00

Chapter 15: shortraker rockfish (none)

Quantity	Last asmt.	This asmt.	Change
M	0.030	0.030	0.00
2019 tier	5	n/a	none
2020 tier	5	5	none
Biomass	24,055	24,055	0.00
2020 FOFL	0.030	0.030	0.00
2020 FABC	0.0225	0.0225	0.00
2019 OFL	722	n/a	0.00
2020 OFL	722	722	0.00
2019 ABC	541	n/a	0.00
2020 ABC	541	541	0.00

Chapter 16: other rockfish (none)

Quantity*	Last asmt.	This asmt.	Change
M	0.034	0.034	0.00
2019 tier	5	n/a	none
2020 tier	5	5	none
Biomass	53,290	53,290	0.00
2020 FOFL	0.034	0.034	0.00
2020 FABC	0.025	0.025	0.00
2019 OFL	1,793	n/a	0.00
2020 OFL	1,793	1,793	0.00
2019 ABC	1,344	n/a	0.00
2020 ABC	1,344	1,344	0.00

*Instantaneous rates are biomass-weighted averages

Chapter 18: Skates (partial)

Quantity **(Alaska skate)**	Last asmt.	This asmt.	Change
M	0.13	0.13	0.00
2019 tier	3a	n/a	none
2020 tier	3a	3a	none
2019 age+ biomass	504,551	n/a	-0.02
2020 age+ biomass	481,653	491,974	0.02
2019 spawning biomass	115,957	n/a	0.02
2020 spawning biomass	114,010	117,973	0.03
B100%	177,761	177,761	0.00
B40%	71,105	71,105	0.00
B35%	62,217	62,217	0.00
2020 FOFL	0.094	0.094	0.00
2020 FABC	0.081	0.081	0.00
2019 OFL	39,173	n/a	-0.03
2020 OFL	36,965	37,813	0.02
2019 ABC	33,730	n/a	-0.03
2020 ABC	31,829	32,559	0.02

Chapter 18: Skates (partial)

Quantity **(other skates)**	Last asmt.	This asmt.	Change
M	0.10	0.10	0.00
2019 tier	5	n/a	none
2020 tier	5	5	none
Biomass	119,787	119,787	0.00
2020 FOFL	0.10	0.10	0.00
2020 FABC	0.075	0.075	0.00
2019 OFL	11,979	n/a	0.00
2020 OFL	11,979	11,979	0.00
2019 ABC	8,984	n/a	0.00
2020 ABC	8,984	8,984	0.00

Chapter 19: Sculpins (partial)

- Tier 5 random effects model was re-run with 2018 AI survey data and 2019 EBS shelf survey data

Quantity*	Last asmt.	This asmt.	Change
M	0.282	0.282	0.00
2019 tier	5	n/a	none
2020 tier	5	5	none
Biomass	188,656	240,487	0.27
2020 FOFL	0.282	0.282	0.00
2020 FABC	0.212	0.211	0.00
2019 OFL	53,201	n/a	0.27
2020 OFL	53,201	67,817	0.27
2019 ABC	39,995	n/a	0.27
2020 ABC	39,995	50,863	0.27

*Instantaneous rates are biomass-weighted averages

Chapter 20: sharks (none)

Quantity	Last asmt.	This asmt.	Change
2019 tier	6	n/a	none
2020 tier	6	6	none
2019 OFL	689	n/a	0.00
2020 OFL	689	689	0.00
2019 ABC	517	n/a	0.00
2020 ABC	517	517	0.00

Chapter 21: octopus (none)

Quantity	Last asmt.	This asmt.	Change
2019 tier	6	n/a	none
2020 tier	6	6	none
2019 OFL	4,769	n/a	0.00
2020 OFL	4,769	4,769	0.00
2019 ABC	3,576	n/a	0.00
2020 ABC	3,576	3,576	0.00