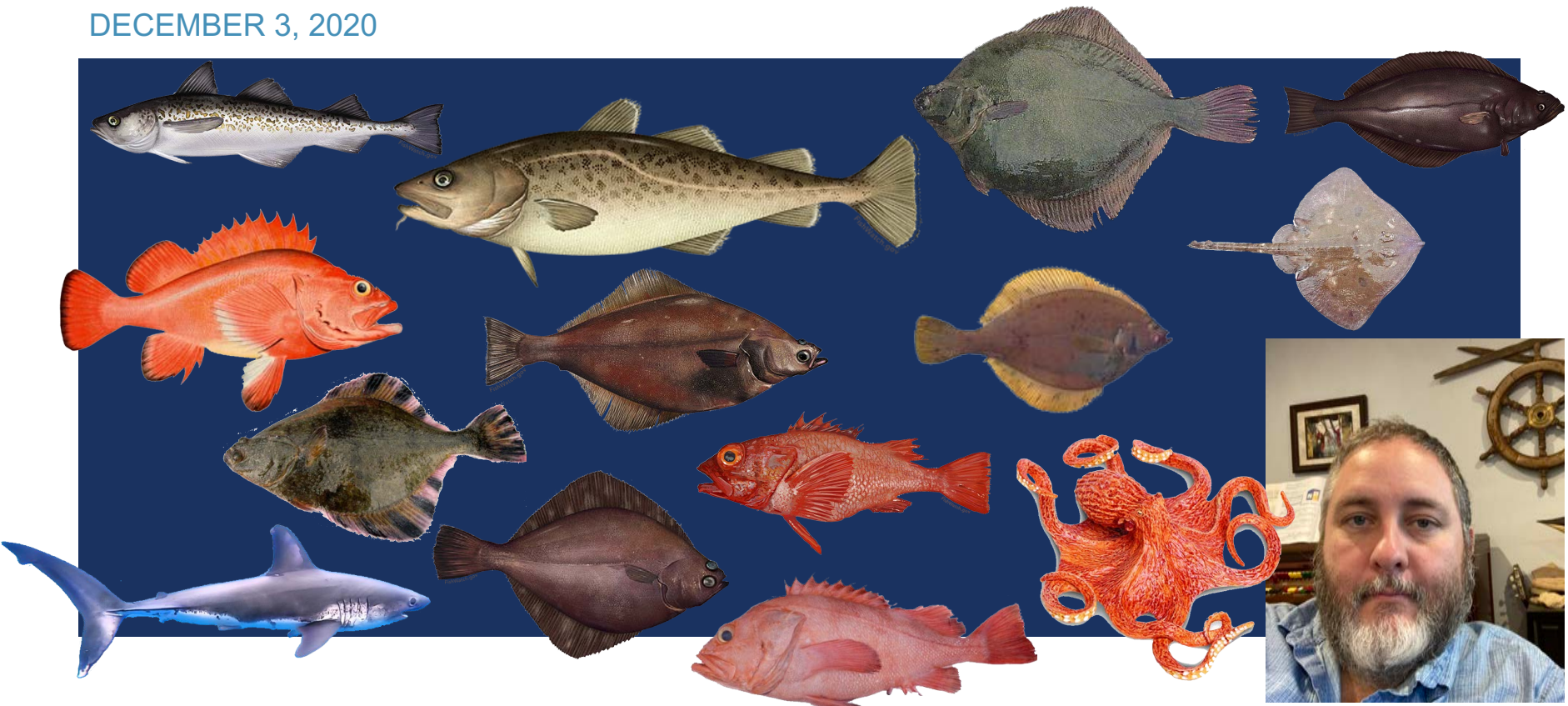




REPORT OF THE NOVEMBER 2020 BSAI GROUNDFISH PLAN TEAM MEETING

STEVE BARBEAUX (CO-CHAIR), GRANT THOMPSON (CO-CHAIR), STEVE MACLEAN (COORDINATOR)
DECEMBER 3, 2020





BSAI PLAN TEAM MEETING OVERVIEW

- Dates: November 17-20
- Place: Cyberspace
- Leaders: Grant Thompson, Steve Barbeaux (co-chairs); Steve MacLean (coordinator)
- Participation:
 - Mary Furuness (NMFS AKRO)
 - Alan Haynie (AFSC REFM)
 - Allan Hicks (IPHC)
 - Lisa Hillier (WDFW)
 - Kirstin Holsman (AFSC REFM)
 - Andy Kingham (AFSC FMA)
 - Kalei Shotwell (AFSC ABL)
 - Chris Siddon (ADF&G)
 - Cindy Tribuzio (AFSC ABL)
 - AFSC and AKRO staff and members of the public





BERING SEA AND ALEUTIAN ISLANDS BIG PICTURE

- Assessments of 23 stocks/complexes (21 full, 2 partial, 0 “none”)
 - New lead author for 9 assessments
- Lots of models (including Tier 5 and 6 methods):
 - 25 base models/methods (2 chapters include models for 2 areas)
 - 28 additional models/methods
- The Team agreed with authors’ recommendations regarding preferred models and harvest specifications in all but 1 case
- Change from current base model/method recommended in 7 cases
- Reductions from maxABC recommended in only 2 cases
- Of the 16 stocks/complexes in Tiers 1 or 3, only 3 are in sub-tier “b”
- No stocks/complexes were subjected to overfishing in 2019, and no Tier 1 or 3 stocks/complexes are overfished/approaching as of 2020

3





BERING SEA AND ALEUTIAN ISLANDS BIG PICTURE (TINY FONT)

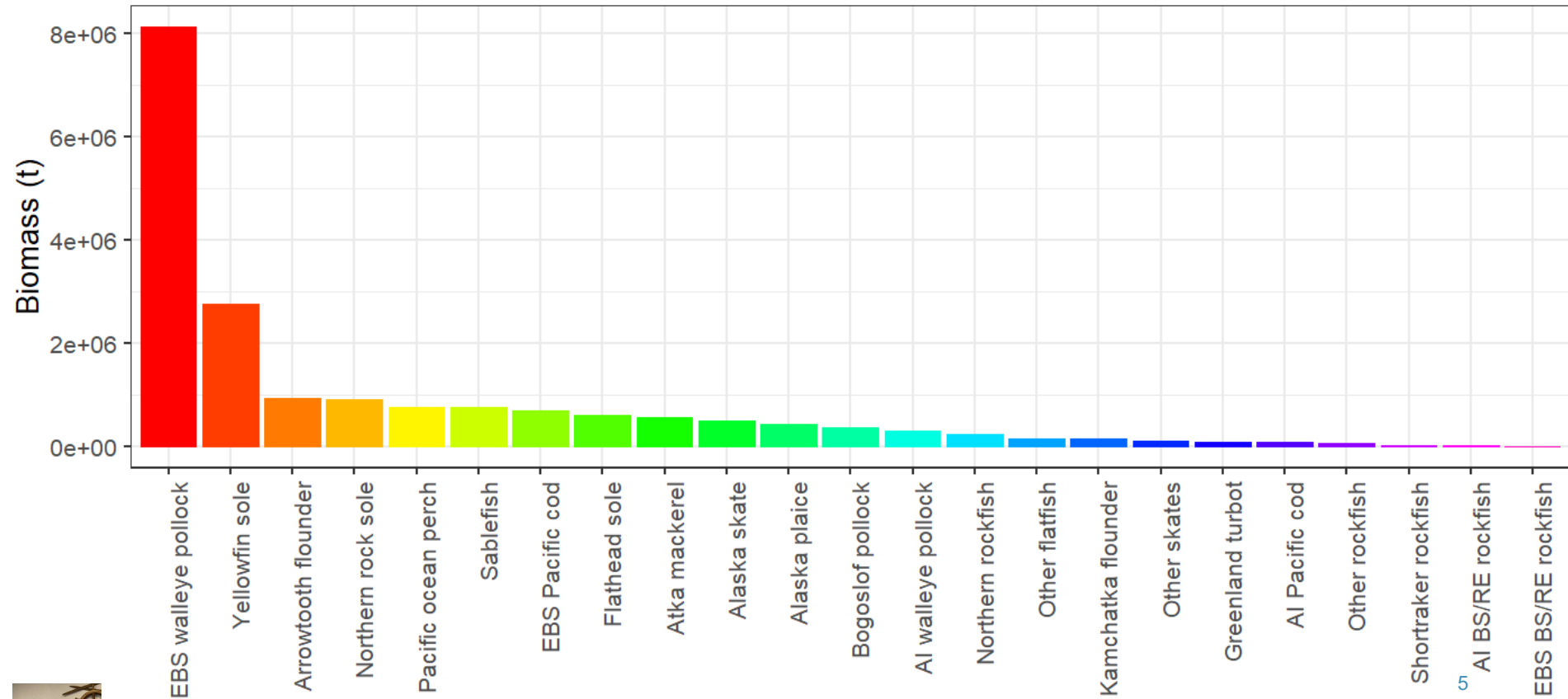
Ch. Assessment	Lead author	Tier	Type	Numbered models (or Tier 5, 6)	Risk
1 EBS pollock	Ianelli	1a	Full	16.2 (base), 20.0, 20.1, 20.0a	1.50
1A AI pollock	Barbeaux	3a	Full	15.1 (base) , 15.2	1.00
1B Bogoslof pollock	Ianelli	5	Full	Tier 5 RE (base) , age-structured model	1.00
2 EBS Pacific cod	Thompson	3b	Full	20.4, 19.12a, 19.15, 19.12 (base), 20.8, 20.9, 20.10; Ens. A {20.4, 19.12a, 19.15, 19.12}, Ens. C {Ens. A, 20.8}, Ens. AB {Ens. C, 20.9, 20.10}	1.25
2A AI Pacific cod	Spies	5	Full	Tier 5 RE (base)	1.25
3 Sablefish	Goethel	3a	Full	16.5 (base)	2.75
4 Yellowfin sole	Spies	1a	Full	18.1 (base), 18.2 , 18.3, 18.4	1.00
5 Greenland turbot	Bryan	3a	Full	16.4 (base), 16.4a	1.25
6 Arrowtooth flounder	Shotwell	3a	Full	18.9 (base)	1.00
7 Kamchatka flounder	Bryan	3a	Full	16.0a (base), 16.0b (same as base, with updated data)	1.00
8 Northern rock sole	McGilliard	1a	Full	15.1 (base), 18.3 , 18.3 (exploratory)	1.25
9 Flathead sole	Monnahan	3a	Full	18.2c (base)	1.00
10 Alaska plaice	Ormseth	3a	Partial	11.1 (base)	n/a
11 Other flatfish	Monnahan	5	Full	Tier 5 RE (base)	1.00
12 Pacific ocean perch	Spencer	3a	Full	16.3a (base)	1.25
13 Northern rockfish	Spencer	3a	Partial	16.1a (base)	n/a
14 Blackspot/rougeye	Spencer	3b/5	Full	AI: 18.1 (base), 20 , 20a, 20b, 20c; EBS: Tier 5 RE (base)	2.00
15 Shortraker rockfish	Shotwell	5	Full	Tier 5 RE (base)	1.00
16 Other rockfish	Sullivan	5	Full	Tier 5 RE (base)	1.25
17 Atka mackerel	Lowe	3b	Full	16.0b (base)	1.00
18 Skates	Ormseth	3a/5	Full	Alaska skate: 14.2 (base); other skates: Tier 5 RE (base)	1.00
19 Sharks	Tribuzio	6	Full	Tier 6: 16.0 (base) , 20.0, 20.1, 20.2	1.50
22 Octopus	Ormseth	6	Full	Tier 6: cod consumption (base)	1.00





BERING SEA AND ALEUTIAN ISLANDS BIOMASS

Biomass of BSAI groundfish species 2021



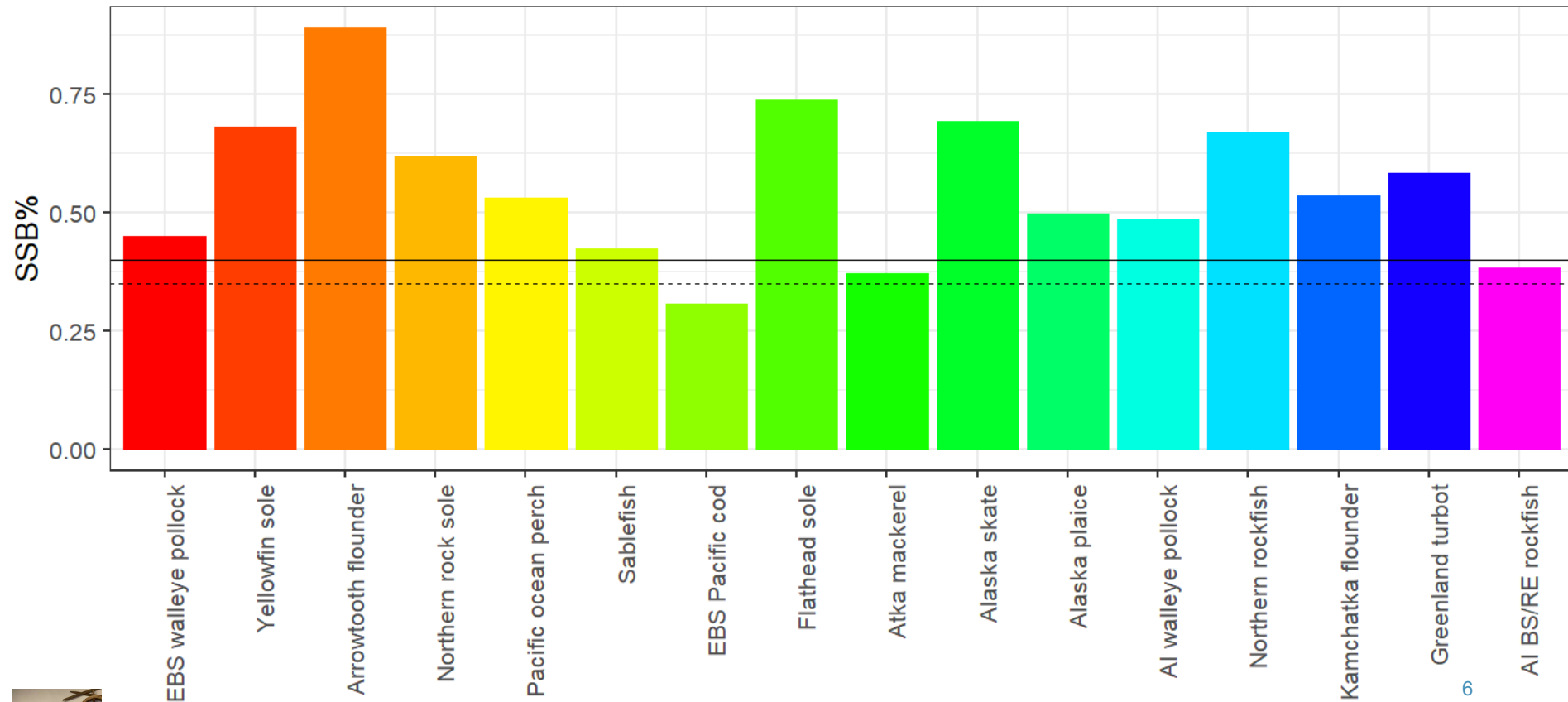
⁵





BERING SEA AND ALEUTIAN ISLANDS SPAWNING BIOMASS

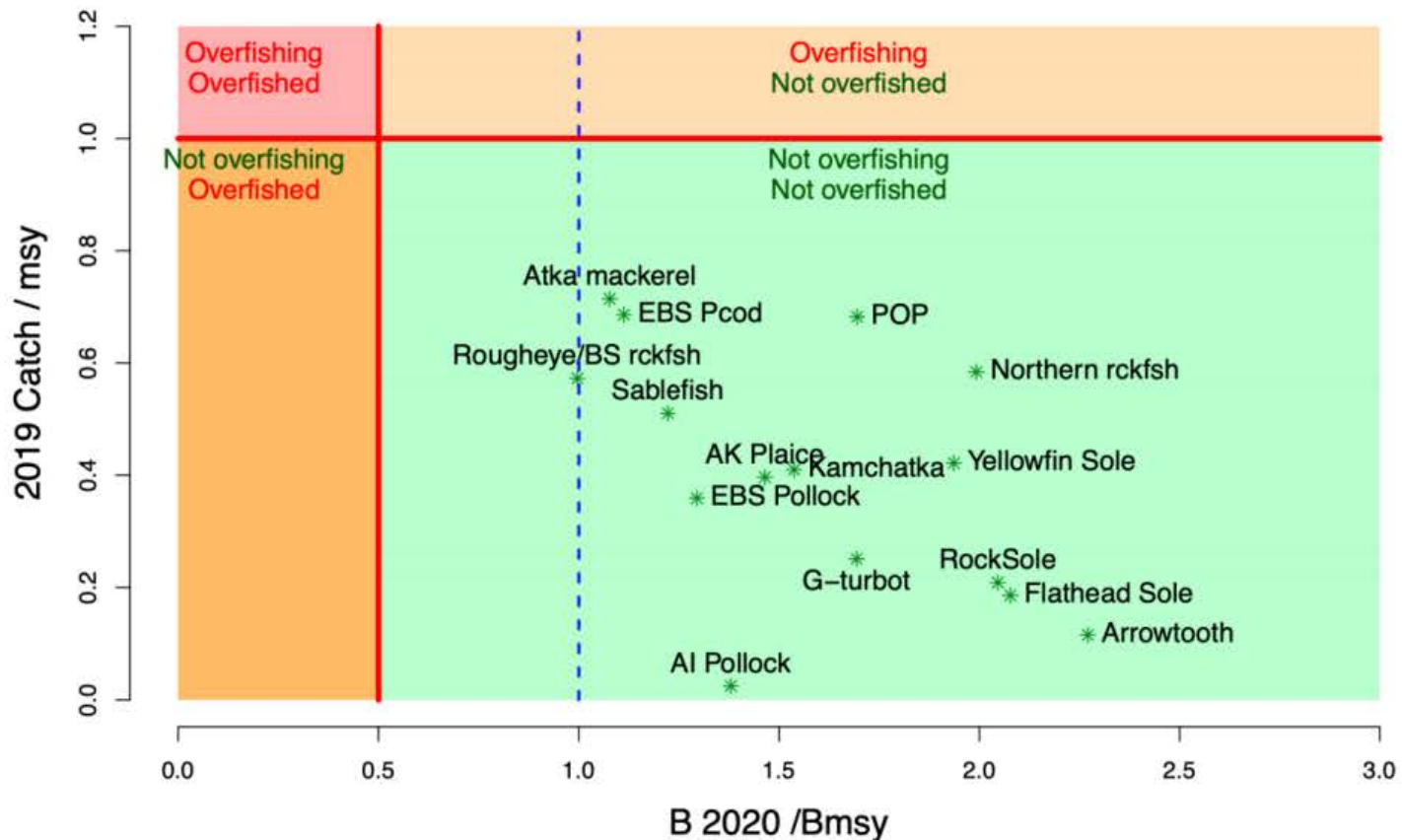
Female biomass Tier 1 and 3 BSAI groundfish species 2021





BERING SEA AND ALEUTIAN ISLANDS BIG PICTURE – STOCK STATUS

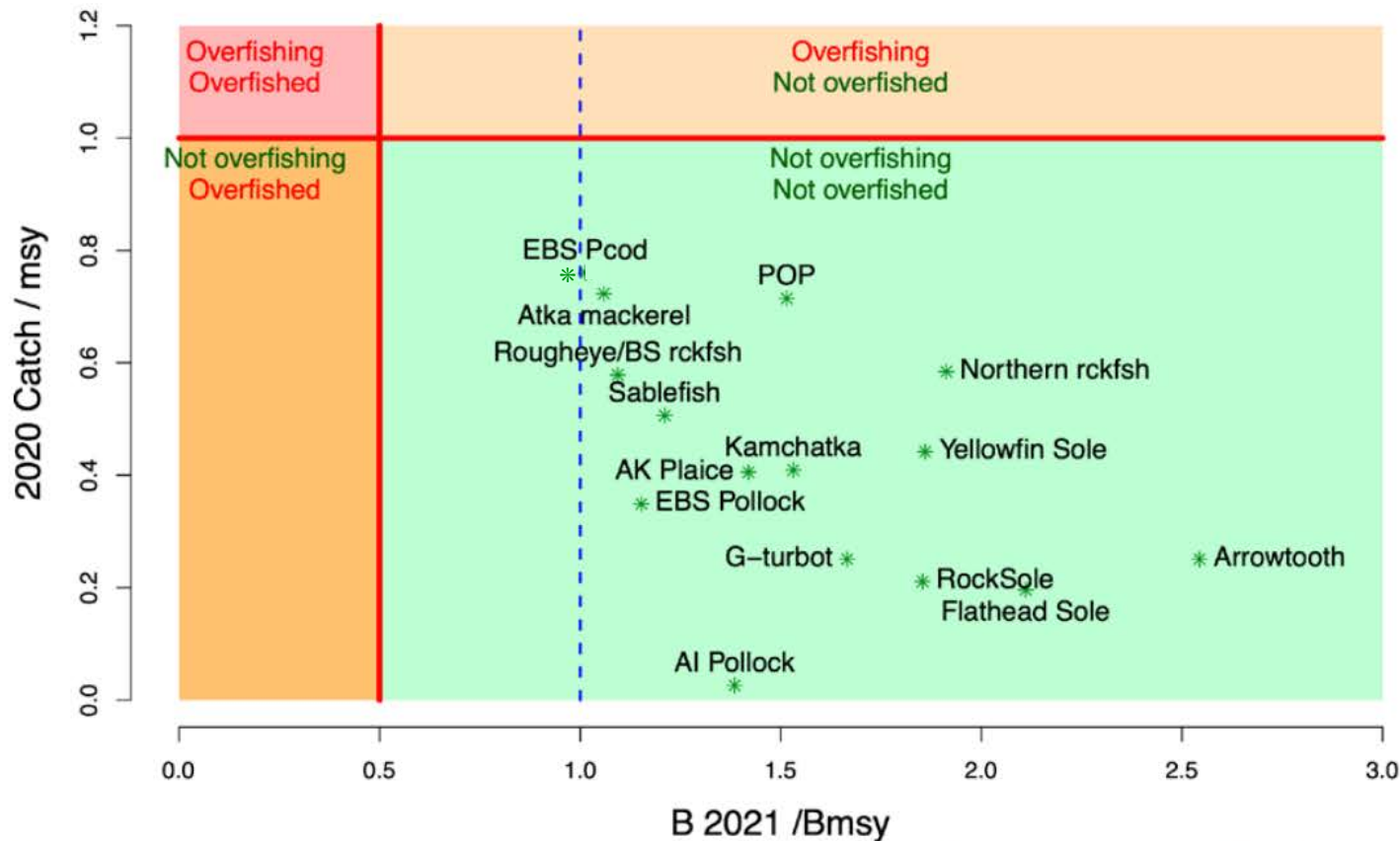
Bering Sea and Aleutian Islands





BERING SEA AND ALEUTIAN ISLANDS BIG PICTURE – STOCK STATUS

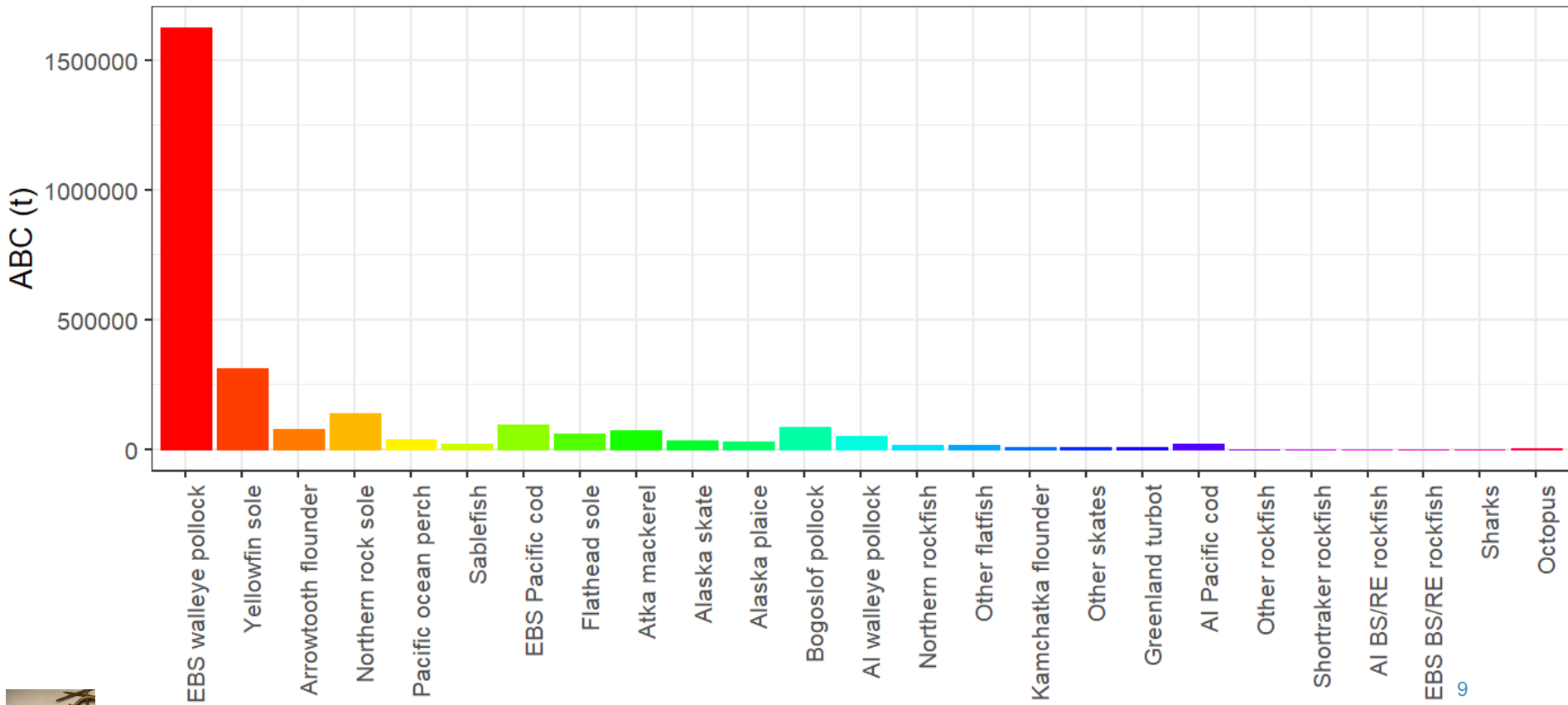
Bering Sea and Aleutian Islands





BERING SEA AND ALEUTIAN ISLANDS ALLOWABLE BIOLOGICAL CATCH (ABC)

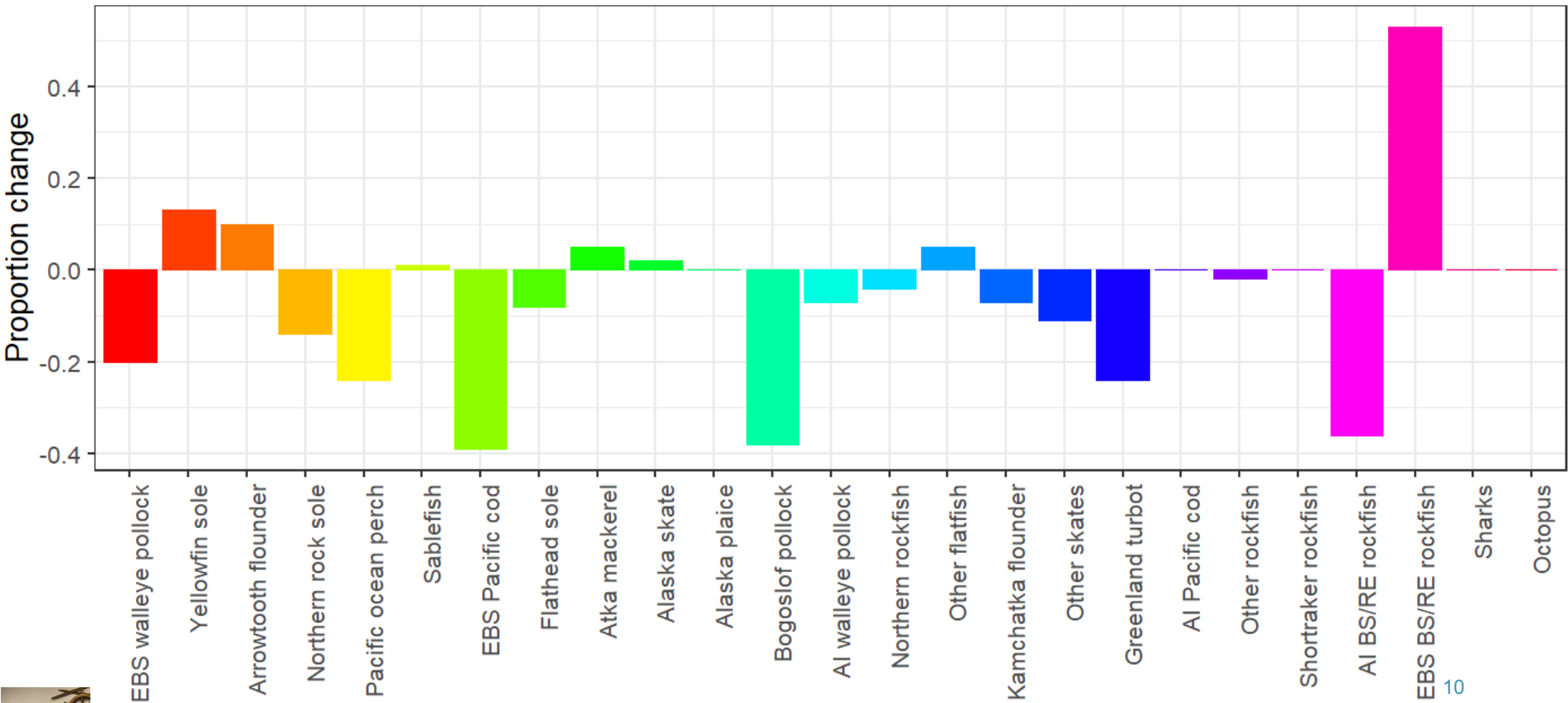
ABC of BSAI groundfish species





BERING SEA AND ALEUTIAN ISLANDS CHANGE IN ABC FROM 2020

Change in ABC of BSAI groundfish species from 2020

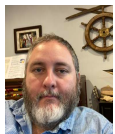




GENERAL ISSUES

RISK TABLES

- Authors and the Team continued to struggle with consistency in the filling in the risk tables.
- The Team accepted the authors' risk levels in all cases, but this should be interpreted more as the Team's acknowledgment that each author identified reasonable rationales in assigning levels than an assertion that the criteria used to assign levels were consistent across authors.





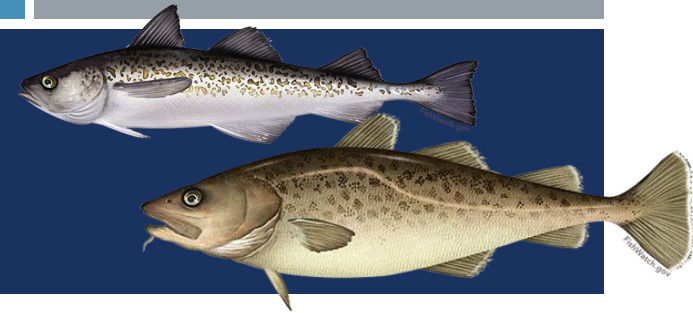
GENERAL ISSUES

EBS SLOPE AND AI SURVEYS

- The Team noted that the continued lack of surveys in the eastern Bering Sea slope and the Aleutian Islands region is a concern for many flatfish and rockfish stocks that rely upon these data
 - The recent uncertainty analysis by Bryan *et al.*, 2020 notes that stocks that rely on the biennial survey update are more impacted by the loss of one survey
 - A large number of stocks will have increased uncertainty in the biomass estimates, if future surveys in the Bering Sea slope and Aleutian Islands are not prioritized
 - This may result in increased risk levels in the assessment category



POLLOCK AND PACIFIC COD SUMMARY



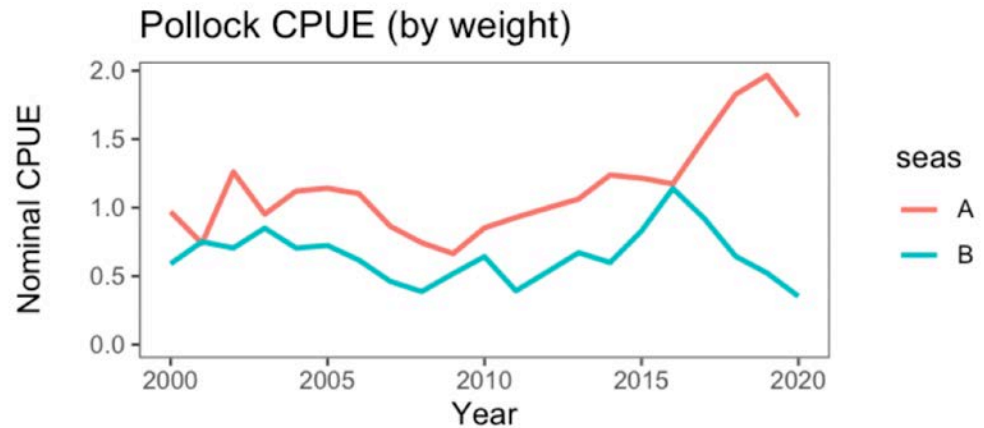
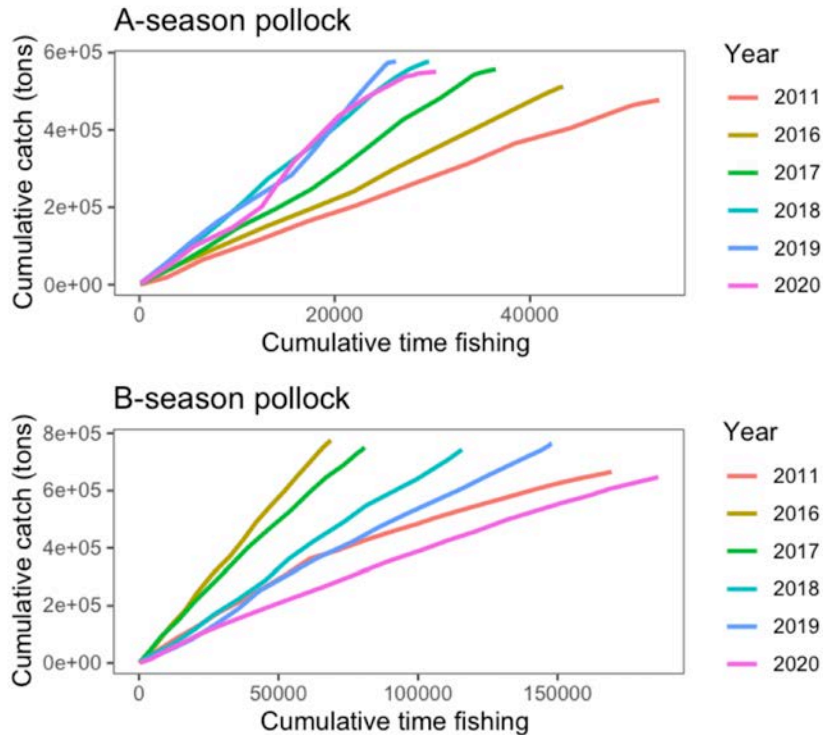
Stock	Tier	2021 ABC (t)	2021 OFL (t)	Change from 2020 ABC/OFL	Change from 2021 ABC/OFL
EBS Pollock	1a	1,626,000	2,594,000	-0.20 / -0.36	-0.08 / -0.23
AI pollock	3a	51,241	61,856	-0.08	-0.12
Bogoslof pollock	5	85,109	113,479	-0.38	-0.38
EBS Pacific cod	3b	94,552	112,851	-0.39 / -0.41	-0.08 / -0.10
AI Pacific cod	5	20,600	27,400	0.00	0.00



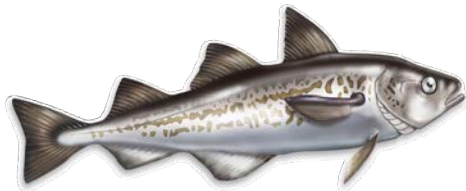


CHAPTER 1 EBS WALLEYE POLLOCK

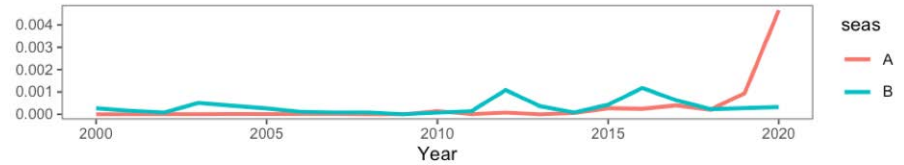
- Slow fishing and lower CPUE in B-season



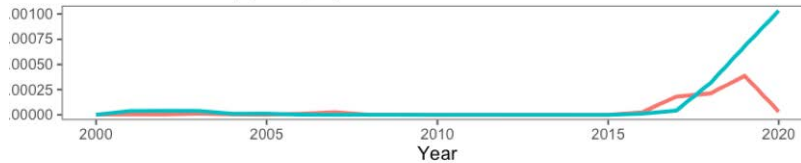
EBS WALLEYE POLLOCK BYCATCH CPUE



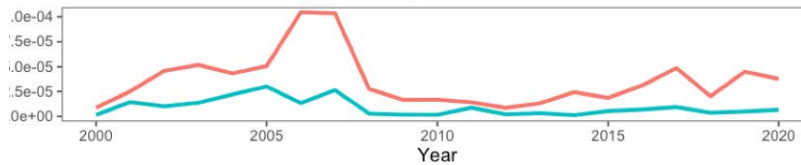
Herring CPUE (by weight)



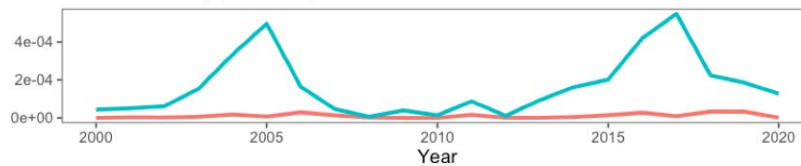
Sablefish CPUE (by weight)



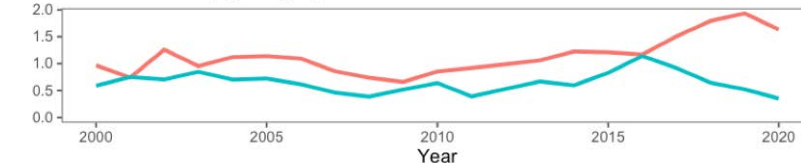
Chinook salmon CPUE (by number)



Chum CPUE (by number)



Pollock CPUE (by weight)



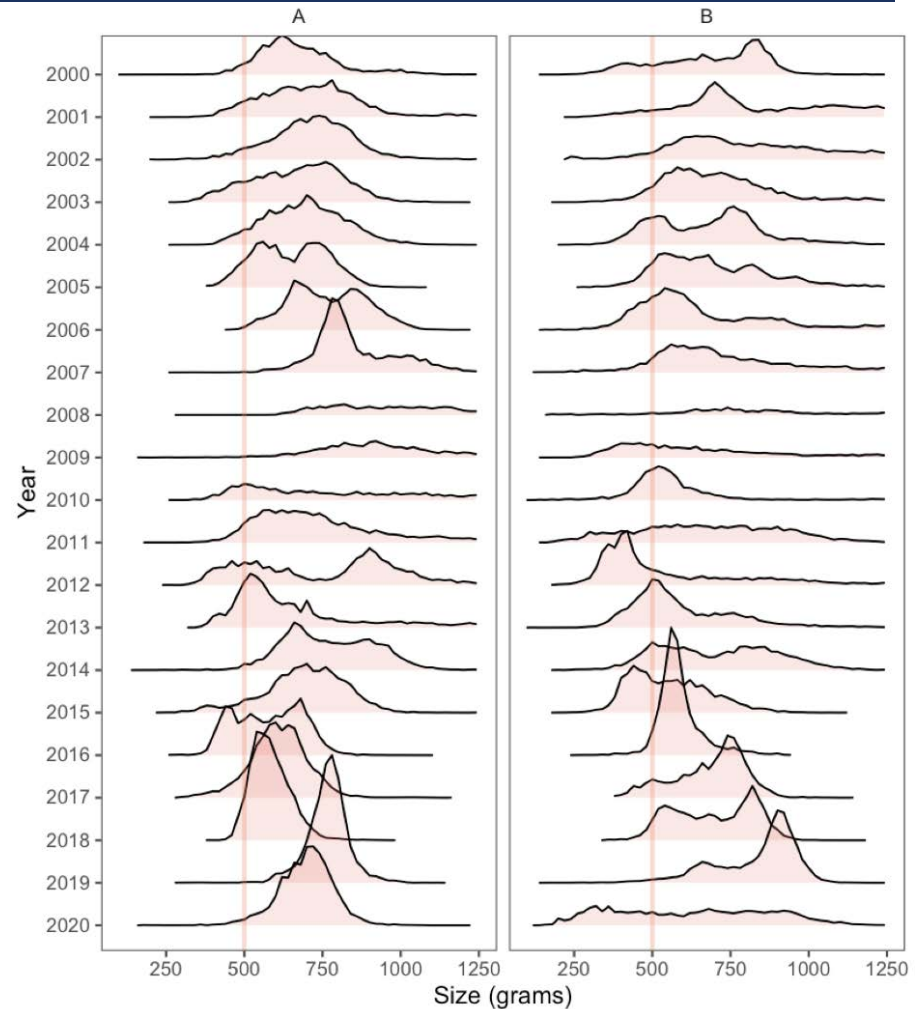
EBS WALLEYE POLLOCK FISHERY SIZE DISTRIBUTION



Size distributions by
sample mean weight
in tows...

Binned weight frequency

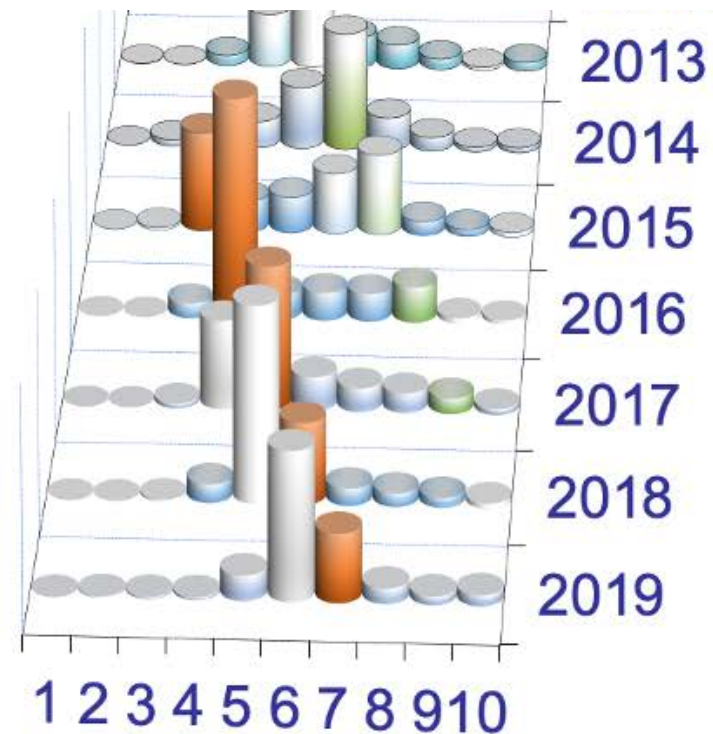
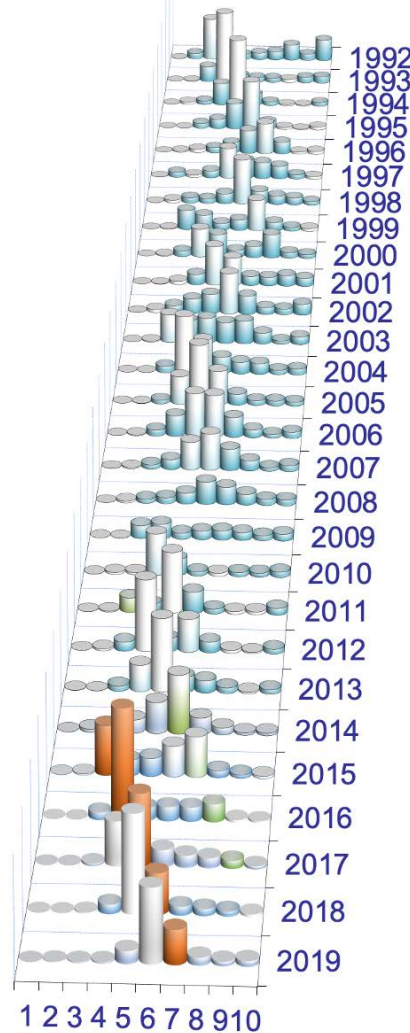
Tow sample mass
divided by
Tow sample N



EBS WALLEYE POLLOCK FISHERY CATCH-AT-AGE



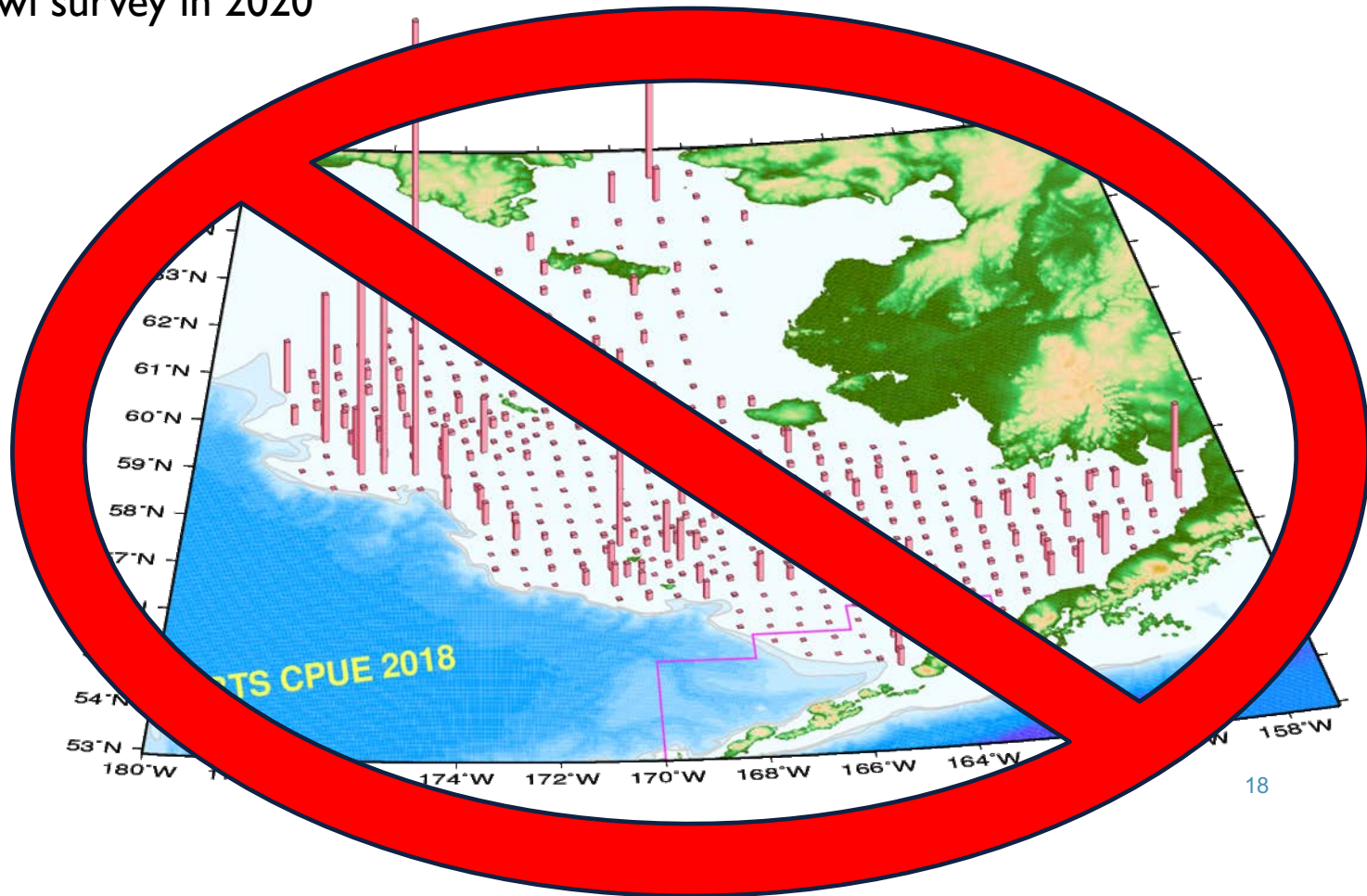
Fishery catch-at-age



EBS WALLEYE POLLOCK SCIENTIFIC RESEARCH SURVEY



No bottom trawl survey in 2020

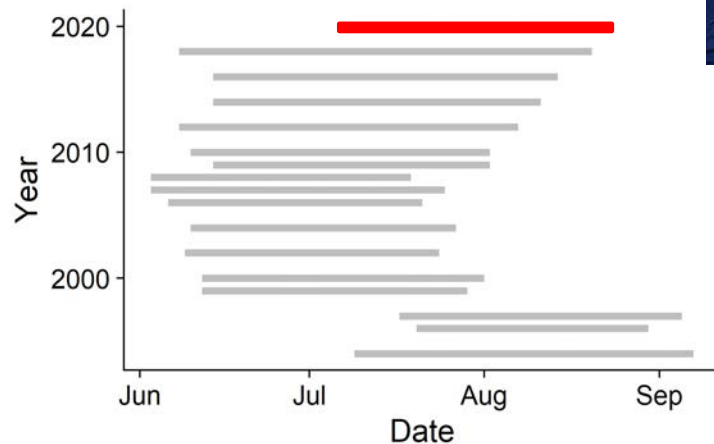
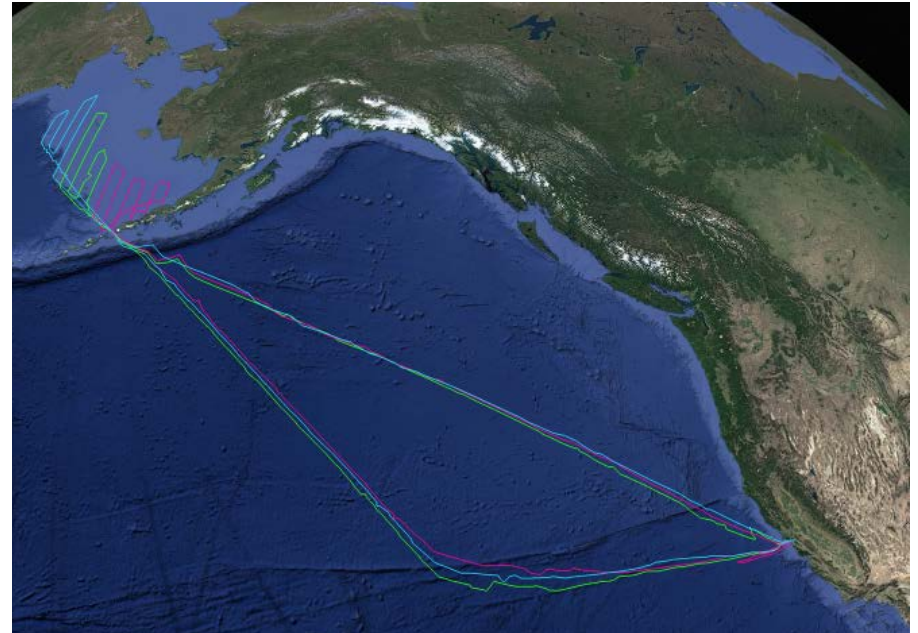


EBS WALLEYE POLLOCK 2020 SAILDRONE SURVEY (USV)



Approach

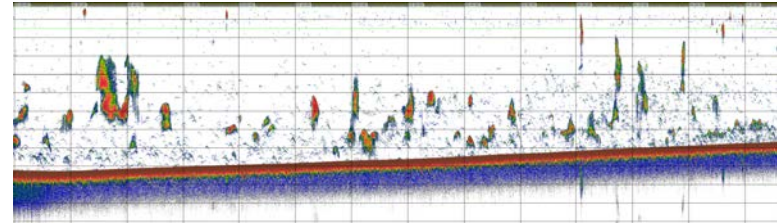
- Sail to/from Alaska
- 3 saildrones
- 40 nmi spacing
- Survey July 4-20 Aug
- Survey during daylight
- Pause at >25 knots
- Assume midwater backscatter minus jellyfish is pollock



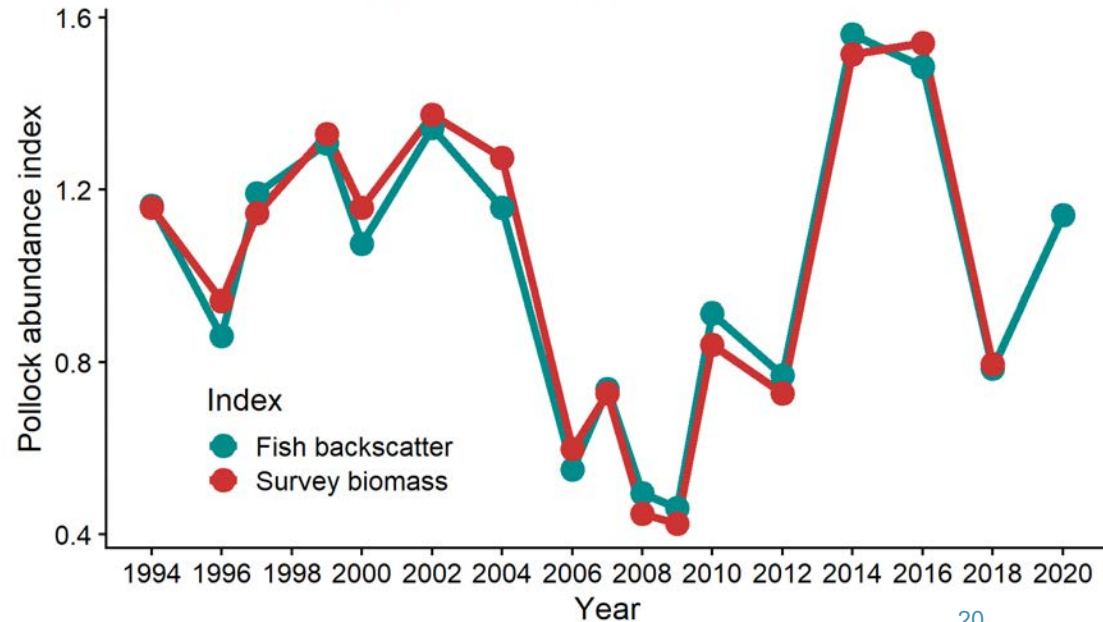
EBS WALLEYE POLLOCK 2020 SAILDRONE SURVEY (USV)



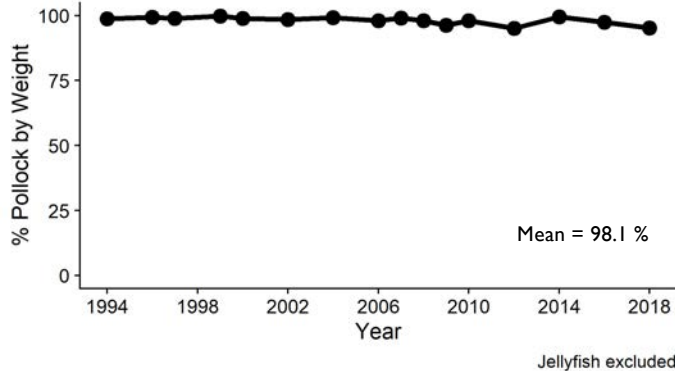
- Pollock dominate midwater biomass
- Backscatter is proportional to biomass



Acoustic survey (normalized)



Midwater survey biomass





EBS WALLEYE POLLOCK 2020 SAILDRONE SURVEY (USV)

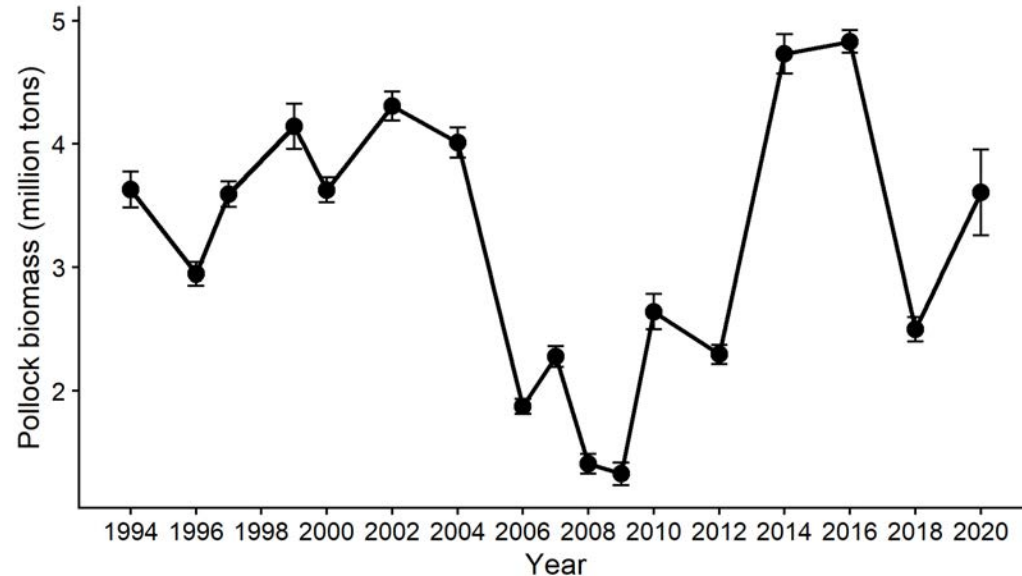
2020 USV estimate

- 3.6 million tons
- 44.5 % increase from 2018

Summary

- Contingency plan in case surveys were cancelled
- Things went as well as they could have
- Data processed in a similar way to traditional acoustic-trawl survey data
- Reduced sampling effort and conversion to biomass accounted for in increased uncertainty associated with the estimate.

Acoustic survey biomass to 0.5m



EBS WALLEYE POLLOCK MODELS



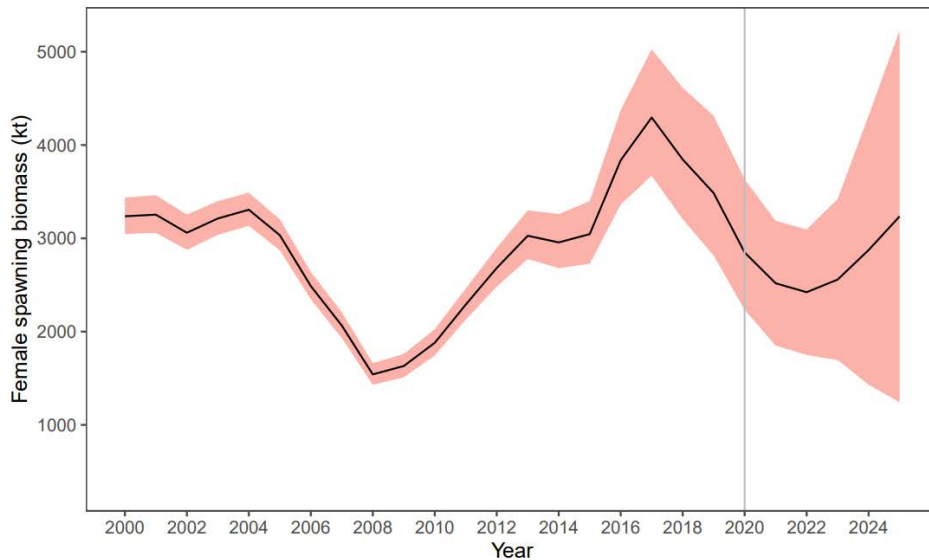
- Models explored
 - USV configurations considered
 - Biomass converted from 2020 backscatter extending the acoustic trawl survey index
 - All data treated as acoustic backscatter for entire time series
 - Use VAST to model unbalanced data
 - Variations on the stock-recruitment relationship
- **Model 20.0A (author recommended)**
 - **Extended the acoustic trawl survey time series with USV biomass conversion**
 - **Excludes 1978 year class from stock-recruitment relationship**



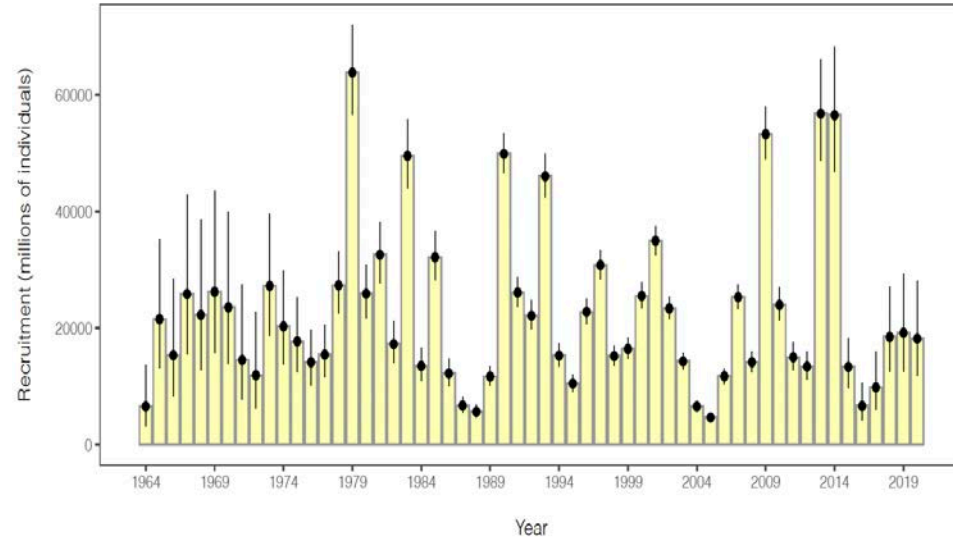
EBS WALLEYE POLLOCK MODEL 20.0A



Female spawning biomass: thousands of tons



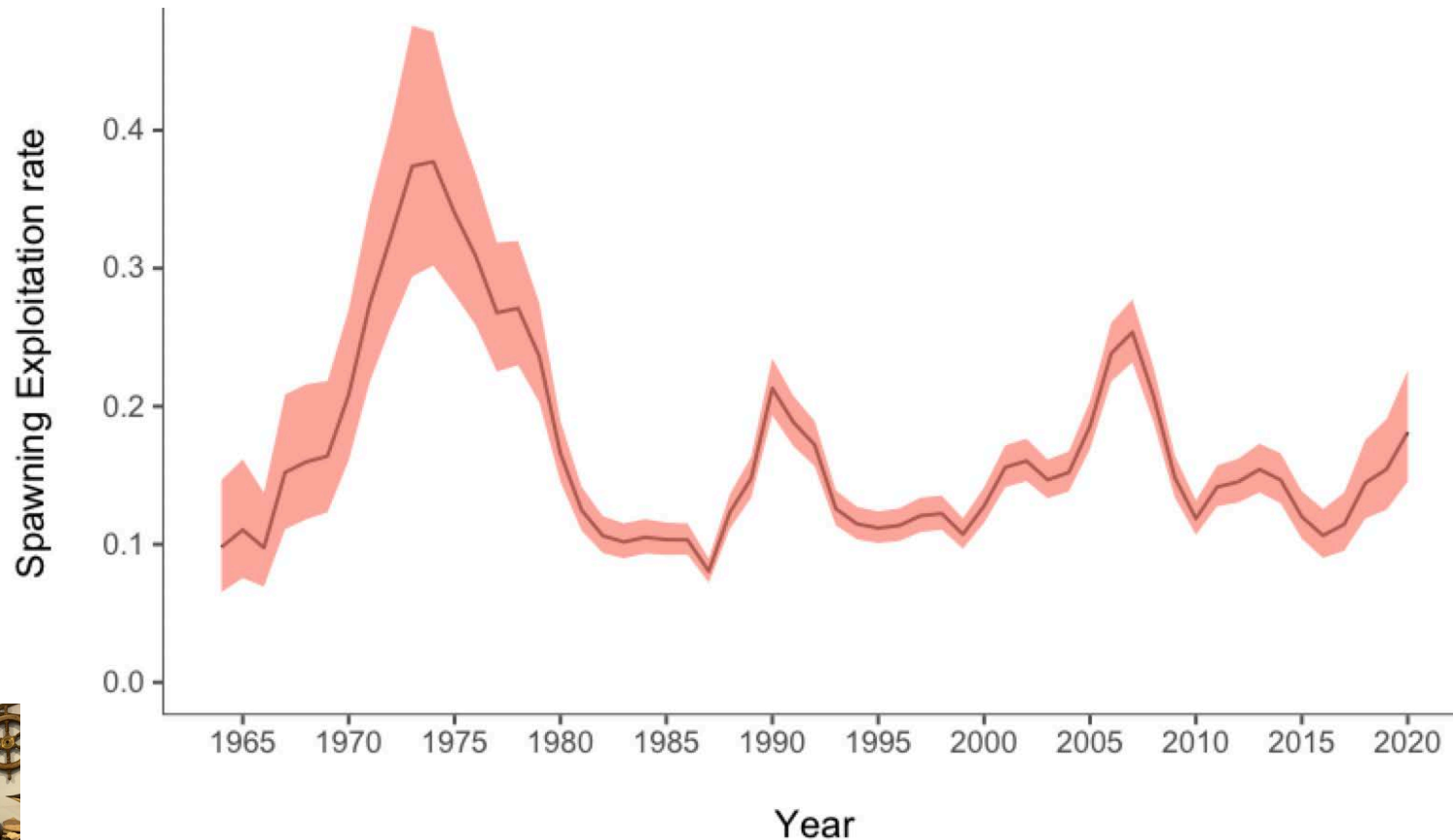
Recruitment: Age-I millions of individuals



EBS WALLEYE POLLOCK MODEL 20.0A



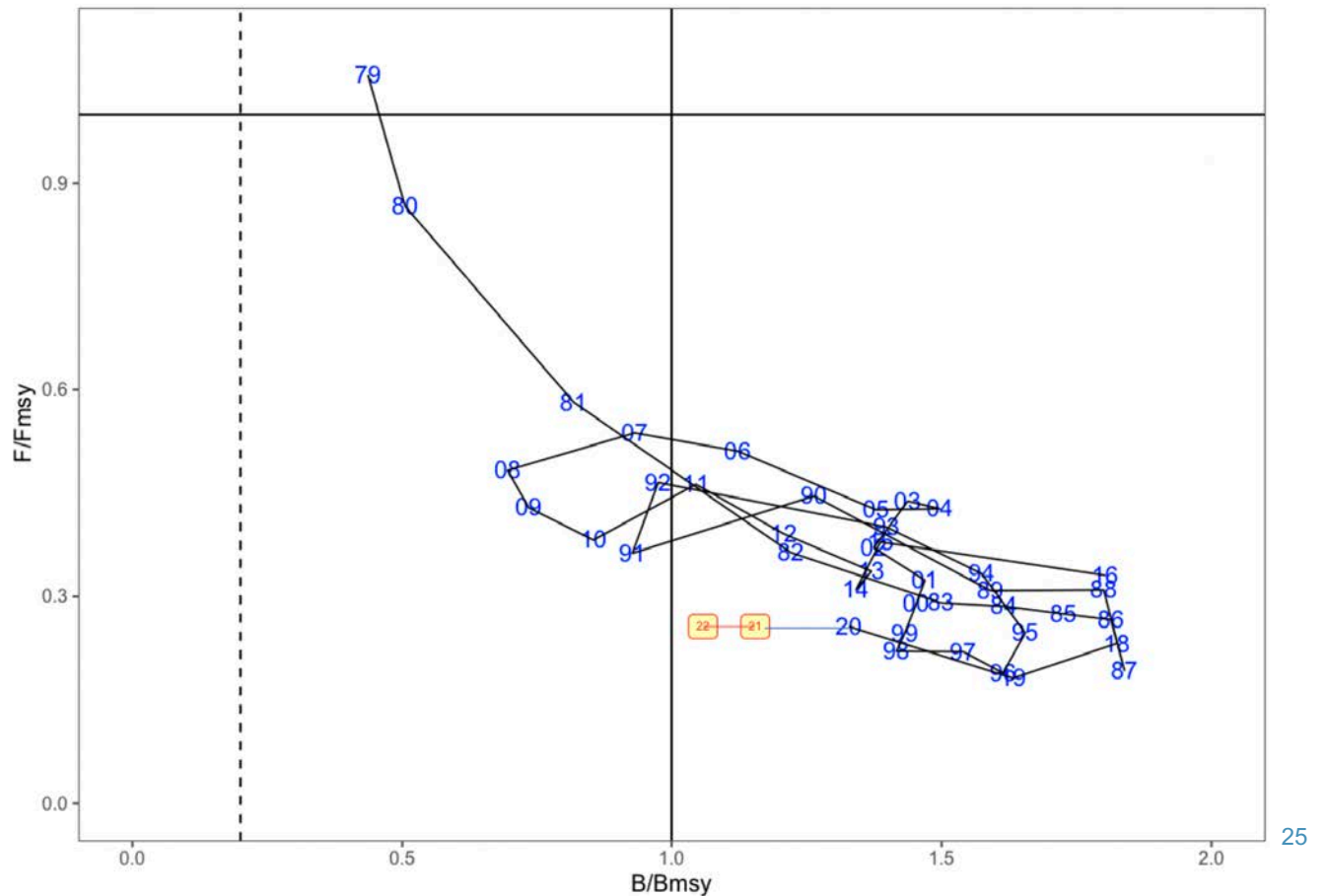
Spawning exploitation rate





EBS WALLEYE POLLOCK MODEL 20.0A

Approaching B_{msy}





EBS WALLEYE POLLOCK SUMMARY

Spawning biomass **declining** from high levels

Unusual fishing conditions in B-season

- Small (and skinny) fish
- Poor catch rates

Decision table may guide TAC considerations

Table 48: Outcomes of decision (expressed as chances out of 100) given different 2021 catches (first row, in kt). Note that for the 2018 and later year-classes average values were assumed. Constant F_s based on the 2021 catches were used for subsequent years.

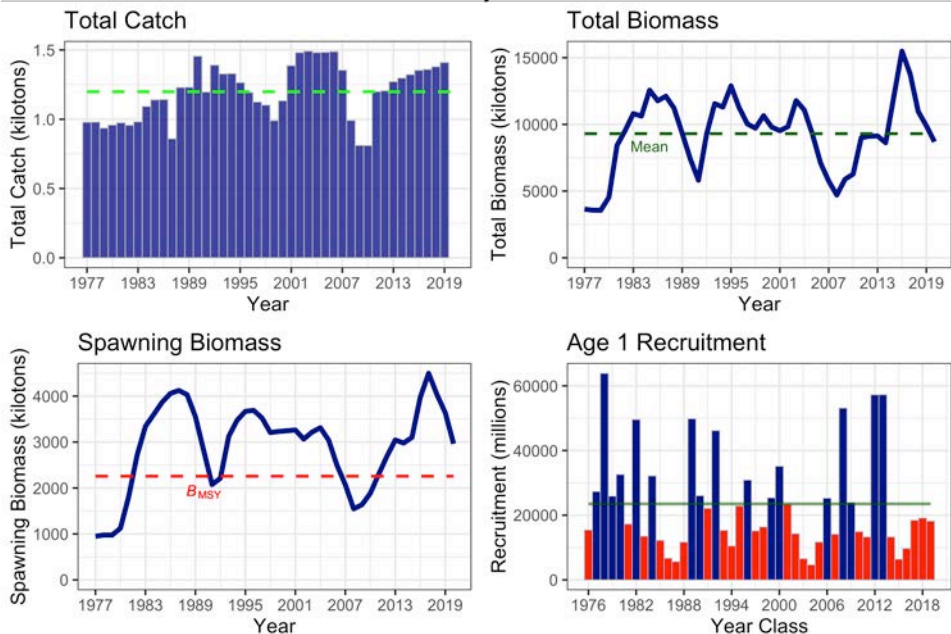
	10	850	1000	1150	1350	1300	1450	1600
$P[F_{2021} > F_{MSY}]$	0	1	5	13	29	25	36	47
$P[B_{2022} < B_{MSY}]$	14	28	32	35	41	39	44	48
$P[B_{2023} < B_{MSY}]$	8	23	27	32	39	37	43	49
$P[B_{2022} < \bar{B}]$	34	84	89	93	96	96	97	98
$P[B_{2025} < \bar{B}]$	4	28	35	41	50	48	54	60
$P[B_{2025} < B_{2021}]$	3	19	23	28	34	33	38	42
$P[B_{2023} < B_{20\%}]$	0	1	1	1	2	2	2	3
$P[p_{a5,2023} > \bar{p}_{a5}]$	20	66	72	76	81	80	83	85
$P[D_{2022} < D_{1994}]$	0	0	0	0	0	0	0	0
$P[D_{2025} < D_{1994}]$	0	4	5	8	12	11	14	19
$P[E_{2021} > E_{2020}]$	0	4	22	47	74	69	82	90





EBS WALLEYE POLLOCK SUMMARY

- ABCs to be reduced by 30% from Tier 1 maxABC in 2021 and 2022, following the Tier 3 maxABC control rule.



Quantity	Last asmt.	This asmt.	Change
M	0.30	0.30	0.00
2020 tier	1a	n/a	none
2021 tier	1a	1a	none
2020 age+ biomass	9,128,000	n/a	-0.11
2021 age+ biomass	8,494,000	8,145,000	-0.04
2020 spawning biomass	2,991,000	n/a	-0.13
2021 spawning biomass	2,674,000	2,602,000	-0.03
B0	5,777,000	5,792,000	0.00
Bmsy	2,148,000	2,257,000	0.05
2021 FOFL	0.449	0.341	-0.24
2021 FABC	0.225	0.214	-0.05
2020 OFL	4,085,000	n/a	-0.36
2021 OFL	3,385,000	2,594,000	-0.23
2020 ABC	2,043,000	n/a	-0.20
2021 ABC	1,767,000	1,626,000	-0.08

- The Team recommended that the AFSC stock assessment groups evaluate the impact of data loss associated with the fixed gear EM program and the trawl EM Exempted Fishing Permit.





CHAPTER 2

EBS PACIFIC COD

- New author: **no**; change from base: **yes**; risk table >1: **yes**
- ESP developed and presented this year, see Appendix 2.2.
- Model changes/alternatives
 - Seven models presented with three ensembles:
 - A = Blue ensemble; B = Yellow ensemble, AB= All models

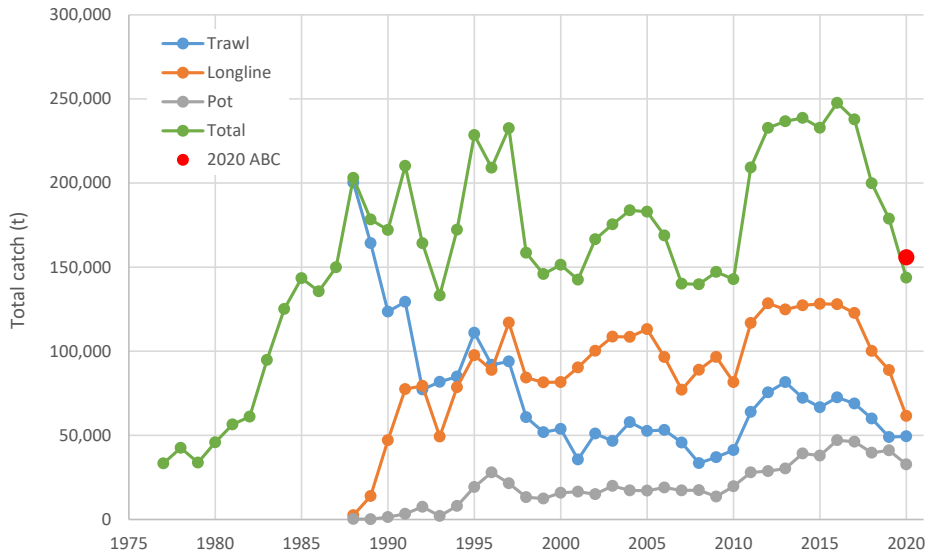
Factor A1: Allow Q to vary?	no		yes		(yes)		
Factor A2: Combine surveys?	no	yes	no	yes			
Factor B1: Use fishery CPUE?	(no)			no		yes	
Factor B2: Allow domed selex?				no	yes	no	yes
Model:	20.4	19.12a	19.15	19.12	20.8	20.9	20.10



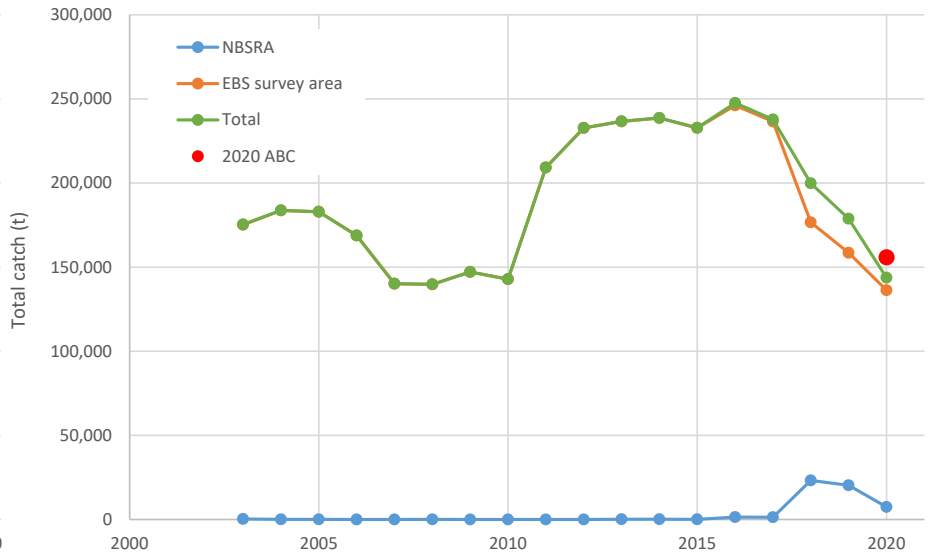


EBS PACIFIC COD CATCH TIME SERIES

Eastern Bering Sea (EBS) 1977-2020



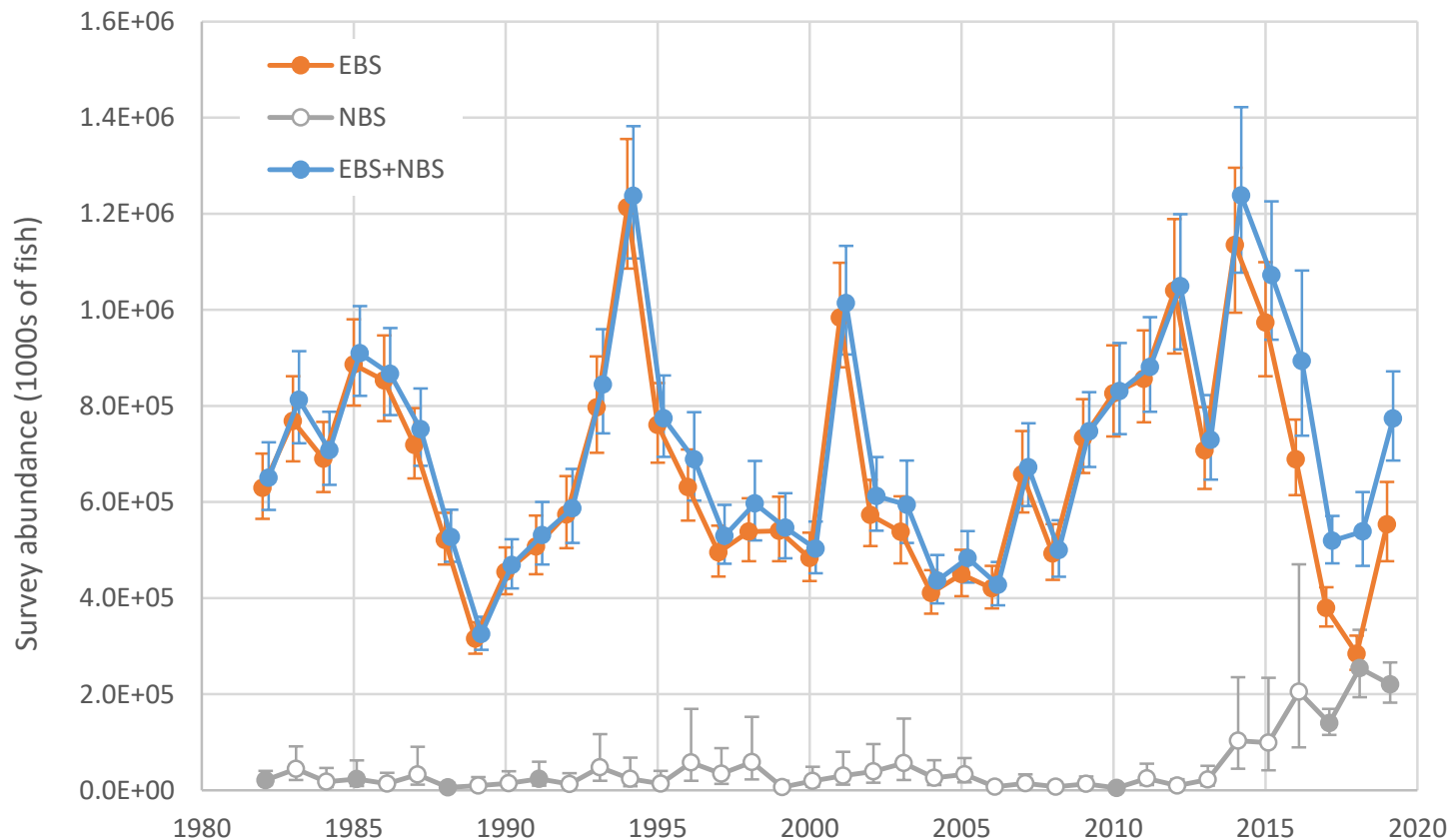
EBS and Northern Bering Sea 2003-2020





EBS PACIFIC COD AFSC SURVEY ABUNDANCE (VAST)

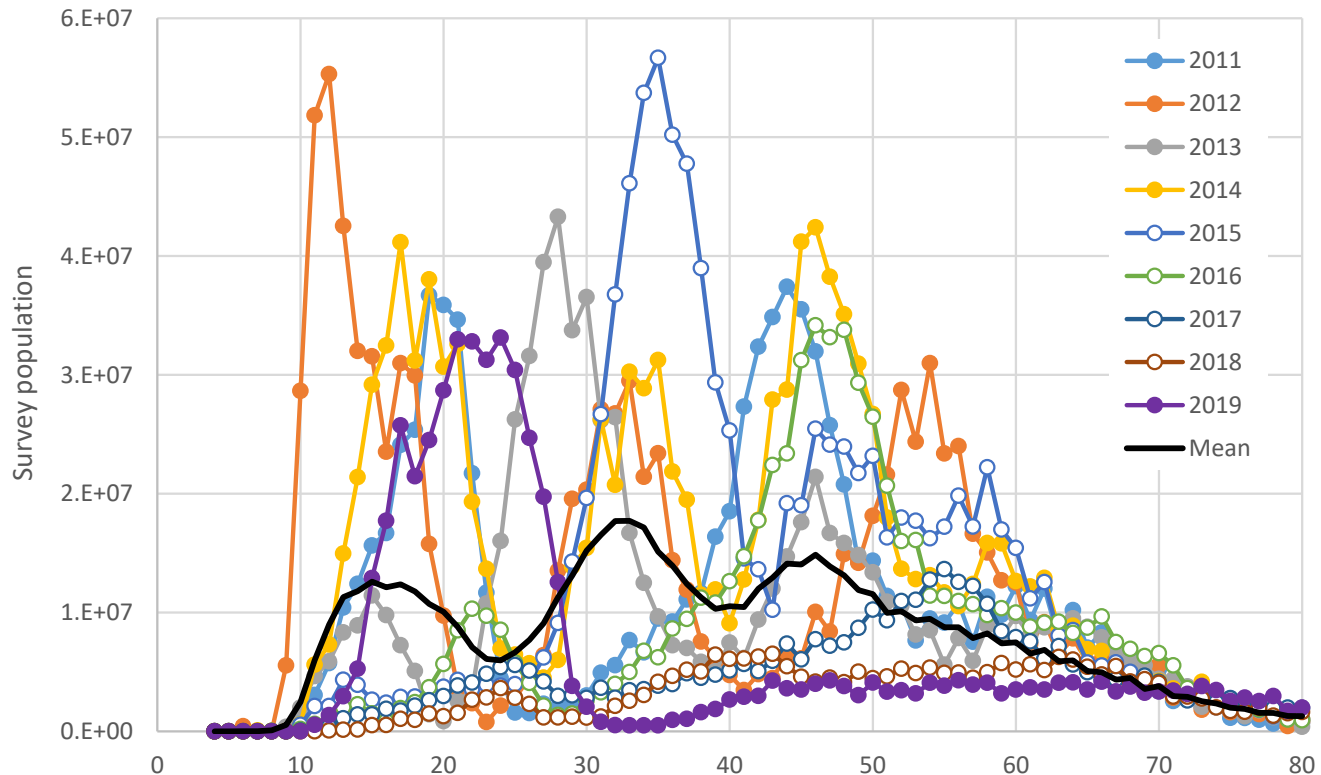
- Cold-pool effect included in VAST derived abundance index (number of fish)

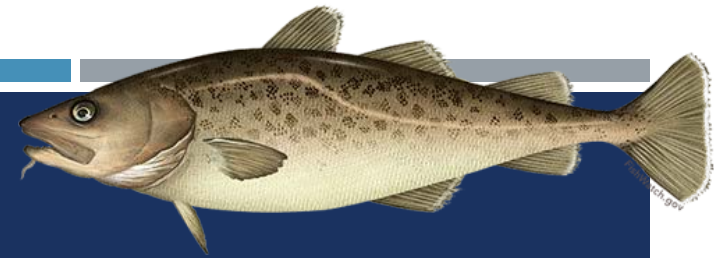




EBS PACIFIC COD SIZE COMPOSITION

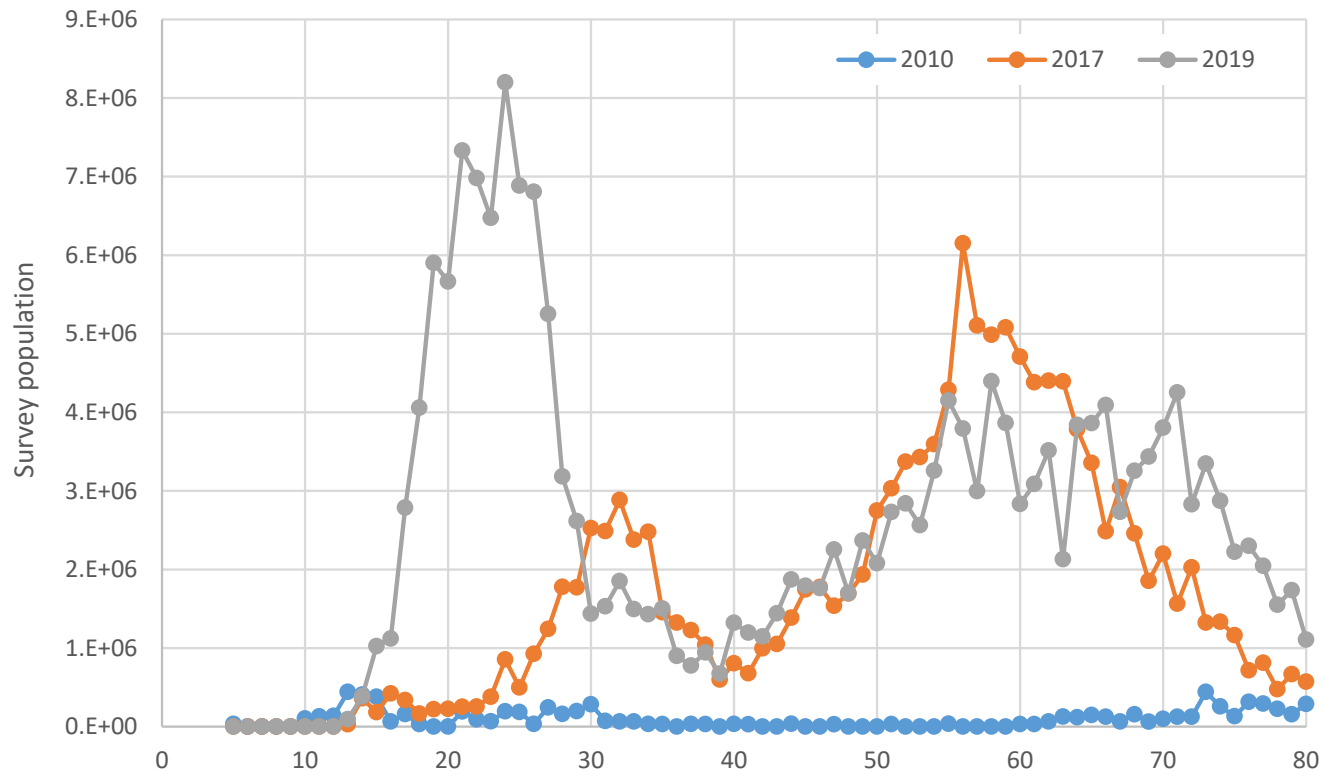
- **Recent survey size comps (EBS)**
 - 2011-14: strong age 1; 2015-18: Weak age 1; 2019: strong age 1





EBS PACIFIC COD SIZE COMPOSITION

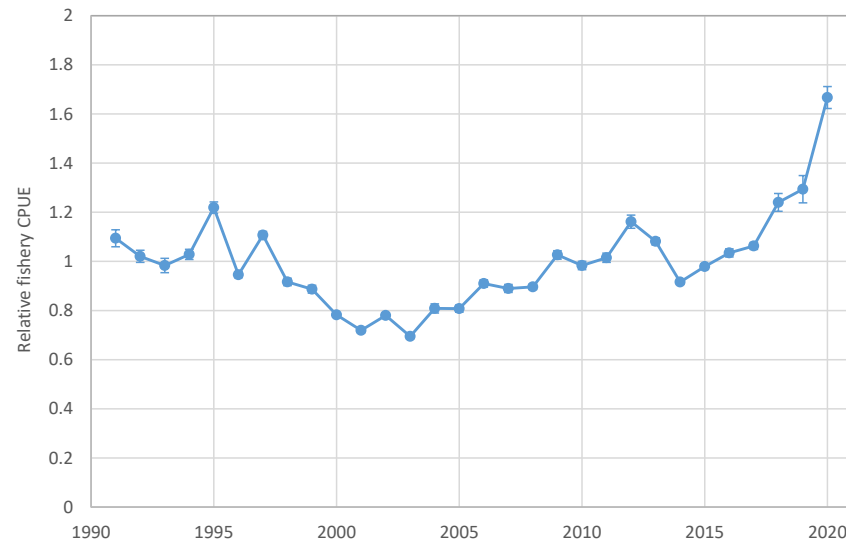
- **Recent survey sizecomps (NBS)**
 - 2018 looks strong here, too (the result of NBS spawning?)



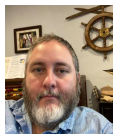


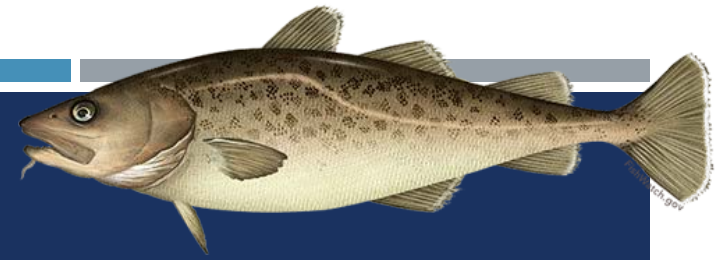
EBS PACIFIC COD CPUE INDEX

- Catch-weighted, all-gear, annual mean CPUE by weight



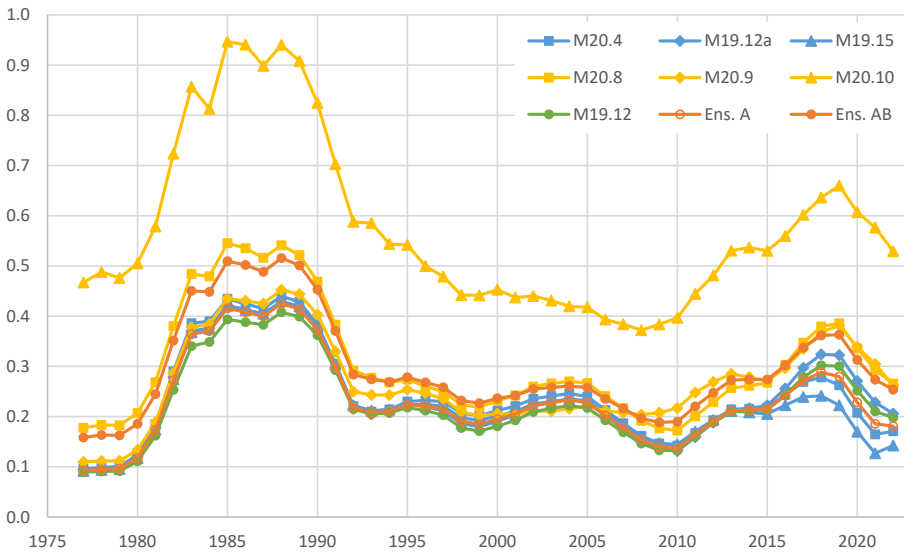
- **Although Team determined not to include models with fishery CPUE index, the Team recommended that the CPUE be standardized using alternative statistical methods and that it be discussed at the CIE review in 2021.**



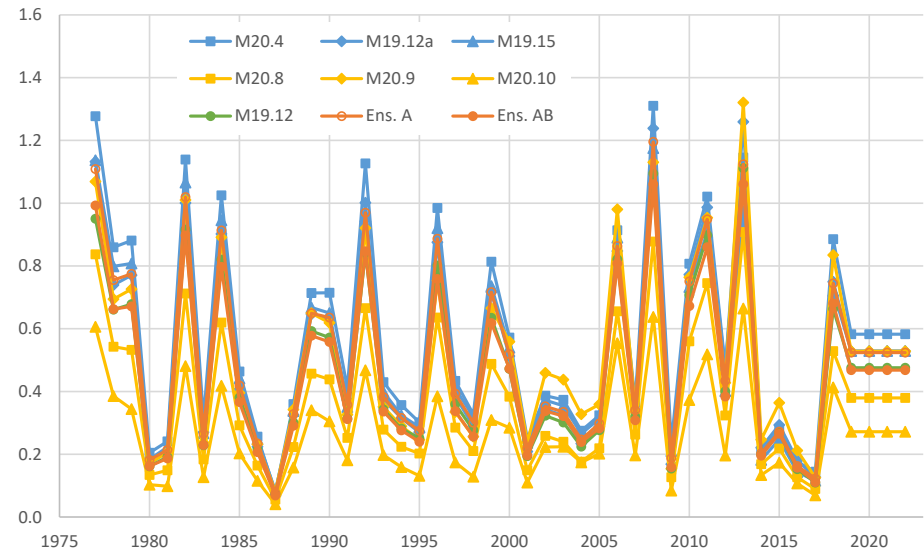


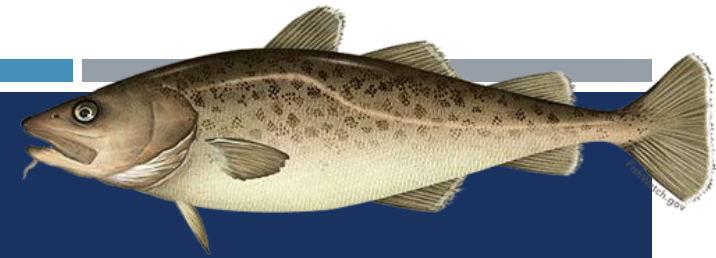
EBS PACIFIC COD TIME SERIES

Spawning Biomass: millions of tons



Age 0 Recruitment: billions of fish



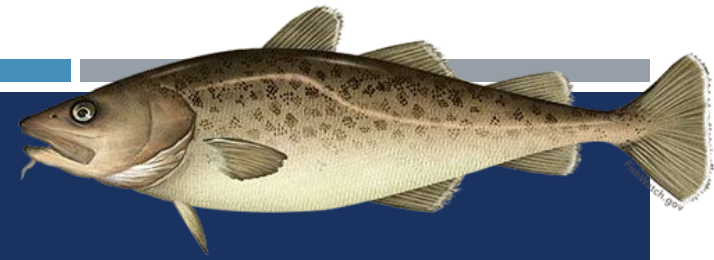


EBS PACIFIC COD OVERVIEW OF MODELS

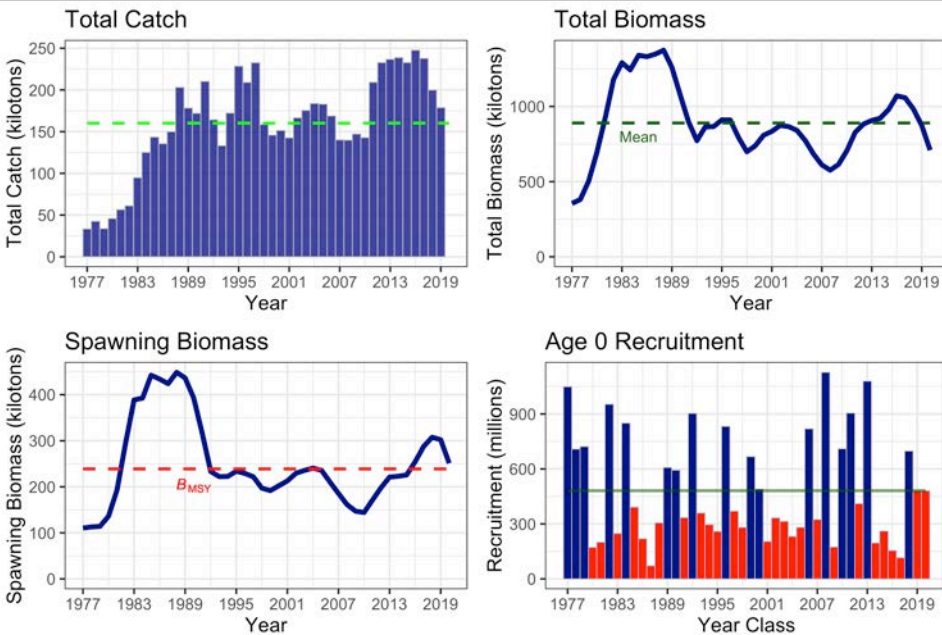
- The Team proposed new ensemble C excluding CPUE index models.
- The Team also recommended changes to the ensemble weighting criteria to better reflect the new sets of models.

Factor A1: Allow Q to vary?		no		yes			
Factor A2: Combine surveys?		no	yes	no	yes		
Factor B2: Allow domed selex?		no			yes		
Criterion	Emph.	20.4	19.12a	19.15	19.12	20.8	Ensemble C
Plausible hypothesis	3	1	1	1	1	1	
Plausible catchability	3	0	1	0	1	1	
Acceptable retrospective bias	3	1	1	1	1	1	
Fits consistent with variances	2	0	0	1	1	1	
Asymptotic survey selectivity	1	1	1	1	1	0	
Model reviewed in September	1	1	1	1	1	0	
Model Weight Ensemble C		0.1509	0.2075	0.1887	0.2453	0.2075	
2021 OFL		87,678	147,949	50,770	118,895	145,354	112,851
2021 max ABC		72,848	123,805	42,029	99,310	123,210	94,552
2022 OFL		101,682	128,340	68,639	110,353	128,447	108,662
2022 max ABC		84,295	106,852	56,788	91,845	108,512	90,665



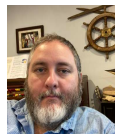


EBS PACIFIC COD SUMMARY



Quantity	Last asmt.	This asmt.*	Change
M	0.35	0.34	-0.03
2020 tier	3b	n/a	none
2021 tier	3b	3b	none
2020 age+ biomass	756,811	n/a	-0.08
2021 age+ biomass	702,235	694,707	-0.01
2020 spawning biomass	267,333	n/a	-0.22
2021 spawning biomass	216,255	208,640	-0.04
B100%	672,795	682,270	0.01
B40%	269,118	272,908	0.01
B35%	235,478	238,795	0.01
2021 FOFL	0.33	0.30	-0.09
2021 FABC	0.26	0.25	-0.04
2020 OFL	191,386	n/a	-0.41
2021 OFL	125,734	112,851	-0.10
2020 ABC	155,873	n/a	-0.39
2021 ABC	102,975	94,552	-0.08

*"This asmt." column based on Ensemble C.



FLATFISH SUMMARY



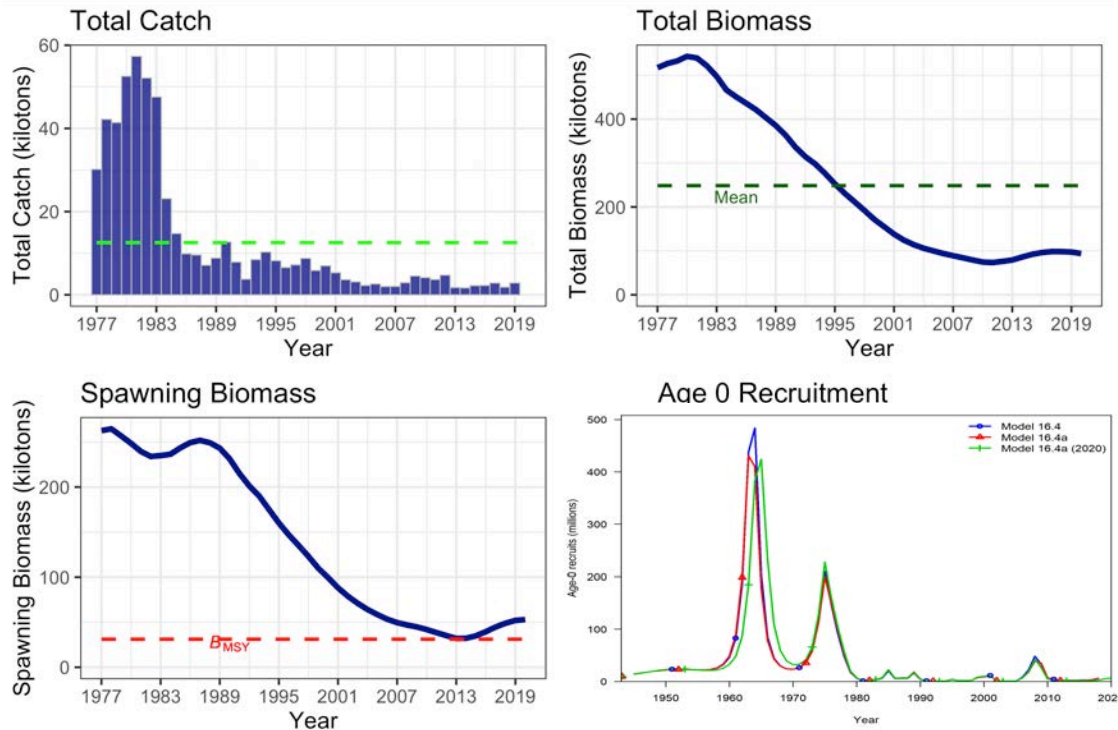
Stock	Tier	2021 ABC (t)	2021 OFL (t)	Change from 2020 ABC/OFL	Change from 2021 ABC/OFL
Yellowfin sole	1a	313,477	341,571	0.13 / 0.11	0.02 / 0.01
Greenland turbot	3a	7,326	8,568	-0.24	-0.14
Arrowtooth flounder	3a	77,349	90,873	0.10	0.08
Kamchatka flounder	3a	8,982	10,630	-0.07 / -0.08	-0.07
Northern rock sole	1a	140,306	145,180	-0.14	-0.43 / -0.42
Flathead sole	3a	62,567	75,863	-0.08	-0.12
Alaska plaice (partial)	3a	31,657	37,924	0.00 / 0.01	0.03 / 0.04
Other flatfish	5	17,189	22,919	0.05	0.05



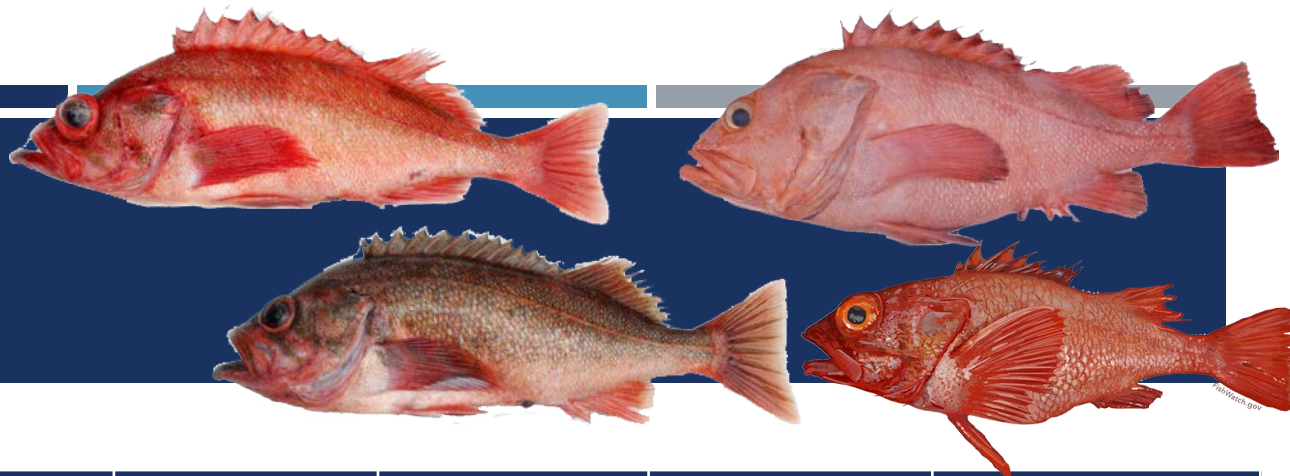


GREENLAND TURBOT

- Poor recruitment in warm years
- Continued assessment issue with lack of slope survey



ROCKFISH SUMMARY



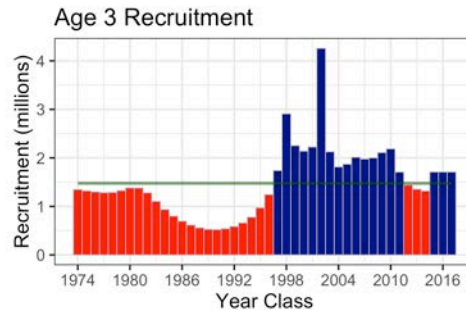
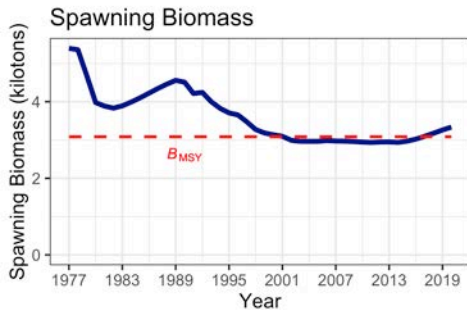
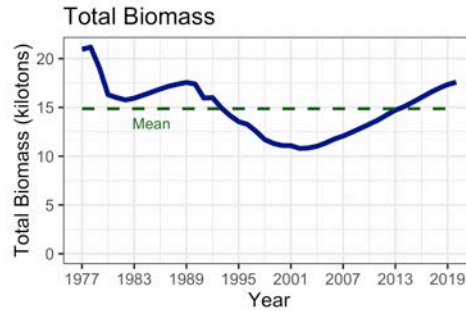
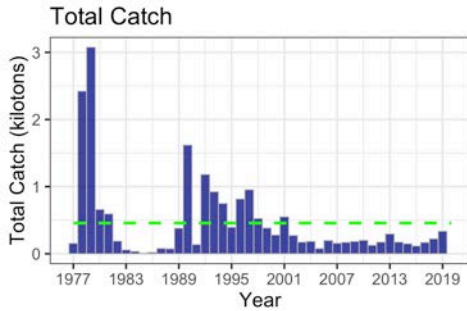
Stock	Tier	2021 ABC (t)	2021 OFL (t)	Change from 2020 ABC/OFL	Change from 2021 ABC/OFL
Pacific ocean perch	3a	37,173	44,376	-0.22 / -0.25	-0.21 / -0.22
Northern rockfish (partial)	3a	15,557	18,917	-0.01	-0.04
Blackspotted/rougheye rockfish					
AI	3b	432	509	-0.36/-0.38	-0.50/-0.51
EBS	5	50	67	0.53	0.53
Shortraker rockfish	5	541	722	0.00	0.00
Other rockfish	5	1,313	1,793	-0.02	-0.02





BLACKSPOTTED/ROUGHEYE ROCKFISH SUMMARY (ALEUTIAN ISLANDS)

- New author: **no**; change from base: **yes**; risk table >1: **yes**



Quantity (AI portion)	Last asmt	This asmt	Change
M	0.032	0.049	0.53
2020 tier	3b	n/a	none
2021 tier	3b	3b	none
2020 age+ biomass	49,005	n/a	-0.64
2021 age+ biomass	51,451	17,632	-0.66
2020 spawning biomass	10,213	n/a	-0.67
2021 spawning biomass	11,551	3,372	-0.71
B100%	29,287	8,811	-0.70
B40%	11,715	3,524	-0.70
B35%	10,250	3,083	-0.70
2021 FOFL	0.047	0.038	-0.19
2021 FABC	0.039	0.032	-0.18
2020 OFL	817	n/a	-0.38
2021 OFL	1,046	509	-0.51
2020 ABC	675	n/a	-0.36
2021 ABC	866	432	-0.50

* Note that the WAI MSSC was exceeded again in 2020



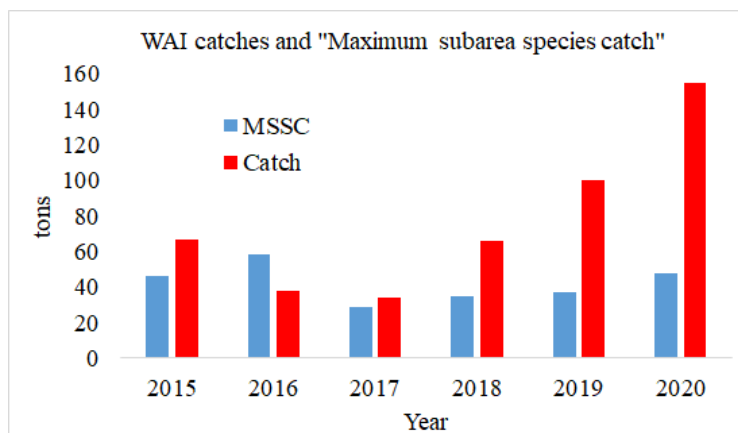


CHAPTER 14

BLACKSPOTTED/ROUGHEYE ROCKFISH

MAXIMUM SUBAREA SPECIES CATCH (MSSC)

- Despite significant effort by the fishery catches continue to exceed MSSC in Western Aleutian Islands subregion.



- **The Team requests guidance from the SSC and Council on how to reduce incidental catch in areas with disproportionate spatial exploitation because the MSSC tool has not provided enough protection.**
- **The Team recommended that the author assess the depth distribution of the survey samples to evaluate trends by depth, to help determine risk considerations and potentially help inform the industry on how to reduce incidental catch.**





BLACKSPOTTED/ROUGHEYE ROCKFISH SUMMARY (EBS)

- Tier 5 assessment with change in M

Quantity (EBS portion)	Last asmt.	This asmt.	Change
M	0.032	0.049	0.53
2020 tier	5	n/a	none
2021 tier	5	5	none
Biomass	1,371	1,371	0.00
2021 FOFL	0.032	0.049	0.53
2021 FABC	0.024	0.037	0.54
2020 OFL	44	n/a	0.53
2021 OFL	44	67	0.53
2020 ABC	33	n/a	0.53
2021 ABC	33	50	0.53



OTHER SUMMARY



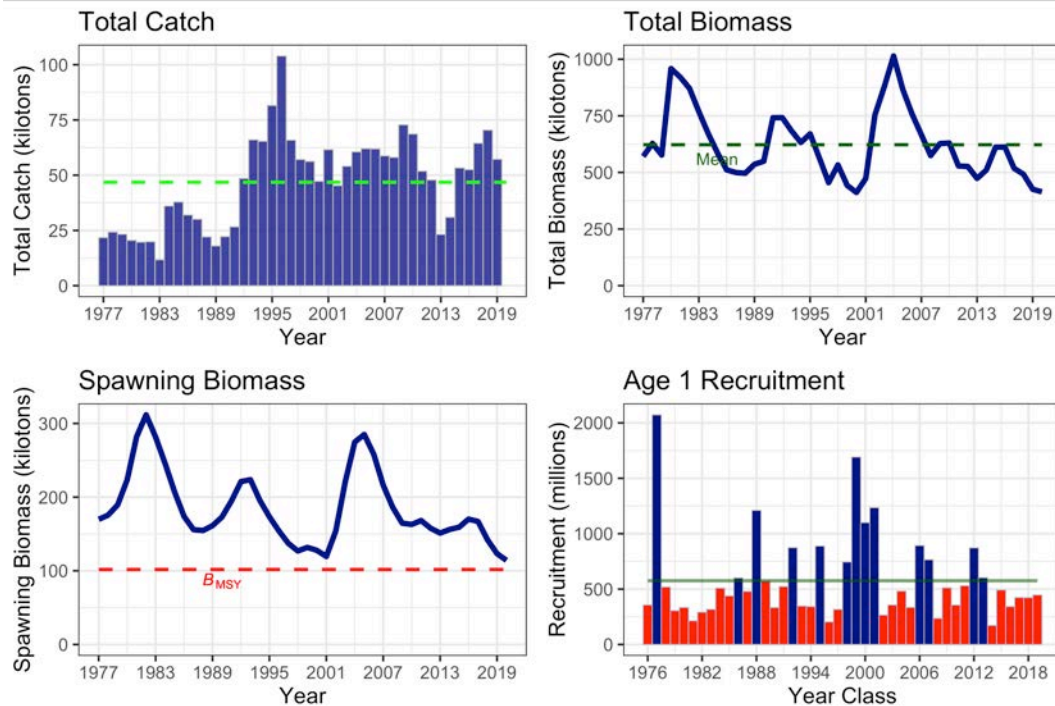
Stock	Tier	2021 ABC (t)	2021 OFL (t)	Change from 2020	Change from 2021
Atka mackerel	3b	73,590	85,580	0.05	0.14
Alaska skate	3a	33,219	38,580	0.02	0.06
Other skate	5	8,038	10,717	-0.11	-0.11
Sharks	6	517	689	0.00	0.00
Octopus	6	3,576	4,769	0.00	0.00





ATKA MACKEREL

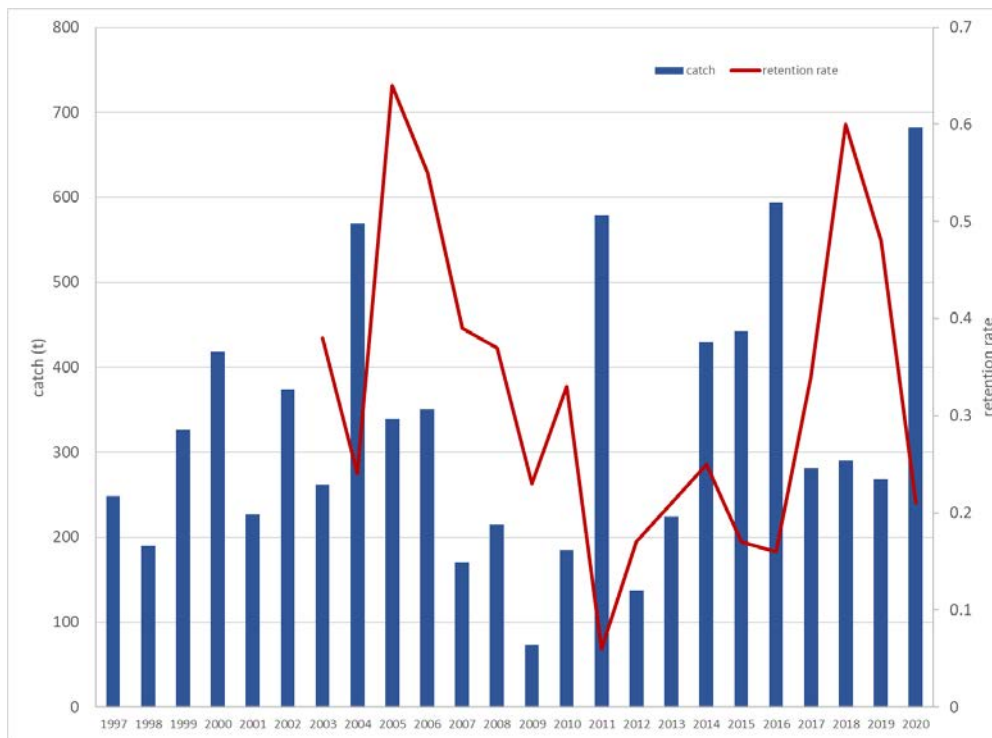
- Female spawning biomass in 2021 at 37% of unfished spawning biomass
- Below average recruitment since 2013



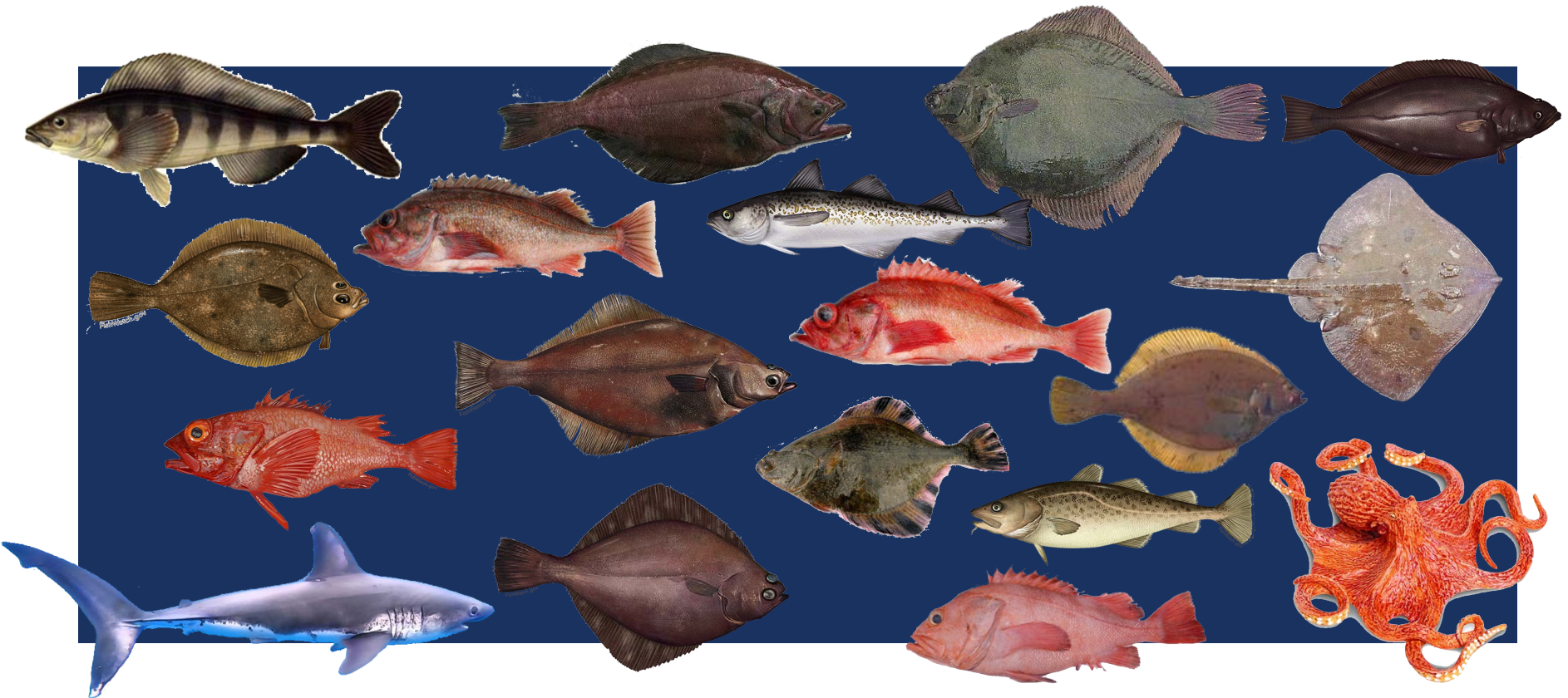
OCTOPUS



- Highest catch in time series
 - Potentially due to increased pot fishery effort in the Aleutian Islands



MORE DETAILED SLIDES AVAILABLE FOR FURTHER QUESTIONS



BSAI TEAM POLLOCK AND COD RECOMMENDATIONS

■ EBS pollock



- The Team recommended that the AFSC stock assessment groups evaluate the impact of data loss associated with the fixed gear EM program and the trawl EM Exempted Fishing Permit

■ EBS Pacific cod



- The Team recommended omitting the models containing fishery CPUE from the ensemble and including the additional model with dome-shaped selectivity along with the four models representing ensemble A.
- The Team recommended retaining only the following weighting criteria: those with an emphasis factor of 3; the fits consistent with variances; and new criteria of whether asymptotic survey selectivity is used and whether the model was previewed in September, both with an emphasis factor of 1. The Team recommended that the fishery CPUE be standardized using alternative statistical methods and that it be discussed at the CIE review in 2021. This should also include a discussion of historical changes in the fishery that may affect the relationship of the index to abundance.
- The Team recommended collating fishery information in the ESP.
- The Team recommended the following topics could be considered for the 2021 CIE review: development of a fishery CPUE index, incorporation of dome-shaped survey selectivity, models to include in an ensemble, whether to apply the sloping HCR before or after ensemble averaging of SSB and other reference points, and development of movement models.

■ AI Pacific cod



- The Team recommended that an age-structured assessment be presented to the Team in September 2021.

BSAI TEAM FLATFISH RECOMMENDATIONS

- **Yellowfin sole**

- The Team recommended that the authors investigate decreased female natural mortality and weight at age next year to help address the issue of a positive retrospective bias in the recommended model.



- **Other flatfish**

- The Team recommended that the author consider adding a secondary table, by species, to the risk table. This breakdown will highlight species specific concerns that can be tracked over time.



BSAI TEAM ROCKFISH RECOMMENDATIONS

■ Pacific ocean perch



- The Team recommended investigating Francis weighting and trying different time blocks of natural mortality to help improve the fit to the Aleutian Islands survey index.

■ Rougheye and blackspotted rockfish



- The Team requests guidance from the SSC and Council on how to reduce incidental catch in areas with disproportionate spatial exploitation because the MSSC tool has not provided enough protection.
- The Team recommended that the author assess the depth distribution of the survey samples to evaluate trends by depth, to help determine risk considerations and potentially help inform the industry on how to reduce incidental catch.

■ Other rockfish

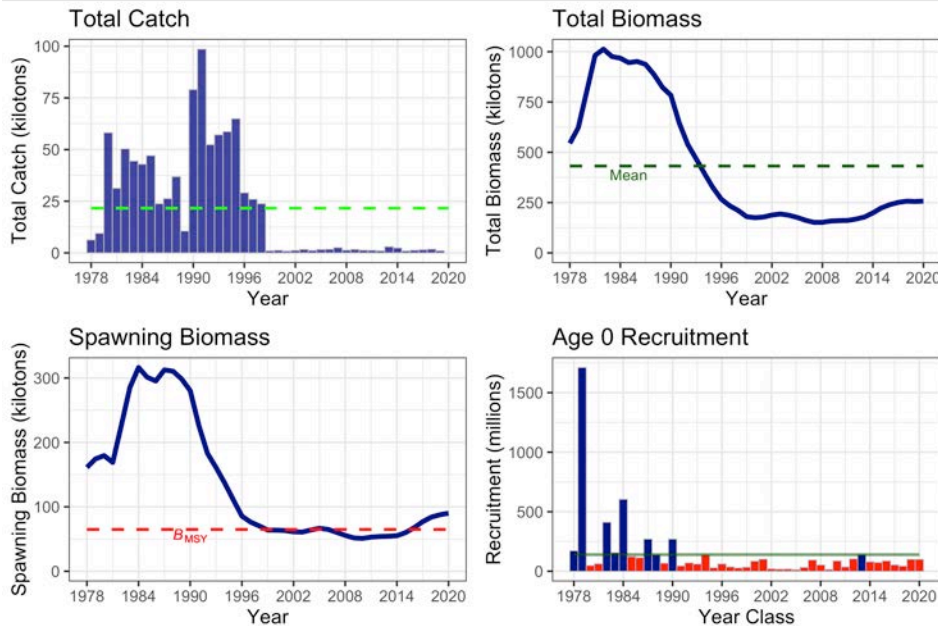


- The Team recommended that the author pursue the planned work in collaboration with other authors to consider issues with the Tier 5 model process for stocks with variable, and at times sparse or missing, survey observations. Specifically, the manner in which biomass estimates of 0 are handled (i.e., currently ignored) should be revisited.
- The Team recommended that the author consult with other rockfish assessment authors to consider revising M for the non-SST portion of the population in future assessments.
- The Team recommended that the author do more spatial analysis of AI catch of non-SST rockfish. The Team recommended the author explore the locations, depths, seasons, the encounter rates and concentration of catch (i.e., frequent constant bycatch rates or a smaller number of highly concentrated hauls).



CHAPTER 1A AI WALLEYE POLLOCK

- New author: **no**; change from base: **no**; risk>1: **no**



Quantity	Last asmt.	This asmt.	Change
M	0.20	0.21	0.05
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	340,680	n/a	-0.14
2021 age+ biomass	367,017	292,967	-0.20
2020 spawning biomass	98,172	n/a	-0.08
2021 spawning biomass	102,413	89,906	-0.12
B100%	203,279	185,475	-0.09
B40%	81,312	74,190	-0.09
B35%	71,147	64,916	-0.09
2021 FOFL	0.415	0.390	-0.06
2021 FABC	0.331	0.313	-0.05
2020 OFL	66,973	n/a	-0.08
2021 OFL	70,970	61,856	-0.13
2020 ABC	55,120	n/a	-0.07
2021 ABC	58,384	51,241	-0.12

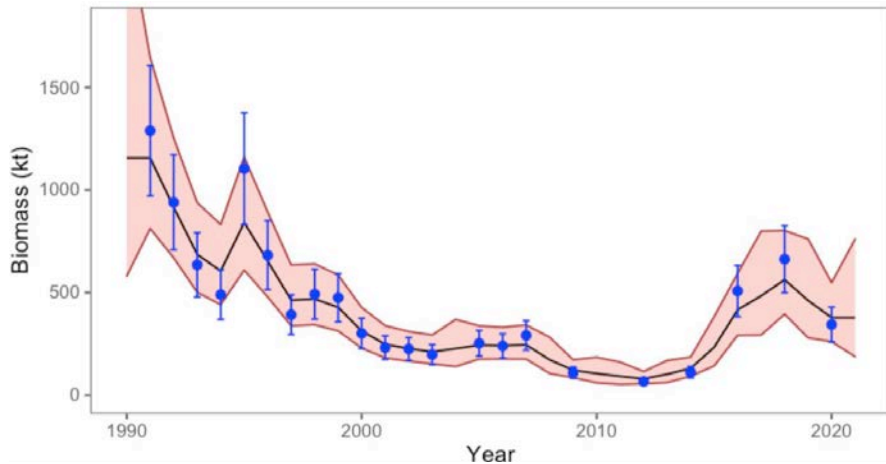




CHAPTER 1B

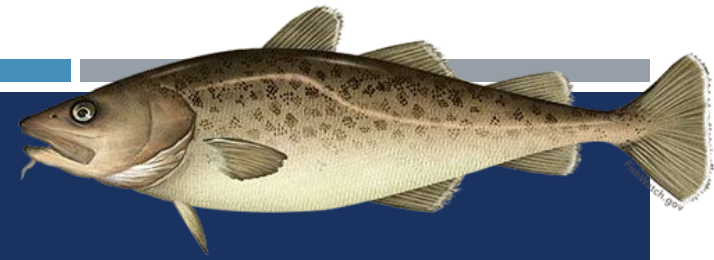
BOGOSLOF WALLEYE POLLOCK

- New author: **no**; >1 model: **yes**; change from base: **no**; risk table >1: **no**



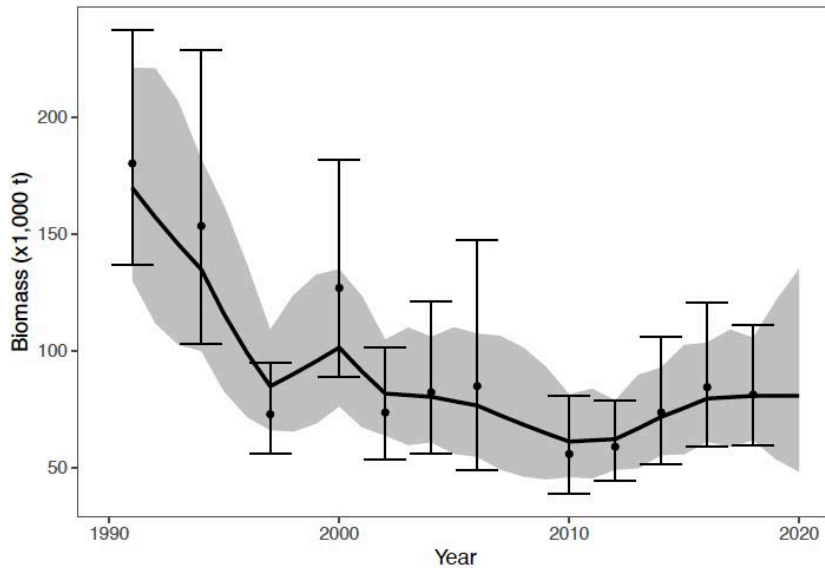
Quantity	Last asmt.	This asmt.	Change
M	0.30	0.30	0.00
2020 tier	5	n/a	none
2021 tier	5	5	none
Biomass	610,267	378,262	-0.38
2021 FOFL	0.300	0.300	0.00
2021 FABC	0.225	0.225	0.00
2020 OFL	183,080	n/a	-0.38
2021 OFL	183,080	113,479	-0.38
2020 ABC	137,310	n/a	-0.38
2021 ABC	137,310	85,109	-0.38





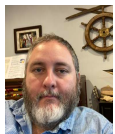
CHAPTER 2A AI PACIFIC COD

- New author: **yes**; change from base: **no**; risk table >1: **yes**



Quantity	Last asmt.	This asmt.	Change
M	0.34	0.34	0.00
2020 tier	5	n/a	none
2021 tier	5	5	none
Biomass	80,700	80,700	0.00
2021 FOFL	0.34	0.34	0.00
2021 FABC	0.255	0.255	0.00
2020 OFL	27,400	n/a	0.00
2021 OFL	27,400	27,400	0.00
2020 ABC	20,600	n/a	0.00
2021 ABC	20,600	20,600	0.00

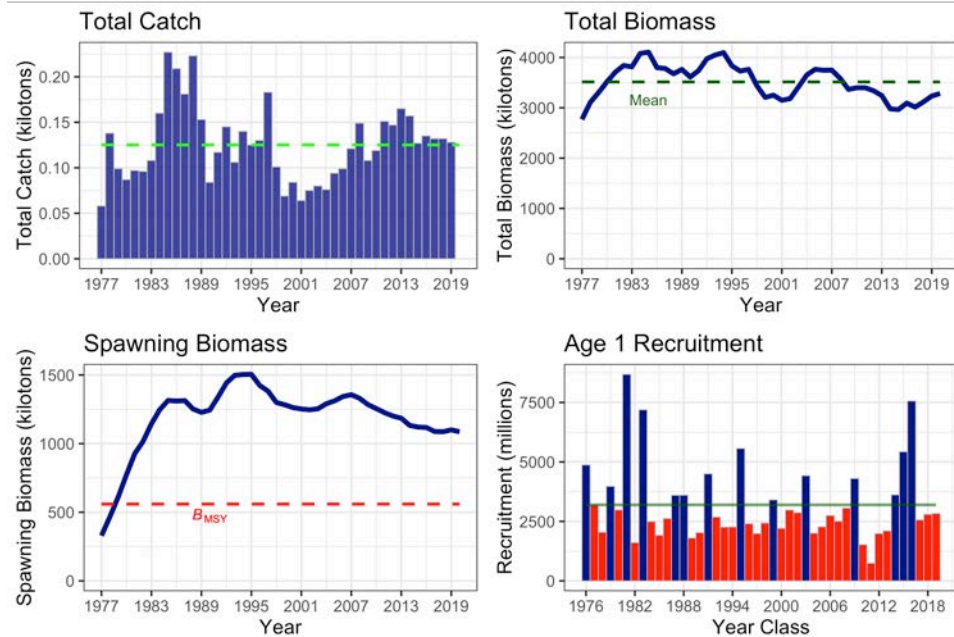
- The Team recommended that an age-structured assessment be presented to the Team in September 2021.





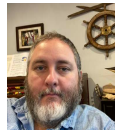
CHAPTER 4 YELLOWFIN SOLE

- New author: **no**; change from base: **yes**; risk table >1: **no**



Quantity	Last asmt.	This asmt.	Change
M (female/male)	0.12	0.12/0.135	0/0.13
2020 tier	1a	n/a	none
2021 tier	1a	1a	none
2020 age+ biomass	2,486,700	n/a	0.11
2021 age+ biomass	2,733,340	2,755,870	0.01
2020 spawning biomass	847,101	n/a	0.23
2021 spawning biomass	809,813	1,040,900	0.29
B0	1,275,940	1,528,700	0.20
Bmsy	477,288	559,704	0.17
2021 FOFL	0.123	0.124	0.01
2021 FABC	0.112	0.114	0.02
2020 OFL	306,410	n/a	0.11
2021 OFL	336,801	341,571	0.01
2020 ABC	278,370	n/a	0.13
2021 ABC	305,980	313,477	0.02

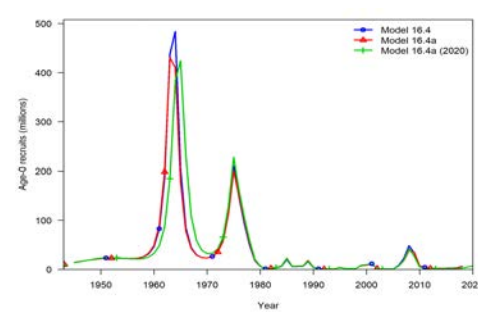
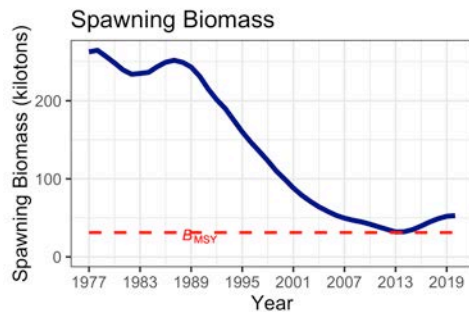
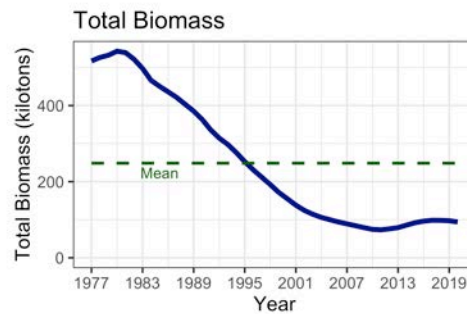
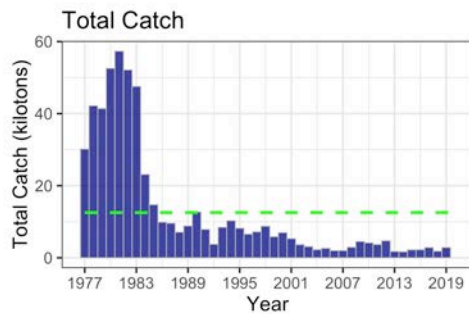
- The Team recommended that the authors investigate decreased female natural mortality and weight at age next year to help address the issue of a positive retrospective bias in the recommended model.



CHAPTER 5 GREENLAND TURBOT

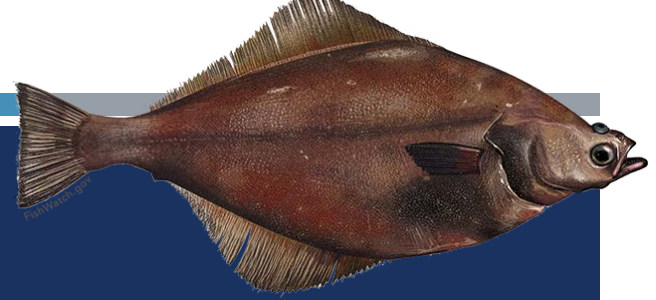


- New author: **no**; change from base: **yes**; risk table >1: **yes**



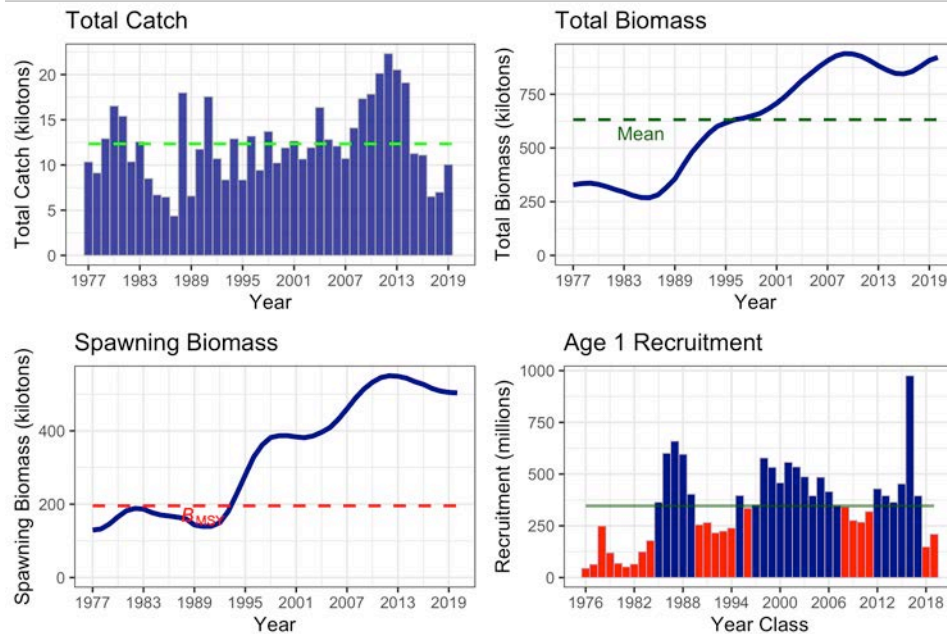
Quantity	Last asmt.	This asmt.	Change
M	0.112	0.112	0.00
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	106,101	n/a	-0.17
2021 age+ biomass	98,532	87,849	-0.11
2020 spawning biomass	57,094	n/a	-0.09
2021 spawning biomass	53,617	51,914	-0.03
B100%	90,534	89,054	-0.02
B40%	36,213	35,622	-0.02
B35%	31,687	31,169	-0.02
2021 FOFL	0.21	0.22	0.05
2021 FABC	0.18	0.18	0.00
2020 OFL	11,319	n/a	-0.24
2021 OFL	10,006	8,568	-0.14
2020 ABC	9,625	n/a	-0.24
2021 ABC	8,510	7,326	-0.14





CHAPTER 6 ARROWTOOTH FLOUNDER

- New author: **yes**; change from base: **no**; risk table >1: **no**



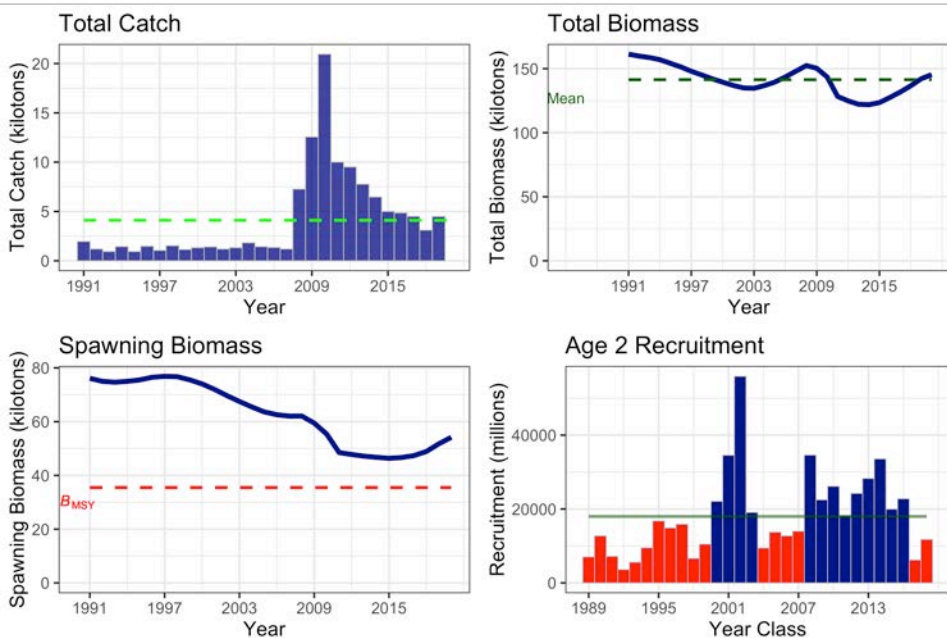
Quantity	Last asmt.	This asmt.	Change
M (female/male)	0.20/0.35	0.20/0.35	0.00
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	891,959	n/a	0.04
2021 age+ biomass	934,008	923,646	-0.01
2020 spawning biomass	481,845	n/a	0.03
2021 spawning biomass	478,260	497,556	0.04
B100%	606,237	558,826	-0.08
B40%	242,495	223,530	-0.08
B35%	212,183	195,589	-0.08
2021 FOFL	0.161	0.160	-0.01
2021 FABC	0.136	0.135	-0.01
2020 OFL	82,860	n/a	0.10
2021 OFL	84,057	90,873	0.08
2020 ABC	70,606	n/a	0.10
2021 ABC	71,618	77,349	0.08



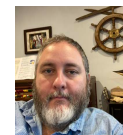


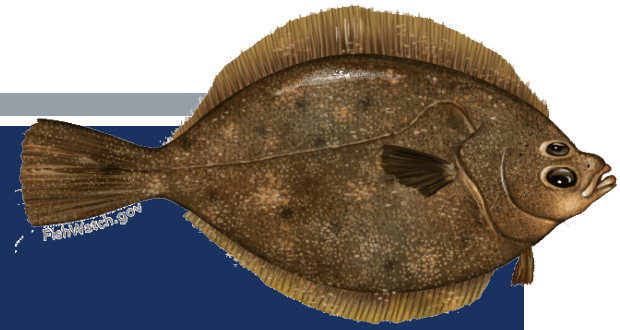
CHAPTER 7 KAMCHATKA FLOUNDER

- New author: **no**; change from base: **yes***; risk table >1: **no**



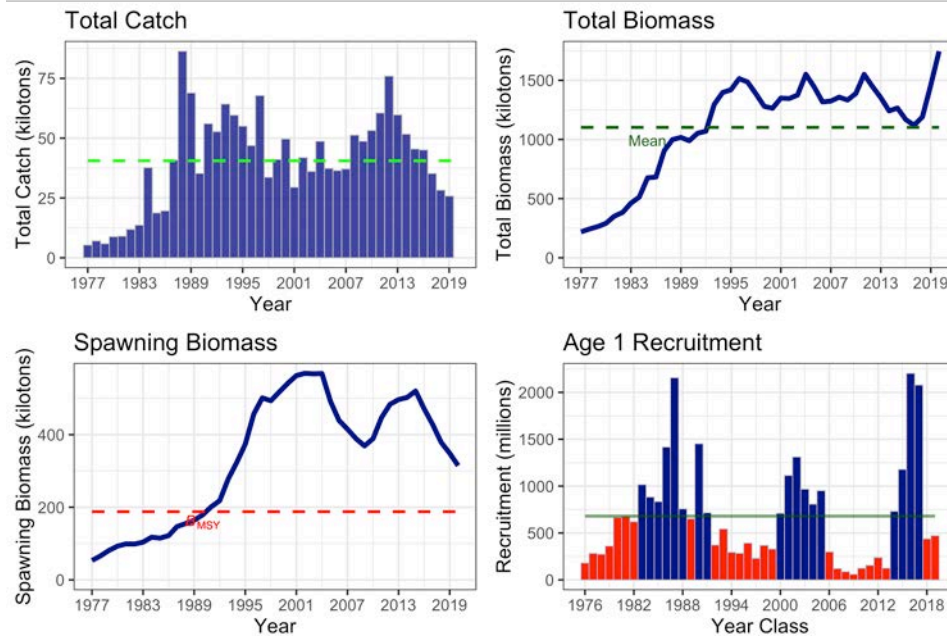
Quantity	Last asmt.	This asmt.	Change
M	0.11	0.11	0.00
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	162,709	n/a	-0.11
2021 age+ biomass	163,158	144,671	-0.11
2020 spawning biomass	57,948	n/a	-0.06
2021 spawning biomass	57,892	54,341	-0.06
B100%	107,673	101,376	-0.06
B40%	43,069	40,550	-0.06
B35%	37,685	35,482	-0.06
2021 FOFL	0.108	0.108	0.00
2021 FABC	0.090	0.090	0.00
2020 OFL	11,495	n/a	-0.08
2021 OFL	11,472	10,630	-0.07
2020 ABC	9,708	n/a	-0.07
2021 ABC	9,688	8,982	-0.07





CHAPTER 8 NORTHERN ROCK SOLE

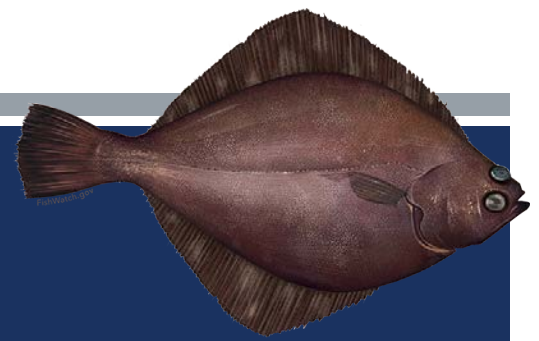
- New author: **yes**; change from base: **yes**; risk table >1: **yes**



Quantity	Last asmt.*	This asmt.	Change
M	0.15	0.15/0.17	0/0.13
2020 tier	1a	n/a	none
2021 tier	1a	1a	none
2020 age+ biomass	1,154,000	n/a	-0.20
2021 age+ biomass	1,729,000	923,197	-0.47
2020 spawning biomass	415,000	n/a	-0.29
2021 spawning biomass	389,000	294,627	-0.24
B0	546,800	476,820	-0.13
Bmsy	197,400	158,972	-0.19
2021 FOFL	0.147	0.157	0.07
2021 FABC	0.142	0.152	0.07
2020 OFL	168,000	n/a	-0.14
2021 OFL	251,800	145,180	-0.42
2020 ABC	163,700	n/a	-0.14
2021 ABC	245,400	140,306	-0.43

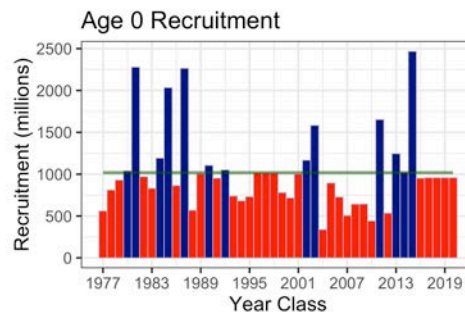
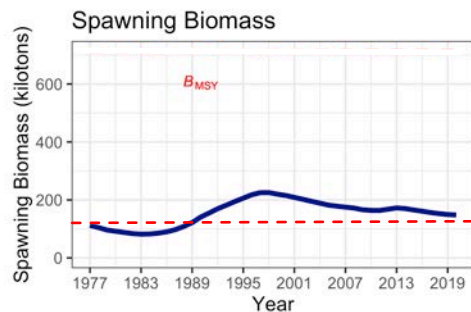
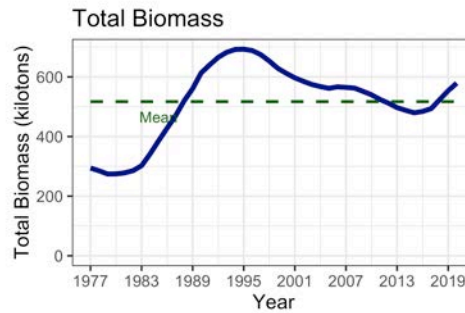
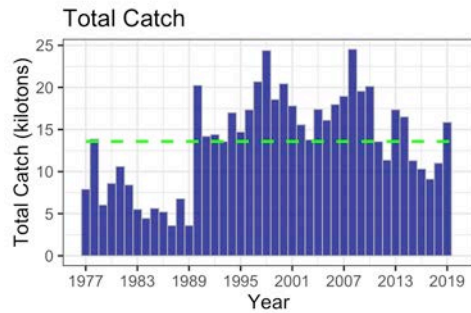
*"Last asmt." column as shown **this** year





CHAPTER 9 FLATHEAD SOLE

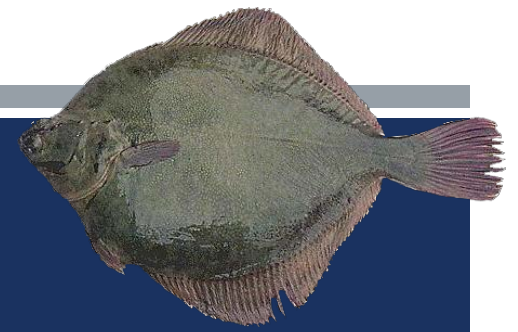
- New author: **yes**; change from base: **no**; risk table >1: **no**



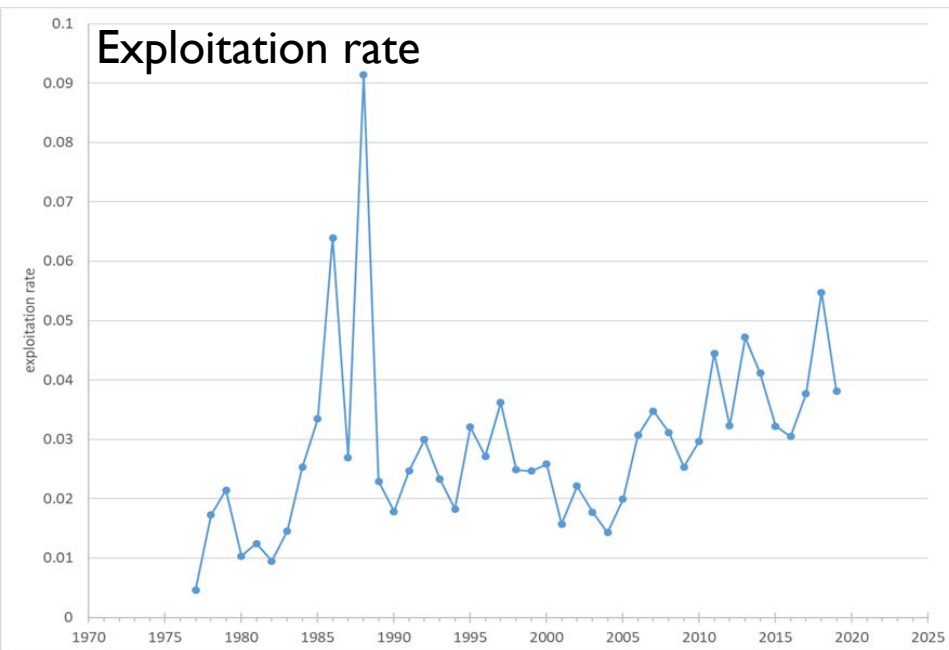
Quantity	Last asmt.	This asmt.	Change
M	0.20	0.20	0.00
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	684,768	n/a	-0.12
2021 age+ biomass	692,915	602,497	-0.13
2020 spawning biomass	154,195	n/a	-0.02
2021 spawning biomass	160,864	150,433	-0.06
B100%	212,060	203,658	-0.04
B40%	84,824	81,463	-0.04
B35%	74,221	71,280	-0.04
2021 FOFL	0.47	0.46	-0.02
2021 FABC	0.38	0.37	-0.03
2020 OFL	82,810	n/a	-0.08
2021 OFL	86,432	75,863	-0.12
2020 ABC	68,134	n/a	-0.08
2021 ABC	71,079	62,567	-0.12



CHAPTER 10 ALASKA PLAICE (PARTIAL)



- New author: **yes**; change from base: **no**; risk table >1: **n/a**



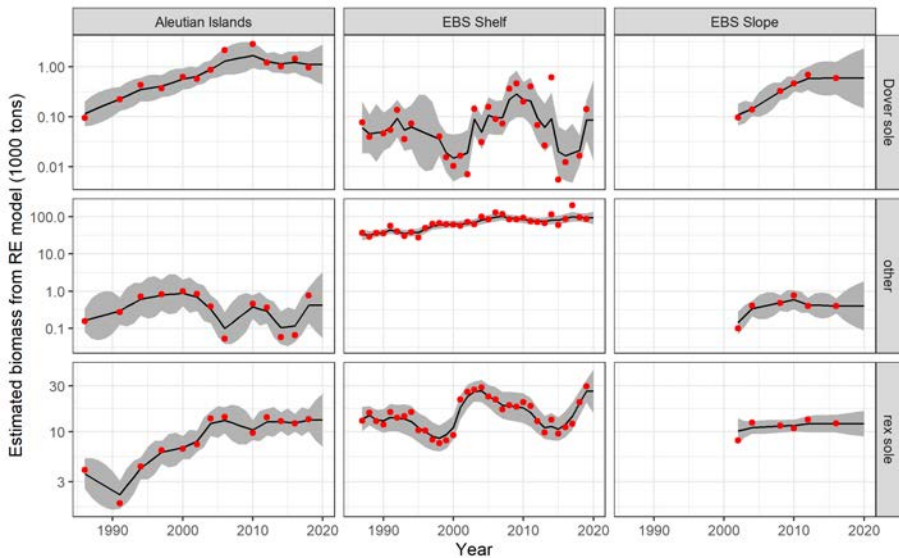
Quantity	Last asmt.	This asmt.	Change
M	0.13	0.13	0.00
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	428,800	n/a	0.00
2021 age+ biomass	435,700	427,587	-0.02
2020 spawning biomass	170,800	n/a	-0.03
2021 spawning biomass	161,000	166,528	0.03
B100%	333,300	335,172	0.01
B40%	133,300	134,069	0.01
B35%	116,600	117,310	0.01
2021 FOFL	0.150	0.160	0.07
2021 FABC	0.125	0.132	0.06
2020 OFL	37,600	n/a	0.01
2021 OFL	36,500	37,924	0.04
2020 ABC	31,600	n/a	0.00
2021 ABC	30,700	31,657	0.03





CHAPTER 11 OTHER FLATFISH

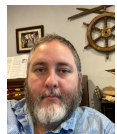
- New author: **yes**; change from base: **no**; risk table >1: **no**



Quantity*	Last asmt.	This asmt.	Change
M	0.154	0.156	0.01
2020 tier	5	n/a	none
2021 tier	5	5	none
Biomass	141,325	146,679	0.04
2021 FOFL	0.154	0.156	0.01
2021 FABC	0.116	0.117	0.01
2020 OFL	21,824	n/a	0.05
2021 OFL	21,824	22,919	0.05
2020 ABC	16,368	n/a	0.05
2021 ABC	16,368	17,189	0.05

*Instantaneous rates are biomass-weighted averages

- **The Team recommended that the author consider adding a secondary table, by species, to the risk table. This breakdown will highlight species specific concerns that can be tracked over time.**

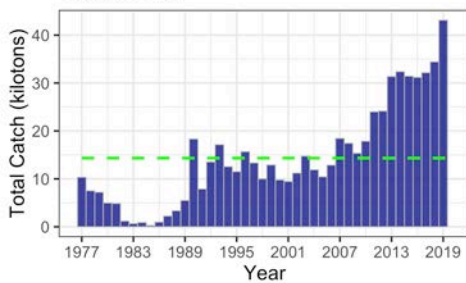




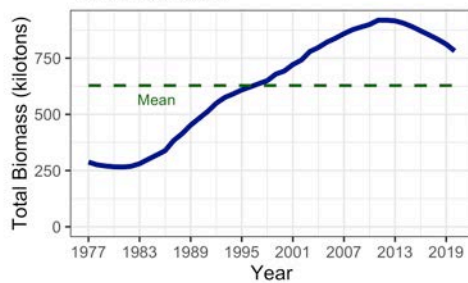
CHAPTER 12 PACIFIC OCEAN PERCH

- New author: **no**; change from base: **no**; risk table >1: **yes**

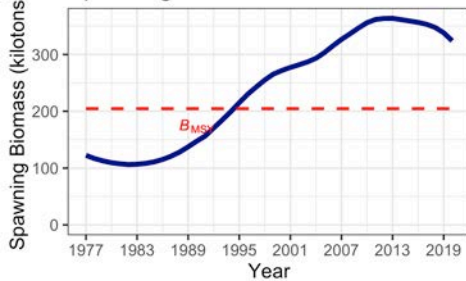
Total Catch



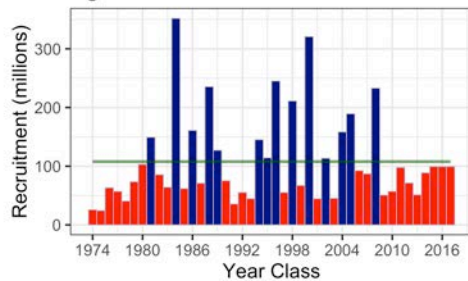
Total Biomass



Spawning Biomass



Age 3 Recruitment



Quantity	Last asmt.	This asmt.	Change
M	0.056	0.056	0.00
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	908,529	n/a	-0.17
2021 age+ biomass	885,439	756,011	-0.15
2020 spawning biomass	383,178	n/a	-0.19
2021 spawning biomass	367,062	310,036	-0.16
B100%	645,738	584,747	-0.09
B40%	258,295	233,899	-0.09
B35%	226,008	204,661	-0.09
2021 FOFL	0.095	0.089	-0.06
2021 FABC	0.079	0.073	-0.08
2020 OFL	58,956	n/a	-0.25
2021 OFL	56,589	44,376	-0.22
2020 ABC	48,846	n/a	-0.24
2021 ABC	46,885	37,173	-0.21

- The Team recommended investigating Francis weighting and trying different time blocks of natural mortality to help improve the fit to the Aleutian Islands survey index.

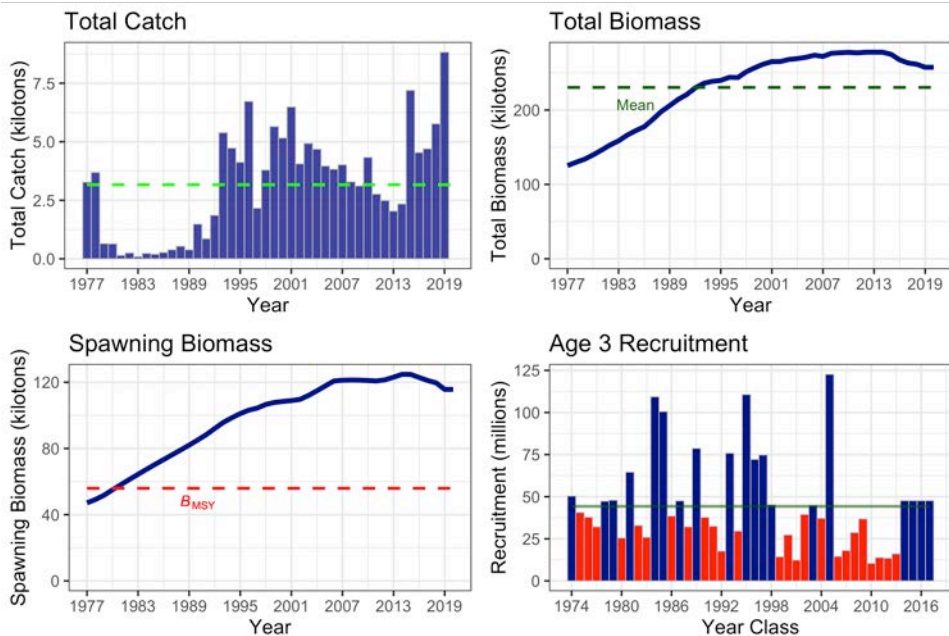




CHAPTER 13

NORTHERN ROCKFISH (PARTIAL)

- New author: **no**; change from base: **no**; risk table >1: **n/a**



Quantity	Last asmt.	This asmt.	Change
M	0.048	0.048	0.00
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	250,235	n/a	-0.02
2021 age+ biomass	246,384	244,600	-0.01
2020 spawning biomass	111,476	n/a	-0.04
2021 spawning biomass	108,063	107,003	-0.01
B100%	159,850	159,850	0.00
B40%	63,940	63,940	0.00
B35%	55,947	55,947	0.00
2021 FOFL	0.075	0.075	0.00
2021 FABC	0.061	0.061	0.00
2020 OFL	19,751	n/a	-0.04
2021 OFL	19,070	18,917	-0.01
2020 ABC	16,243	n/a	-0.04
2021 ABC	15,683	15,557	-0.01

02

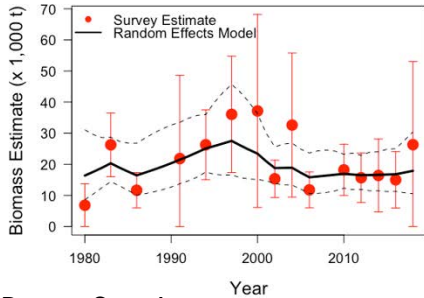




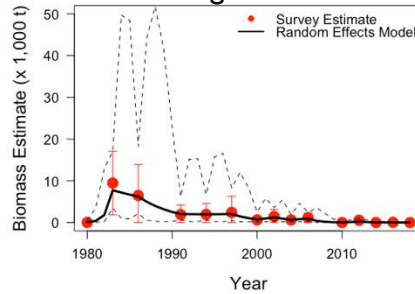
CHAPTER 15 SHORTRAKER ROCKFISH

- New author: **yes**; change from base: **no**; risk>1: **no**

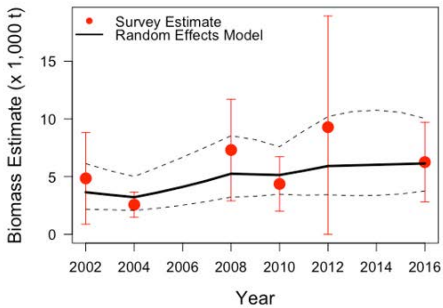
Aleutian Islands



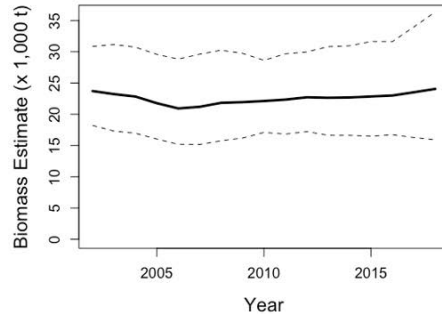
Southern Bering Sea



Bering Sea slope

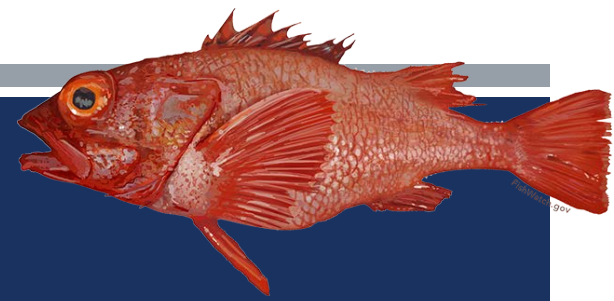


BSAI total



Quantity	Last asmt.	This asmt.	Change
M	0.030	0.030	0.00
2020 tier	5	n/a	none
2021 tier	5	5	none
Biomass	24,055	24,055	0.00
2021 FOFL	0.030	0.030	0.00
2021 FABC	0.0225	0.0225	0.00
2020 OFL	722	n/a	0.00
2021 OFL	722	722	0.00
2020 ABC	541	n/a	0.00
2021 ABC	541	541	0.00





CHAPTER 16 OTHER ROCKFISH

- New author: **yes**; change from base: **no**; risk table >1: **yes**

- The Team recommended that the author work in collaboration with other authors to consider issues with the Tier 5 model process for stocks.
- The Team recommended that the author consult with other rockfish assessment authors to consider revising M for the non-SST portion of the population in future assessments.
- The Team recommended that the author do more spatial analysis of AI catch of non-SST rockfish.

Quantity*	Last asmt.	This asmt.	Change
M	0.034	0.033	-0.02
2020 tier	5	n/a	none
2021 tier	5	5	none
Biomass	53,290	53,248	0.00
2021 FOFL	0.034	0.033	-0.02
2021 FABC	0.025	0.025	-0.02
2020 OFL	1,793	n/a	-0.02
2021 OFL	1,793	1,751	-0.02
2020 ABC	1,344	n/a	-0.02
2021 ABC	1,344	1,313	-0.02

*Instantaneous rates are biomass-weighted averages

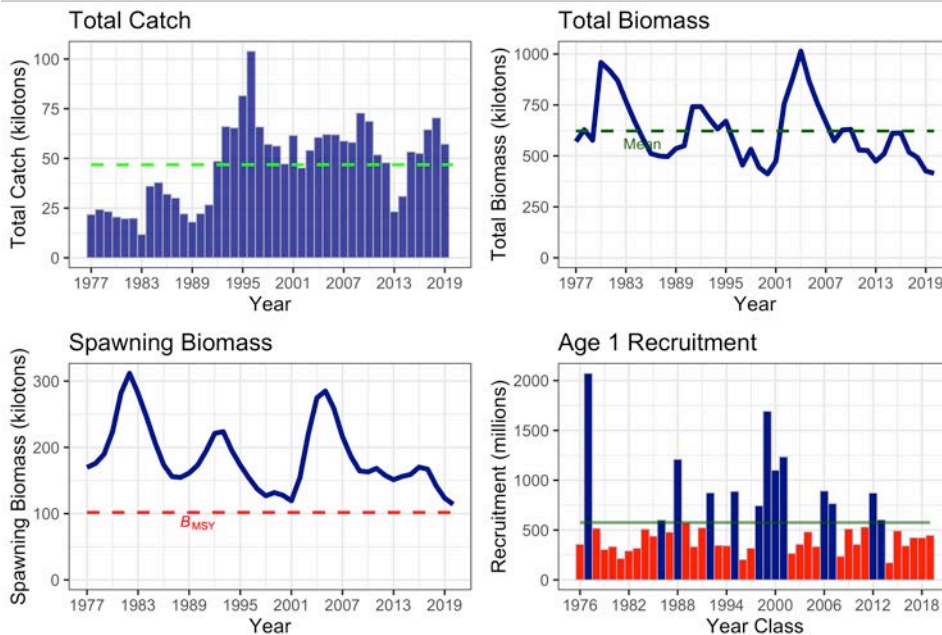




CHAPTER 17

ATKA MACKEREL

- New author: **no**; change from base: **no**; risk>1: **no**

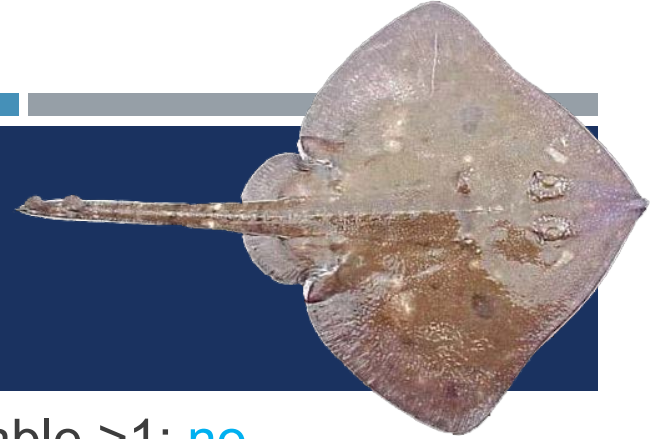


Quantity	Last asmt.	This asmt.	Change
M	0.30	0.30	0.00
2020 tier	3b	n/a	none
2021 tier	3b	3b	none
2020 age+ biomass	515,890	n/a	0.09
2021 age+ biomass	534,220	560,360	0.05
2020 spawning biomass	109,900	n/a	-0.02
2021 spawning biomass	104,700	107,830	0.03
B100%	291,780	290,820	0.00
B40%	116,600	116,330	0.00
B35%	102,020	101,790	0.00
2021 FOFL	0.46	0.51	0.11
2021 FABC	0.39	0.43	0.10
2020 OFL	81,200	n/a	0.05
2021 OFL	74,800	85,580	0.14
2020 ABC	70,100	n/a	0.05
2021 ABC	64,400	73,590	0.14

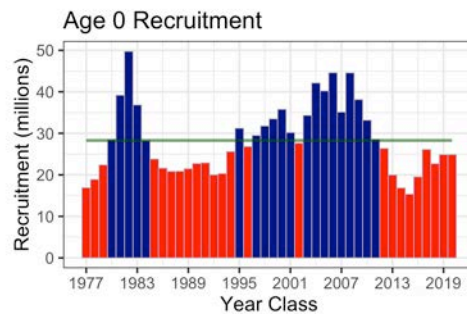
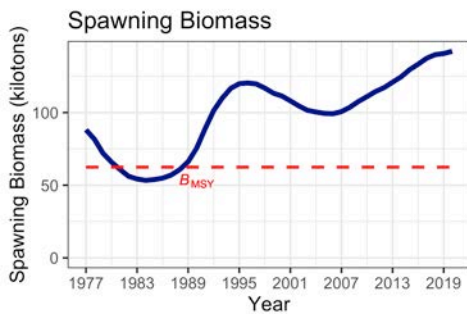
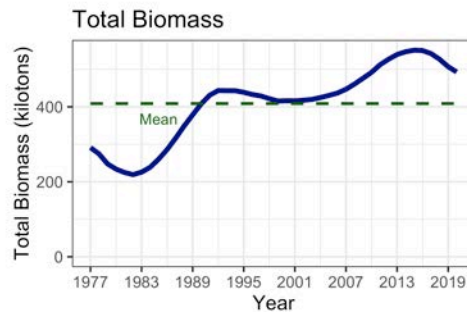
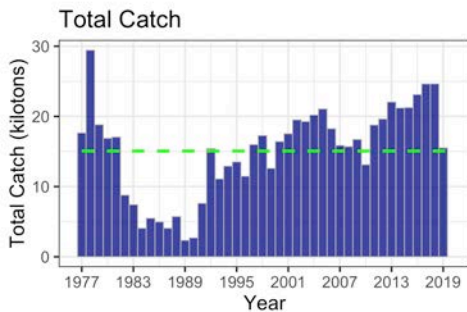


CHAPTER 18 - SKATES

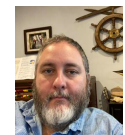
ALASKA SKATE - SUMMARY



- New author: **no**; change from base: **no**; risk table >1: **no**

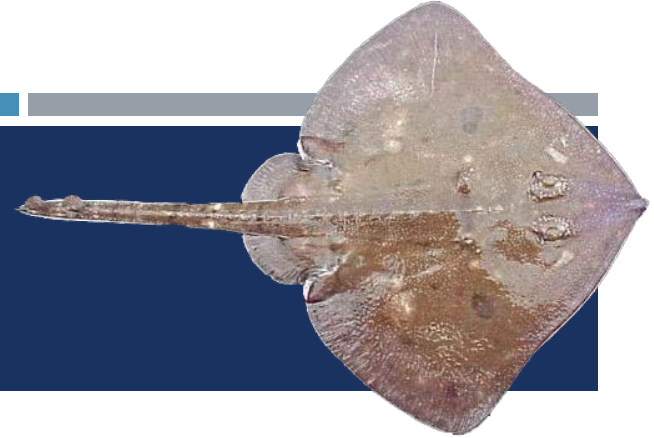


Quantity (Alaska skate)	Last asmt.	This asmt.	Change
M	0.13	0.13	0.00
2020 tier	3a	n/a	none
2021 tier	3a	3a	none
2020 age+ biomass	491,974	n/a	0.03
2021 age+ biomass	478,477	504,691	0.05
2020 spawning biomass	117,973	n/a	0.05
2021 spawning biomass	114,985	123,390	0.07
B100%	177,761	178,425	0.00
B40%	71,105	71,370	0.00
B35%	62,217	62,449	0.00
2021 FOFL	0.094	0.092	-0.02
2021 FABC	0.081	0.079	-0.02
2020 OFL	37,813	n/a	0.02
2021 OFL	36,310	38,580	0.06
2020 ABC	32,559	n/a	0.02
2021 ABC	31,264	33,219	0.06



CHAPTER 18 - SKATES

OTHER SKATE - SUMMARY



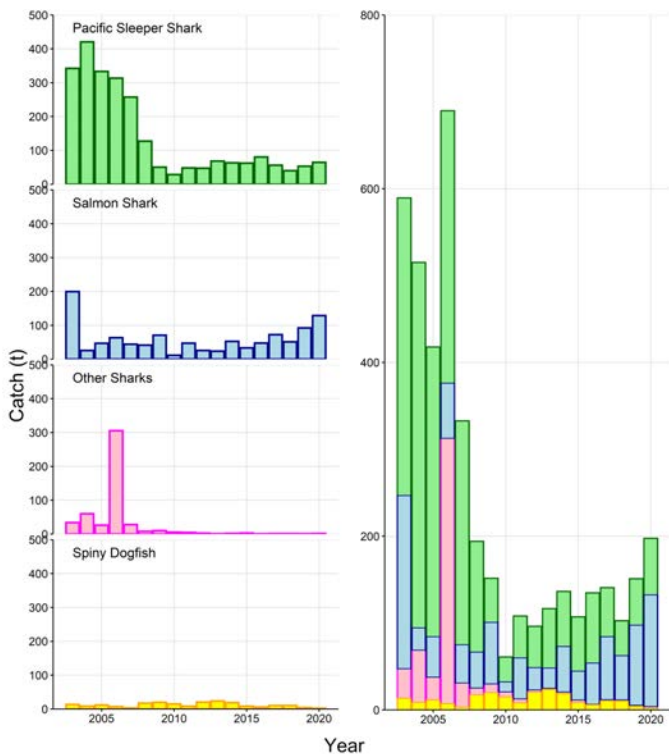
Quantity (other skates)	Last asmt.	This asmt.	Change
M	0.10	0.10	0.00
2020 tier	5	n/a	none
2021 tier	5	5	none
Biomass	119,787	107,174	-0.11
2021 FOFL	0.10	0.10	0.00
2021 FABC	0.075	0.075	0.00
2020 OFL	11,979	n/a	-0.11
2021 OFL	11,979	10,717	-0.11
2020 ABC	8,984	n/a	-0.11
2021 ABC	8,984	8,038	-0.11





CHAPTER 19 SHARKS

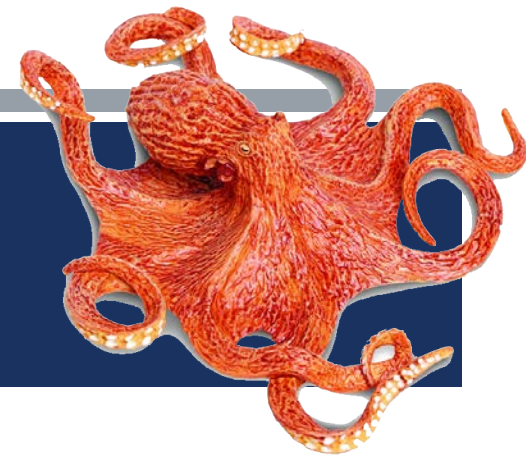
- New author: **no**; change from base: **no**; risk table >1: **yes**



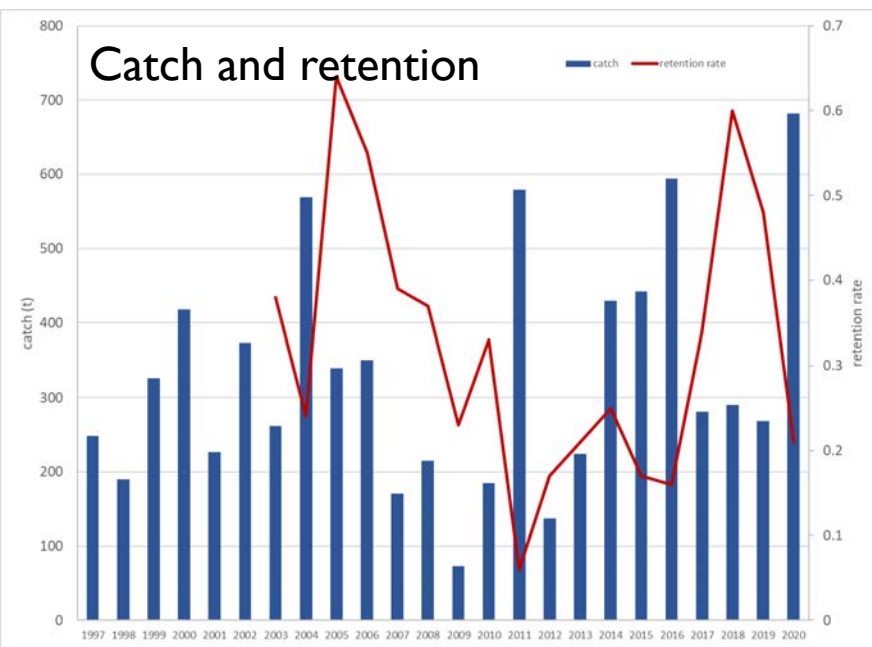
Quantity	Last asmt.	This asmt.	Change
2020 tier	6	n/a	none
2021 tier	6	6	none
2020 OFL	689	n/a	0.00
2021 OFL	689	689	0.00
2020 ABC	517	n/a	0.00
2021 ABC	517	517	0.00



CHAPTER 22 OCTOPUS



- New author: **no**; change from base: **no**; risk>1: **no**



Quantity	Last asmt.	This asmt.	Change
2020 tier	6	n/a	none
2021 tier	6	6	none
2020 OFL	4,769	n/a	0.00
2021 OFL	4,769	4,769	0.00
2020 ABC	3,576	n/a	0.00
2021 ABC	3,576	3,576	0.00

