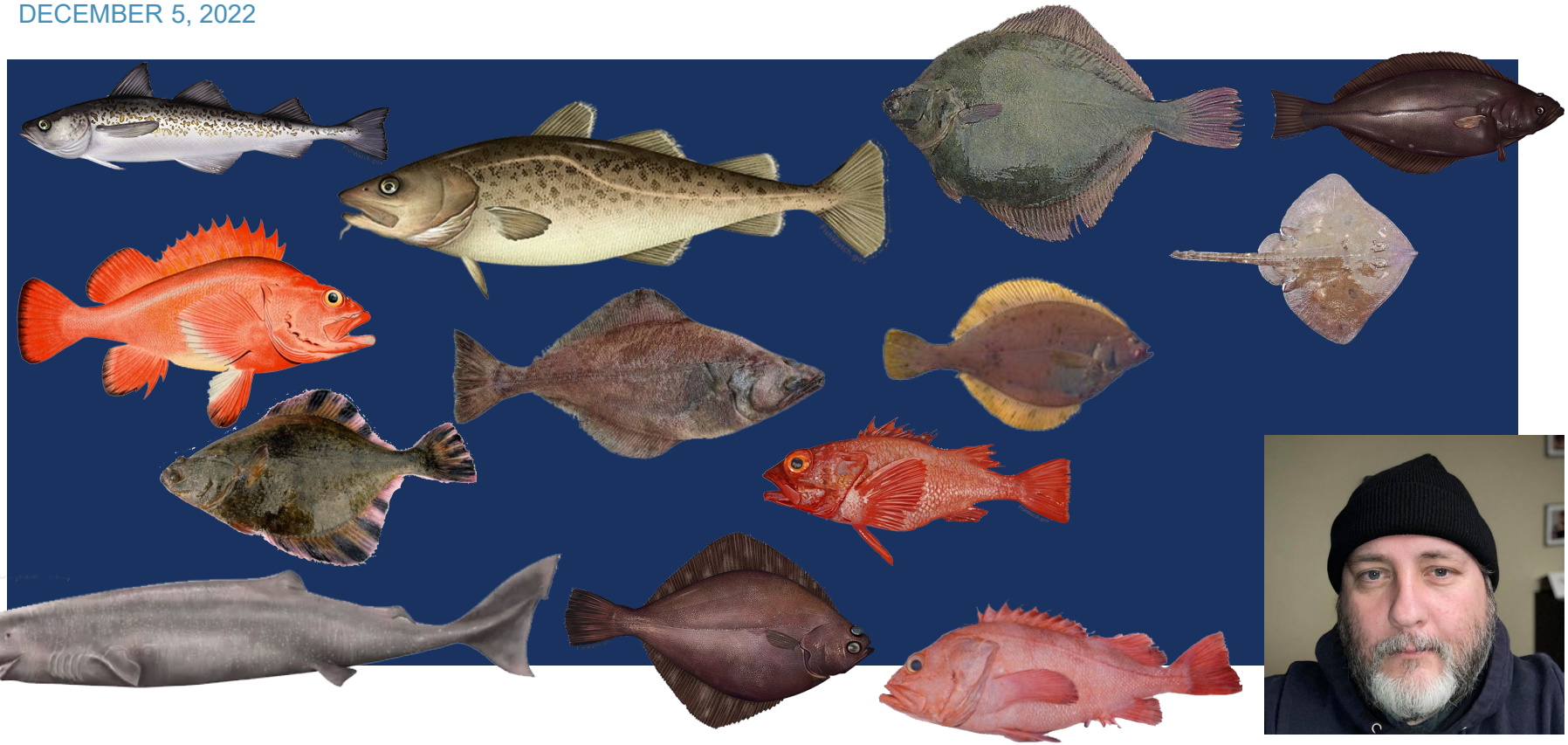
REPORT OF THE NOVEMBER 2022 BSAI GROUNDFISH PLAN TEAM MEETING

STEVE BARBEAUX (CO-CHAIR), KALEI SHOTWELL (CO-CHAIR), CINDY TRIBUZIO (VICE-CHAIR). DIANA STRAM (COORDINATOR)

DECEMBER 5, 2022



BSAI PLAN TEAM MEETING OVERVIEW

- Dates: November 14-18
- Place: Hybrid - AFSC in Seattle/Virtual
- Leaders: Steve Barbeaux, Kalei Shotwell (co-chairs); Cindy Tribuzio (vice-chair); Diana Stram (coordinator)
- Participation:
  - **Caitlin Akeselrud (AFSC RACE)**
  - Mary Furuness (NMFS AKRO)
  - Allan Hicks (IPHC)
  - Lisa Hillier (WDFW)
  - Kirstin Holsman (AFSC REFM)
  - Phil Joy (ADF&G)
  - Andy Kingham (AFSC FMA)
  - **Beth Matta (AFSC REFM)**
  - **Andy Seitz (UAF)**
  - **Michael Smith (AFSC REFM)**
  - **Jane Sullivan (AFSC)**
  - AFSC and AKRO staff and members of the public

BERING SEA AND ALEUTIAN ISLANDS BIG PICTURE

- Assessments of 22 stocks/complexes (17 **full**, 5 partial; 1 “none”)
  - Compared to 17 last year (8 full, 9 partial; 6 “none”)
- Total of 37 models, including Tier 5/6 methods (same as last year):
  - 20 base models/methods (down 5 from last year)
  - 17 additional models/methods
- The Team agreed with authors’ recommendations regarding preferred models/methods and harvest specifications in all but one stock (sharks)
- Reductions from maximum permissible ABC recommended in 5 stocks
- Of the 15 stocks/complexes in Tiers 1 or 3, only 2 are in sub-tier “b”
- No stocks/complexes were subjected to overfishing in 2021, and no Tier 1 or 3 stocks/complexes are overfished/approaching as of 2022
- 27 Team recommendations

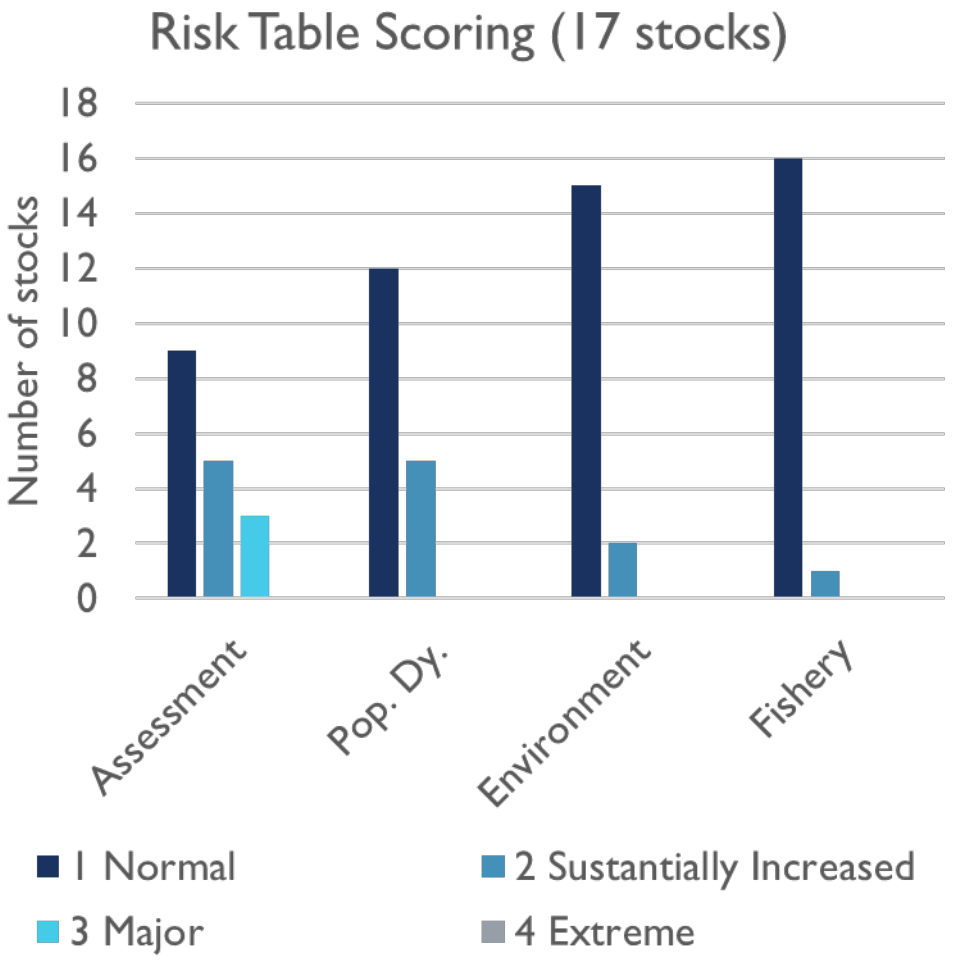
BERING SEA AND ALEUTIAN ISLANDS BIG PICTURE (TINY FONT)

Chapter	Assessment	Author	Tier	Type	Risk*	% Red.
1	Eastern Bering Sea pollock	Ianelli	1a	Full	2,2,1,1	**43%**
1B	Bogoslof Island Pollock	Ianelli	5	Full	1,1,1,NA	
1A	Aleutian Islands pollock	Barbeaux	3a	Full	1,1,1,1	
2	Eastern Bering Sea Pacific Cod	Barbeaux	**3b**	Full	1,1,1,1	
2A	Aleutian Islands Pacific cod	Spies	5	Full	1,2,2,1	
3	Sablefish	Goethel	3a	Full	1,1,1,1	
4	Yellowfin sole	Spies	1	Full	1,1,1,1	
5	Greenland Turbot	Bryan	3a	Full	2,2,1,1	**6%**
6	Arrowtooth flounder	Shotwell	3a	Full	1,1,1,1	
7	Kamchatka flounder	Bryan	3a	Full	2,1,1,1	
8	Northern Rock sole	McGilliard	1a	Full	3,1,1,1	**23%**
9	Flathead sole	Kapur	3a	Partial	NA	
10	Alaska plaice	Monnahan/Sullivan	3a	Partial	NA	
11	Other flatfish	NA	5	None	NA	
12	Pacific ocean perch	Spencer	3a	Full	2,1,1,1	
13	Northern rockfish	Spencer	3a	Partial	NA	
14	Blackspotted & rougheye rockfish	Spencer	**3b**/5	Full	3,2,1,2	**12%**
15	Shortraker rockfish	Shotwell	5	Full	1,1,1,1	
16	Other rockfish	Sullivan	5	Full	1,1,1,1	
17	Atka mackerel	Lowe	3	Full	2,1,2,1	
18	Skates	Ianelli/Tribuzio	3a/5	Partial	NA	
19	Sharks	Tribuzio	6	Full	3,2,1,1	**13%**
22	Octopus	Rodgveller/Lowe	6	Partial	NA	

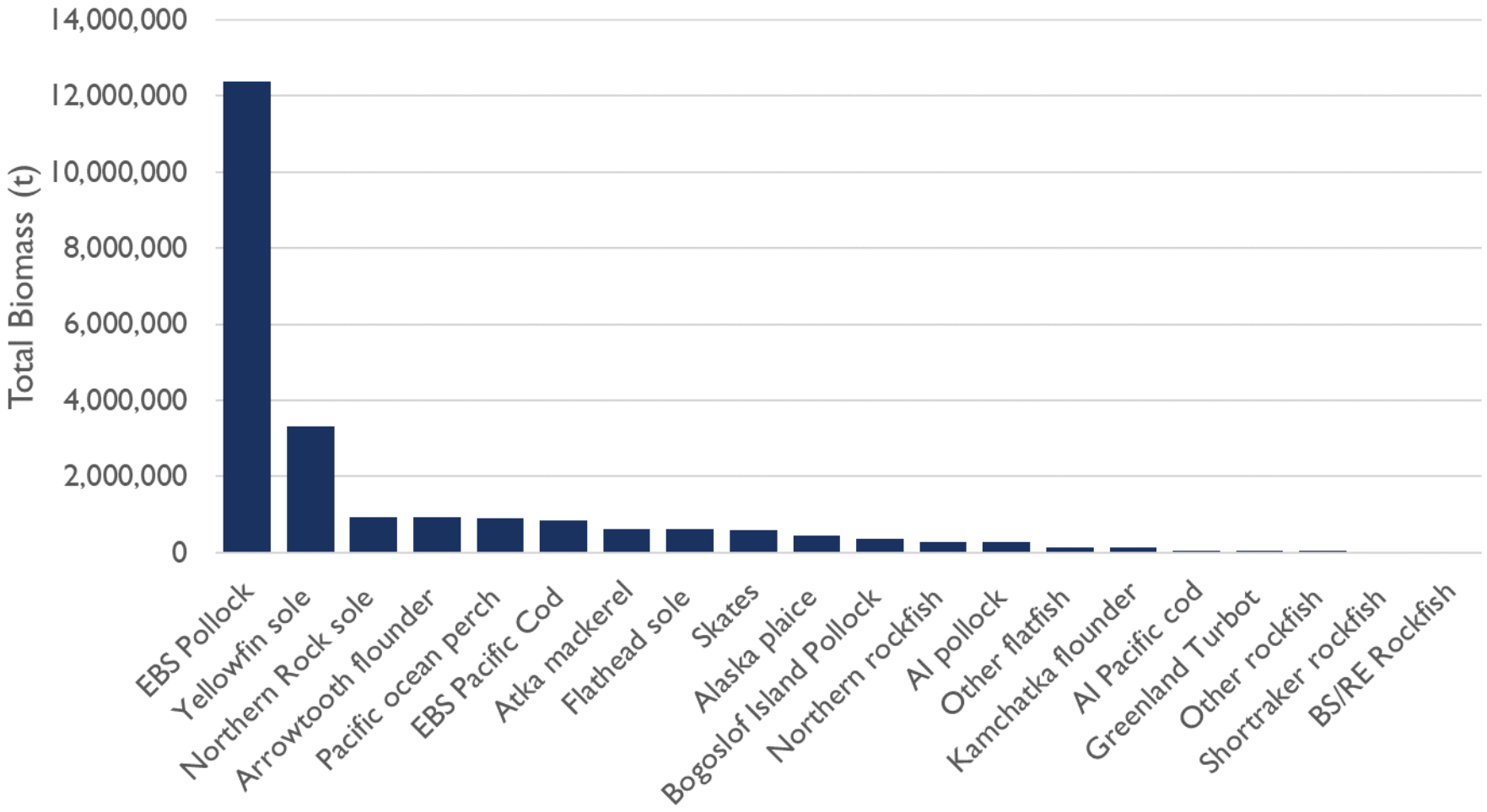
* Assessment, Pop Dy., Environment, Fishery

BERING SEA AND ALEUTIAN ISLANDS RISK TABLE AND REDUCTIONS

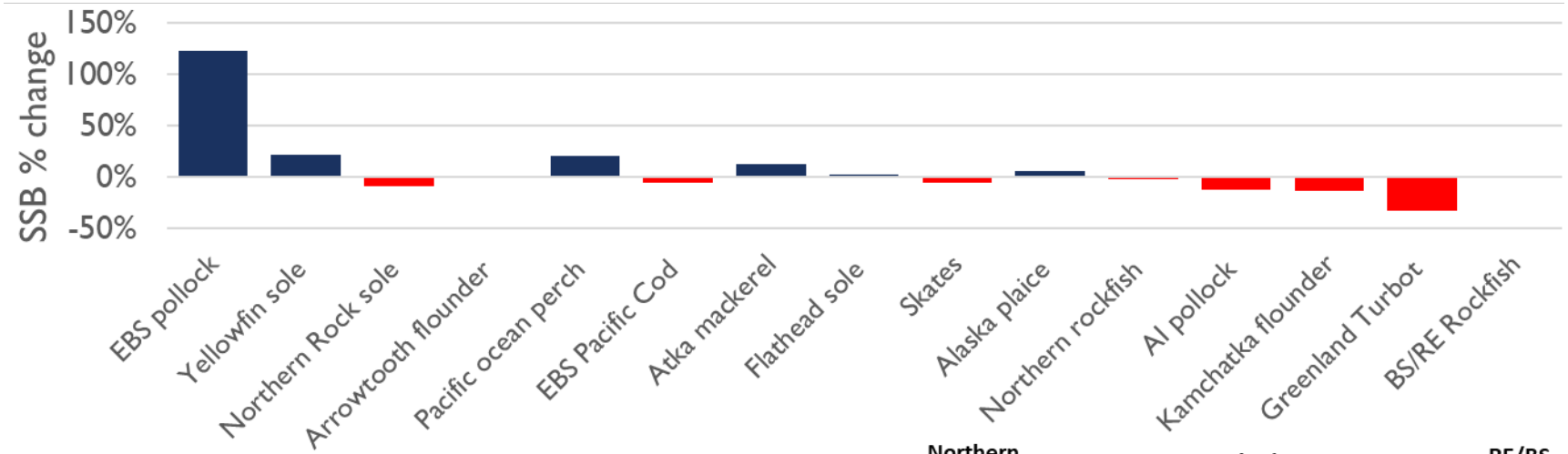
- All 5 recommendations for reduction from maximum permissible ABC were in response to elevated assessment concerns
- 4 of the 5 reductions were in agreement with recommendations from the authors
- 1 reduction was recommended as the author's choice of models was not accepted (shark) which elevated assessment concerns

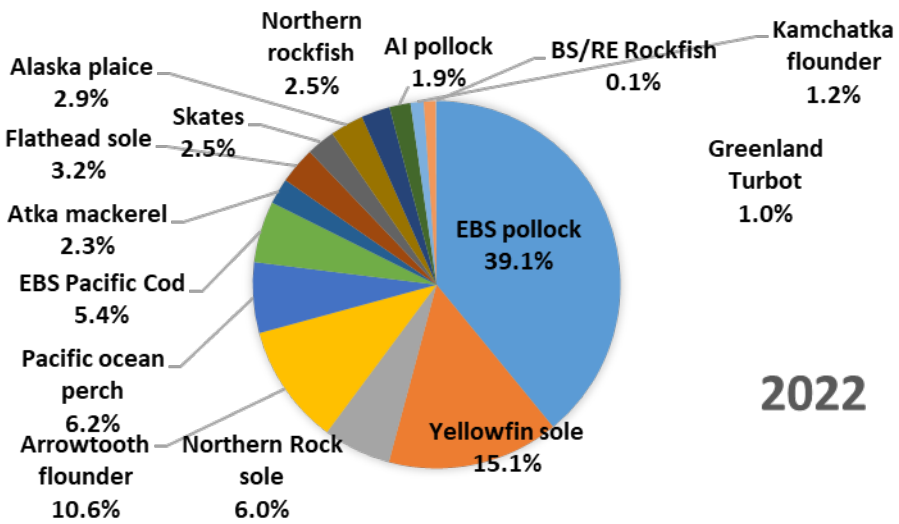


BERING SEA AND ALEUTIAN ISLANDS TOTAL BIOMASS (TIER 1, 3, AND 5)

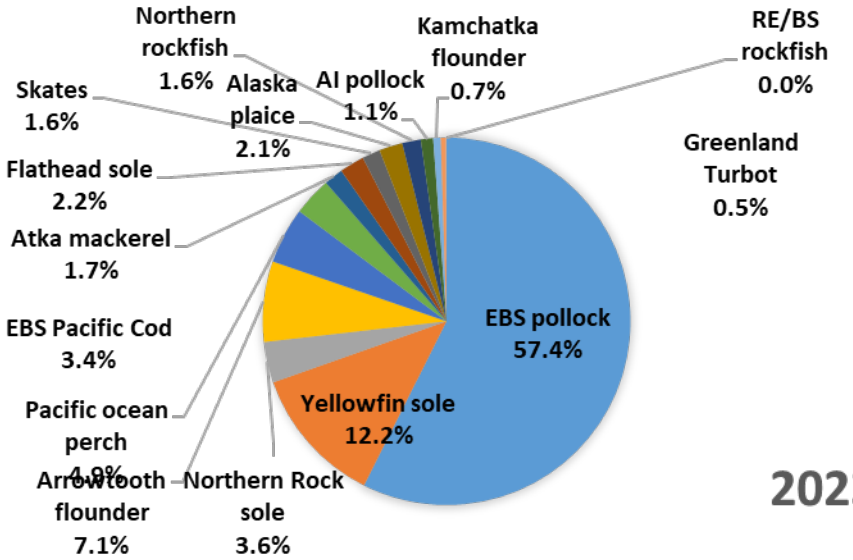


BERING SEA AND ALEUTIAN ISLANDS SPAWNING BIOMASS (TIERS 1 AND 3)



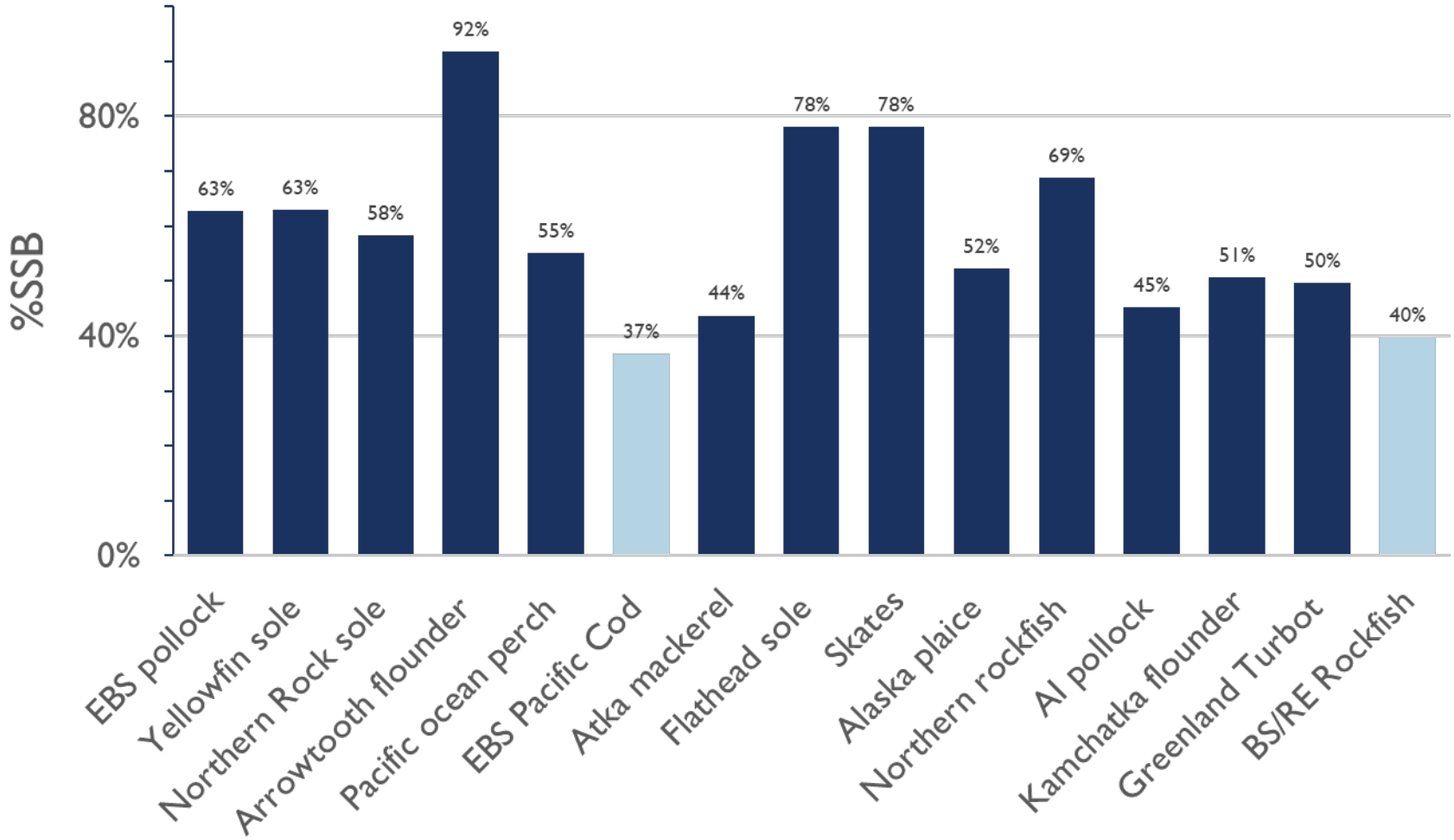


2022

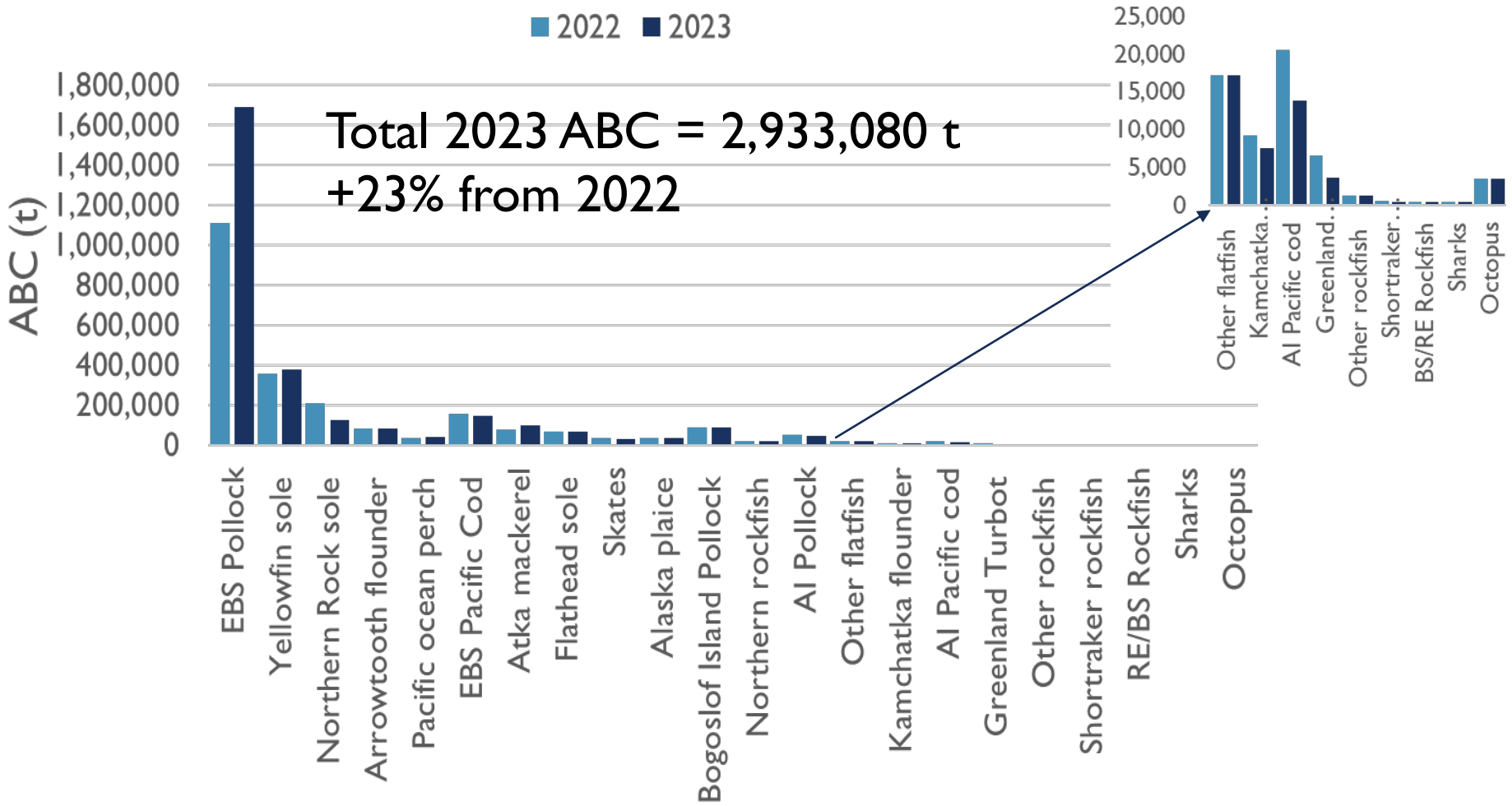


2023

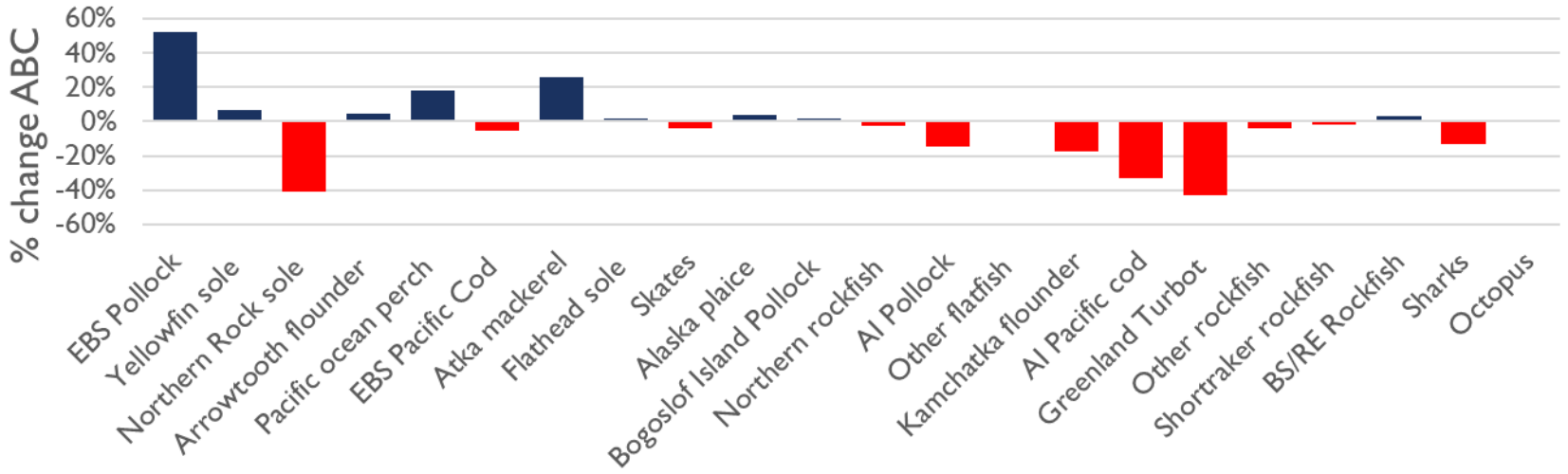
BERING SEA AND ALEUTIAN ISLANDS SPAWNING BIOMASS (TIERS 1 AND 3)

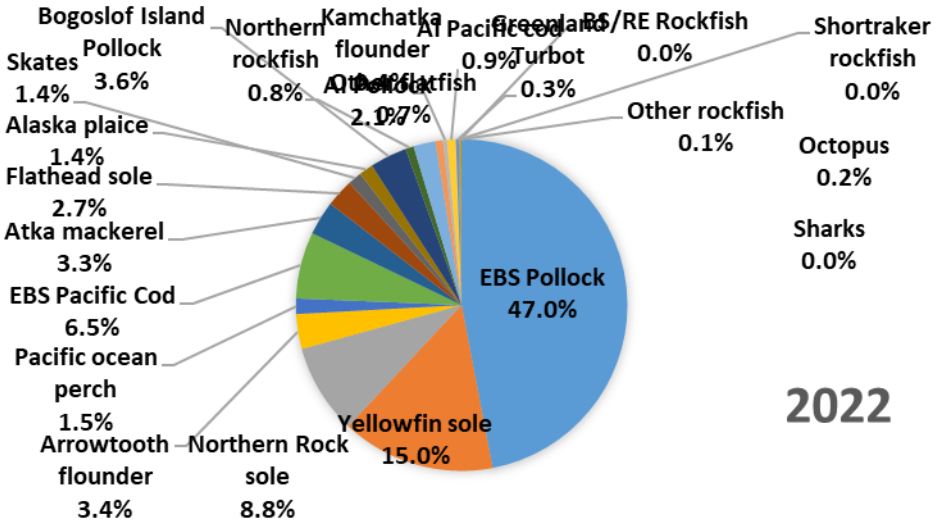


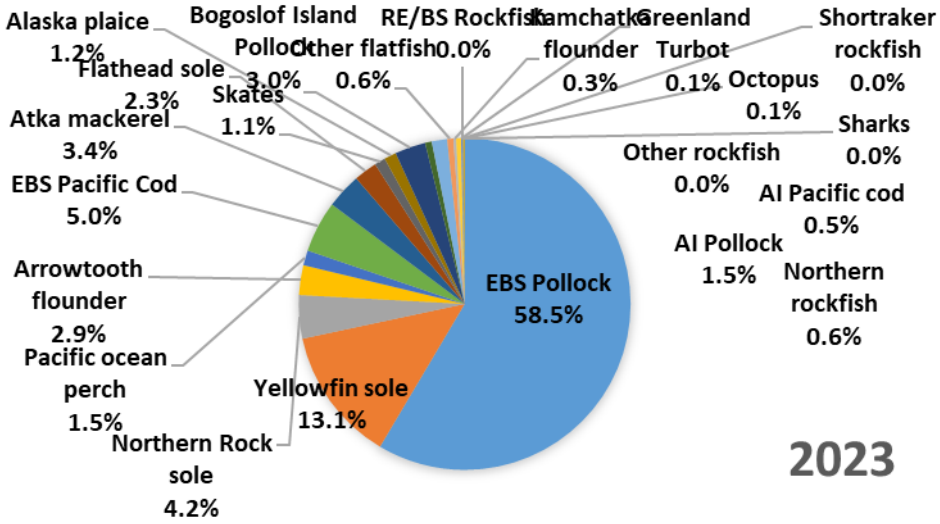
BERING SEA AND ALEUTIAN ISLANDS ALLOWABLE BIOLOGICAL CATCH (ABC)



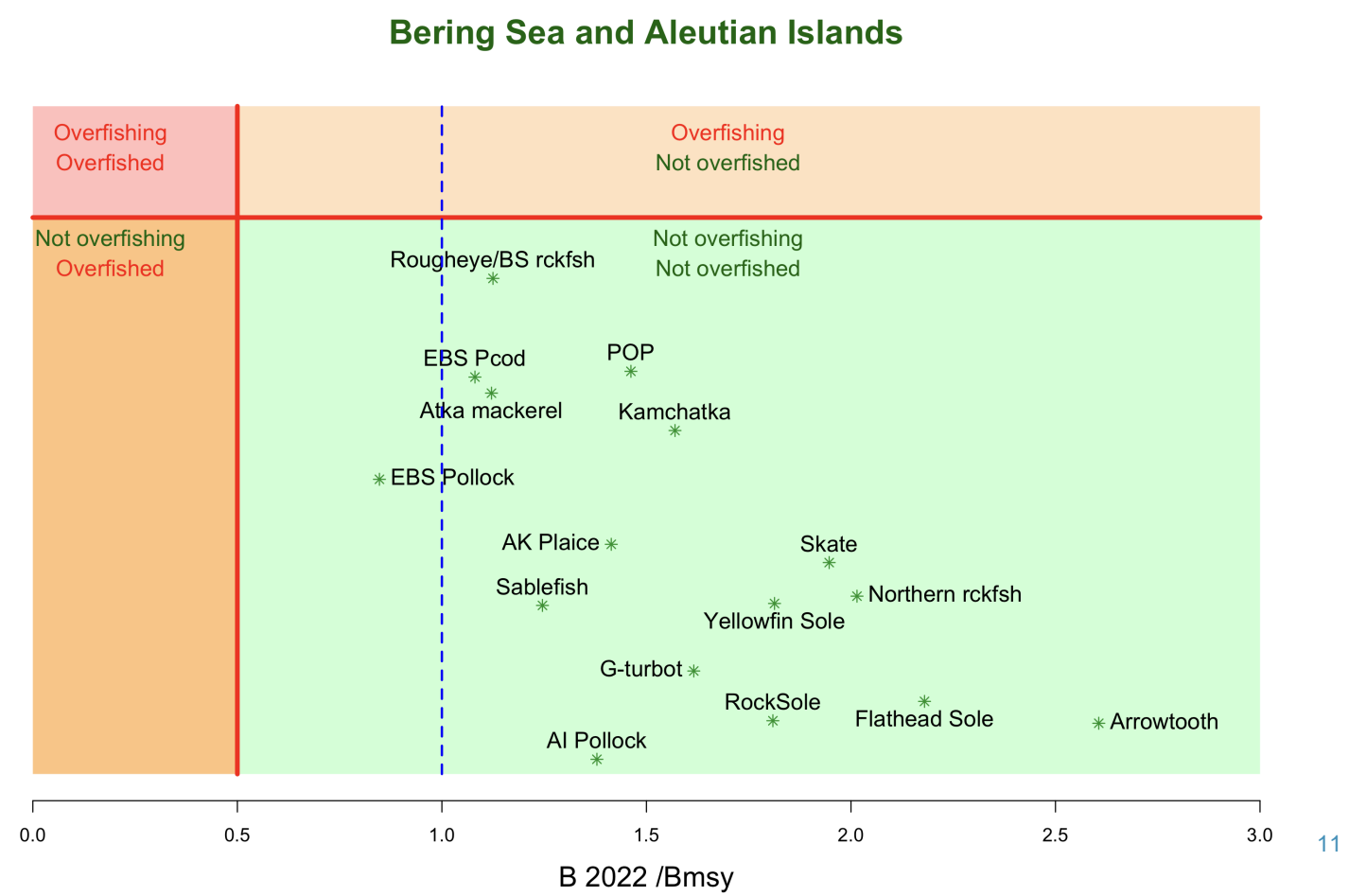
BERING SEA AND ALEUTIAN ISLANDS CHANGE IN 2023 ABC *PROJECTION*



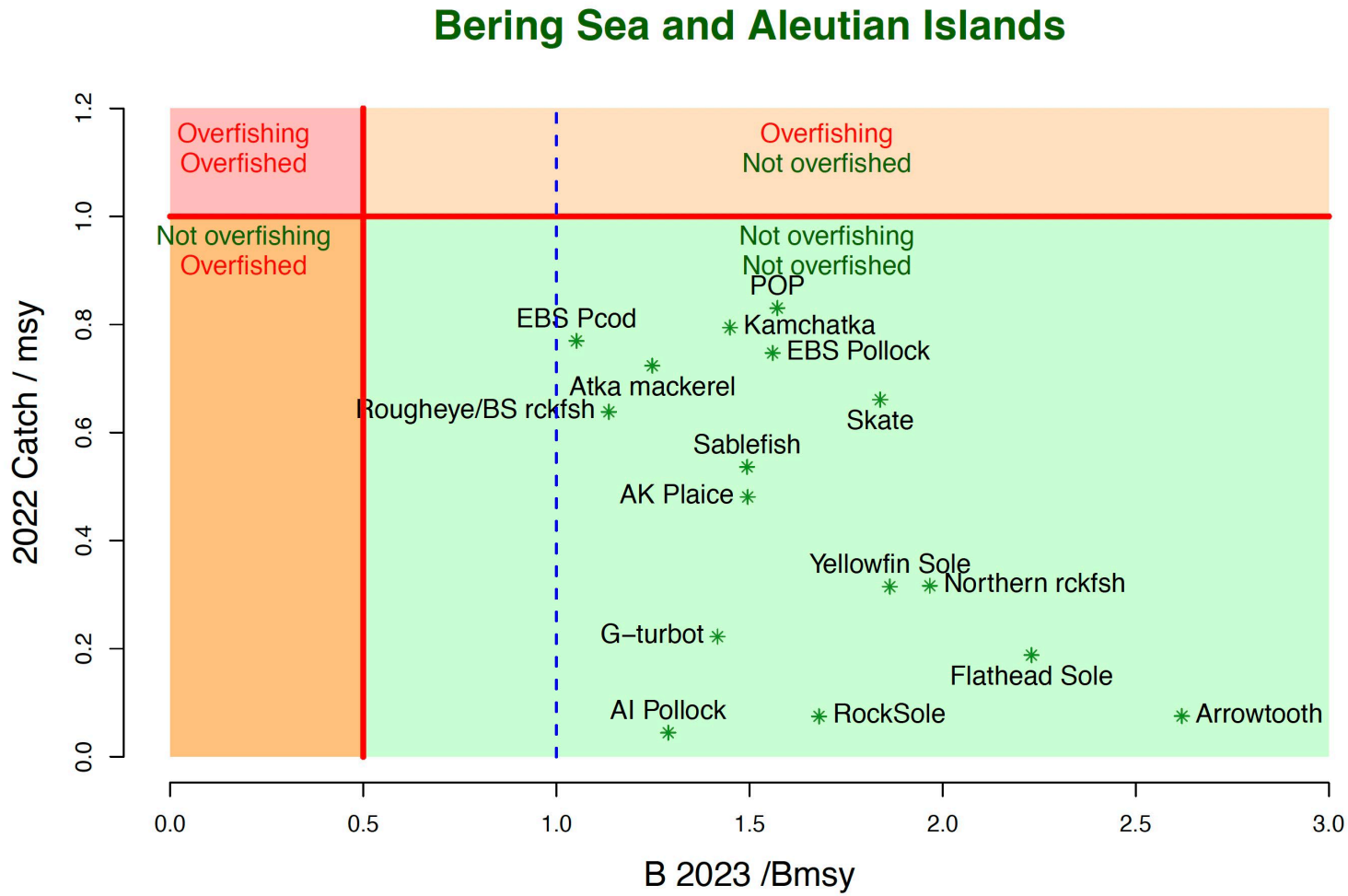




BERING SEA AND ALEUTIAN ISLANDS
BIG PICTURE – STOCK STATUS



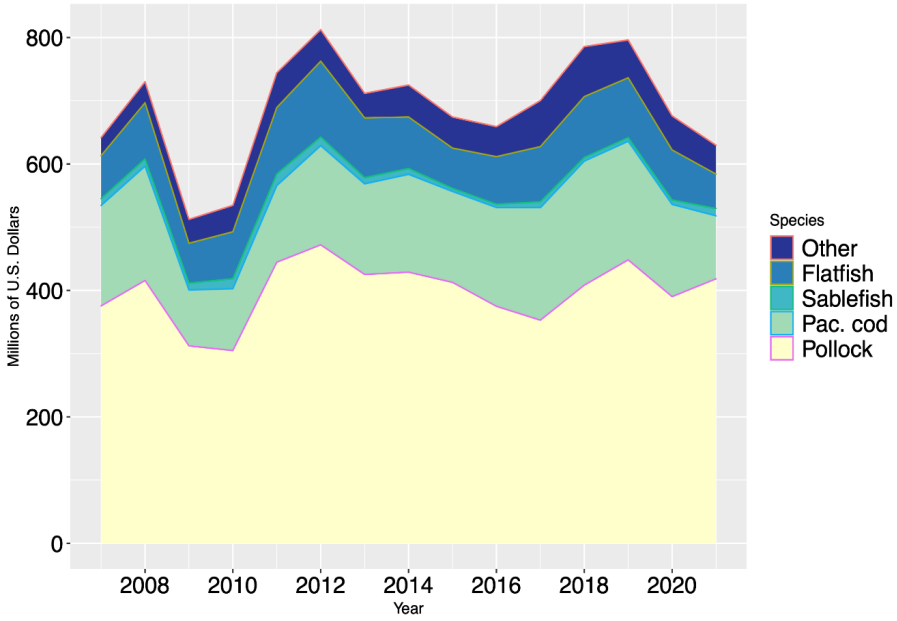
BERING SEA AND ALEUTIAN ISLANDS BIG PICTURE – STOCK STATUS

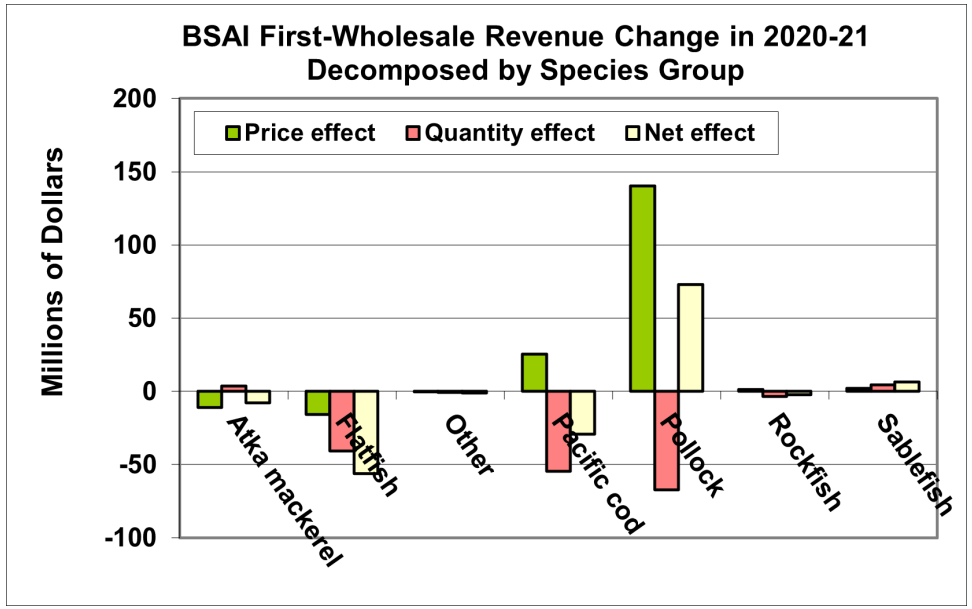


BERING SEA AND ALEUTIAN ISLANDS BIG PICTURE – ECONOMICS

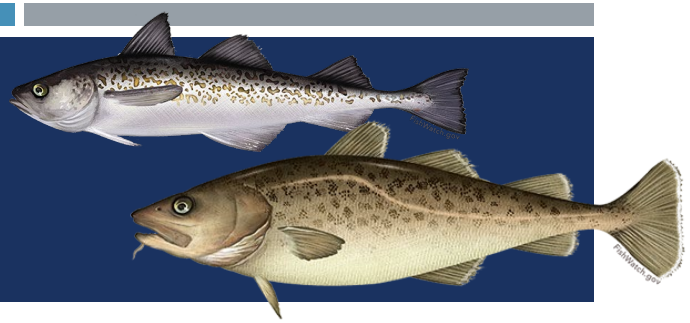
- Continued overall decrease in value of BSAI harvested species from 2020 to 2021

Real ex-vessel value





POLLOCK AND PACIFIC COD SUMMARY

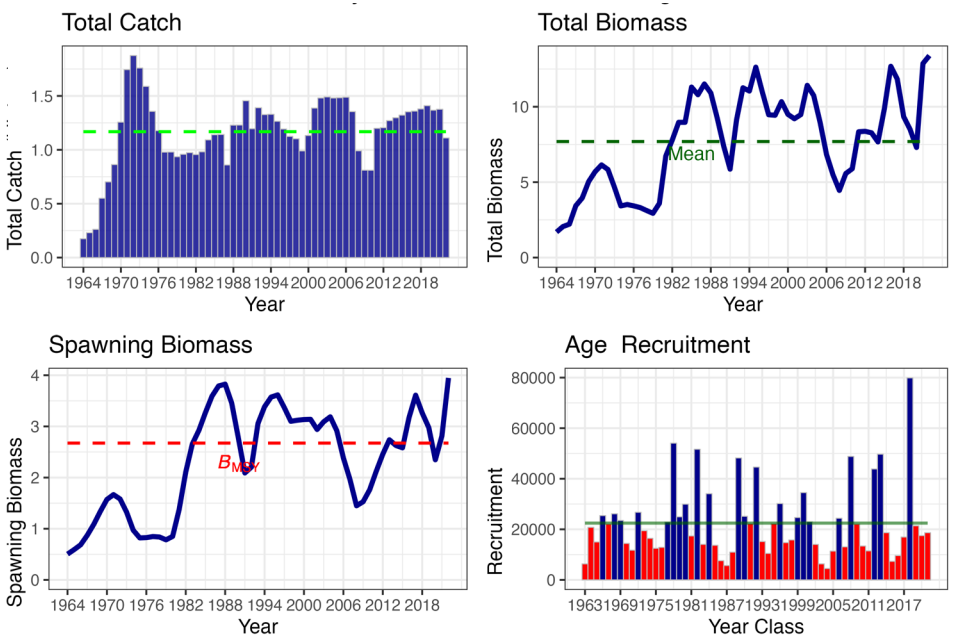


Stock	Tier	2023 ABC (t)	2023 OFL (t)	Change from 2022 ABC
EBS Pollock	1a	**1,688,000*(43%)**	3,381,000	52%
AI pollock	3a	43,413	52,383	-14%
Bogoslof poll.	5	86,360	115,1460	1%
EBS Pacific cod	3b	144,834	172,495	-6%
AI Pacific cod	5	13,812	18,416	-33%

***xx% Reduced from maximum permissible ABC**

CHAPTER 1
EBS WALLEYE POLLOCK

- New model(s): yes; change from base: yes; risk table (2,2,1,1)
- Authors presentation



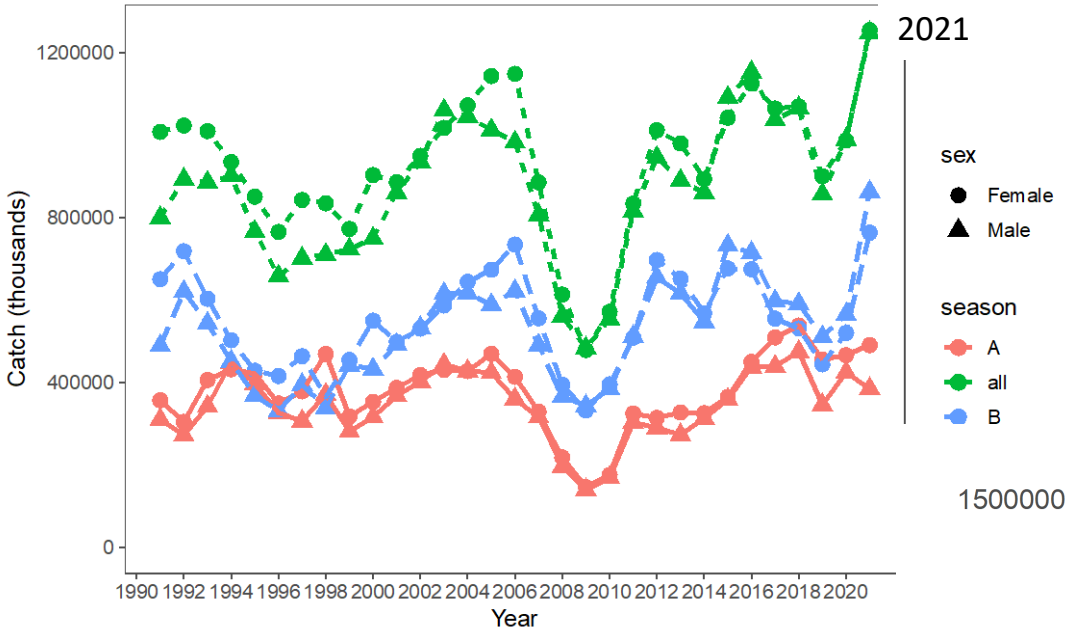
Quantity	Last asmt.	This asmt.	Change
M	0.3	0.3	0%
2022 Tier	1b		
2023 Tier	1b	1a	
2022 age+ biomass	6,839,000		81%
2023 age+ biomass	6,969,000	12,389,000	78%
2022 spawning biomass	1,881,000		122%
2023 spawning biomass	1,905,000	4,171,000	119%
B_0	5,575,000	6,653,000	16%
B_{msy}	2,220,000	2,674,000	20%
2023 F_{OFL}	0.392	0.491	25%
2023 F_{ABC}	0.314	0.365	16%
2022 OFL	1,469,000		130%
2023 OFL	1,704,000	3,381,000	98%
2022 ABC	1,111,000		52%
2023 ABC	1,289,000	1,688,000	31%

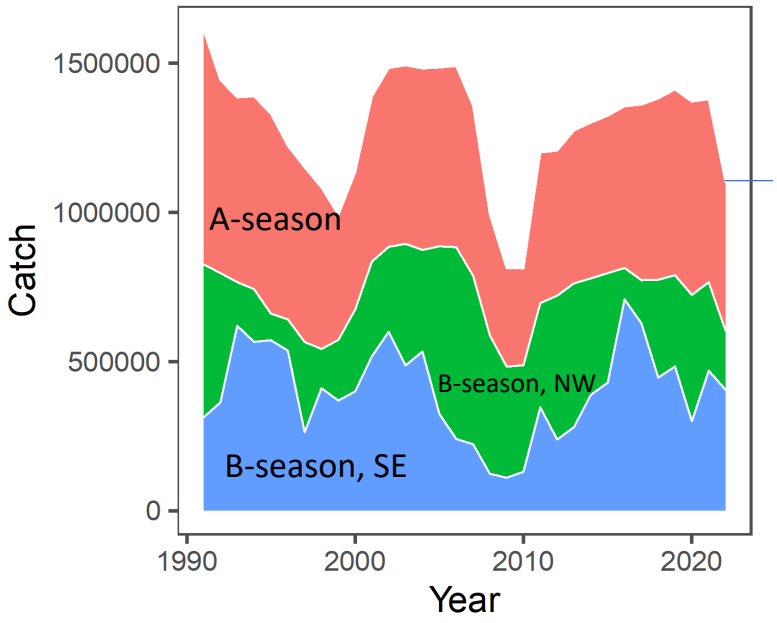
Stock assessment work for Alaska pollock in the Eastern Bering Sea

Jim Ianelli, Taina Honkalehto, Sarah Stienessen, E. Siddon, Caitlin Allen-Akselrud

Alaska Fisheries Science Center

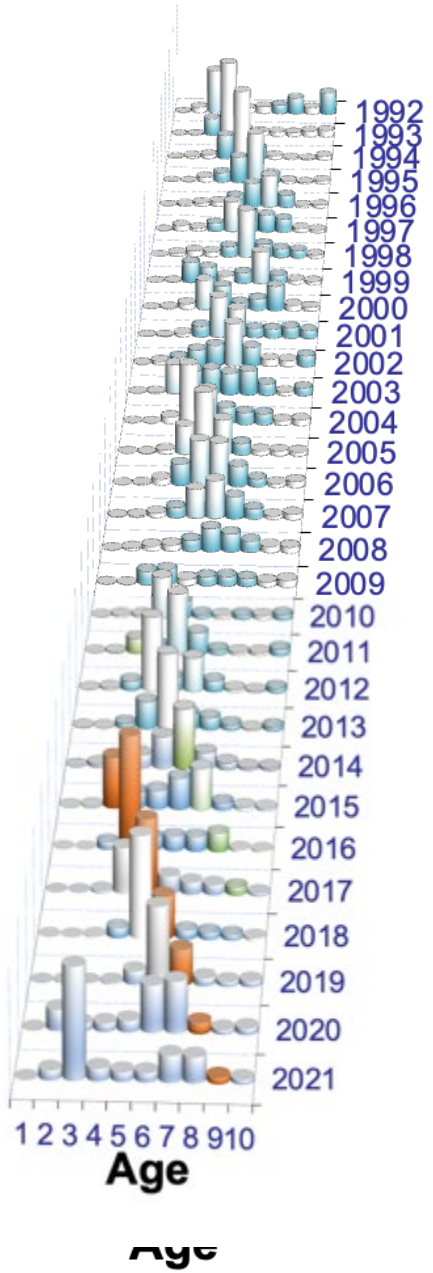
Fishery catches

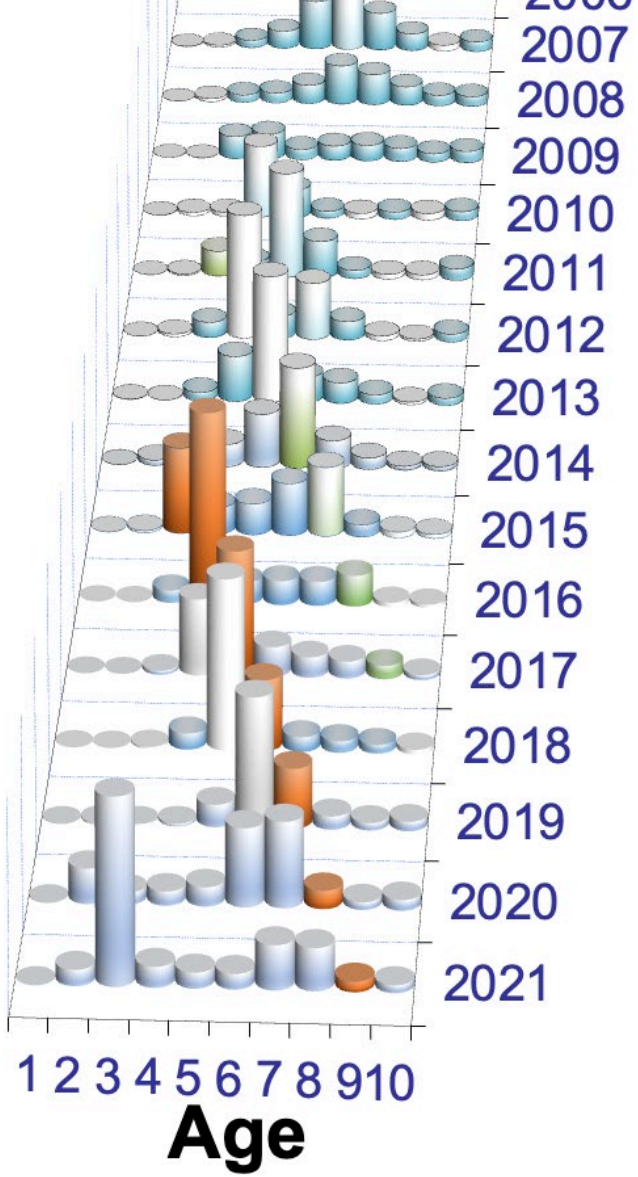




2022
(1.11 million t)

Fishery catch-at-age




2007
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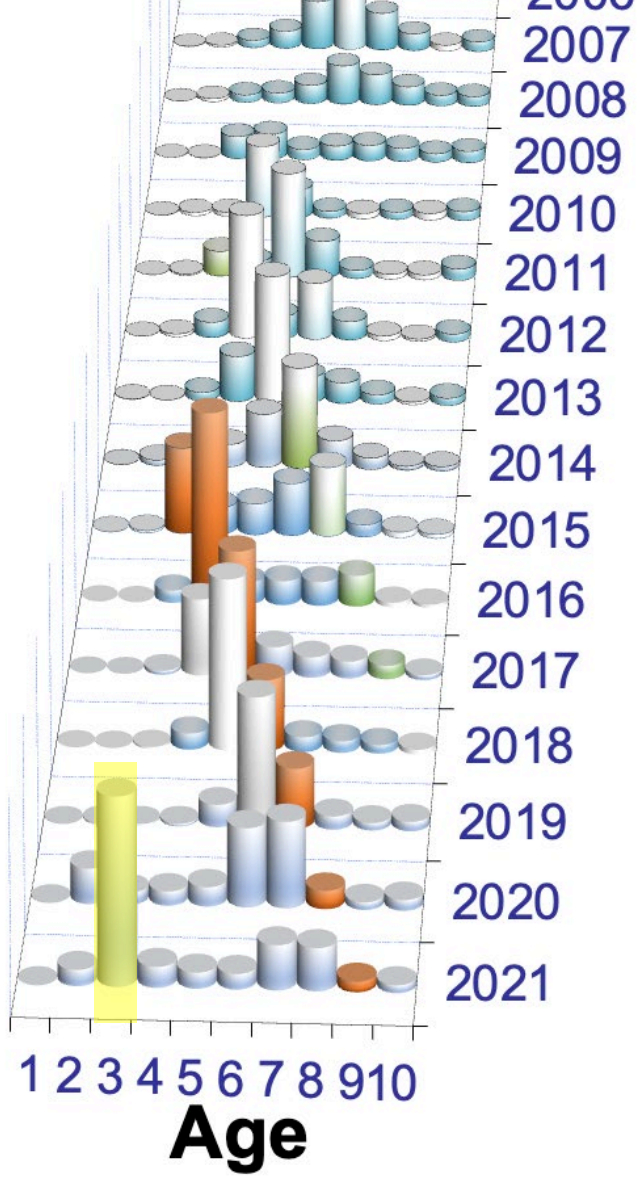
2019
2020
2021
1 2 3 4 5 6 7 8 9 10
Age

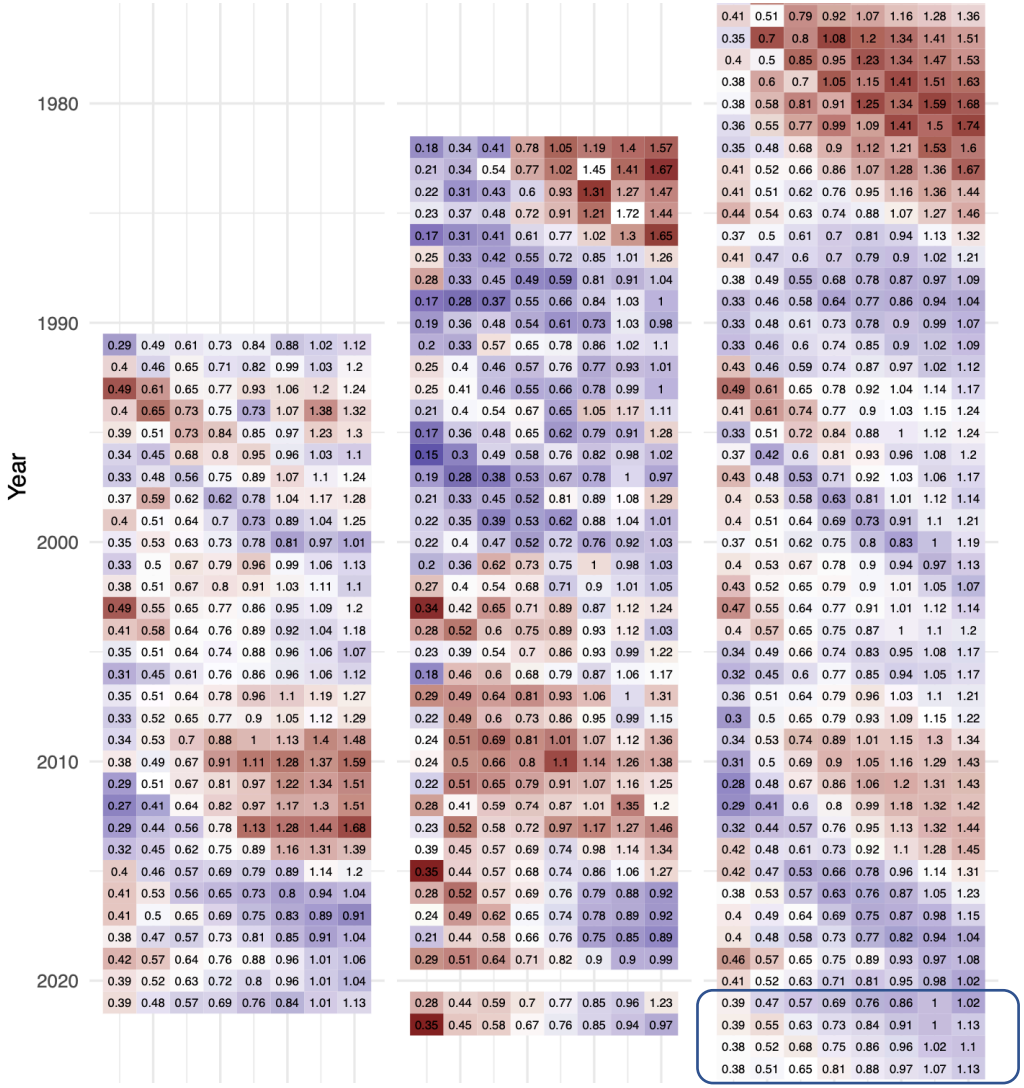


2021 New information

Eastern Bering Sea pollock

Historical wt-age

- And projected…



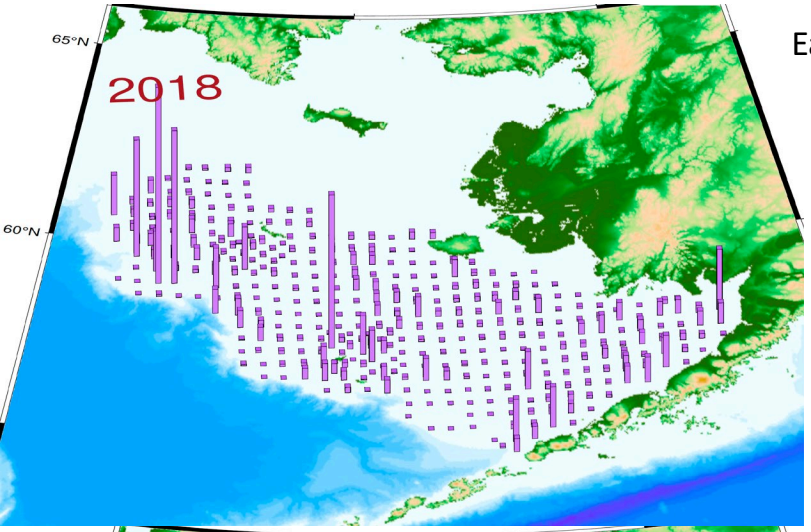
Eastern Bering Sea pollock

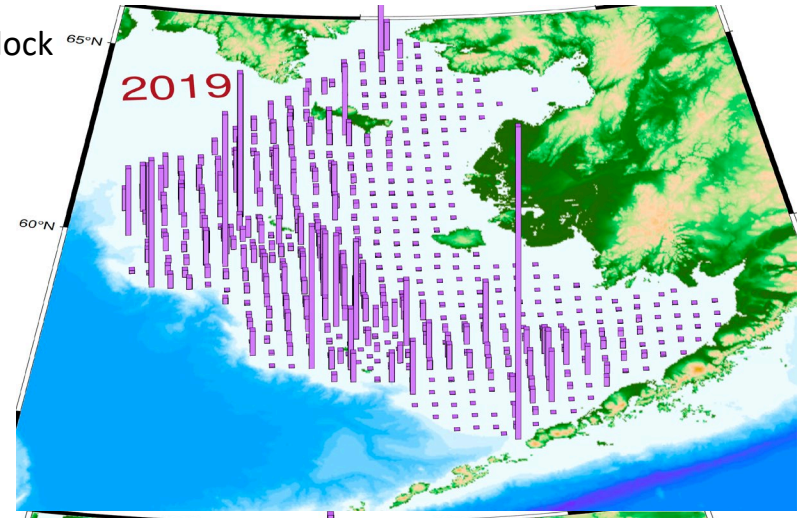
Survey work

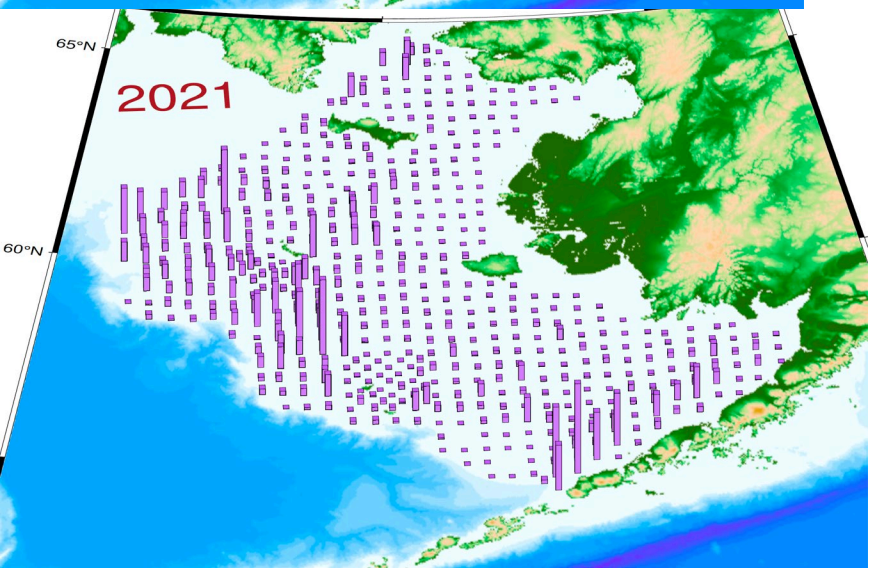
FV *Vesteraalen*
2014-present
8th year

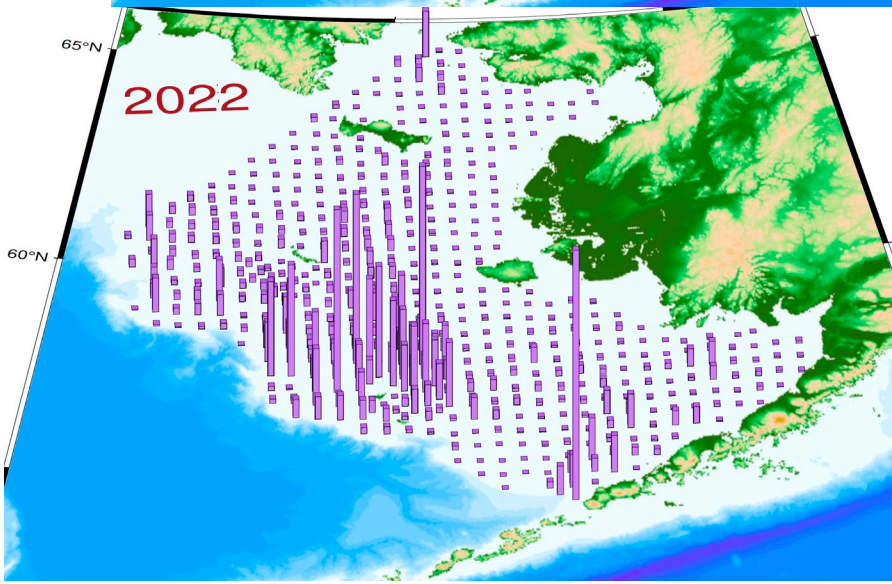
FV *Alaska Knight*
2010-present
11th year

Eastern Bering Sea pollock

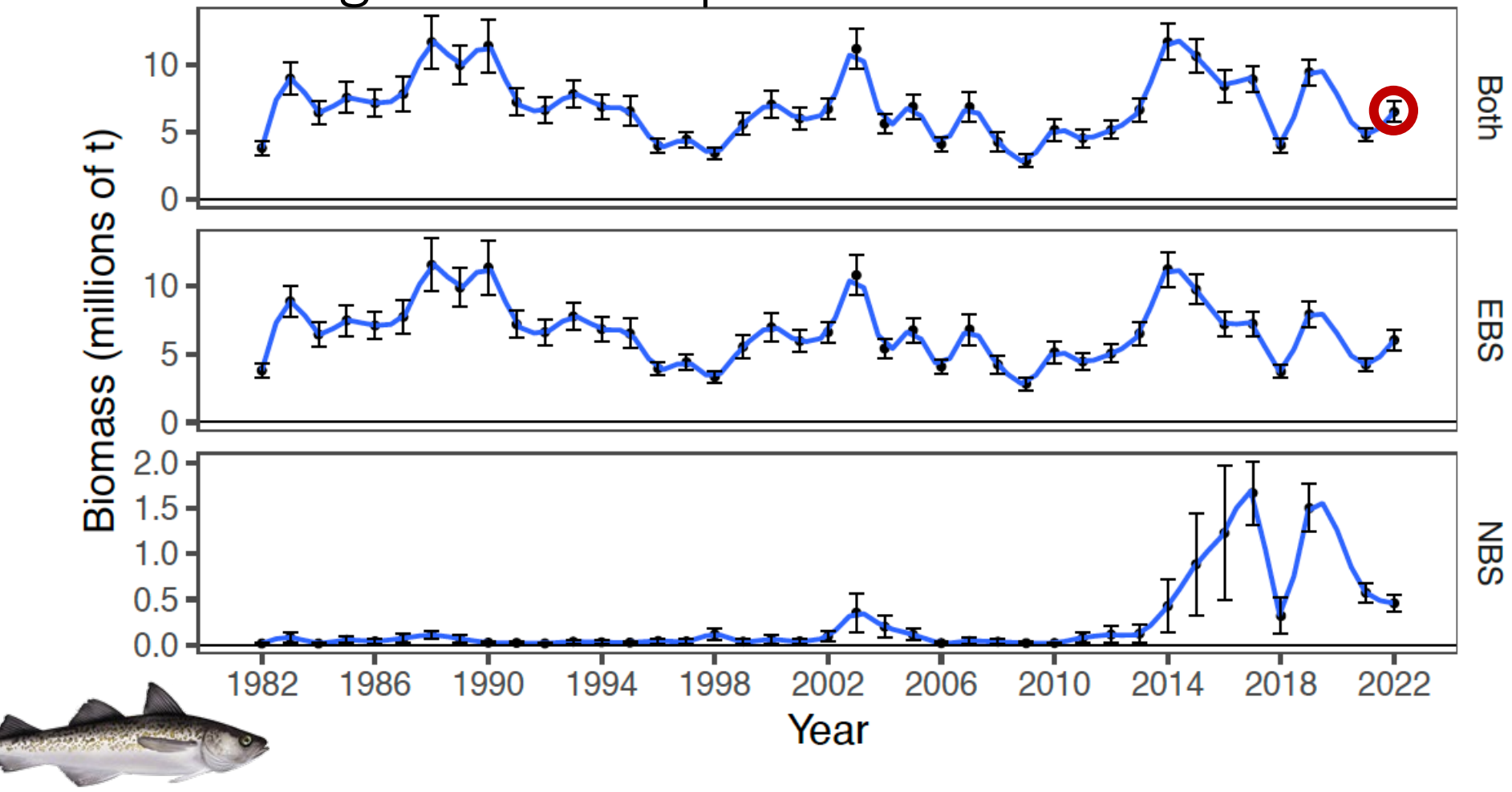






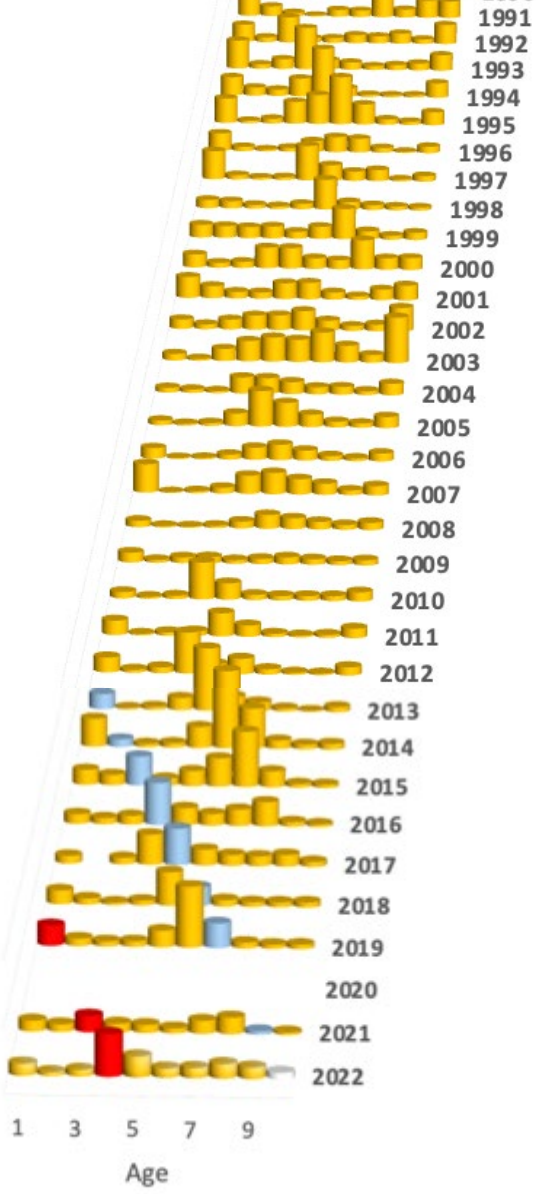


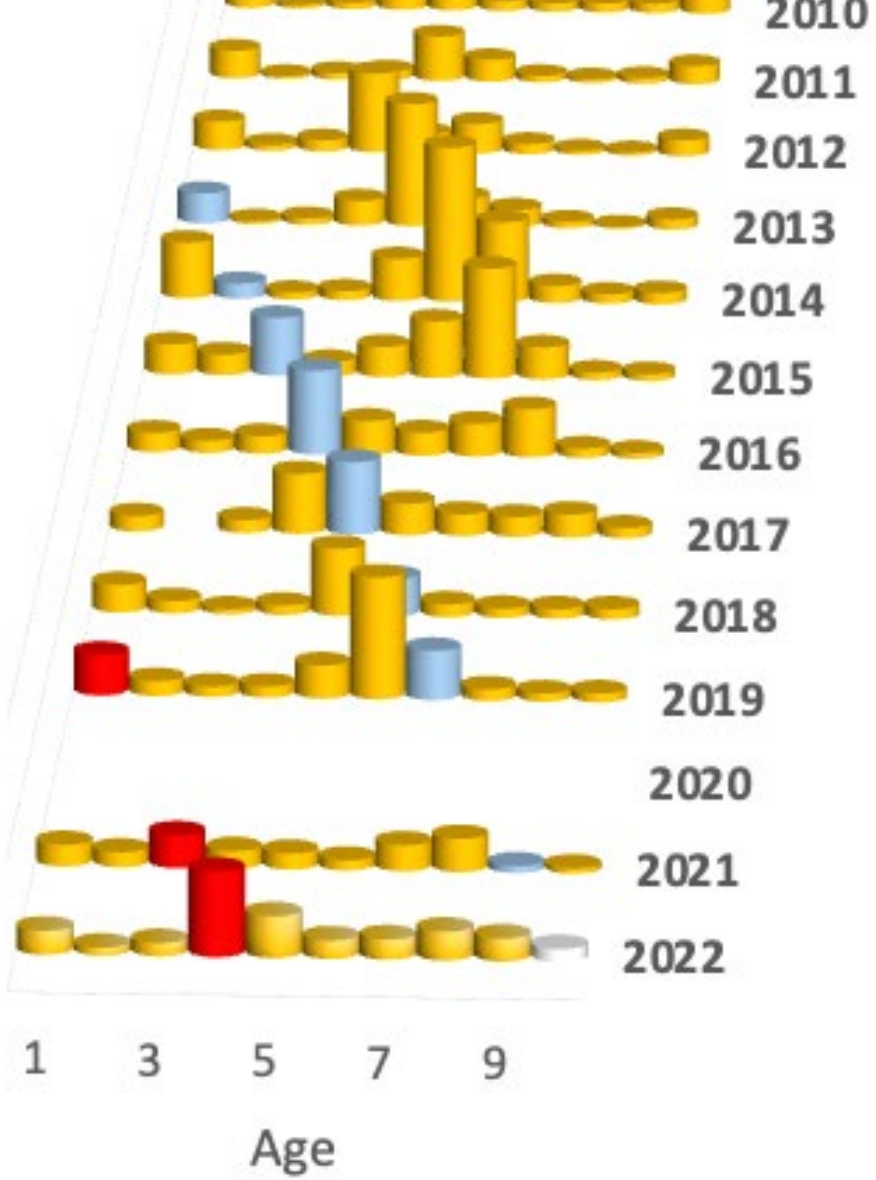
E. Bering Sea Alaska pollock



Survey abundance-at-age

- Eastern Bering Sea pollock




2010
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3
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9
Age

New VAST age-comps

- Bottom trawl survey

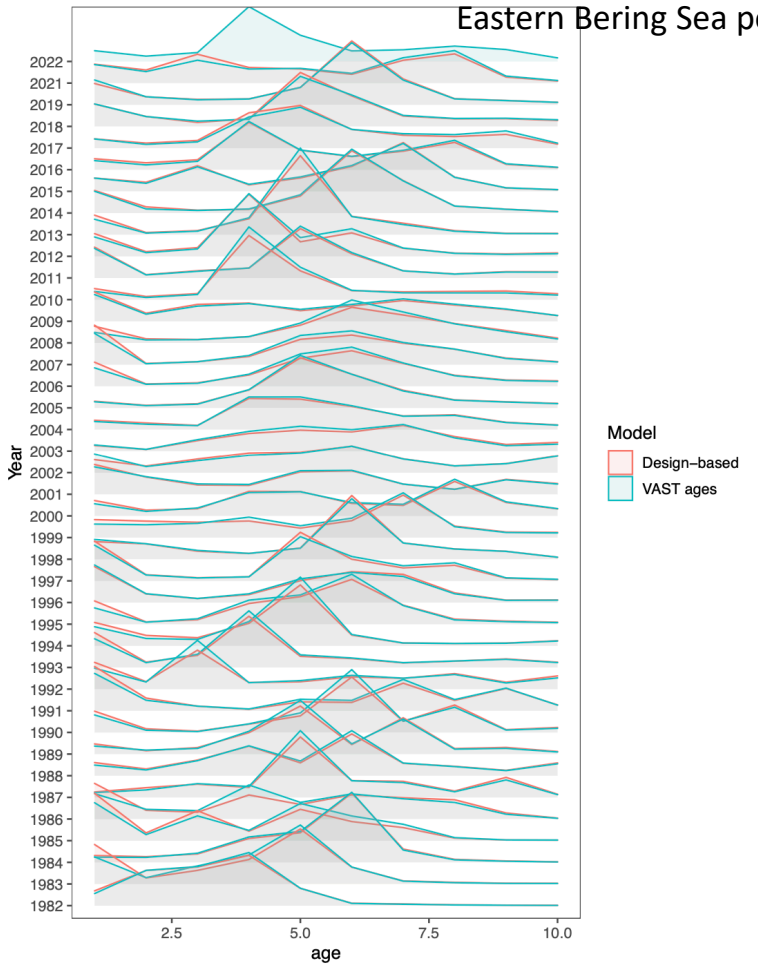


Figure 1-20. Comparison of EBS pollock estimated proportions-at-age from the bottom trawl surveys using the standard design-based estimates and those using the VAST spatio-temporal model, 1982-2022 (no data from 2020).

Eastern Bering Sea pollock

Noted update in bottom-trawl survey weight-at-age

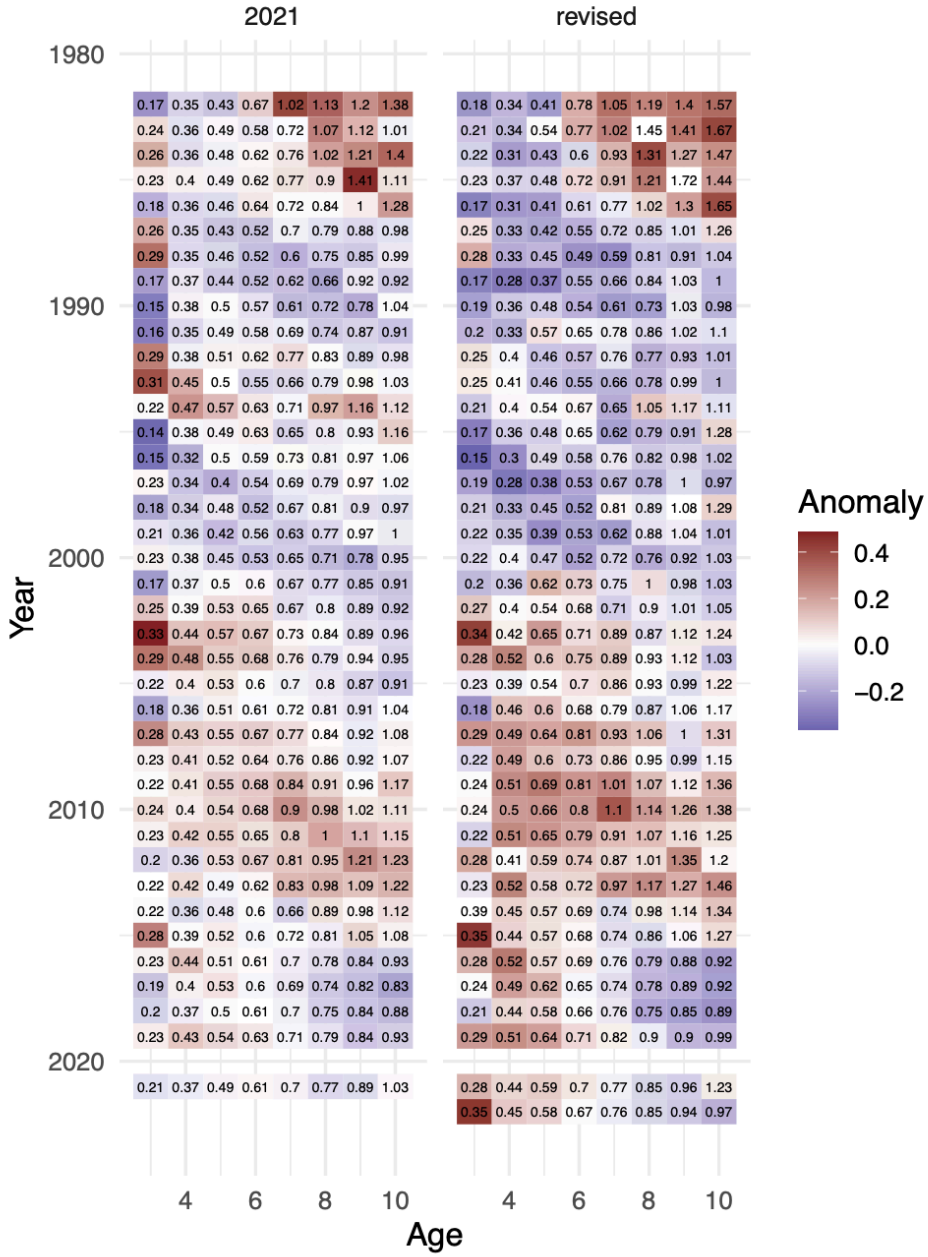
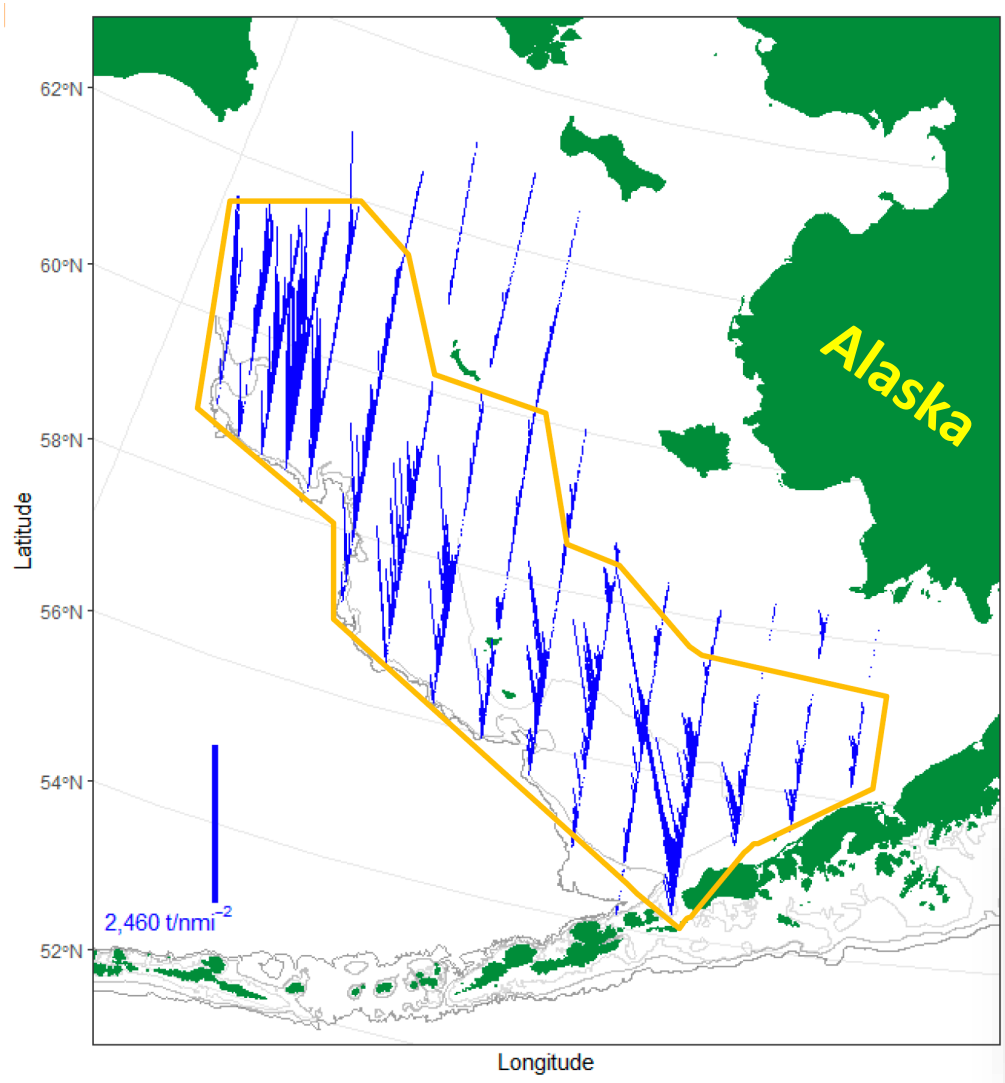
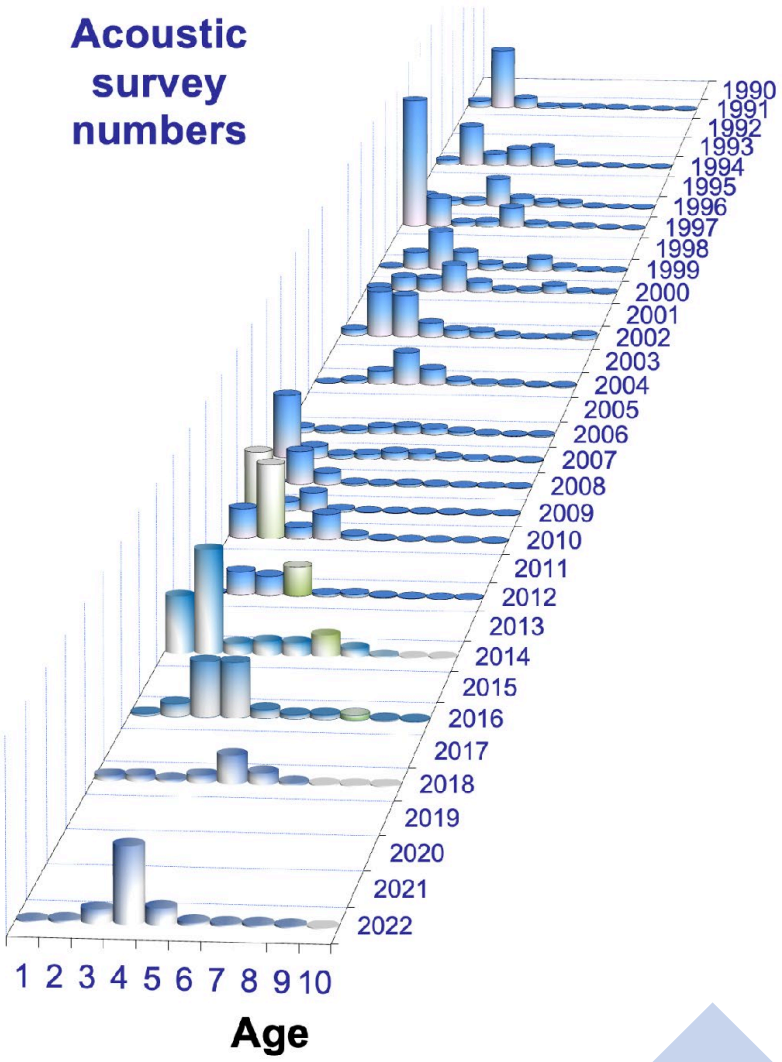


Figure 1-21. Panels showing the values for mean pollock weight-at-age used in the previous assessment (left panel) and the values revised for this assessment as based on more data and appropriate CPUE weighting (right panel). the shadings indicate anomalies over time within ages (columns).


62°N
60°N
58°N
56°N
54°N
52°N
Latitude
Alaska
2,460 t/nmi^{-2}
Longitude


OSCAR DYSON
NOAA


Acoustic survey numbers
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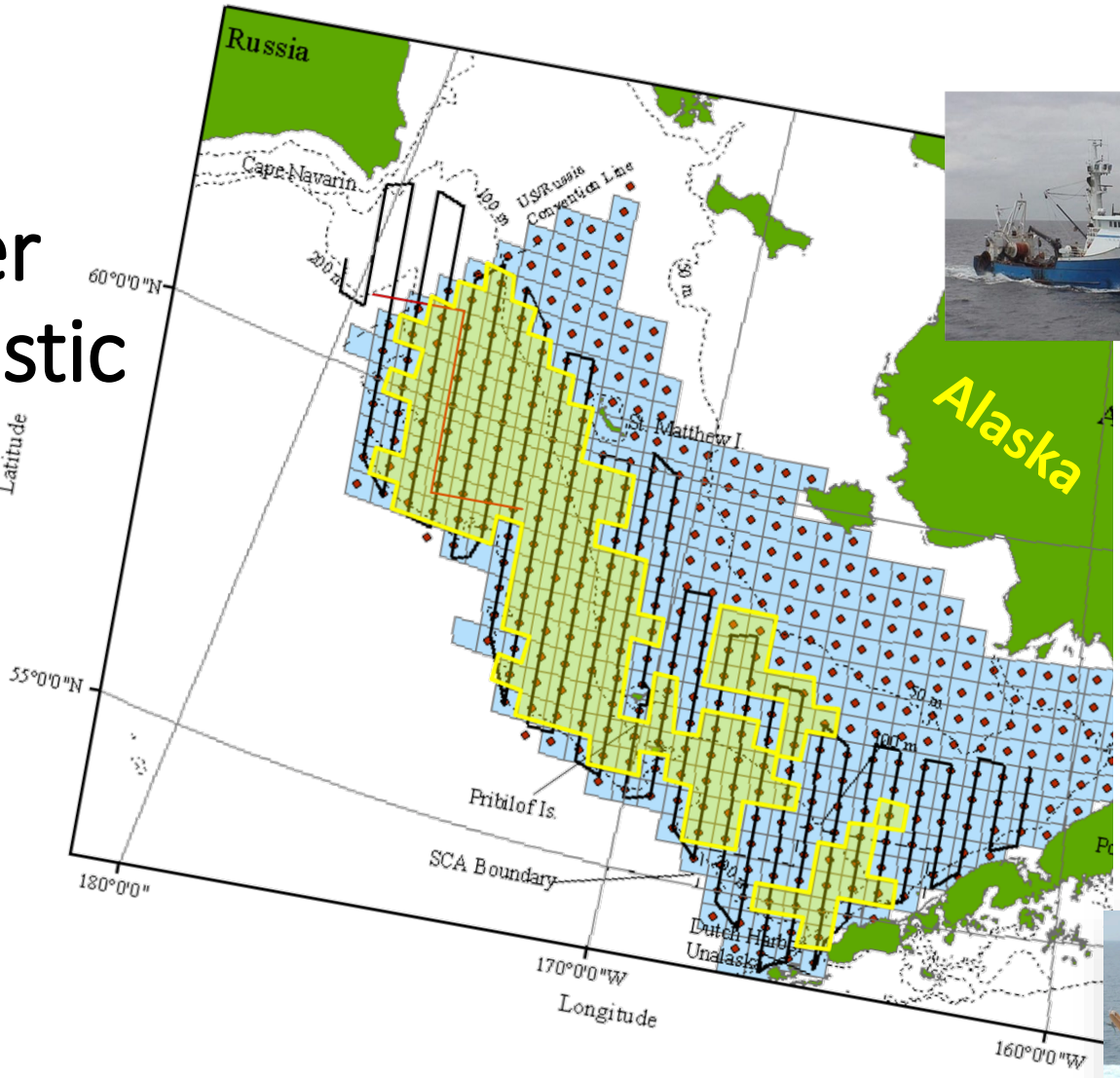
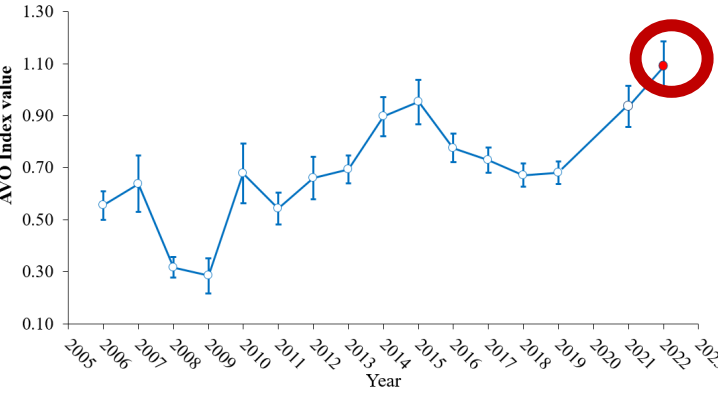
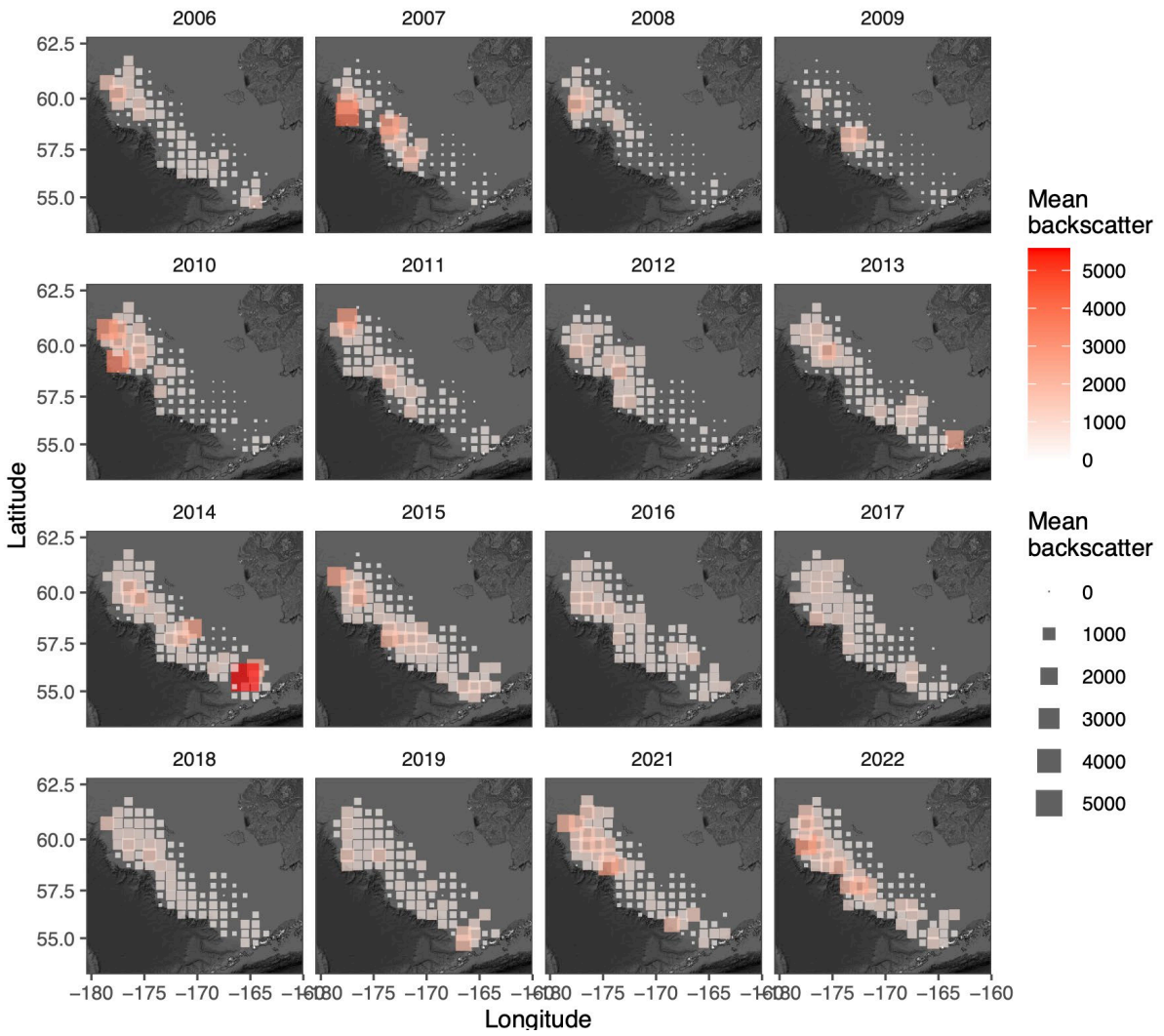
2020
2021
2022
1 2 3 4 5 6 7 8 9 10
Age

Other acoustic data



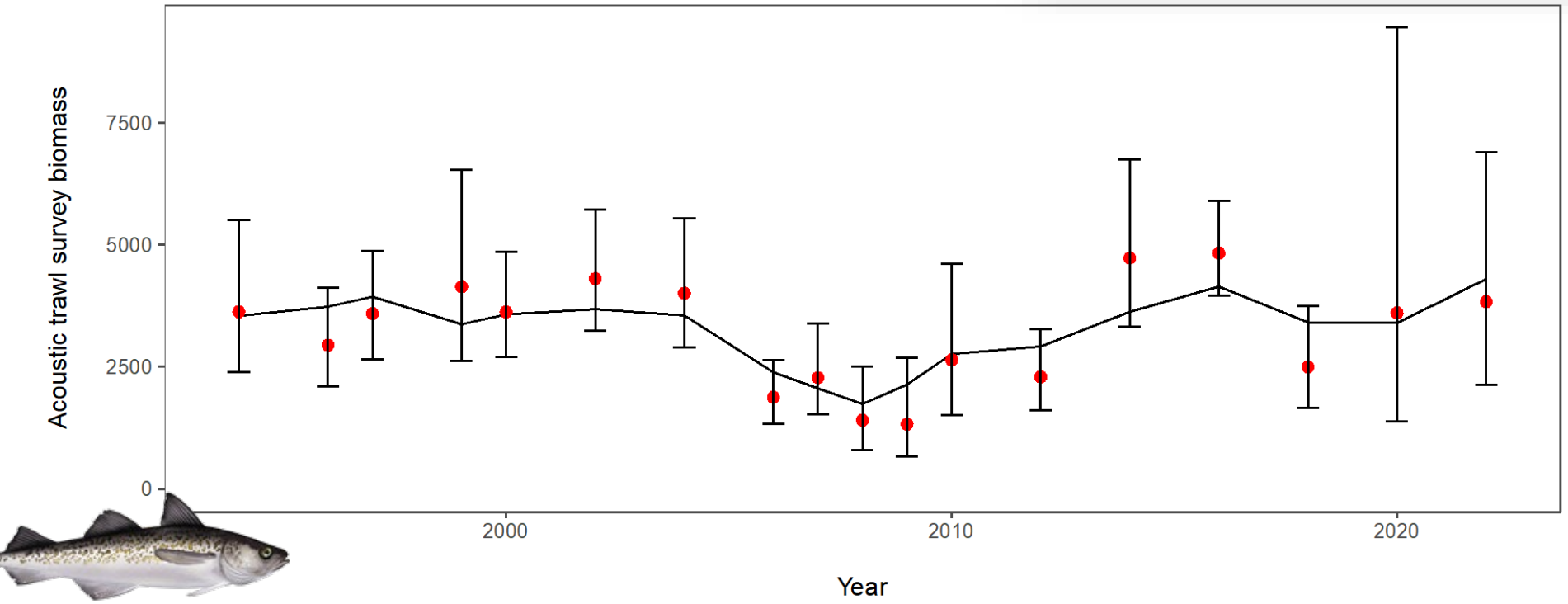
AVO time series





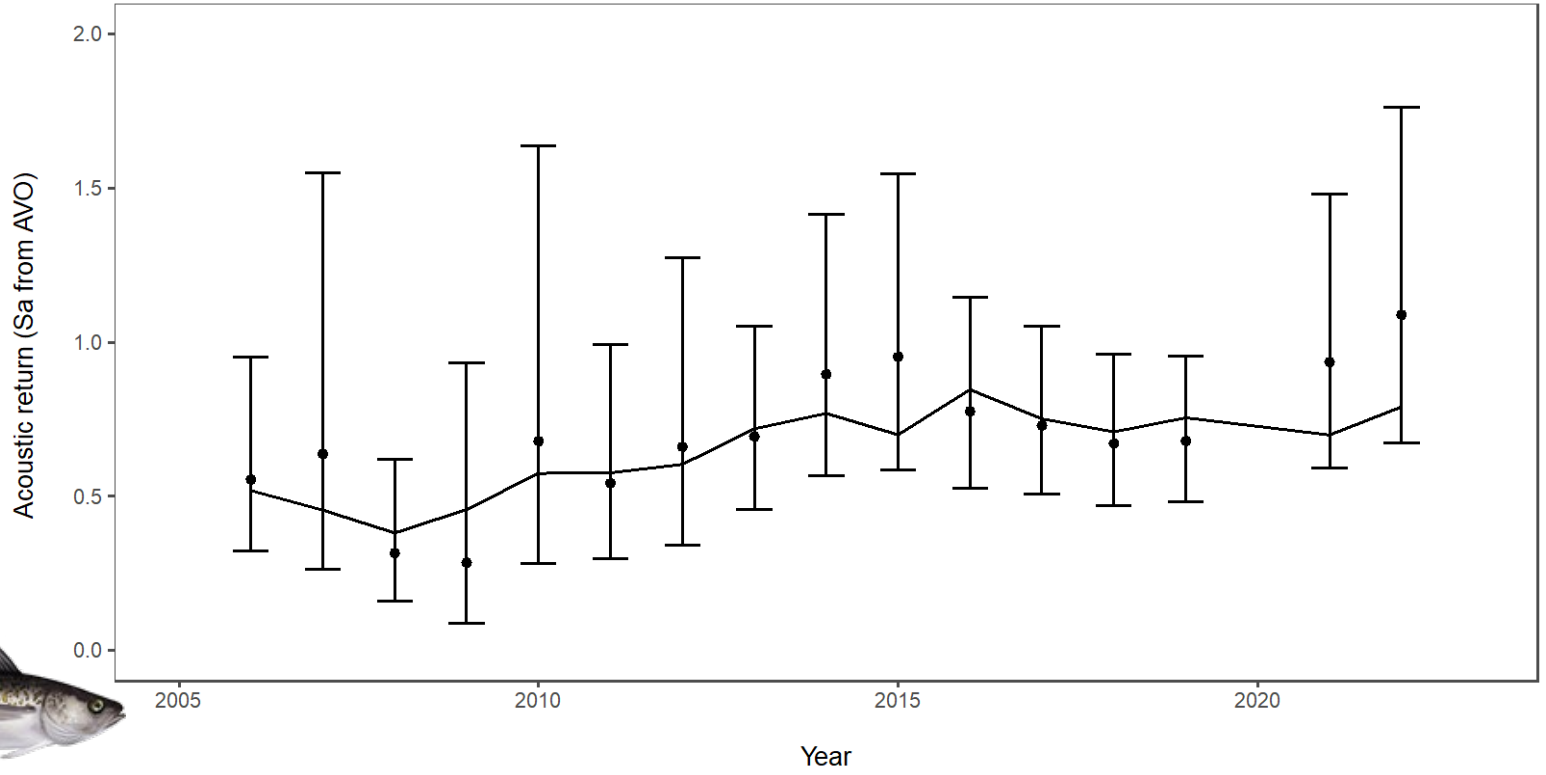
NMFS Bottom trawl survey…

Fit to acoustic-trawl index

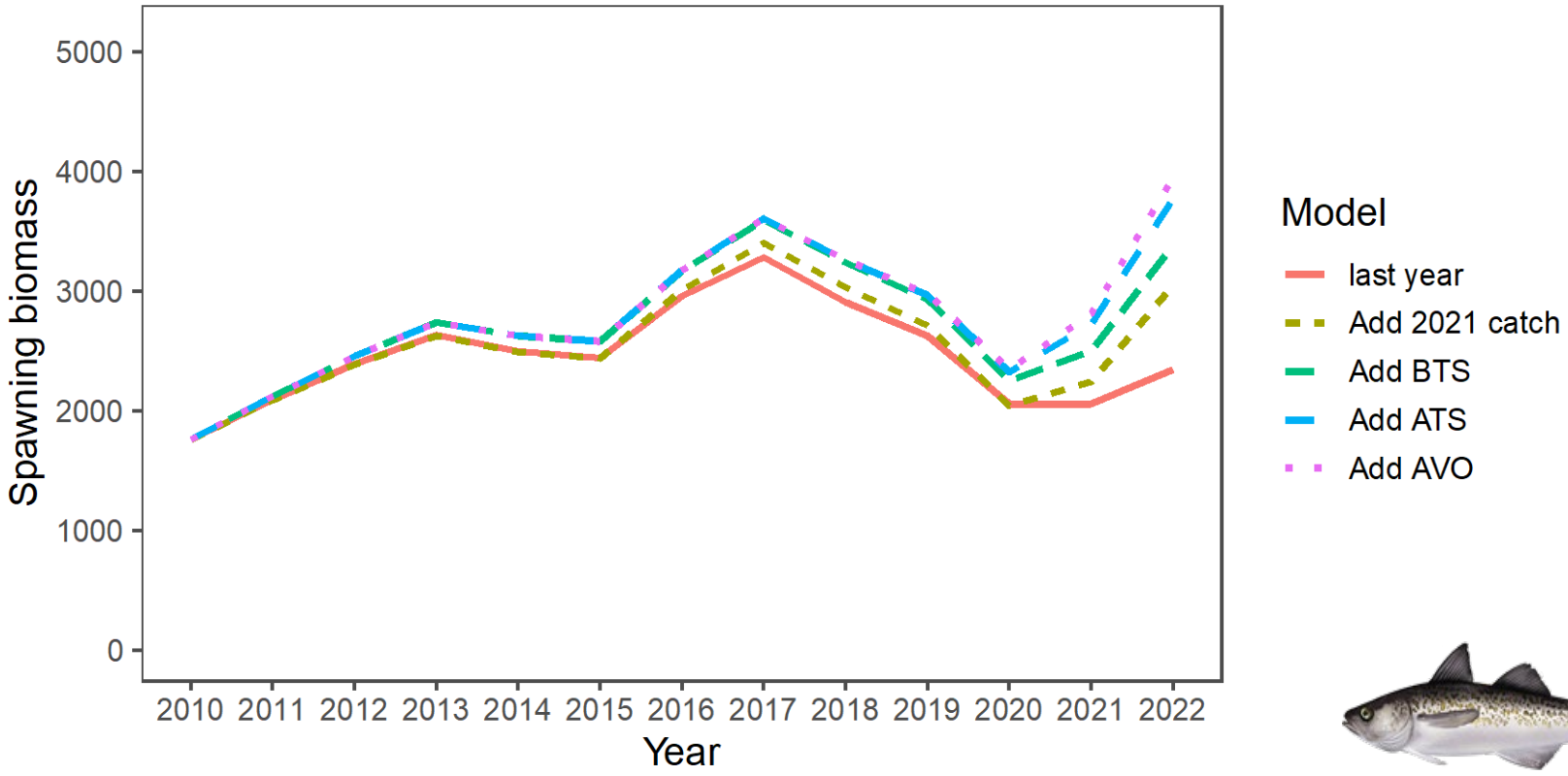


AVO Index

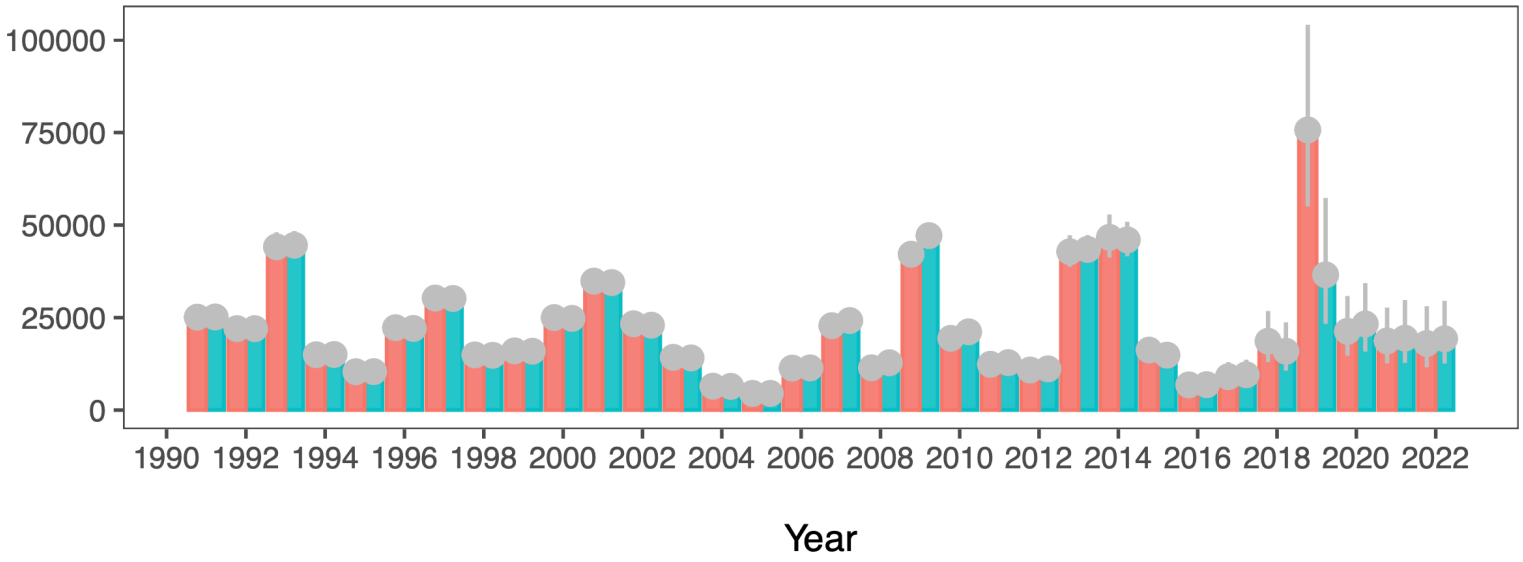
Acoustics collected opportunistically on bottom-



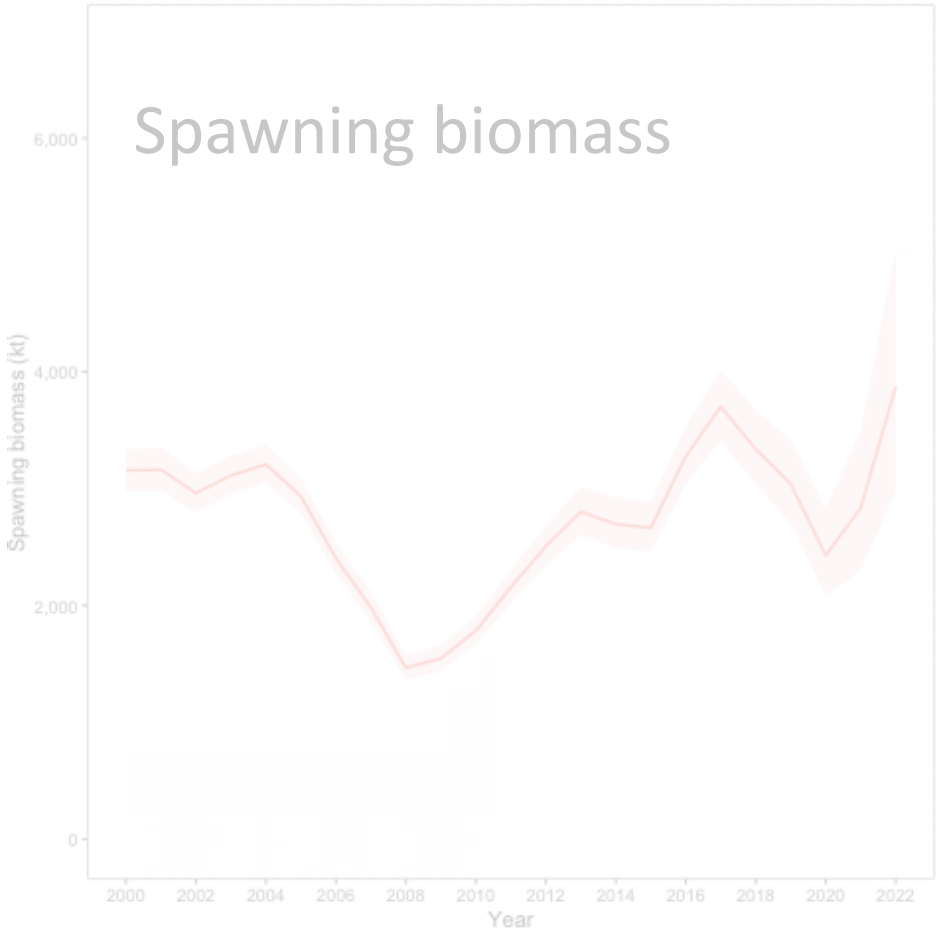
Incremental effect of new data

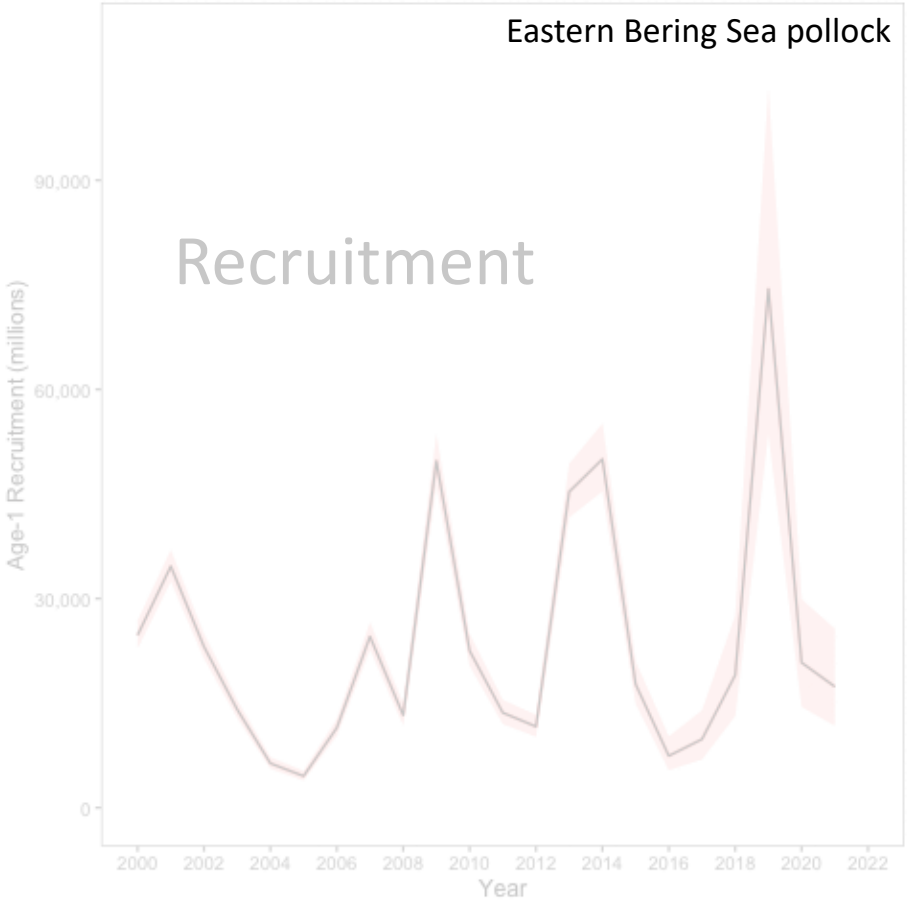


Recruitment estimates revised from last year



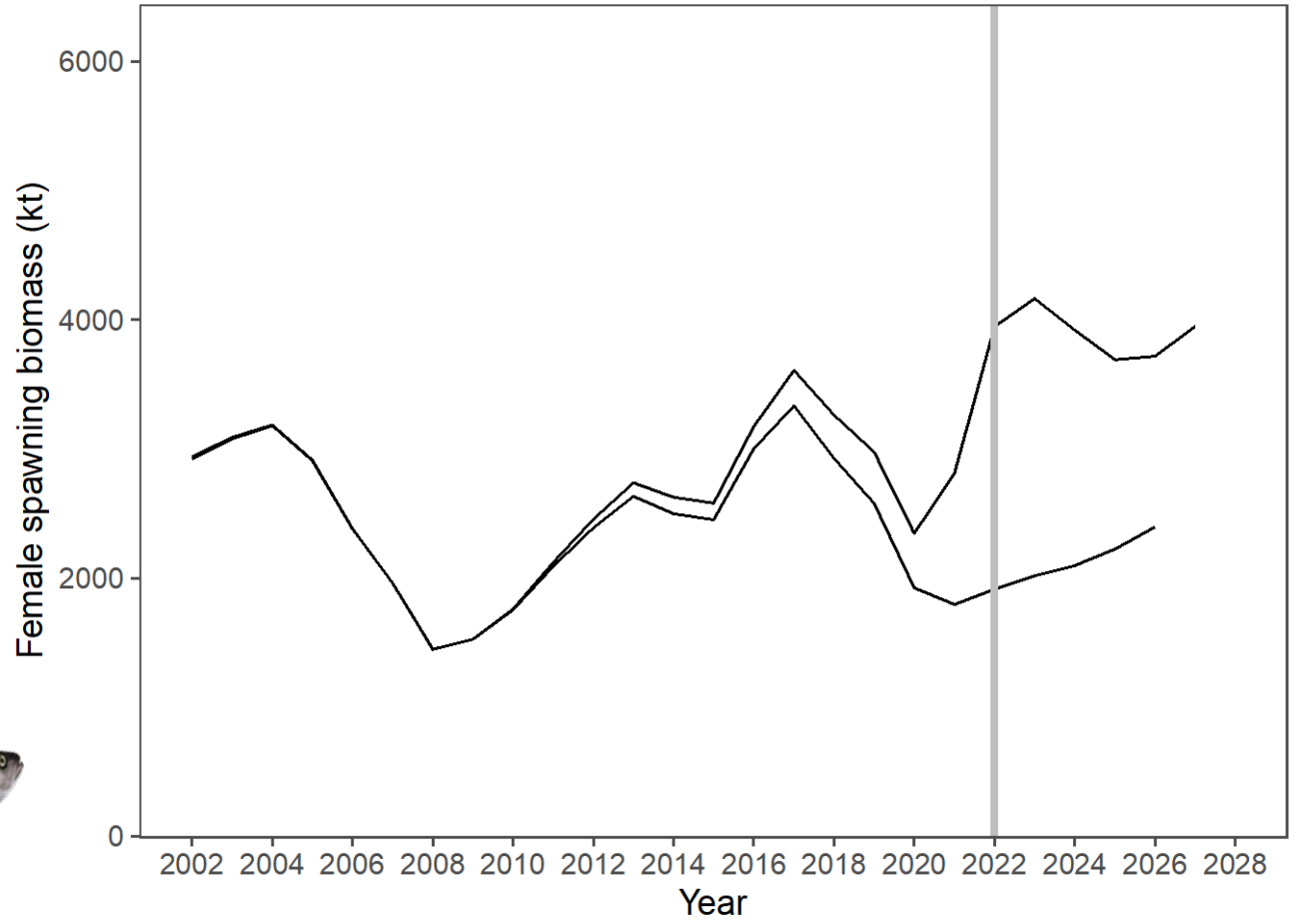
Eastern Bering Sea pollock





Eastern Bering Sea pollock

Result, new data and update on spawning biomass



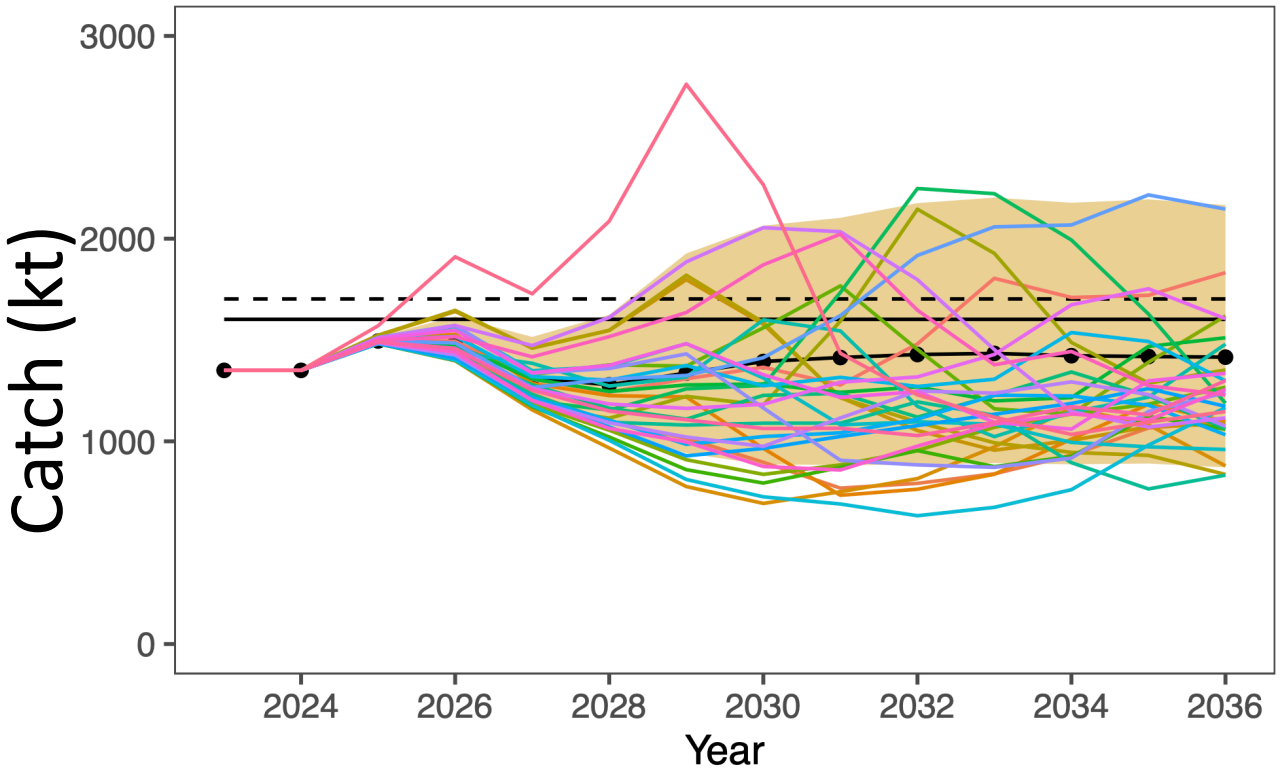
Eastern Bering Sea pollock

Quantity	As estimated or *specified* *last* year for: 2022	2023	As estimated or *recommended* *this* year for: 2023	2024
M (natural mortality rate, ages 3+)	0.3	0.3	0.3	0.3
Tier	1b	1b	1a	1a
Projected total (age 3+) biomass (t)	6,839,000 t	6,969,000 t	12,389,000 t	11,445,000 t
Projected female spawning biomass (t)	1,881,000 t	1,905,000 t	4,171,000 t	3,944,000 t
B_0	5,575,000 t	5,575,000 t	6,653,000 t	6,653,000 t
B_{msy}	2,220,000 t	2,220,000 t	2,674,000 t	2,674,000 t
F_{OFL}	0.392	0.415	0.491	0.491
$maxF_{ABC}$	0.334	0.353	0.434	0.434
F_{ABC}	0.296	0.314	0.365	0.365
OFL	1,469,000 t	1,704,000 t	3,381,000 t	4,639,000 t
$maxABC$	1,251,000 t	1,451,000 t	2,987,000 t	4,099,000 t
ABC	1,111,000 t	1,289,000 t	1,688,000 t	1,815,000 t
Status	2020	2021	2021	2022
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

Projections

Eastern Bering Sea pollock

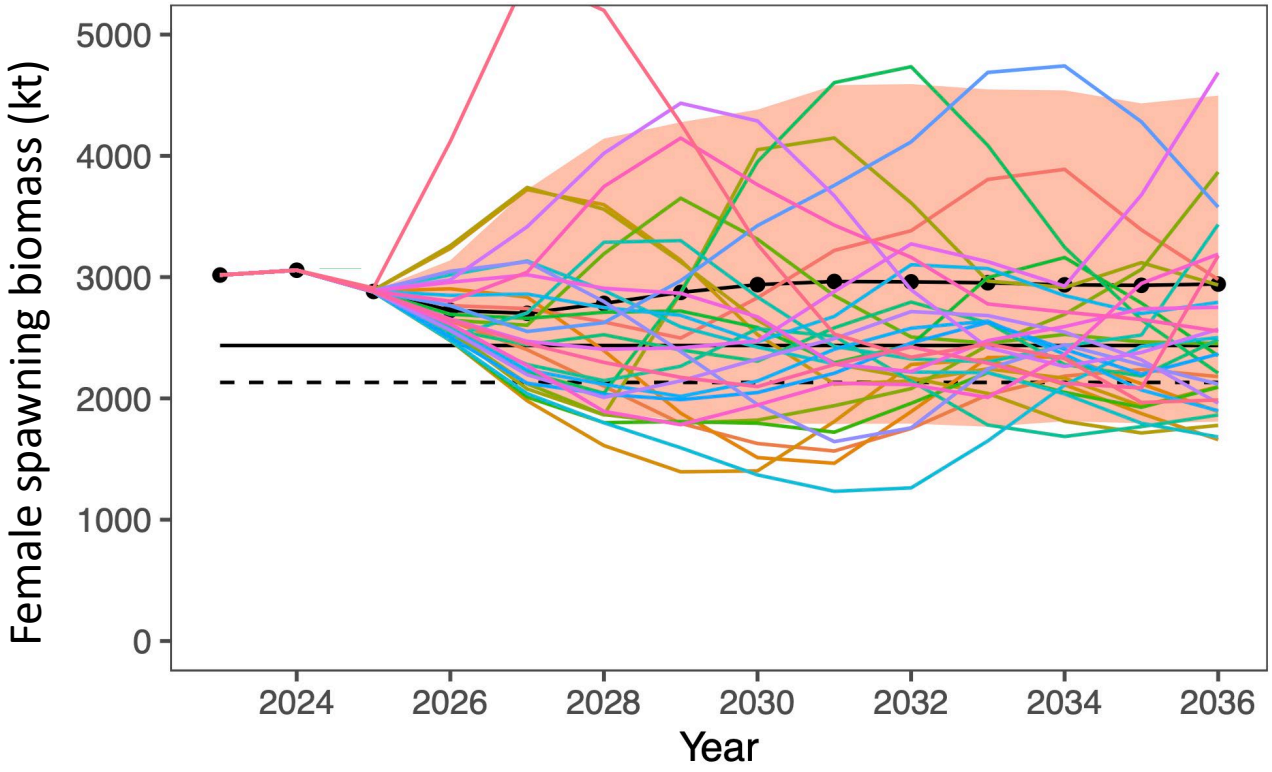
Effort equal to recent 5-years



Projections

Eastern Bering Sea pollock

Effort equal to recent 5-years



Decision variables (?)

Table 1-34. Outcomes of decision (expressed as chances out of 100) given different 2023 catches (first row, in kt). Note that for the 2020 and later year-classes average values were assumed. Constant Fs based on the 2023 catches were used for subsequent years.

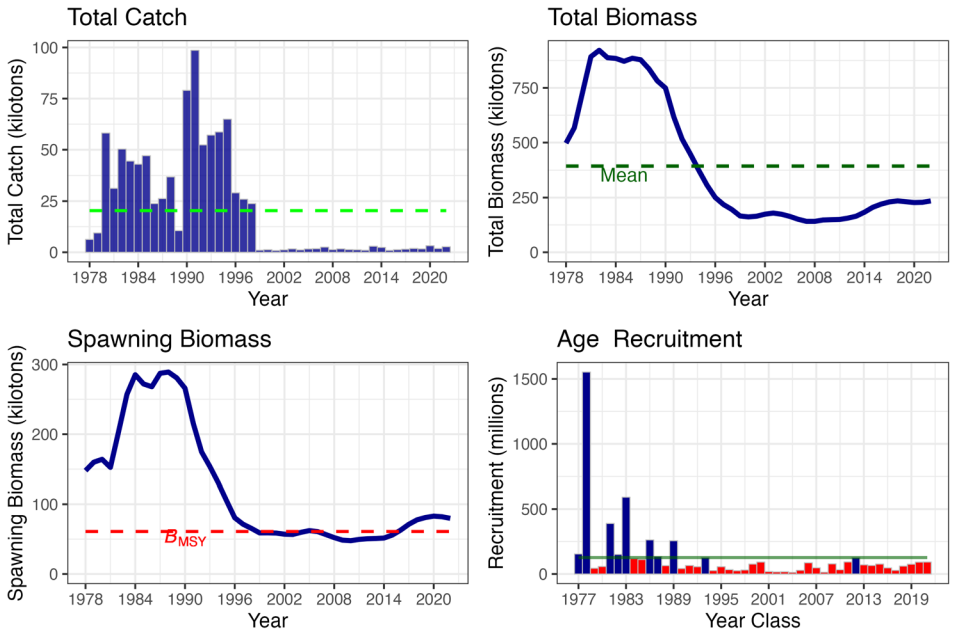
	10	850	1000	1110	1150	1300	1450	1600
$P\left[F_{2023} > F_{MSY}\right]$	0	0	0	0	0	0	0	0
$P\left[B_{2024} < B_{MSY}\right]$	4	7	8	9	9	10	12	14
$P\left[B_{2025} < B_{MSY}\right]$	2	8	10	12	12	15	19	23
$P\left[B_{2024} < \bar{B}\right]$	0	1	1	1	1	2	3	4
$P\left[B_{2027} < \bar{B}\right]$	0	7	9	12	12	15	19	22
$P\left[B_{2027} < B_{2023}\right]$	9	45	52	56	58	63	68	72
$P\left[B_{2025} < B_{20\%}\right]$	0	0	0	0	0	0	0	0
$P\left[p_{a_5,2024} > \bar{p}_{a_5}\right]$	1	36	44	50	52	58	64	69
$P\left[D_{2024} < D_{1994}\right]$	53	71	74	76	77	80	83	85
$P\left[D_{2027} < D_{1994}\right]$	0	2	3	5	5	8	11	15
$P\left[E_{2023} > E_{2022}\right]$	0	0	3	18	27	62	85	95

Table 1-33. Details and explanation of the decision table factors selected in response to the Plan Team requests (as originally proposed in the 2012 assessment).

Term	Description	Rationale
$P\left[F_{2023} > F_{MSY}\right]$	Probability that the fishing mortality in 2023 exceeds F_{MSY}	OFL definition is based on F_{MSY}
$P\left[B_{2024} < B_{MSY}\right]$	Probability that the spawning biomass in 2024 is less than B_{MSY}	B_{MSY} is a reference point target and biomass in 2021 provides an indication of the impact of 2023 fishing
$P\left[B_{2025} < B_{MSY}\right]$	Probability that the spawning biomass in 2025 is less than B_{MSY}	B_{MSY} is a reference point target and biomass in 2023 provides an indication of the impact of fishing in 2023 and 2024
$P\left[B_{2025} < \bar{B}\right]$	Probability that the spawning biomass in 2024 is less than the 1978–2022 mean	To provide some perspective of what the stock condition might be relative to historical estimates after fishing in 2023.
$P\left[B_{2027} < \bar{B}\right]$	Probability that the spawning biomass in 2027 is less than the long term mean	To provide some perspective of what the stock condition might be relative to historical estimates after fishing in 2023.
$P\left[B_{2027} < B_{2023}\right]$	Probability that the spawning biomass in 2027 is less than that estimated for 2023	To provide a medium term expectation of stock status relative to 2023 levels
$P\left[B_{2025} < B_{20\%}\right]$	Probability that the spawning biomass in 2025 is less than $B_{20\%}$	$B_{20\%}$ had been selected as a Steller Sea Lion lower limit for allowing directed fishing
$P\left[p_{a_5,2025} > \bar{p}_{a_5}\right]$	Probability that in 2025 the proportion of age 1–5 pollock in the population exceeds the long-term mean	To provide some relative indication of the age composition of the population relative to the long term mean.
$P\left[D_{2024} < D_{1994}\right]$	Probability that the diversity of ages represented in the spawning biomass (by weight) in 2024 is less than the value estimated for 1994	To provide a relative index on the abundance of different age classes in the 2024 population relative to 1994 (a year identified as having low age composition diversity)
$P\left[D_{2027} < D_{1994}\right]$	Probability that the diversity of ages represented in the spawning biomass (by weight) in 2027 is less than the value estimated for 1994	To provide a medium-term relative index on the abundance of different age classes in the population relative to 1994 (a year identified as having low age composition diversity)
$P\left[E_{2023} > E_{2022}\right]$	Probability that the theoretical fishing effort in 2023 will be greater than that estimated in 2022.	To provide the relative effort that is expected (and hence some idea of costs).

CHAPTER 1A
AI WALLEYE POLLOCK

- New model(s): no; change from base: no; risk table (1,1,1,1)



Quantity	Last asmt.	This asmt.	Change
M	0.21	0.21	0%
2022 Tier	3a		
2023 Tier	3a	3a	
2022 age+ biomass	308,525		-14%
2023 age+ biomass	330,375	264,173	-20%
2022 spawning biomass	89,516		-12%
2023 spawning biomass	87,650	78,628	-10%
B_0	185,475	174,218	-6%
2023 F_{OFL}	0.390	0.380	-3%
2023 F_{ABC}	0.313	0.305	-3%
2022 OFL	61,264		-14%
2023 OFL	61,379	52,383	-15%
2022 ABC	50,752		-14%
2023 ABC	50,825	43,413	-15%

CHAPTER 1B
BOGOSLOF WALLEYE POLLOCK

- New model(s): no; change from base: no; risk table (1,1,1,NA)

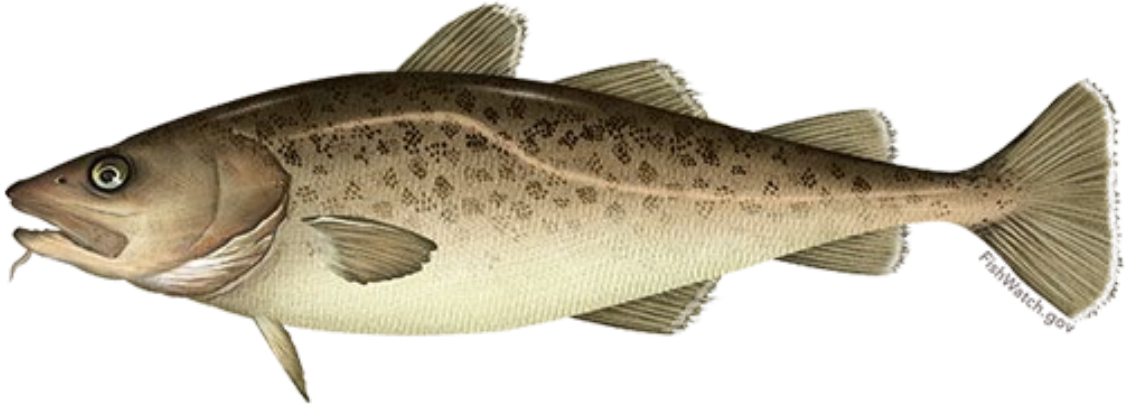
- Tier 5 with M derived from age structured model and biomass from a random effects model

- Team agreed with author's recommendation

Quantity	Last asmt.	This asmt.	Change
M	0.3	0.313	4%
2022 tier	5		
2023 tier	5	5	
Biomass	378,262	367,880	-3%
2023 F_{OFL}	0.300	0.313	4%
2023 F_{ABC}	0.225	0.235	4%
2022 OFL	113,479		1%
2023 OFL	113,479	115,146	1%
2022 ABC	85,109		1%
2023 ABC	85,109	86,360	1%

CHAPTER 2
EBS PACIFIC COD

- New model(s): yes; change from base: yes; risk table (1,1,1,1)
- Authors' presentation



EBS PACIFIC COD

Steven J. Barbeaux, Lewis Barnett, Jason Connor, Julie Nielson, S. Kalei Shotwell, Elizabeth Siddon, and Ingrid Spies

December, 2022

NOAA FISHERIES

THANKS TO THE MANY CONTRIBUTORS TO THIS ASSESSMENT

Caitlin Allen-Akselrud, Kerim Aydin, Mathew Callahan, Curry Cunningham, Lucas DeFilippo, Bridget Ferriss, Ben Fissel, Madison Hall, Kirstin Holsman, Tom Hurst, Kelly Kearney, Ben Laurel, Cecilia A. O'Leary, Beth Matta, Susanne McDermott, Sandi Neidetcher, Jens Nielsen, Kimberly Rand, Patrick Ressler, Heather Renner, Sean Rohan, Katie Sweeney, Grant Thompson, James Thorson, Muyin Wang, Jordan Watson, Sarah Wise, and Stephani Zador

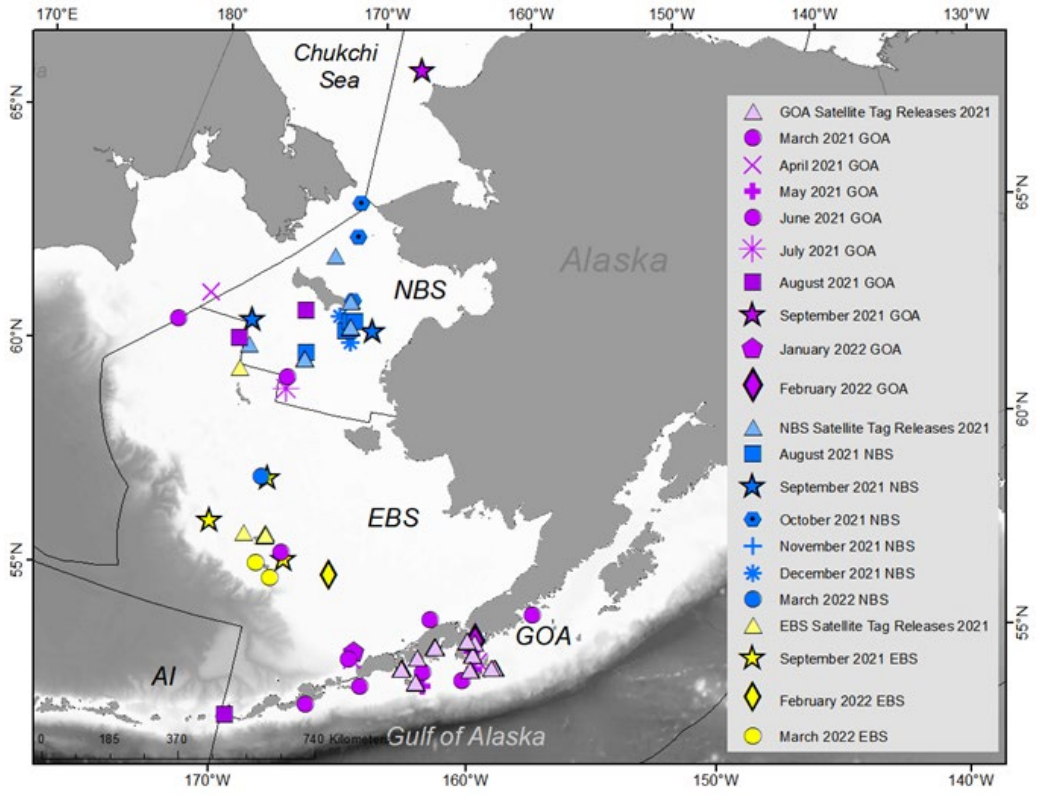
TEAMS OR SSC COMMENTS

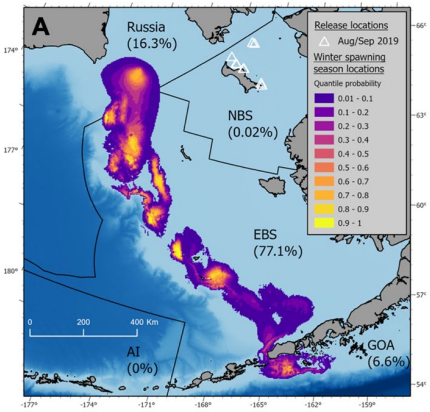
- *Given that an ensemble model structure has been endorsed by the SSC in 2021, representing a fairly large change in the assessment process, if the new authors choose to propose an ensemble in the future it may be prudent to minimize changes to the suite of models comprising the ensemble so that the potential benefits of a stable ensemble can be realized*.
  - **The authors presented a series of minor changes to the model this year. The Plan Team and SSC endorsed removing of the weight-at-length adjustments and the aging bias for post-2007. These model changes resulted in very minimal changes to the resulting model and are described below.**

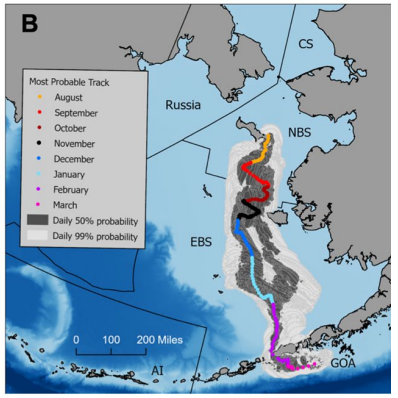
- *If model ensembles are brought forward in the future, the authors should work with the BSAI GPT to define a process whereby GPT members themselves assign model scores based on the same, or an updated set, of scoring criteria. This would allow for future development of ensemble member weightings based upon independent review, and the SSC believes this would address one of the concerns highlighted in public comment.*
  - **In light of the above recommendation, model changes were kept to a minimum and the weighting criteria used for this year's ensemble were judged to rate the same as the weights generated by the CIE and endorsed by the SSC in 2021.**

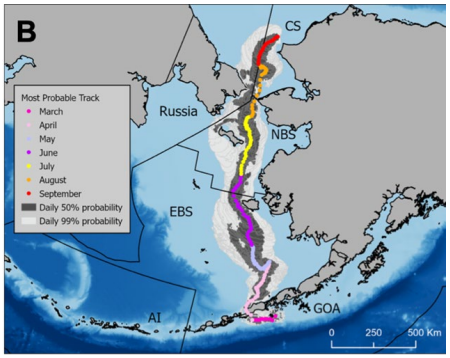
- *The SSC recommends that inclusion of [fishery age composition data] be fully explored in a later assessment cycle, either within a single model or multiple ensemble members, highlighting that it views this as a top priority for future research.*
  - **Given the already monumental task of taking this stock over from Dr. Thompson, the authors chose not to investigate the use of fishery age composition data. This also in light of the SSCs recommendation to minimize changes to the suite of models comprising the ensemble. The authors intend to investigate the use of fishery age composition data in the future.**

PACIFIC COD PSAT



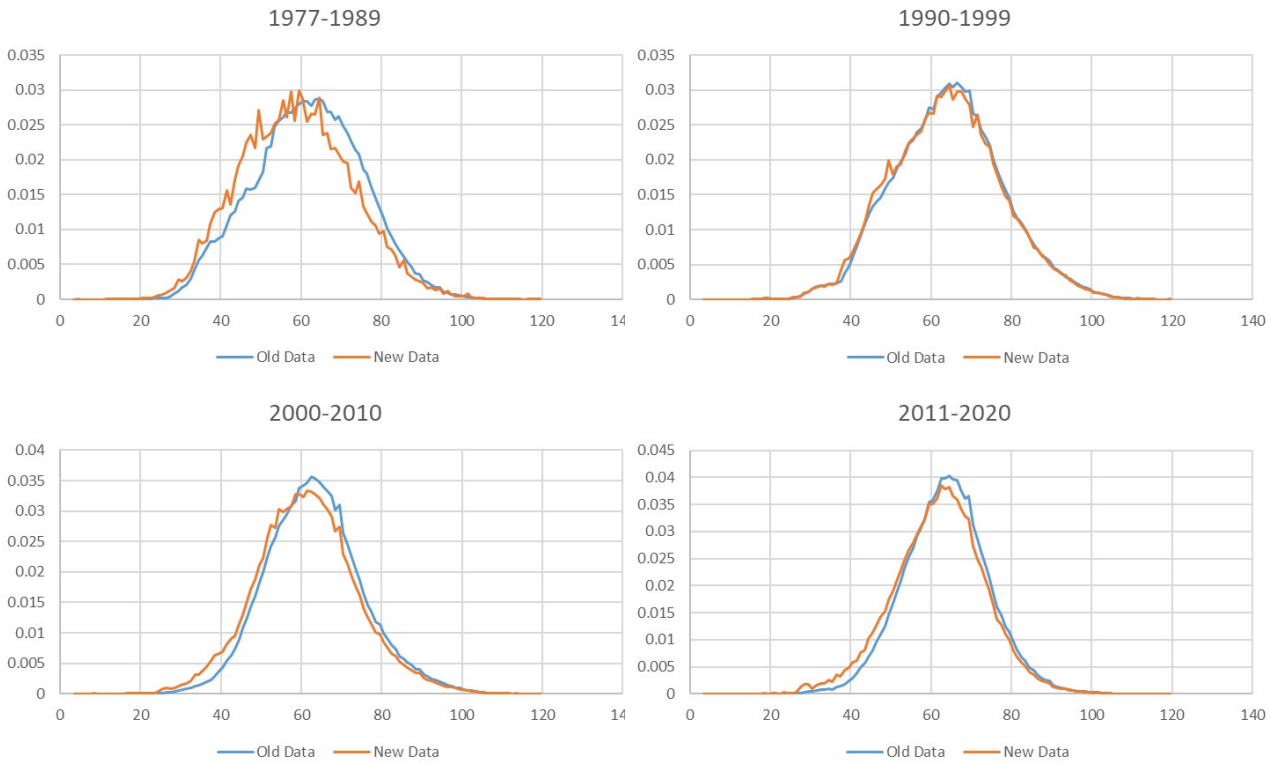






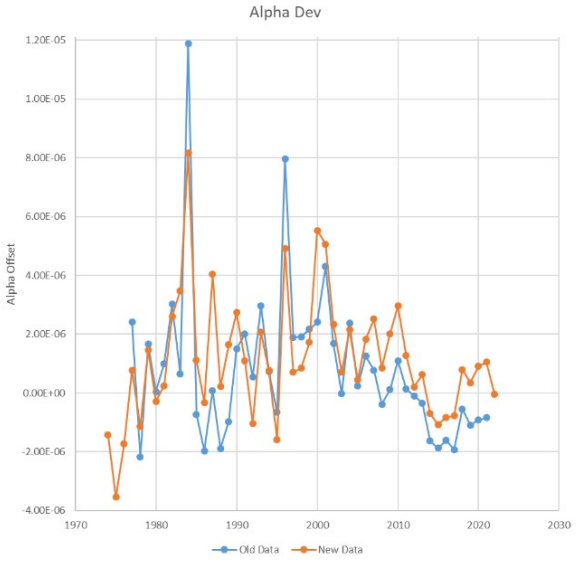
DATA CHANGES
FISHERY LENGTH COMPOSITION

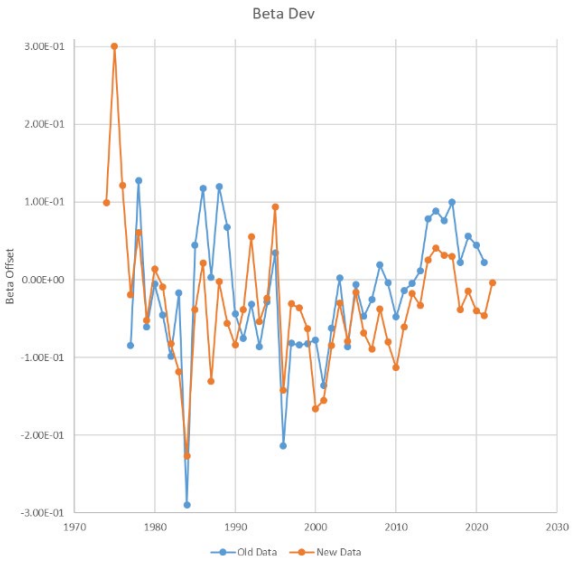
- New algorithm for constructing fishery length composition (described in September)
- Data weighted by haul, vessel, gear, month, NMFS area, and year
- Resulted in shift to more small fish in distribution

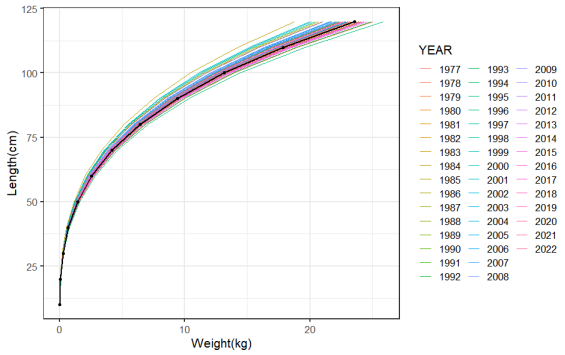


DATA CHANGES – ANNUAL WEIGHT-AT-LENGTH ADJUSTMENTS

- Switch from linear Mathcad algorithm to GAM in R mgcv library (described in September)
- Similar resulting trend in adjustments

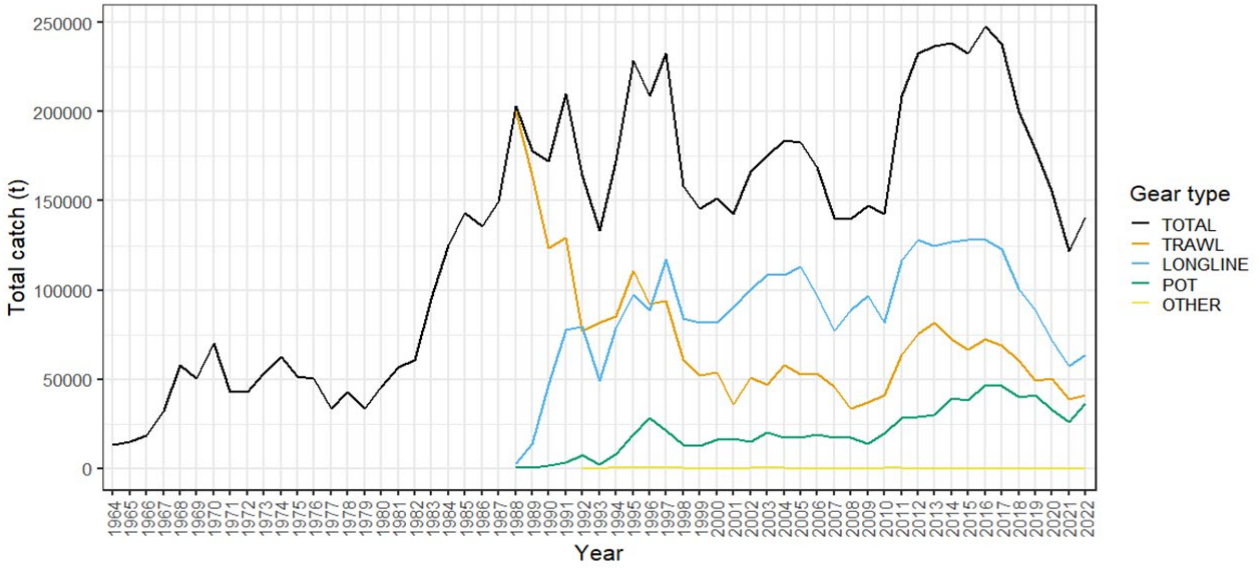


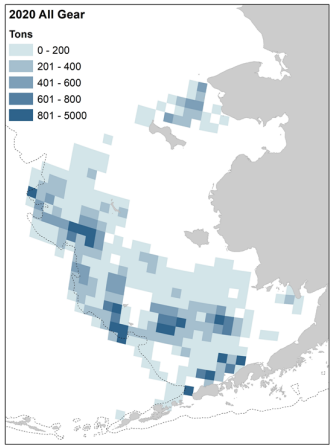


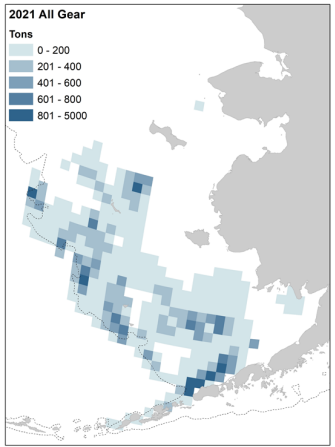


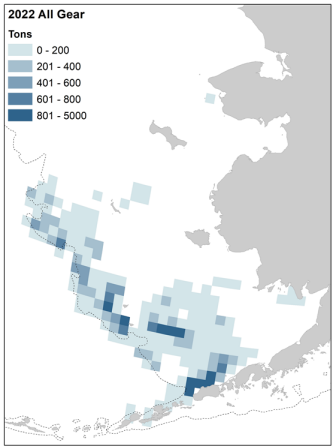
CATCH – FISHERY SECTOR

- Increase in catch from 2021 but lower than 10-year average
- Longline remains dominant
- Continued increasing trend in pot proportion and decreasing trend in trawl proportion





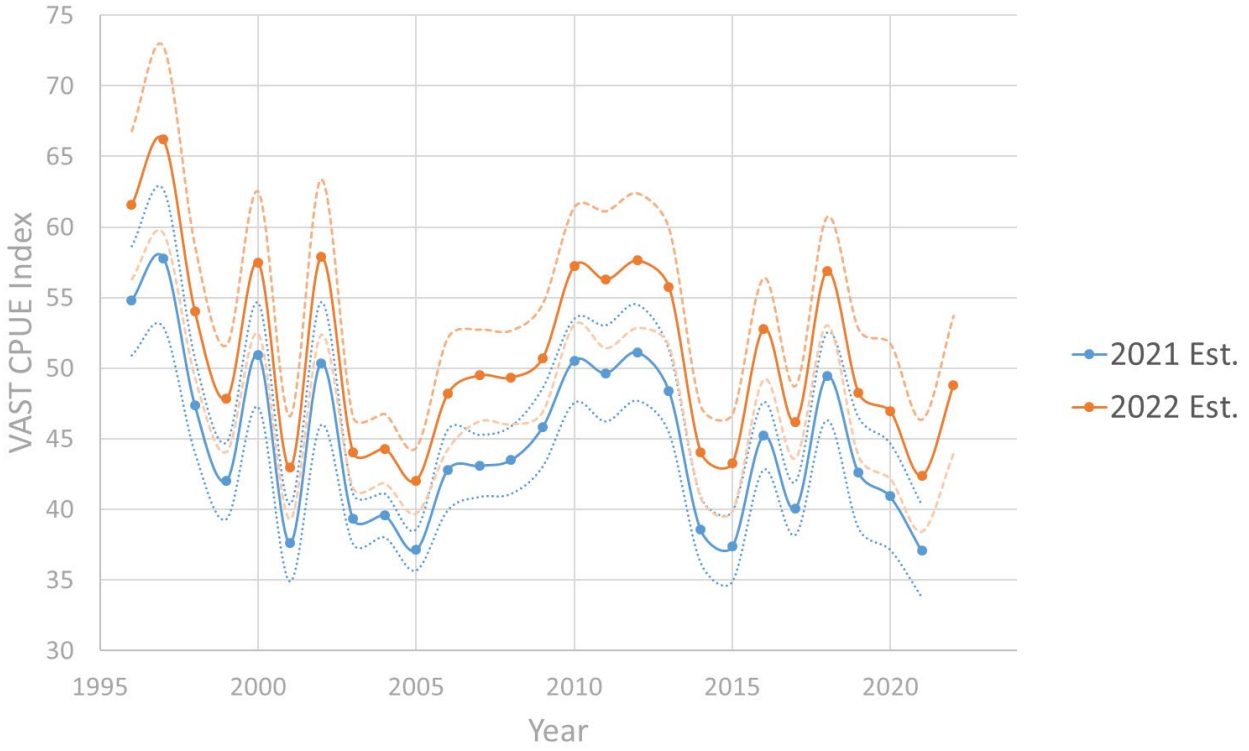




- Southwestward shift in center of gravity
- Low level of fishing in NBS

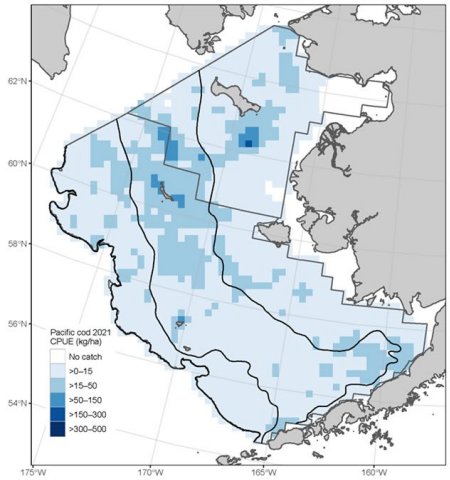
VAST CPUE INDEX – JAN.-FEB. LONGLINE FISHERY

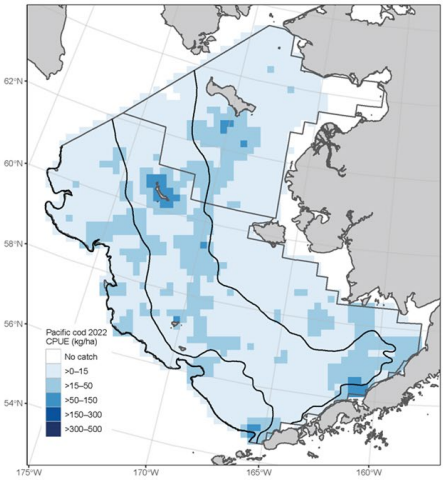
- Difference in spatial extent resulted in overall inflation of index
- Trend remains the same with high correlation between indices
- 15% Increase in 2022 from 2021

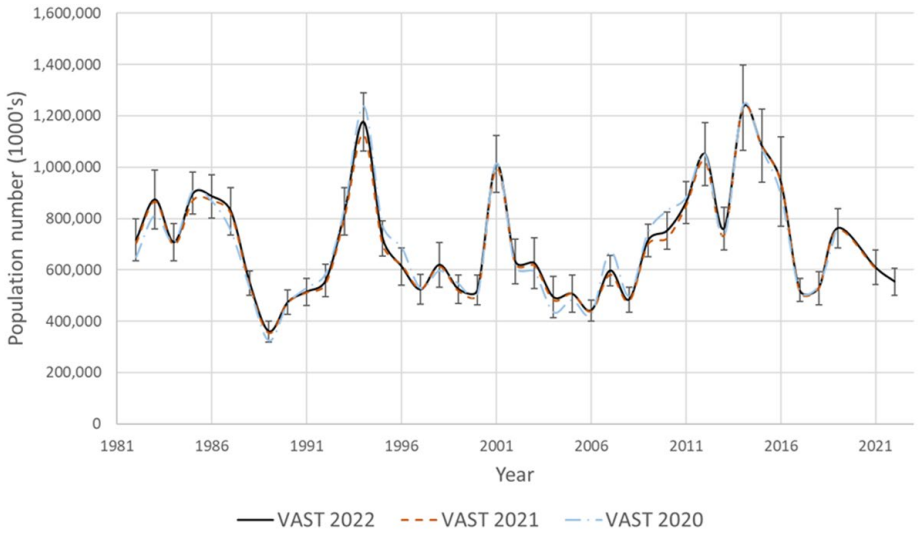


VAST SURVEY INDEX – BERING SEA SHELF BOTTOM TRAWL

- Southeastward shift in center of gravity
- Small changes in time series from previous years
- Overall drop in abundance (VAST -8.9% from 2021)

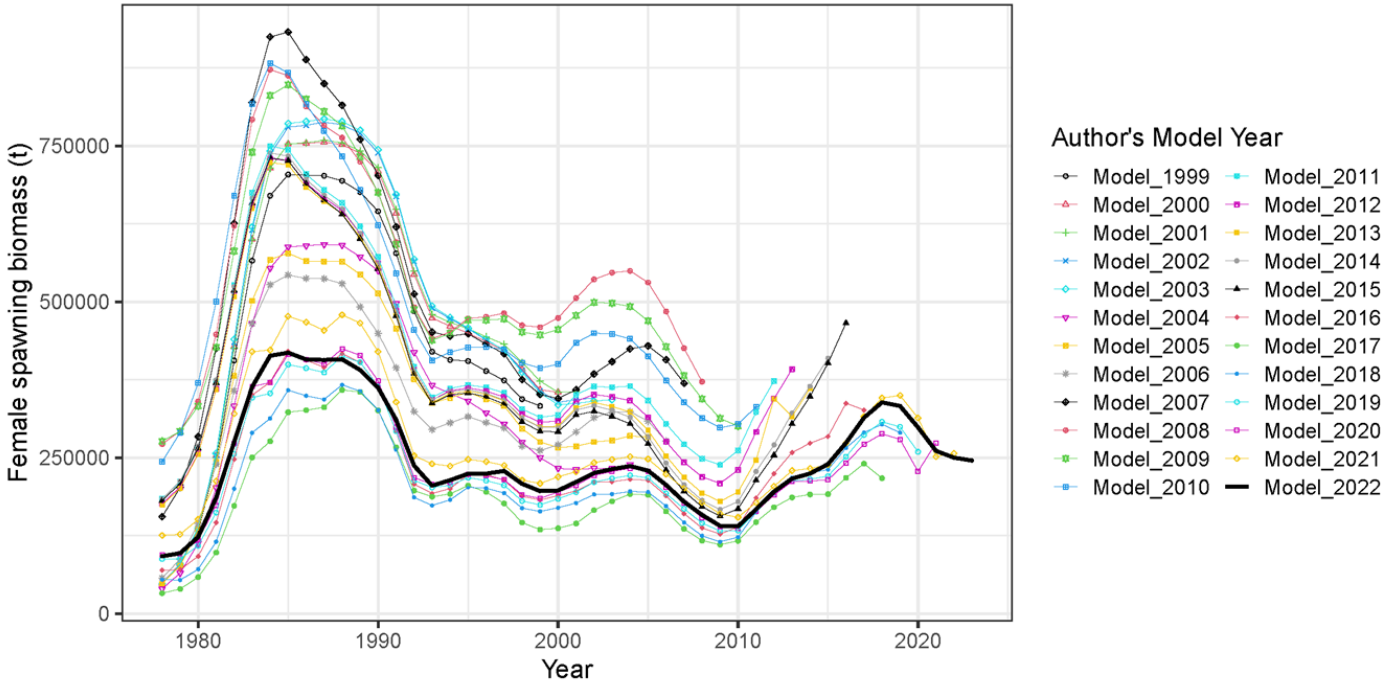






STOCK ASSESSMENT MODELS

- Diverse set of models over the past 22 years
- Current base model is an ensemble of 4 models



MODEL CONFIGURATIONS

Thompson Series models	M 19.12	M 19.12A	M 21.1	M 21.2
New Series models	**M 22.1**	**M 22.2**	**M 22.3**	**M 22.4**
Feature 1: Allow catchability to vary?	**YES**	NO	NO	NO
Feature 2: Allow domed survey selectivity?	NO	NO	**YES**	NO
Feature 3: Use fishery CPUE?	NO	NO	NO	**YES**

New Series models - Same as Thompson Series models except

- Seasonally corrected annual weight-at-length adjustments removed
- Post-2007 aging bias block removed
- Although minor model changes, substantial changes in data processing resulting in model name changes for this year.

MODEL FITS

- Exploration of individual models and their fits can be found at the link provided

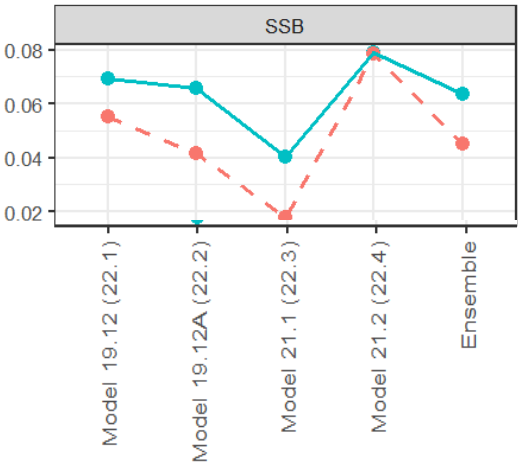
- Model fits and results were nearly identical between the Thompson and New Series models

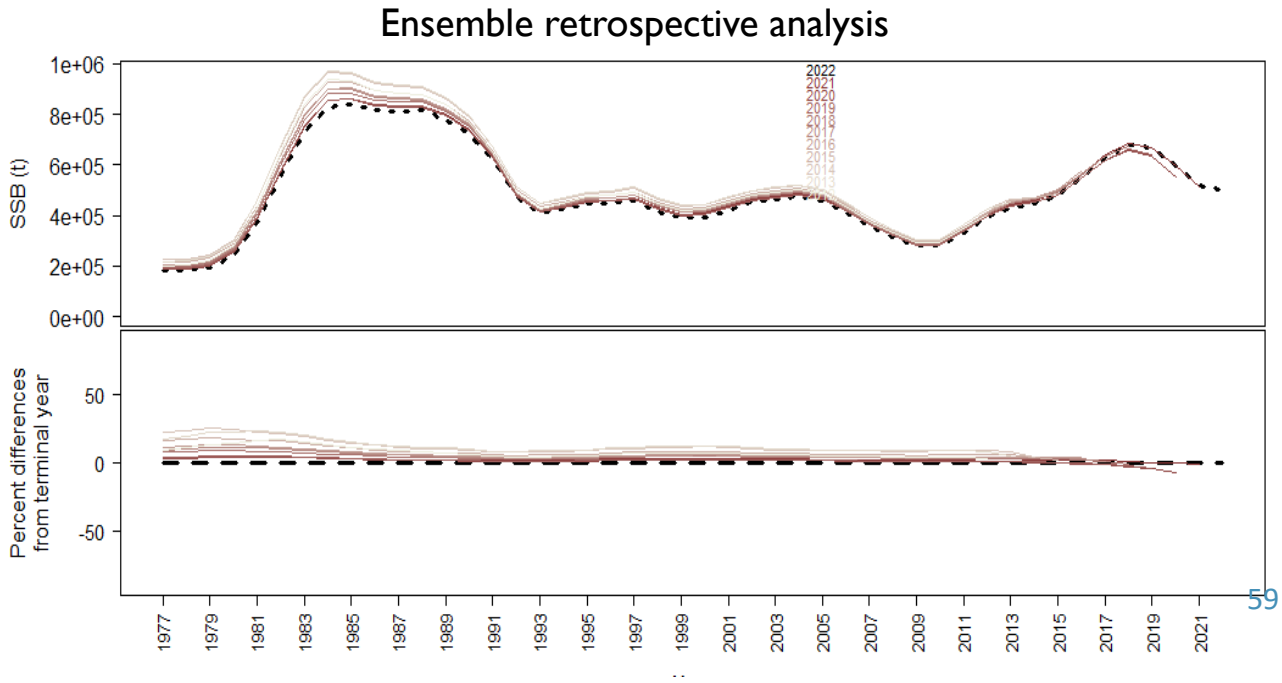
- Largest difference was the fit to the age composition data with a degraded fit due to the removal of the post-2007 aging bias

https://afsc-assessments.github.io/EBS_PCOD/2022_ASSESSMENT/NOVEMBER_MODELS/

MODELS – RETROSPECTIVE ANALYSIS

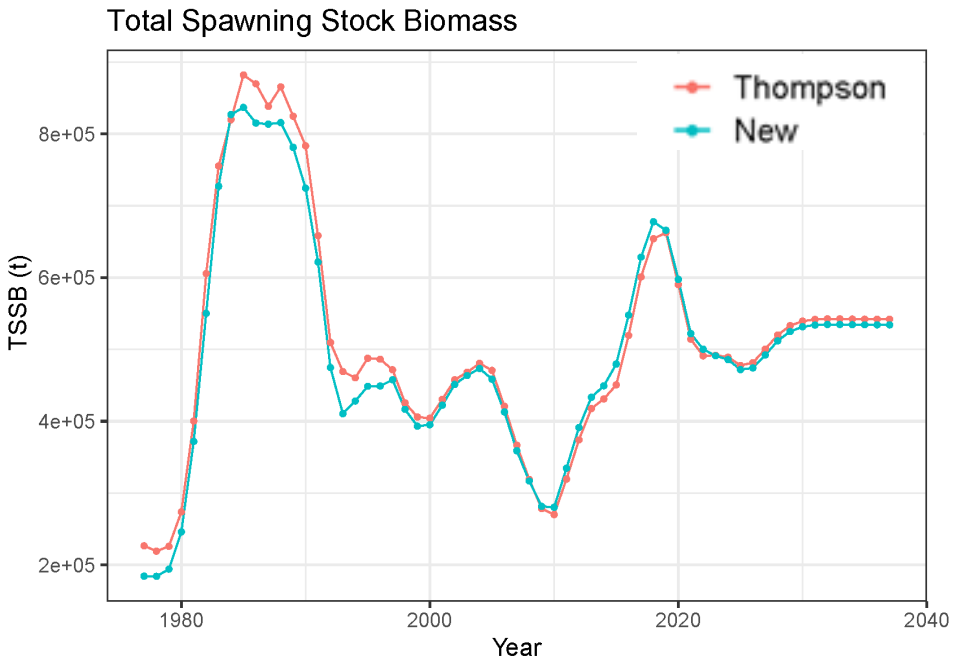
- Consistently low positive bias on Mohn's ρ for SSB from both series

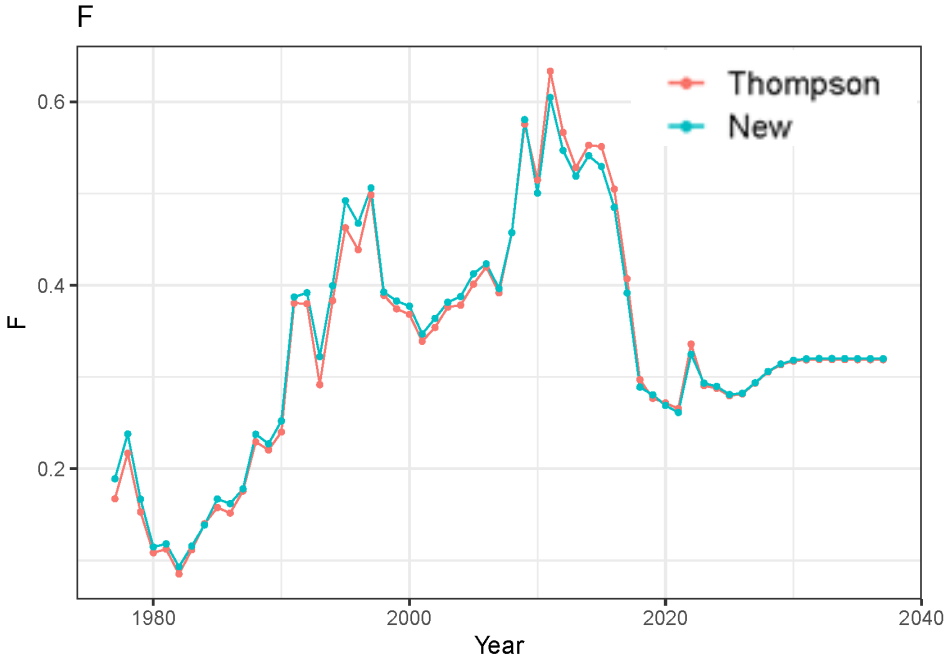




MODELS – DERIVED QUANTITIES

- Spawning biomass slightly higher in early part for Thompson Series

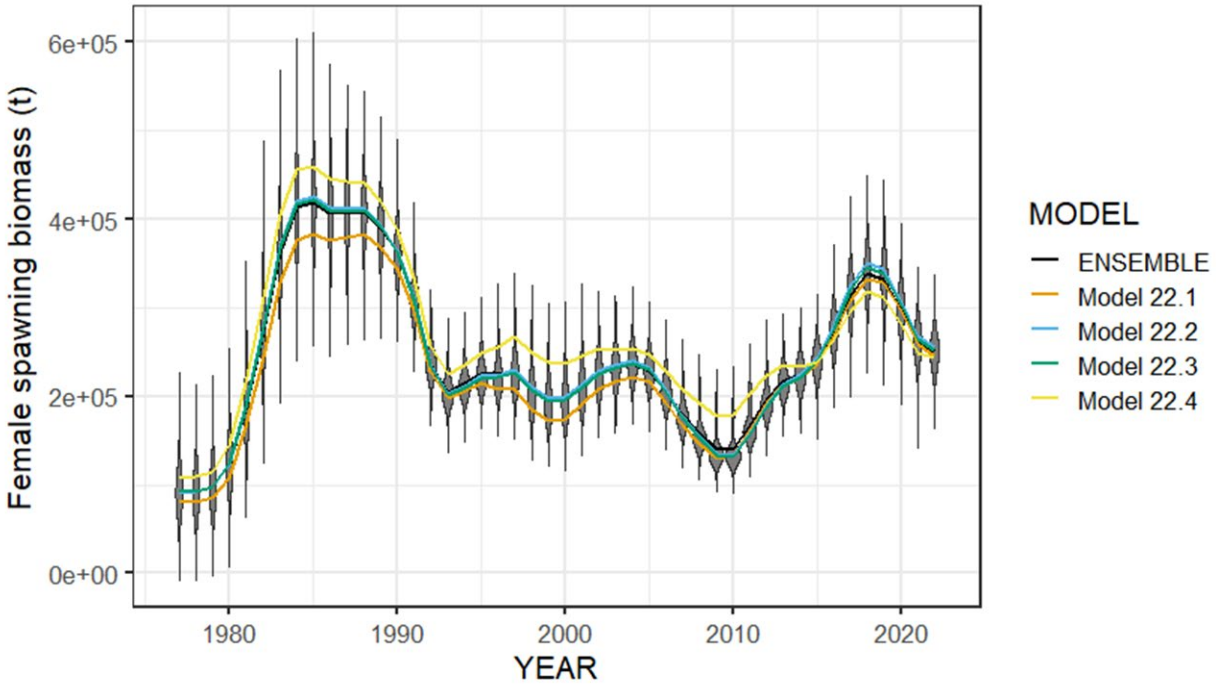




- Higher variability in fishing mortality in Thompson Series

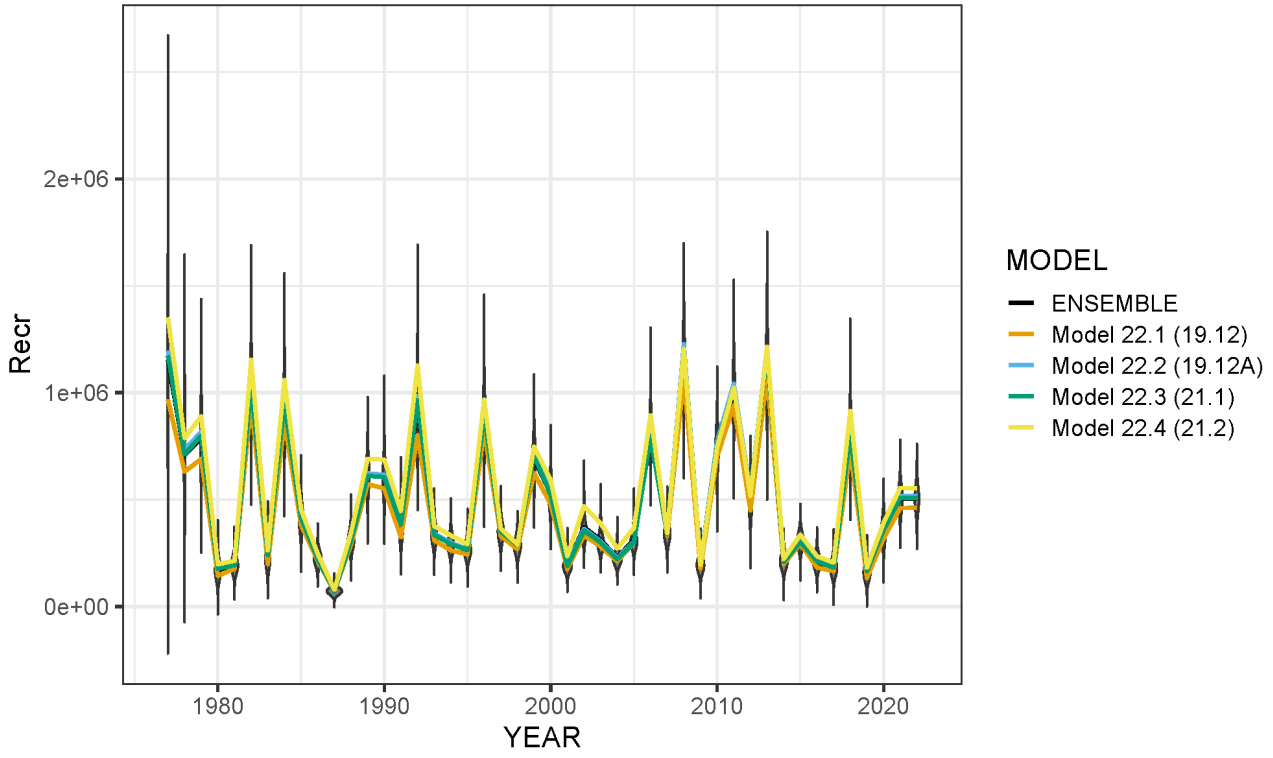
NEW SERIES RESULTS – FEMALE SPAWNING BIOMASS

- All four models show reduction from 2018 high point.
- Model 22.4 with CPUE index indicates higher SSB earlier in the time series and lower in most recent



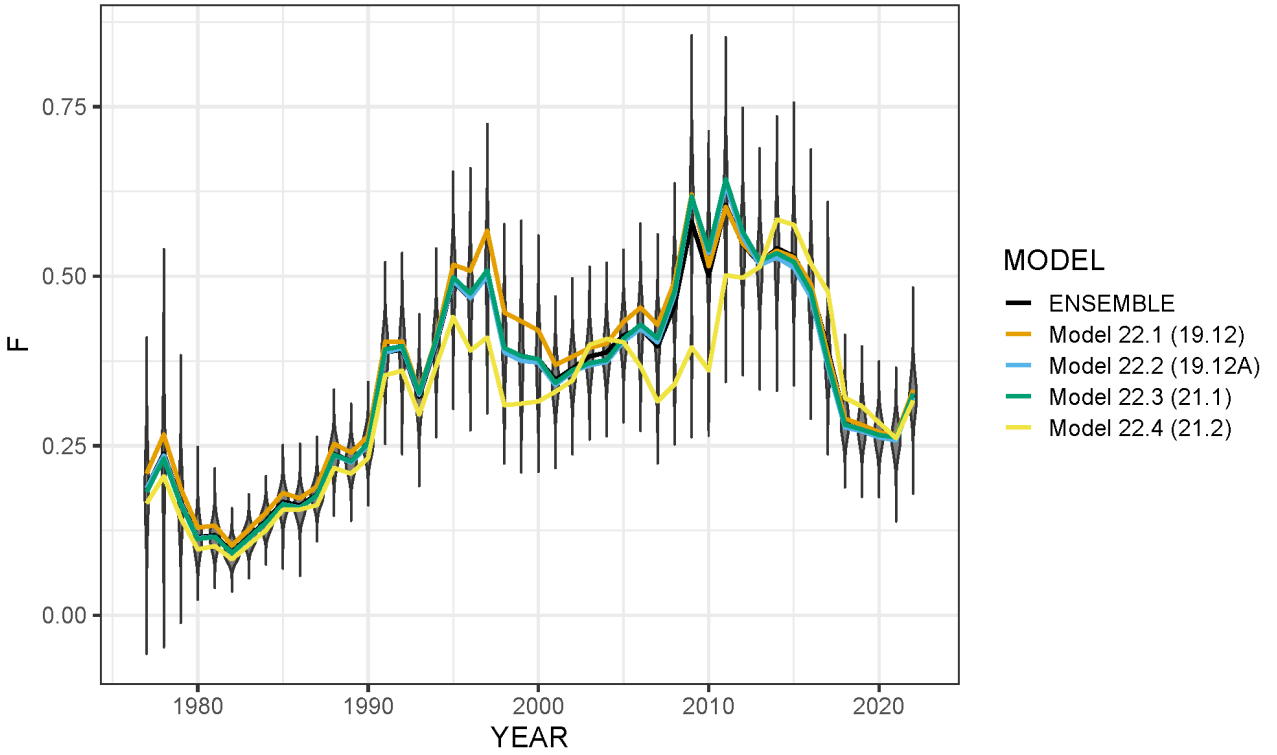
NEW SERIES RESULTS – AGE-0 RECRUITMENT

- Large 2018 year class
- 2014-2017, 2019, and 2020 estimated to be below average
- 2021 and 2022 set at ~R_0 as not yet well defined in the data.



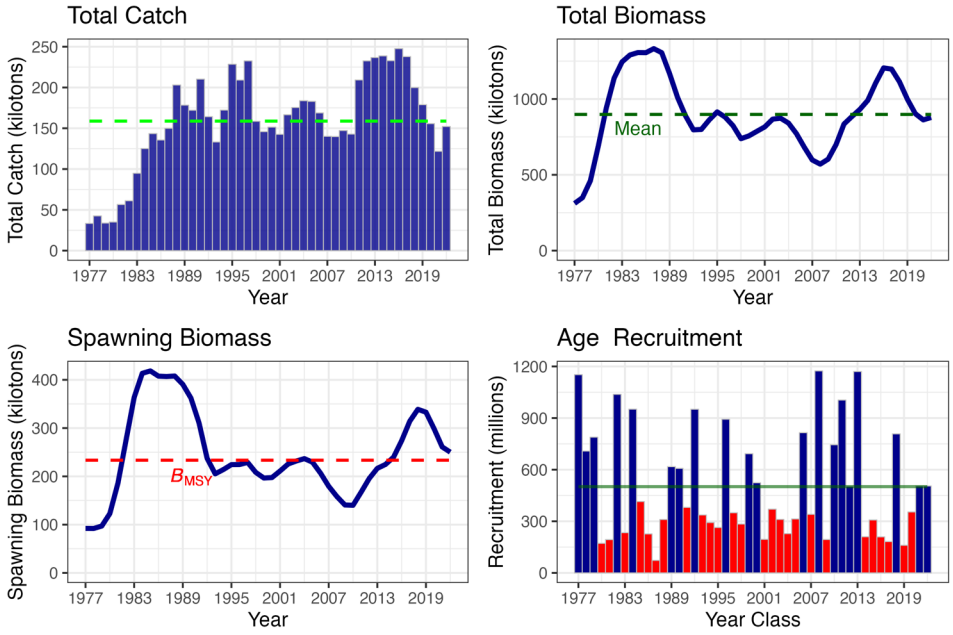
NEW SERIES RESULTS – APICAL FISHING MORTALITY

- High fishing mortality from 2008-2016 with dome-shaped survey selectivity
- Drop in F 2017-2021 change to asymptotic survey selectivity.
- Increase in 2022 due again to change in model with ensemble



CHAPTER 2
EBS PACIFIC COD

- New model(s): yes; change from base: yes; risk table (1,1,1,1)
- Team agreed with author's recommendation of using the New Series ensemble

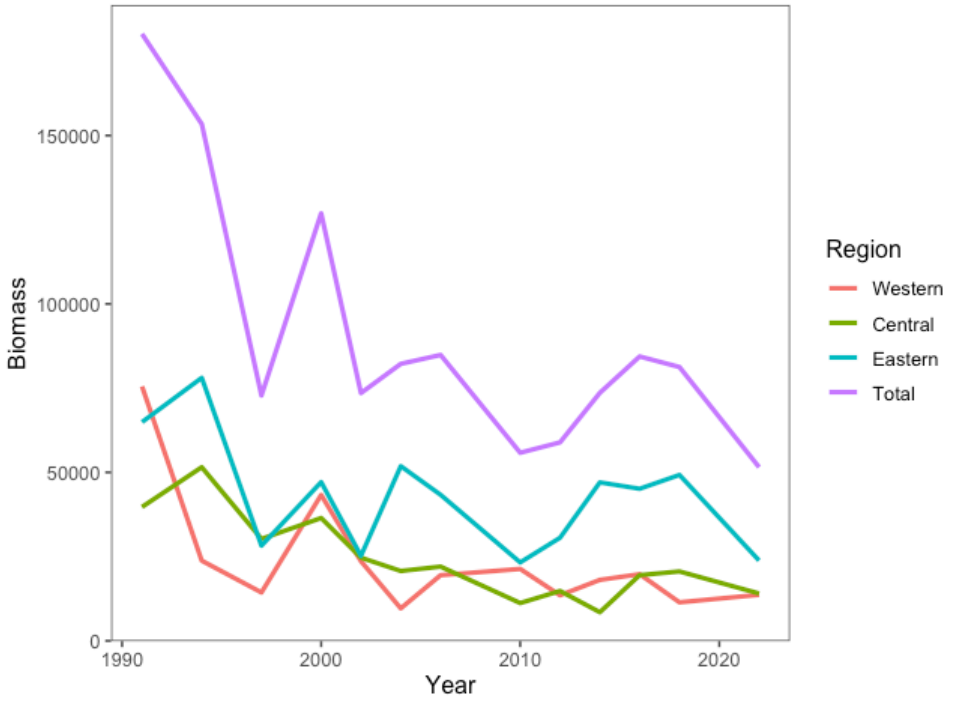


Quantity	Last asmt.	This asmt.	Change
M	0.34	0.34	0%
2022 Tier	3b		
2023 Tier	3b	3b	
2022 age+ biomass	879,978		-4%
2023 age+ biomass	848,615	844,578	-0.5%
2022 spawning biomass	259,789		-5%
2023 spawning biomass	254,585	245,594	-4%
B_0	686,761	668,477	-3%
2023 F_{OFL}	0.380	0.360	-5%
2023 F_{ABC}	0.310	0.290	-6%
2022 OFL	183,012		-6%
2023 OFL	180,909	172,495	-5%
2022 ABC	153,383		-6%
2023 ABC	151,709	144,834	-5%

CHAPTER 2A:
AI PACIFIC COD

- New model(s): yes; change from base: no; risk table (1,2,2,1)

- 2022 AI bottom trawl survey
  - -37% from 2018
  - lowest in time series
- Development of two new age-structured models
  - Not recommended for management by author due to positive retrospective bias
    - Lack of survey in 2020 and potential change in productivity in AI may be cause of bias



CHAPTER 2A:
AI PACIFIC COD

- New model(s): yes; change from base: no; risk table (1,2,2,1)

- 2022 AI bottom trawl survey
  - -37% from 2018
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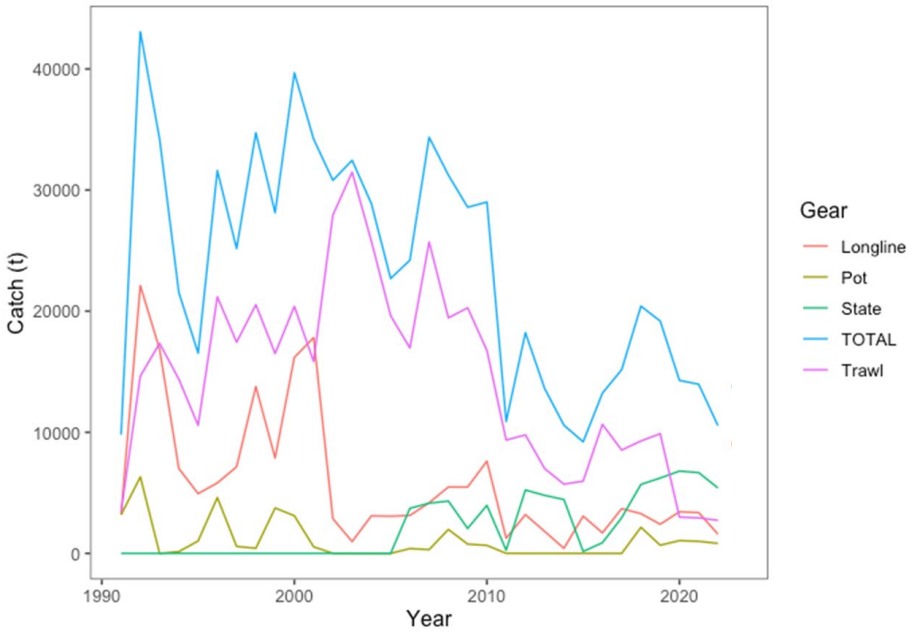
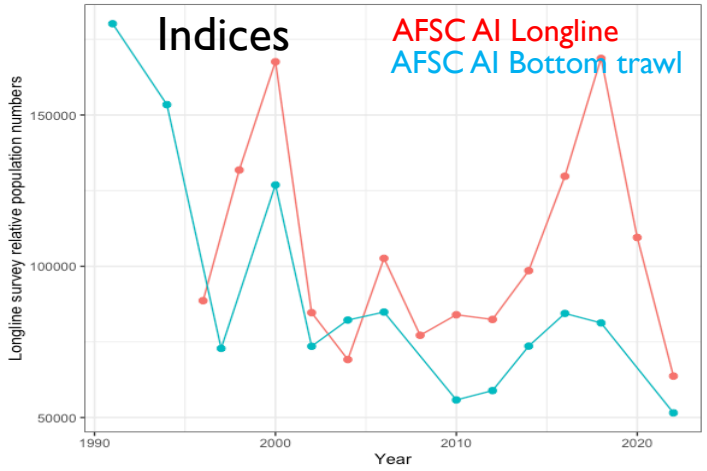
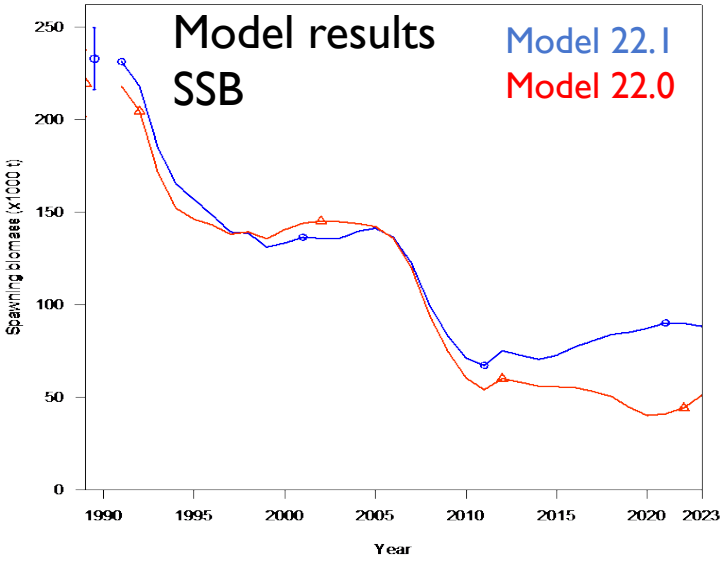


CHAPTER 2A: AI PACIFIC COD

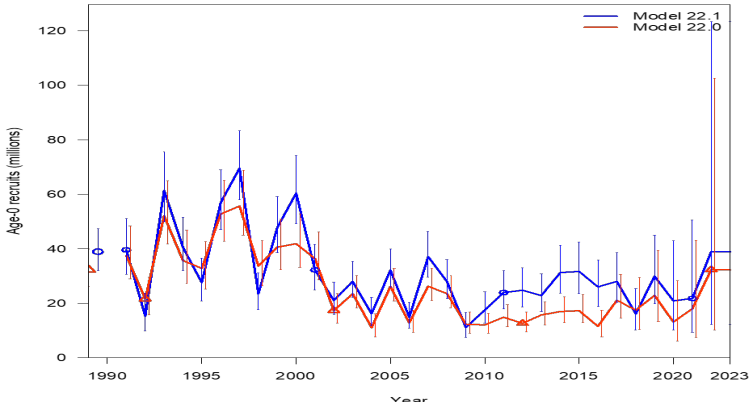
- Model 22.0 (Simple)
  - Single fishery
  - AFSC AI bottom trawl index
- Model 22.1 (Complex)
  - 3 fisheries (longline, pot, trawl)
  - 2 surveys
    - AFSC AI bottom trawl index
    - AFSC AI longline index

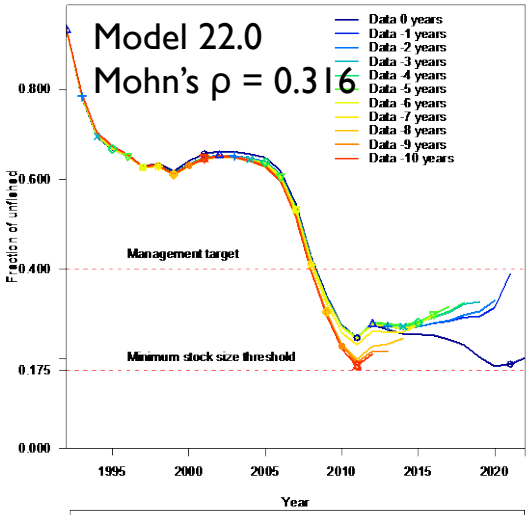


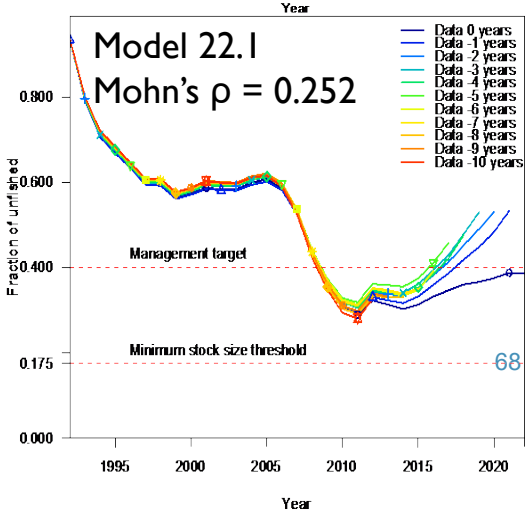


CHAPTER 2A: AI PACIFIC COD

- Both age-structured models have high positive retrospective bias leading to optimistic projections with lack of data
  - Bias is due to overly optimistic estimates of R_0
- Neither model shows the stock reaching R_0 in over 20 years.



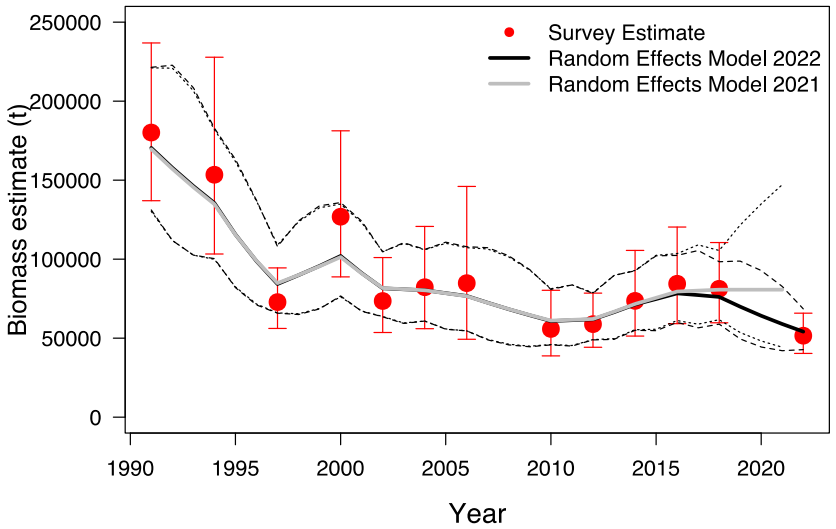




CHAPTER 2A: AI PACIFIC COD

- New model(s): yes; change from base: no; risk table (1,2,2,1)

- Team agreed with authors' recommendation of using Tier 5 random effects model



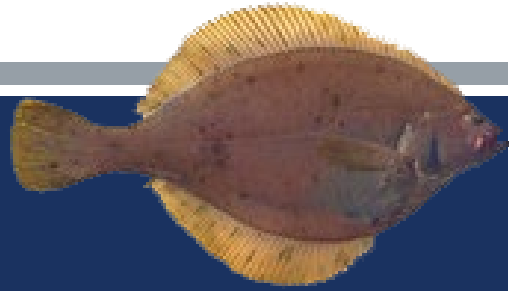
Quantity	Last asmt.	This asmt.	Change
M	0.34	0.34	0
2022 tier	5		
2023 tier	5	5	
Biomass	80,700	54,165	-49%
2023 F_{OFL}	0.340	0.340	0%
2023 F_{ABC}	0.255	0.255	0%
2022 OFL	27,400		-33%
2023 OFL	27,400	18,416	-33%
2022 ABC	20,600		-33%
2023 ABC	20,600	13,812	-33%

FLATFISH SUMMARY

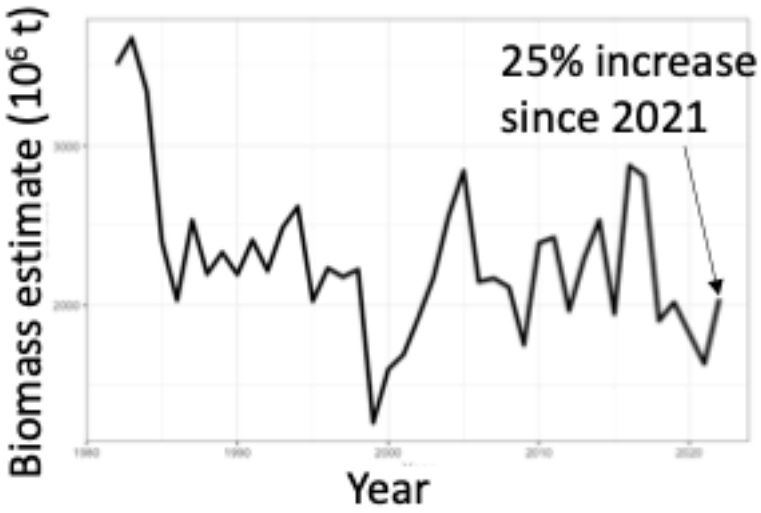
Stock	Tier	2023 ABC (t)	2023 OFL (t)	Change from 2022 ABC
Yellowfin sole	1a	378,499	404,882	7%
Greenland turbot	3a	**3,722*(6%)**	4,645	-43%
Arrowtooth flounder	3a	83,852	98,787	4%
Kamchatka flounder	3a	7,579	8,946	-18%
Northern rock sole	1a	**121,719*(23%)**	166,034	-41%
Flathead sole (partial)	3a	65,244	79,256	2%
Alaska plaice (partial)	3a	33,946	40,823	4%
Other flatfish (none)	5	17,189	22,919	0%

***xx% Reduced from maximum permissible ABC**

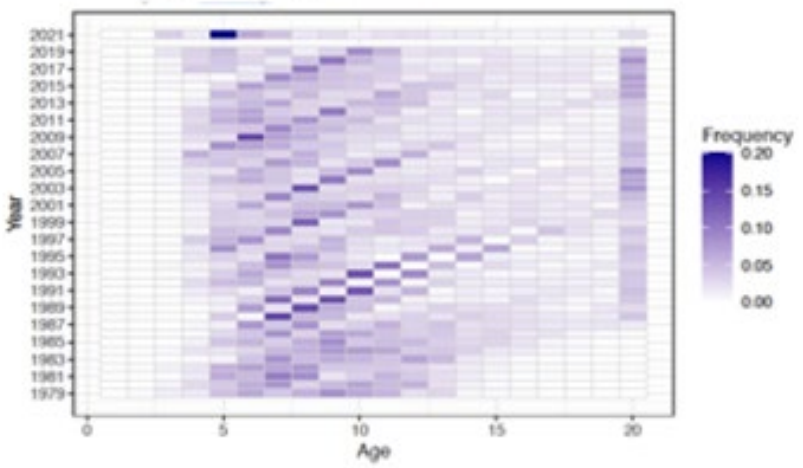
CHAPTER 4
YELLOWFIN SOLE



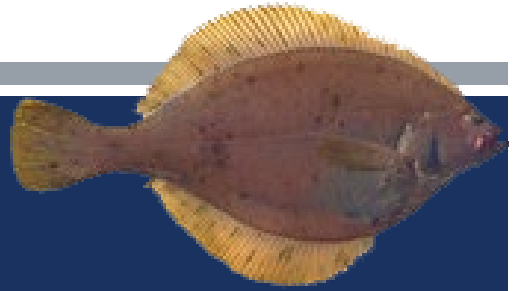
- New model(s): yes; change from base: yes; risk table (1,1,1,1)
  - Increase in survey biomass from 2021
  - Large 2017 year class



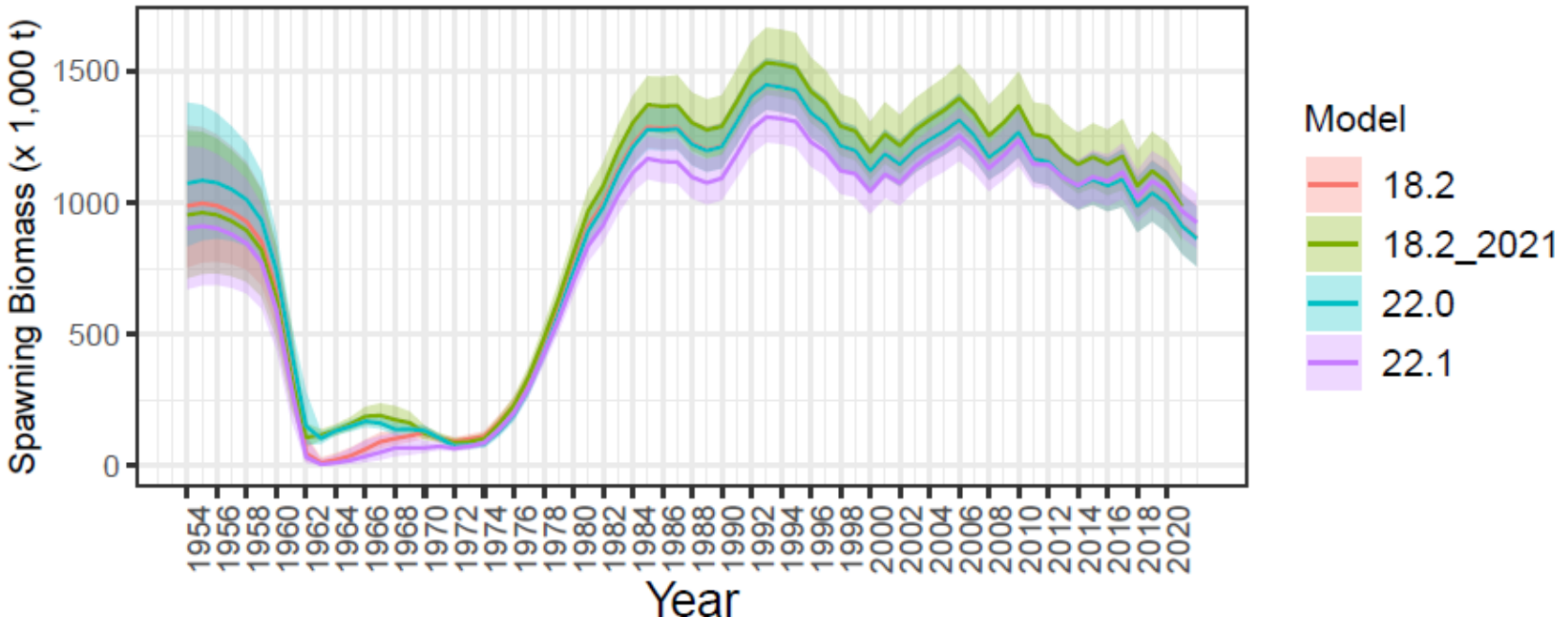
Survey age comps indicate very strong 2017 year class.



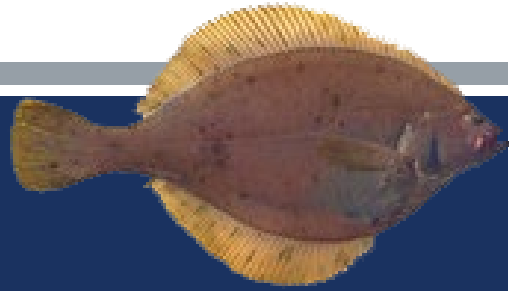
CHAPTER 4
YELLOWFIN SOLE



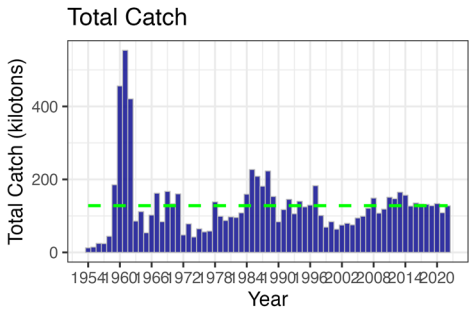
- New model(s): yes; change from base: yes; risk table (1,1,1,1)
- Two new models
  - **22.0** Single sex selectivity (nearly identical to 18.2)
  - **22.1** 22.0 W/ VAST EBS & NBS survey index

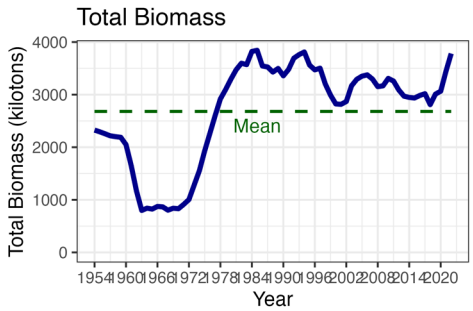


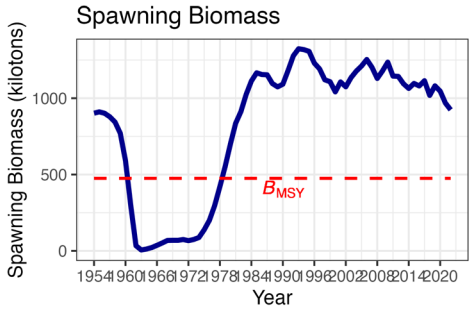
CHAPTER 4
YELLOWFIN SOLE

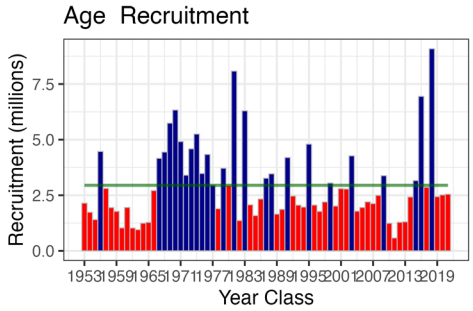


- New model(s): yes; change from base: yes; risk table (1,1,1,1)
- Sharp increase in total biomass
- Gradual projected increase in SSB





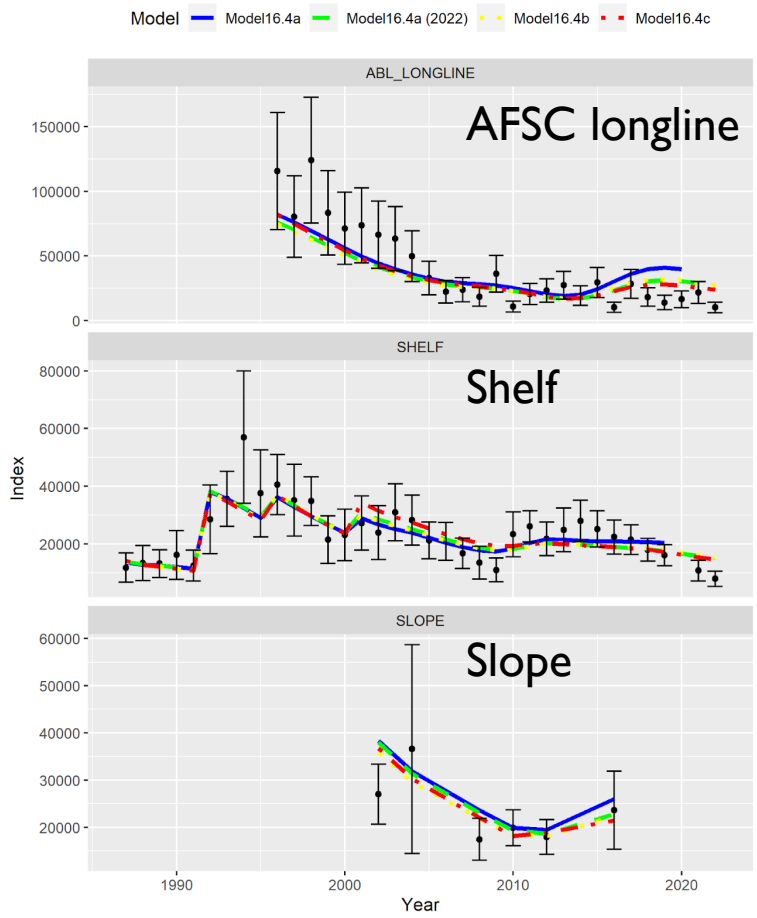




Quantity	Last asmt.	This asmt.	Change
M	0.12/0.135	0.12/0.125	
2022 Tier	1a		
2023 Tier	1a	1a	
2022 age+ biomass	2,479,370		34%
2023 age+ biomass	2,284,820	3,321,640	45%
2022 spawning biomass	857,101		3%
2023 spawning biomass	727,101	885,444	22%
B_0	1,489,190	1,407,000	-6%
B_{msy}	495,904	475,199	-4%
2023 F_{OFL}	0.152	0.122	-20%
2023 F_{ABC}	0.143	0.114	-20%
2022 OFL	377,071		7%
2023 OFL	347,483	404,882	17%
2022 ABC	354,014		7%
2023 ABC	326,235	378,499	16%

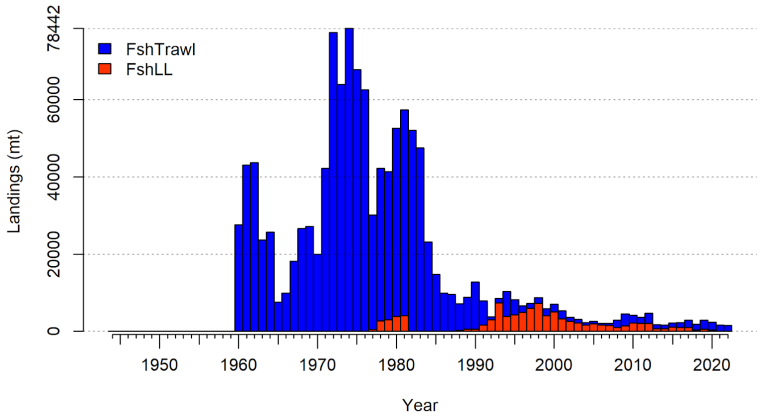
CHAPTER 5
GREENLAND TURBOT

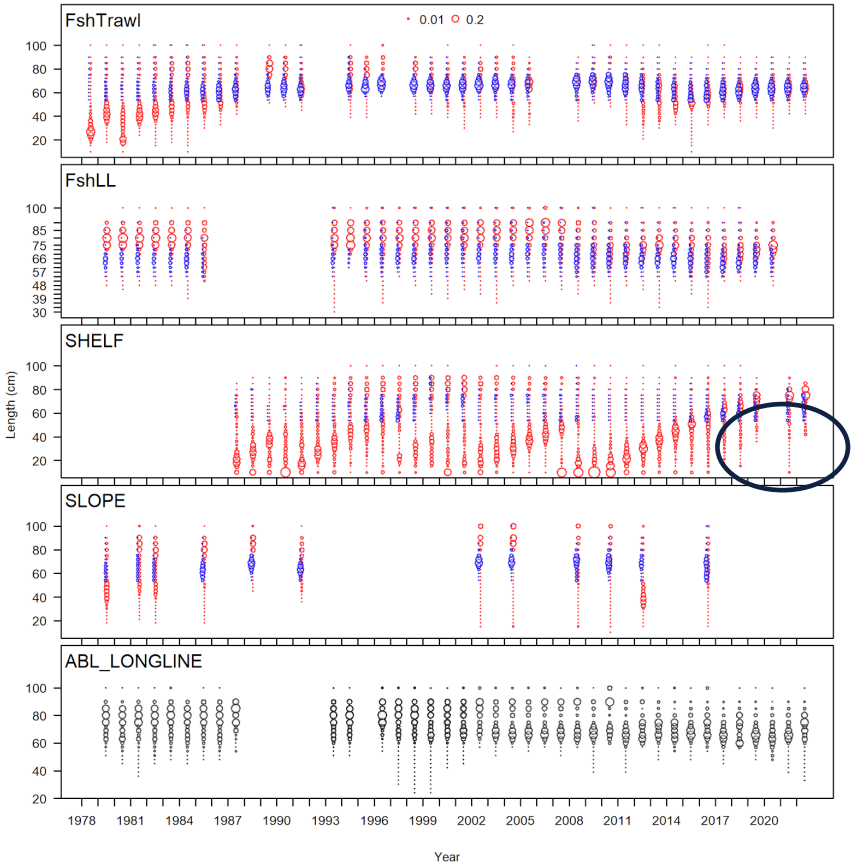
- New model(s): yes; change from base: yes; risk table (2,2,1,1)
- AFSC longline has been relatively flat in recent years with small decline in 2022
- EBS shelf survey biomass declined by 33% in 2021 and 26% in 2022
- Minor changes made in assessment model
  - Included AFSC LL length data and estimated selectivity
  - EBS slope mean length at age data to inform growth



CHAPTER 5
GREENLAND TURBOT

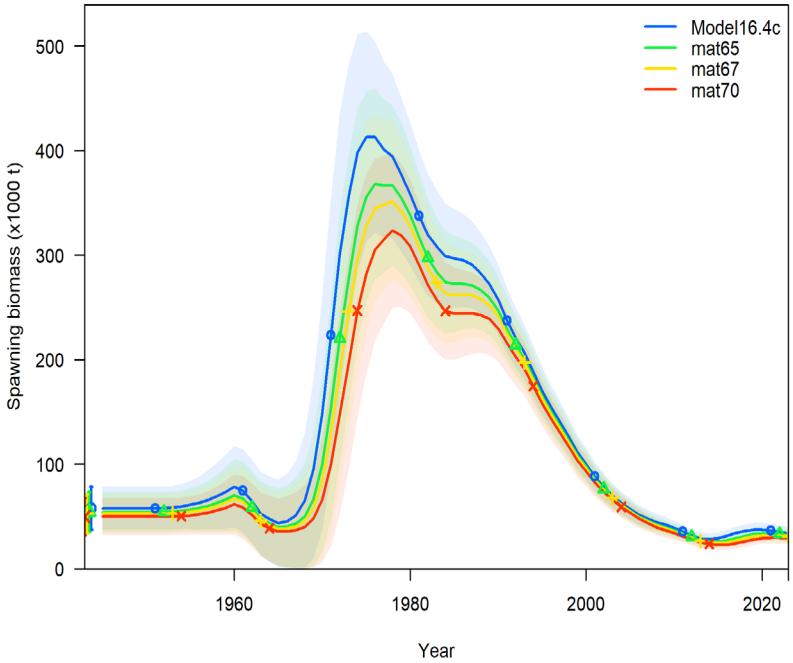
- New model(s): yes; change from base: yes; risk table (2,2,1,1)
- EBS shelf survey is an indicator for young Greenland turbot
- Less smaller, younger fish in recent years
- Longline fishery not actively fishing for GT - no length data in 2021 and 2022





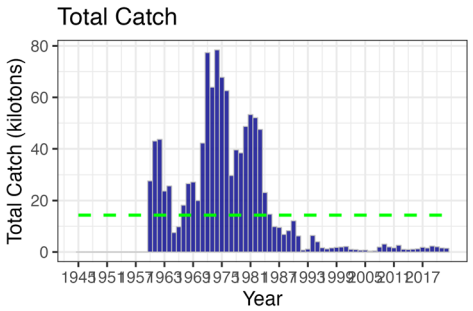
CHAPTER 5
GREENLAND TURBOT RISK TABLE

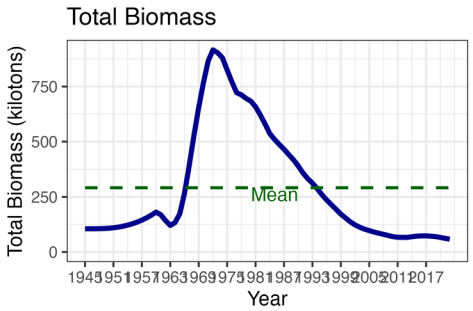
- Uncertainty about the length at 50% maturity is unresolved
  - Conducted a maturity sensitivity analysis
    - Used estimates from Cooper et al. (2007): 65cm, 67cm, and 70cm
  - Results:
    - SSB reduced by 6% - 13% on average
- Author suggested reduction from maximum permissible ABC was warranted, but did not suggest a specific value

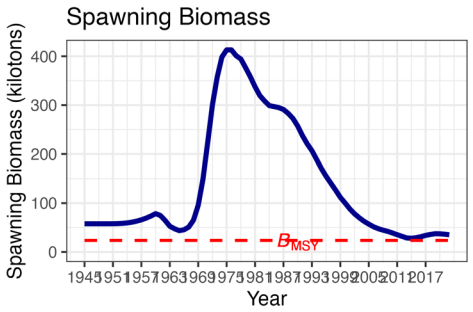


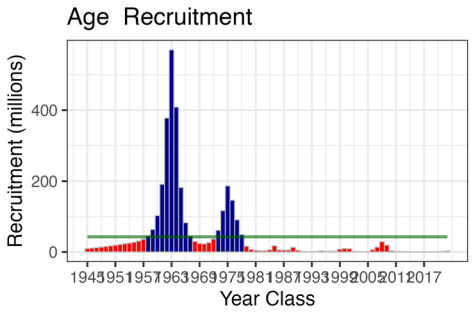
CHAPTER 5
GREENLAND TURBOT

- New model(s): yes; change from base: yes; risk table (2,2,1,1)









Quantity	Last asmt.	This asmt.	Change
M	0.112	0.112	0%
2022 Tier	3a		
2023 Tier	3a	3a	
2022 age+ biomass	84,341		-36%
2023 age+ biomass	80,404	53,907	-33%
2022 spawning biomass	50,361		-33%
2023 spawning biomass	47,376	33,554	-29%
B_0	89,054	67,647	-32%
2023 F_{OFL}	0.220	0.200	-9%
2023 F_{ABC}	0.180	0.170	-6%
2022 OFL	7,687		-40%
2023 OFL	6,698	4,645	-31%
2022 ABC	6,572		-43%
2023 ABC	5,724	3,722	-35%

CHAPTER 5
GREENLAND TURBOT

- New model(s): yes; change from base: yes; risk table (2,2,1,1)
- Team agreed with author's recommendations
- Team recommended 6% reduction from maximum permissible ABC due to assessment concerns.

Apportionment:

Area	%	ABC
Bering Sea	84.3%	3772
Aleutian Islands	15.7%	584

Quantity	Last asmt.	This asmt.	Change
M	0.112	0.112	0%
2022 Tier	3a		
2023 Tier	3a	3a	
2022 age+ biomass	84,341		-36%
2023 age+ biomass	80,404	53,907	-33%
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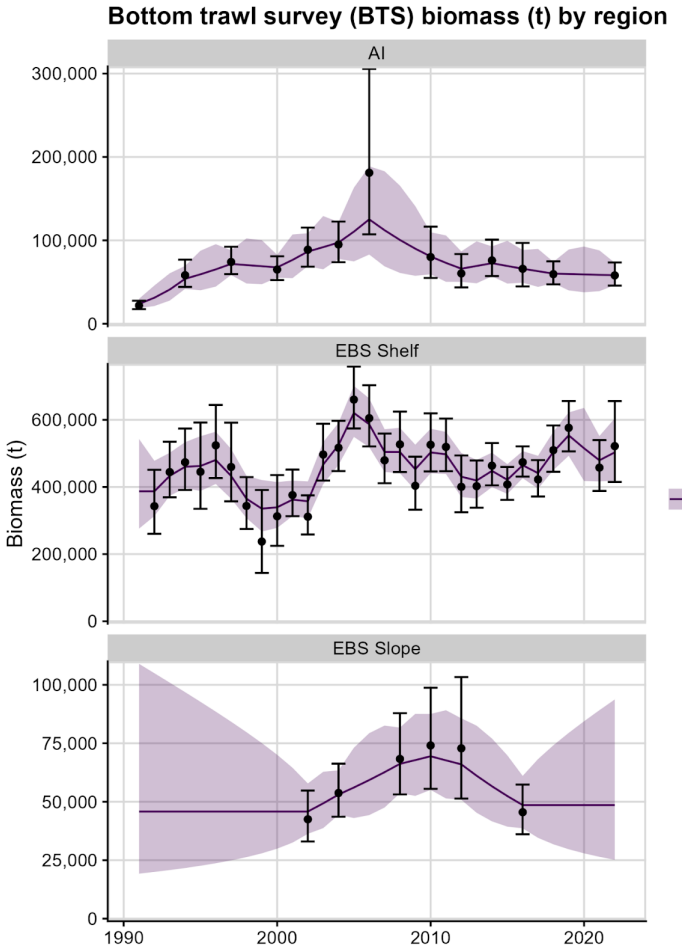
2023 OFL	6,698	4,645	-31%
2022 ABC	6,572		-43%
2023 ABC	5,724	3,722	-35%

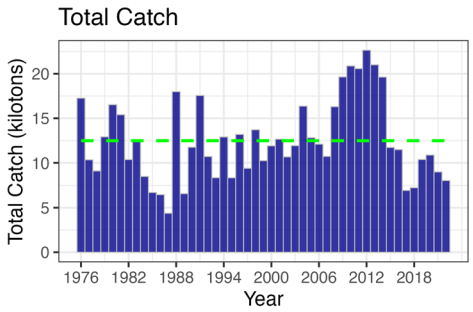
CHAPTER 6
ARROWTOOTH FLOUNDER

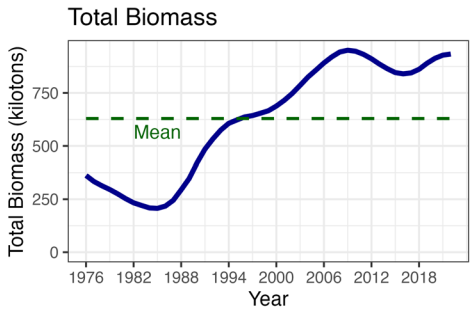
- New model(s): no; change from base: no; risk table (1,1,1,1)
- 2021 catch was 11% of ABC, in recent years has been ~10-15%
- 2022 EBS bottom trawl survey up 14% from 2021
- 2022 AI bottom trawl survey slightly down 3% from 2018
- 2022 Longline survey down from 2020 in AI (not used in model)
- Overall, surveys mixed, population levels are stable

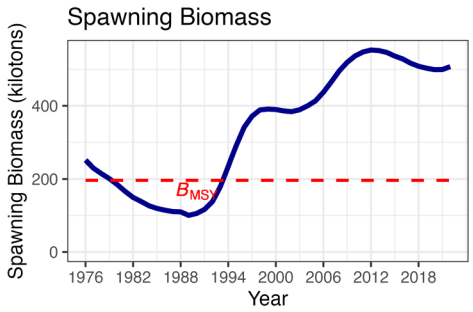


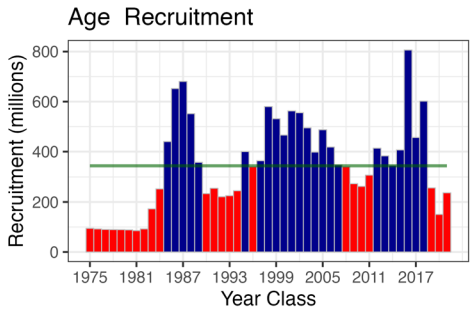
CHAPTER 6
ARROWTOOTH FLOUNDER

- New model(s): no; change from base: no; risk table (1,1,1,1)
- Team accepted authors recommended model





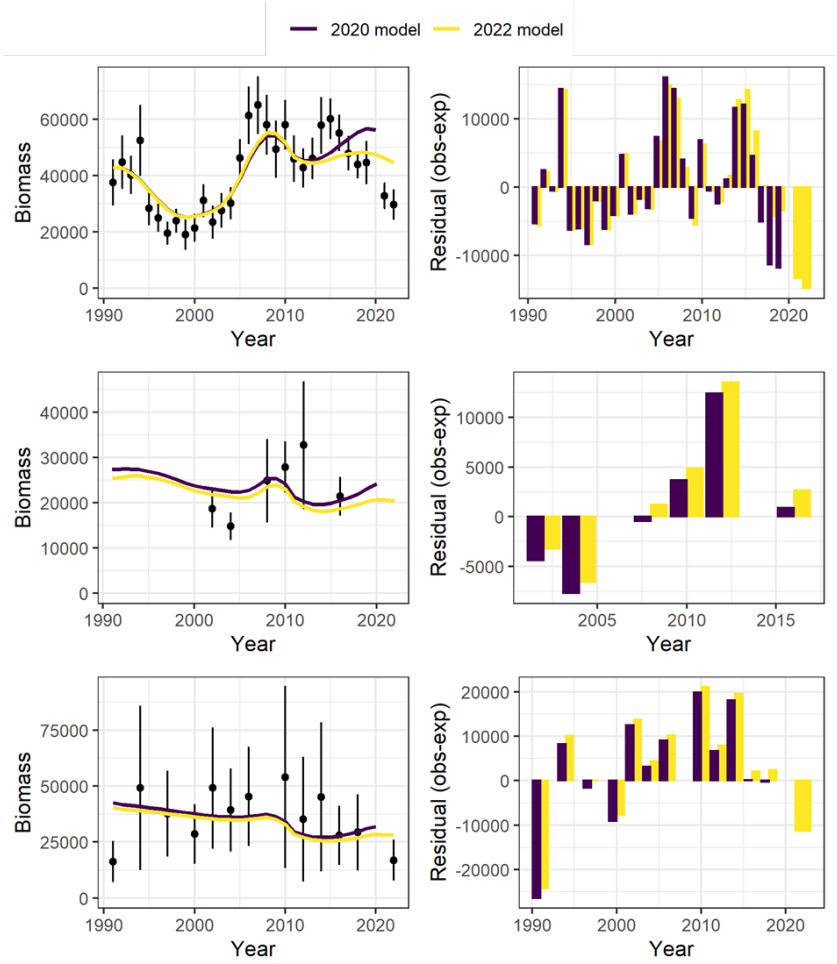




Quantity	Last asmt.	This asmt.	Change
M	0.2/0.35	0.2/0.35	0%
2022 Tier	3a		
2023 Tier	3a	3a	
2022 age+ biomass	921,690		1%
2023 age+ biomass	914,915	929,274	2%
2022 spawning biomass	509,672		1%
2023 spawning biomass	528,725	514,577	-3%
B_0	558,826	561,219	0%
2023 F_{OFL}	0.160	0.174	9%
2023 F_{ABC}	0.135	0.146	8%
2022 OFL	94,445		5%
2023 OFL	97,944	98,787	1%
2022 ABC	80,389		4%
2023 ABC	83,389	83,852	1%

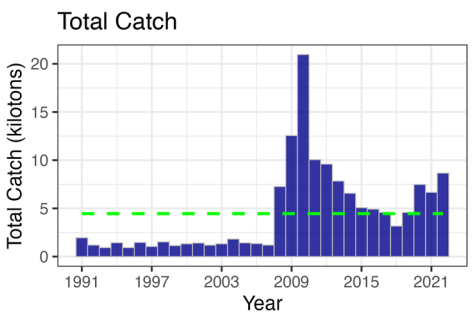
CHAPTER 7
KAMCHATKA FLOUNDER

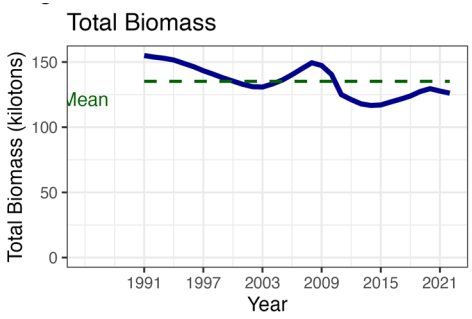
- New model(s): no; change from base: no; risk table (2,1,1,1)
- EBS shelf survey declined by 26% in 2021 and 10% in 2022
  - Overestimating most recent 2 years
  - Changing catchability?
- AI survey declined by 42% in 2022 from 2018
  - Fit scaled down from last assessment. Drawn down by most recent data point

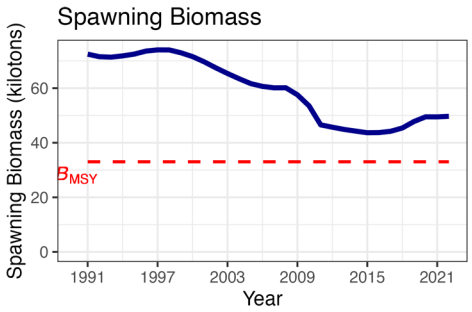


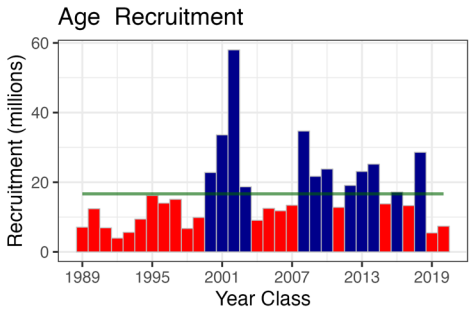
CHAPTER 7
KAMCHATKA FLOUNDER

- New model(s): no; change from base: no; risk table (2,1,1,1)
- Team agreed with author's recommendation



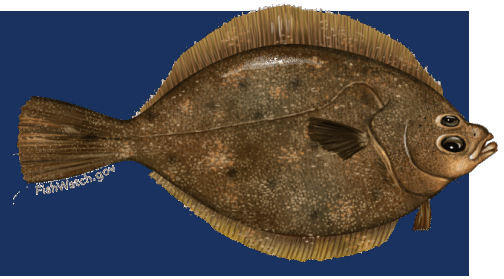




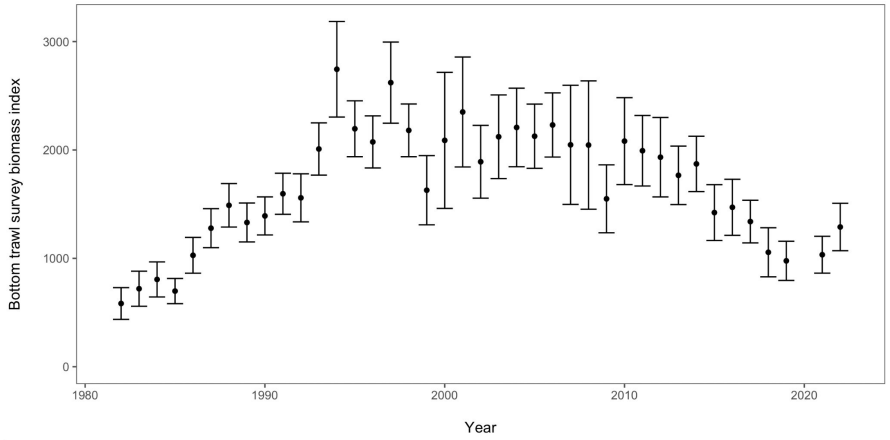


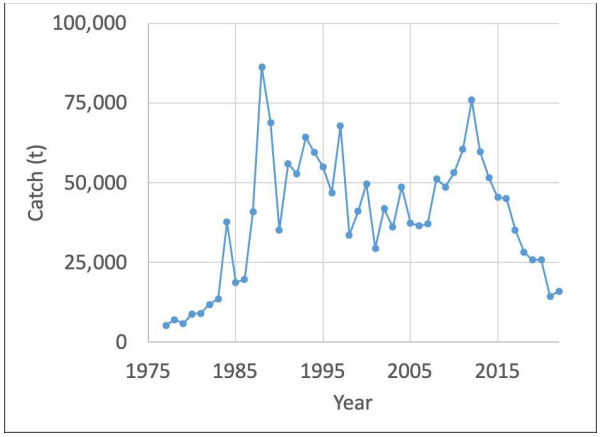
Quantity	Last asmt.	This asmt.	Change
M	0.11	0.11	0%
2022 Tier	3a		
2023 Tier	3a	3a	
2022 age+ biomass	143,983		-15%
2023 age+ biomass	142,762	121,977	-15%
2022 spawning biomass	55,701		-14%
2023 spawning biomass	57,082	47,877	-16%
B_0	101,376	94,370	-7%
2023 F_{OFL}	0.108	0.103	-5%
2023 F_{ABC}	0.090	0.086	-4%
2022 OFL	10,903		-18%
2023 OFL	11,115	8,946	-20%
2022 ABC	9,214		-18%
2023 ABC	9,393	7,579	-19%

CHAPTER 8
NORTHERN ROCKSOLE

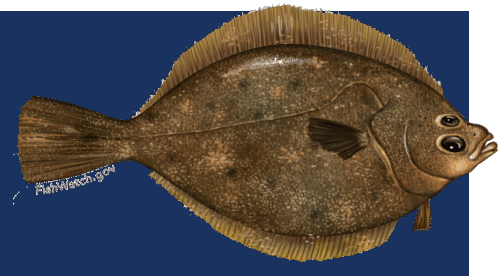


- New model(s): yes; change from base: no - but ; risk table (3,1,1,1)
- Declining biomass 2011 - 2019
- Seeing increases in recent years:
  - 6% increase in 2021
  - 25% increase in 2022
- Low catches in recent years
  - 16k t 2022; 40k t = 10 yr avg

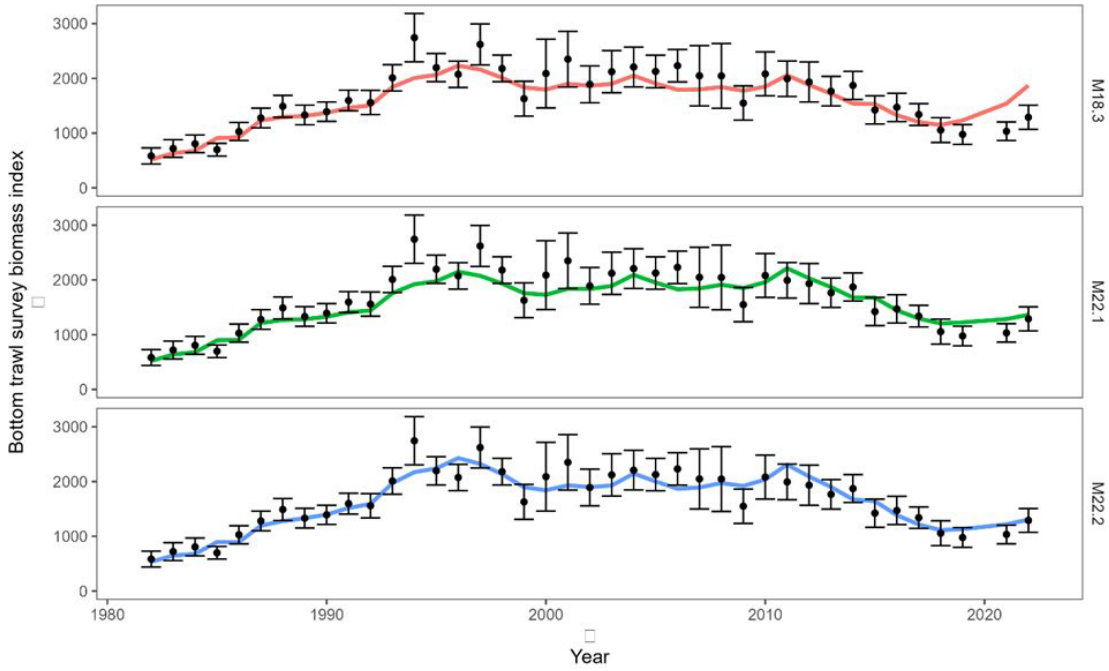




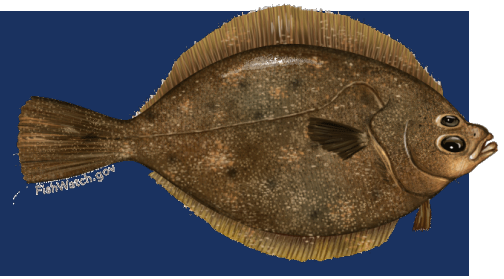
CHAPTER 8
NORTHERN ROCKSOLE



- Alternative models provided in Appendices
  - Model 22.1 - Francis weighting
  - Model 22.2 – Model 22.1 with estimation of both make and female M
- Both alternative models provide improved fits to the survey indices
- Both alternative models recommend much lower ABCs with OFLs below base model ABC.



CHAPTER 8
NORTHERN ROCKSOLE

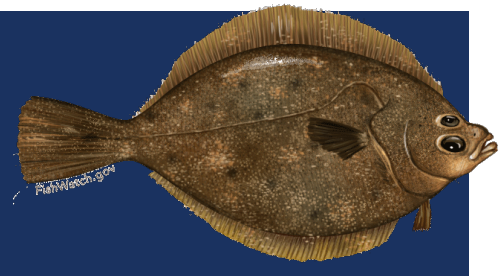


- New model(s): yes; change from base: no - but ; risk table (3,1,1,1)

- Author developed alternative models after October review
- Recommended reduction in maximum permissible ABC to reduce probability of exceeding the 'True OFL'

Quantity	Last asmt.	This asmt.	Change
M	0.15/0.17	0.15/0.19	0%
2022 Tier	1a		
2023 Tier	1a	1a	
2022 age+ biomass	1,363,592		-31%
2023 age+ biomass	1,787,395	941,359	-47%
2022 spawning biomass	287,600		-9%
2023 spawning biomass	320,399	260,887	-19%
B_0	476,820	447,795	-6%
B_{msy}	158,972	155,293	-2%
2023 F_{OFL}	0.157	0.152	-3%
2023 F_{ABC}	0.152	0.129	-15%
2022 OFL	214,084		-22%
2023 OFL	280,621	166,034	-41%
2022 ABC	206,896		-41%
2023 ABC	271,199	121,719	-55%

CHAPTER 8
NORTHERN ROCKSOLE



- New model(s): yes; change from base: no - but; risk table (3,1,1,1)
- Team commended the author on this innovative approach to incorporating new information into the assessment
- Team agreed with the authors recommended approach of using the base model but reducing the ABC to the lowest alternative OFL to reduce the risk of the ABC exceeding the 'true' but unkown OFL.

Quantity	Last asmt.	This asmt.	Change
M	0.15/0.17	0.15/0.19	0%
2022 Tier	1a		
2023 Tier	1a	1a	
2022 age+ biomass	1,363,592		-31%
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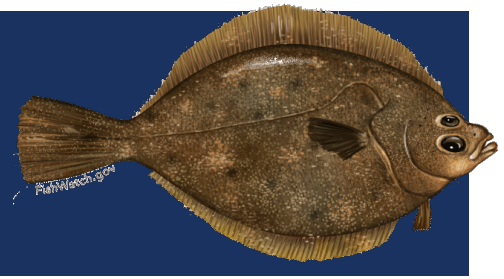
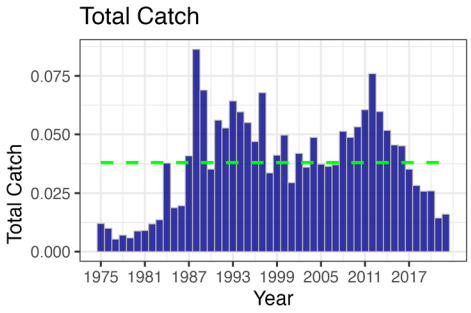
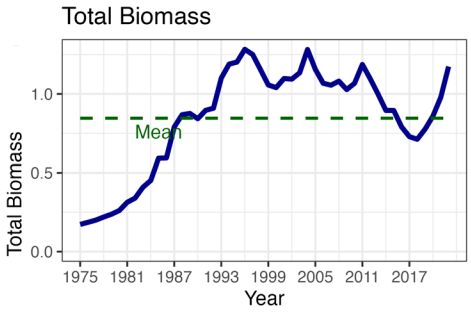
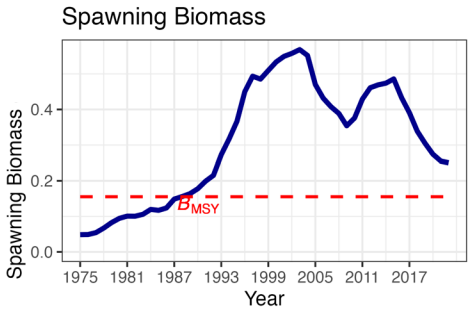
CHAPTER 8
NORTHERN ROCKSOLE

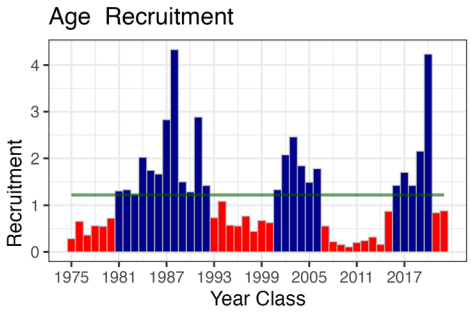


- New model(s): yes; change from base: no - but ; risk table (3,1,1,1)









Quantity	Last asmt.	This asmt.	Change
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2023 Tier	1a	1a	
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2022 OFL	214,084		-22%
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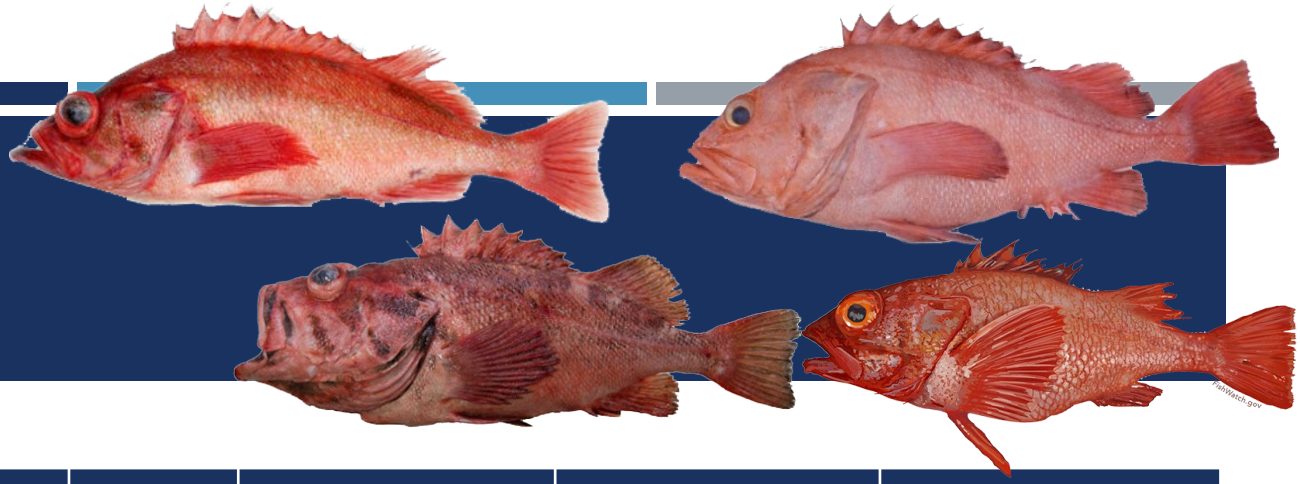
2023 ABC	271,199	121,719	-55%

ROCKFISH SUMMARY

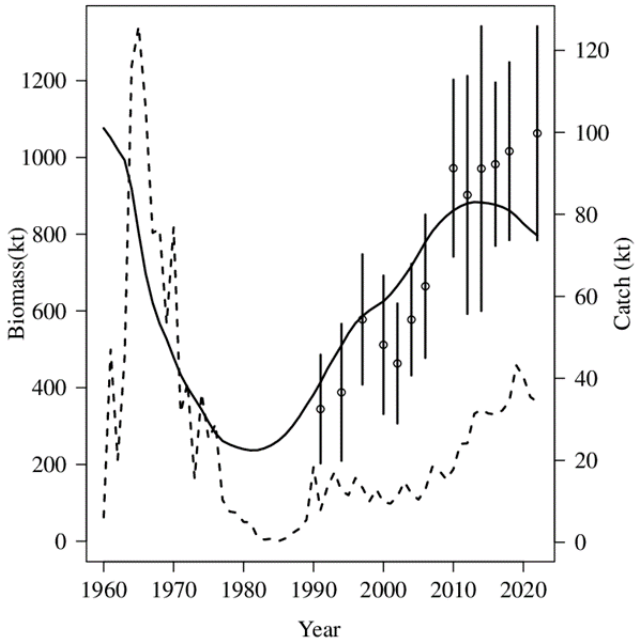


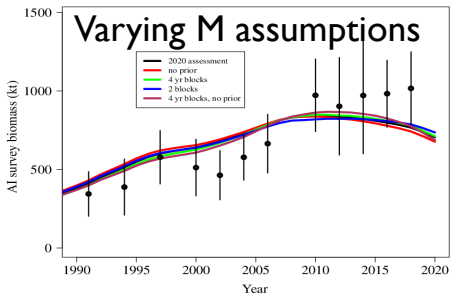
Stock	Tier	2023 ABC (t)	2023 OFL (t)	Change from 2022 ABC
Pacific ocean perch	3a	42,038	50,133	18%
Northern rockfish (Partial)	3a	18,687	22,776	-3%
Blackspotted/rougheye	**3b**/5	**467*(12%)**	703	3%
Shortraker rockfish	5	530	706	-2%
Other rockfish	5	1,260	1,680	-4%

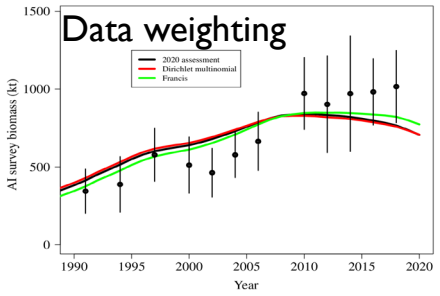
***xx% Reduced from maximum permissible ABC**

CHAPTER 12
PACIFIC OCEAN PERCH

- New model(s): yes; change from base: no; risk table (2,1,1,1)
- 2022 AI survey abundance estimate is largest on record (again)
- Still tension between survey biomass estimates and age/length composition data
  - Focus of discussion during 2022 CIE review, but no obvious answers
    - Explored models with various assumptions on M
    - Explored alternative data weighting

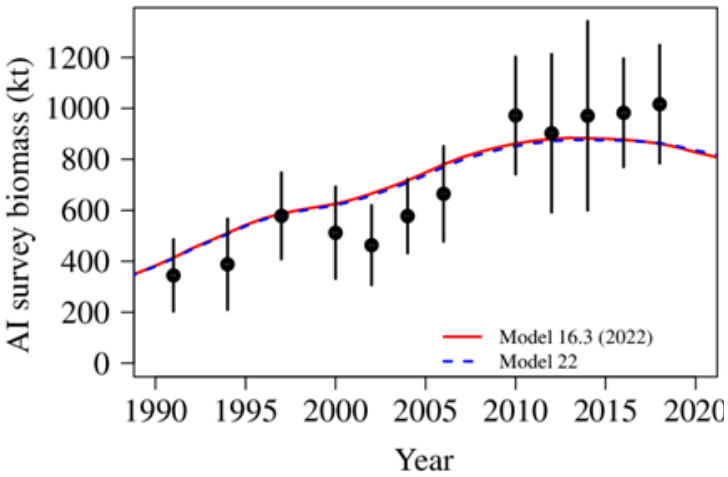


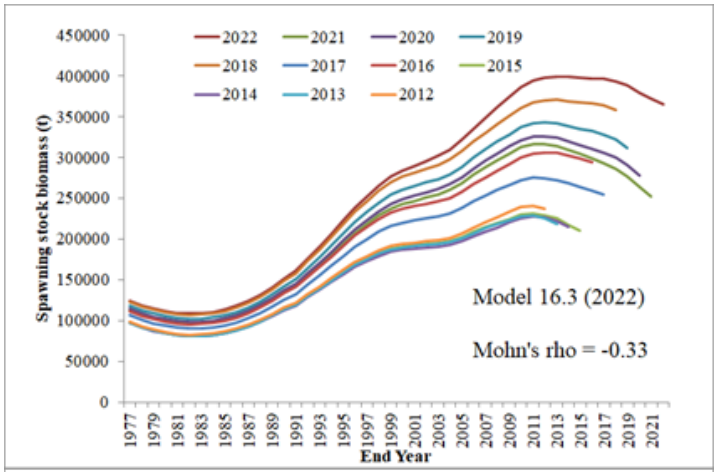


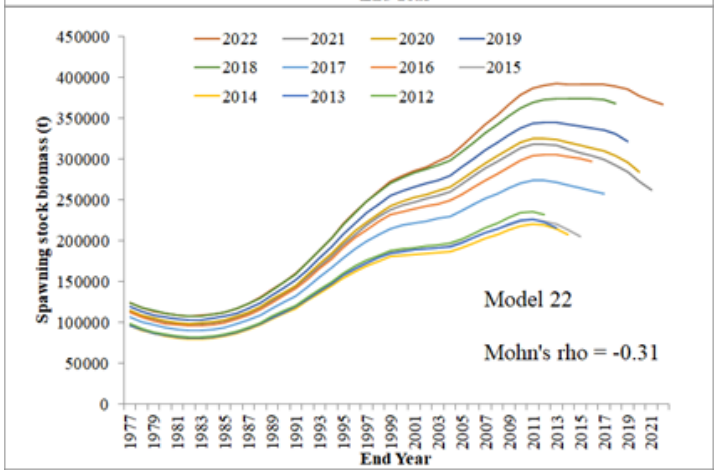


CHAPTER 12
PACIFIC OCEAN PERCH

- Alternative model explored in assessment using AI survey abundance instead of biomass
  - Retrospective pattern remains biased negative
  - No model improvement

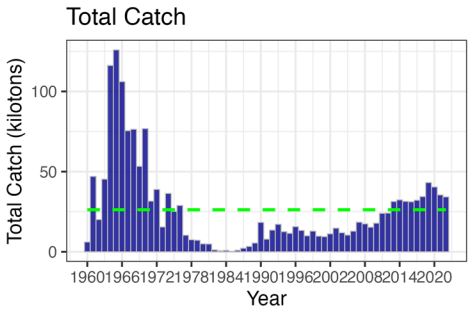


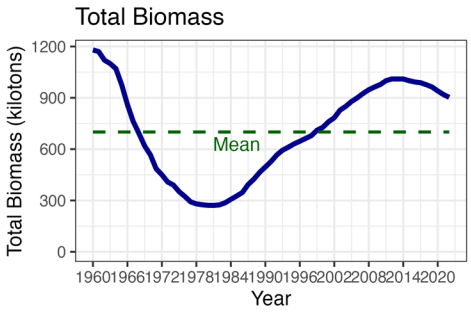


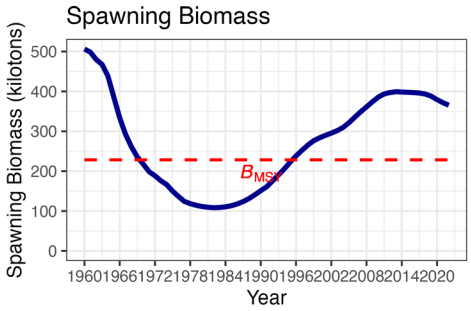


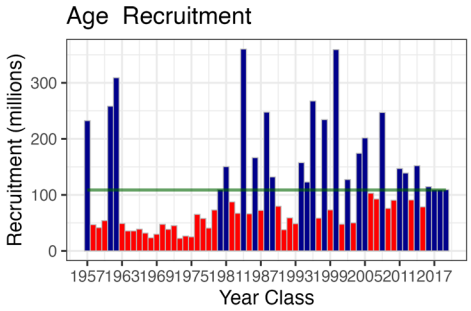
CHAPTER 12
PACIFIC OCEAN PERCH

- New model(s): yes; change from base: no; risk (2,1,1,1)
- Team agreed with author's recommendation and stayed with base model









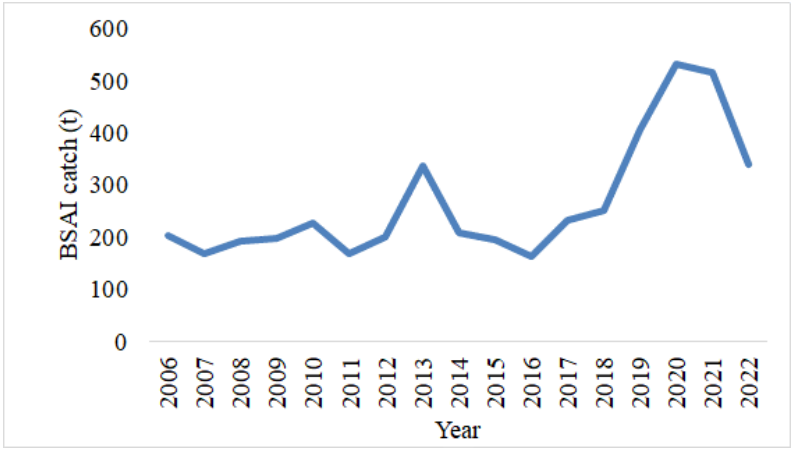
Quantity	Last asmt.	This asmt.	Change
M	0.056	0.056	0%
2022 Tier	3a		
2023 Tier	3a	3a	
2022 age+ biomass	738,710		20%
2023 age+ biomass	724,085	888,722	23%
2022 spawning biomass	299,232		20%
2023 spawning biomass	288,437	359,074	24%
B_0	584,747	652,626	10%
2023 F_{OFL}	0.089	0.089	0%
2023 F_{ABC}	0.073	0.074	1%
2022 OFL	42,605		18%
2023 OFL	40,977	50,133	22%
2022 ABC	35,688		18%
2023 ABC	34,322	42,038	22%

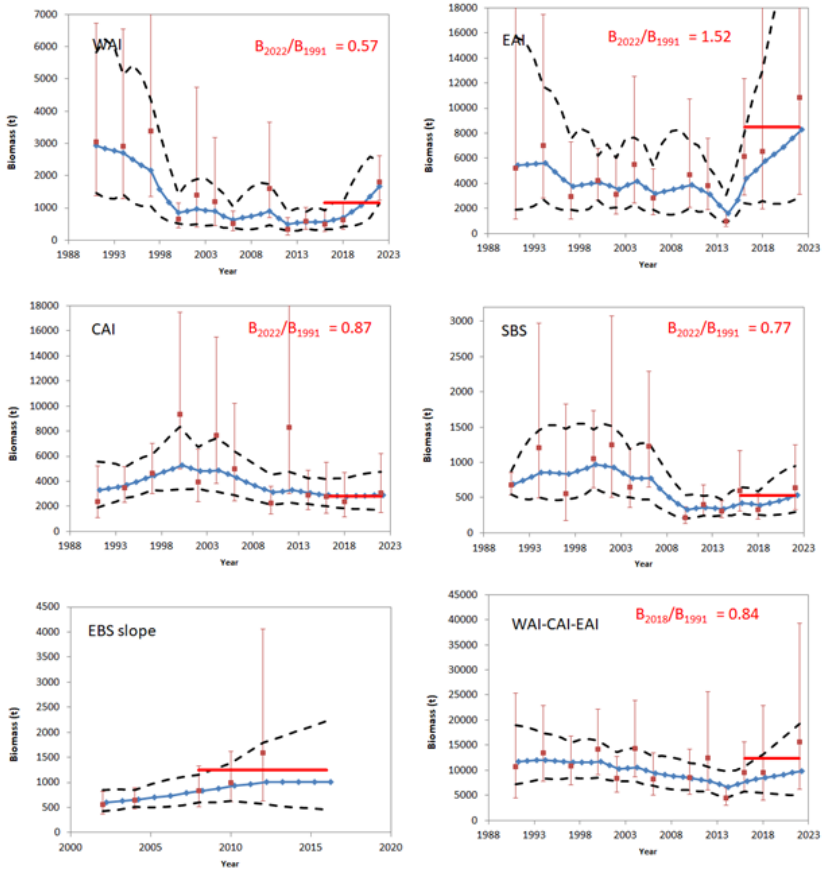
CHAPTER 14
BLACKSPOTTED & ROUGHEYE ROCKFISH

- Aleutian Islands and Bering Sea component split
  - Tier 3 model for Aleutian Islands section
  - Tier 5 RE model for Eastern Bering Sea section
- Issues of concern:
  - In AI model 2010 year class >6 times larger than the next largest cohort
  - Reduction from maximum permissible ABC
  - Spatial management concerns

CHAPTER 14
AI BLACKSPOTTED & ROUGHEYE ROCKFISH

- New model(s): yes; change from base: no - but; risk table (3,2,1,2)
- Stable or increasing recent trend in survey biomass, but high degree of uncertainty
- Decrease in recent catch

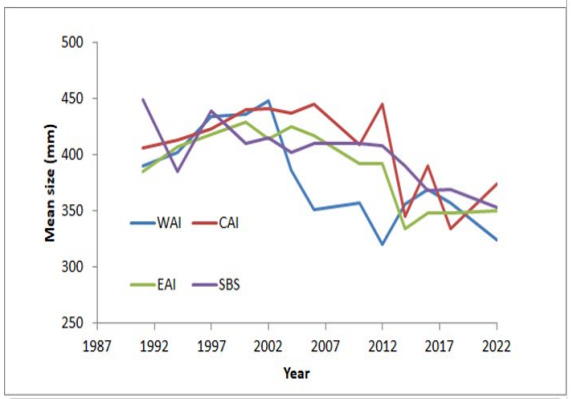


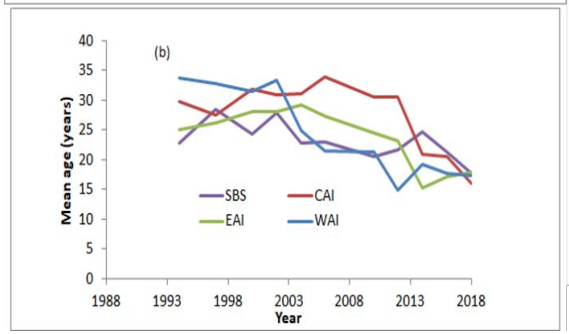


CHAPTER 14
AI BLACKSPOTTED & ROUGHEYE ROCKFISH

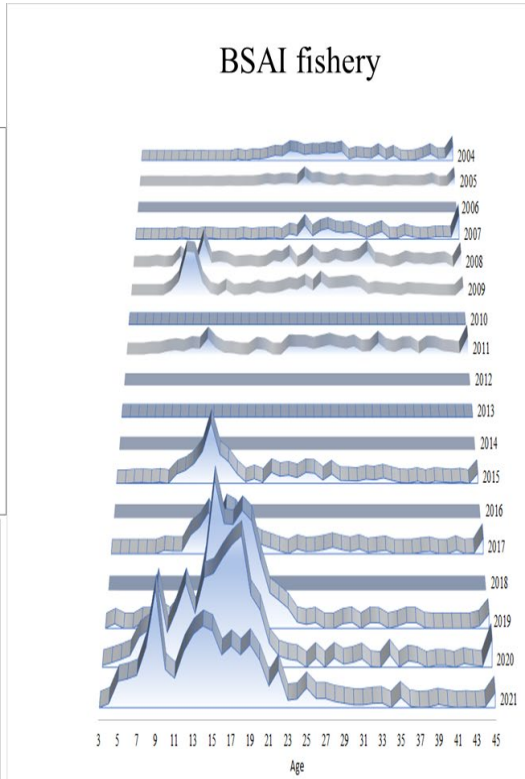
- New model(s): yes; change from base: no - but; risk table (3,2,1,2)
- New age/length composition data show continued recent catch of young/small fish (2019 – 2021 fishery ages, 2022 survey lengths)

AI survey



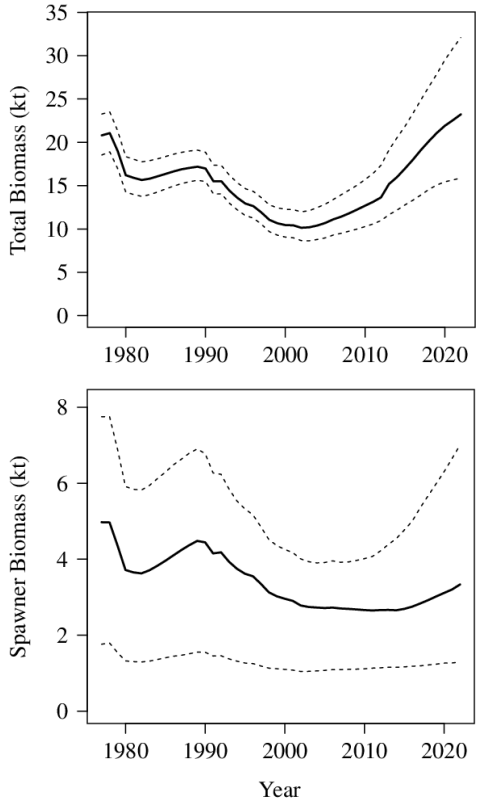


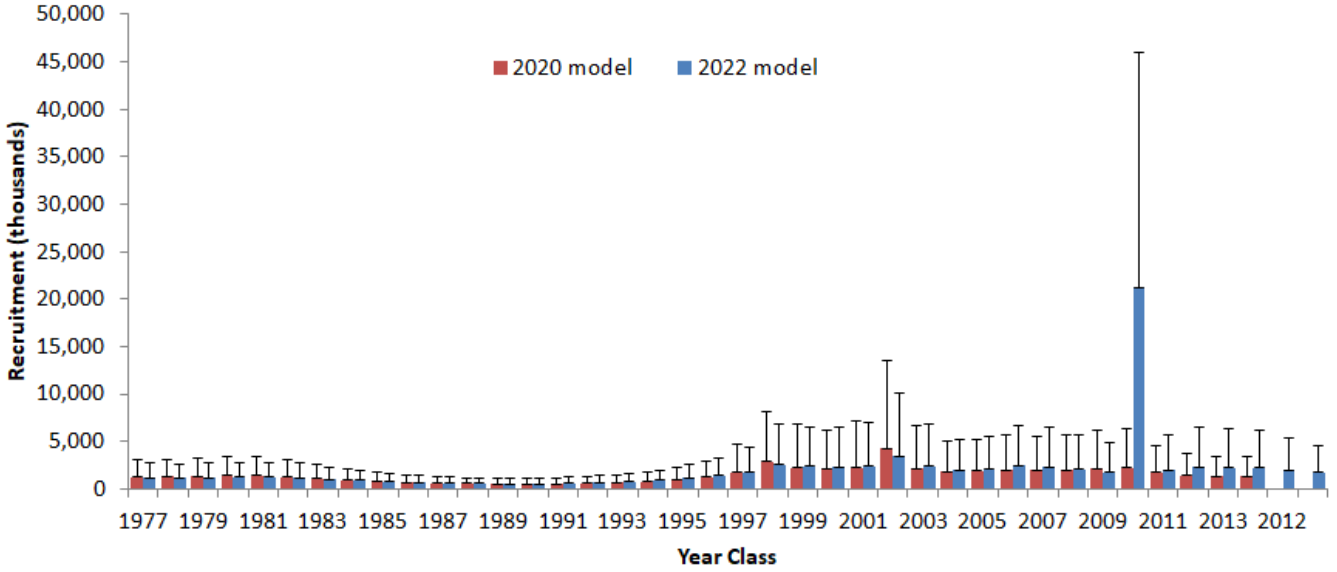
BSAI fishery



CHAPTER 14
AI BLACKSPOTTED & ROUGHEYE ROCKFISH

- The 2010 year class is 21.25 million (CV of 0.58), which is > 6 times the next largest year class
- This year class contributes 25% of the beginning year 2022 total biomass





CHAPTER 14
BLACKSPOTTED & ROUGHEYE ROCKFISH

- In standard procedures, $B_{40\%}$ increases sharply (+32%), and F_{ABC} decreases sharply (-24%), despite little change in estimated SSB
- If the 2010 year class is adjusted when computing mean recruitment to a more likely value, the $B_{40\%}$ is stabilized, but the ABC would increase sharply (based on fishing a stock in which a large portion of the biomass is composed of a large and uncertain year class).
- **Proposed middle ground:** set the value of the 2010 year class to the next largest (3.43 million, 2002 year class) for the purpose of stabilizing $B_{40\%}$ and computing maximum permissible ABC, then recommend a lower ABC so as to not substantially raise the ABC until more certainty in this year class and overall stock size can be obtained.

CHAPTER 14
BLACKSPOTTED & ROUGHEYE ROCKFISH RISK TABLE

- Assessment considerations: Level 3: Major Concern
  - Very poor fits to data; high level of uncertainty; strong retrospective bias.
- Population dynamics considerations: Level 2: Substantially increased concerns.
  - Stock trends are unusual; abundance increasing or decreasing faster than has been seen recently, or recruitment pattern is atypical.
- Fishery performance considerations: Level 2: Substantially increased concerns.
  - Fishery CPUE in the WAI subarea are larger than would be expected based on the spatial distribution of survey biomass estimates. Also, the WAI catches have consistently exceeded the MSSC, and these overages have increased over time. The catches in the WAI/CAI subarea have also exceeded the subarea ABC from 2019 – 2022, and the BSAI ABC in 2021.

CHAPTER 14
AI BLACKSPOTTED & ROUGHEYE ROCKFISH

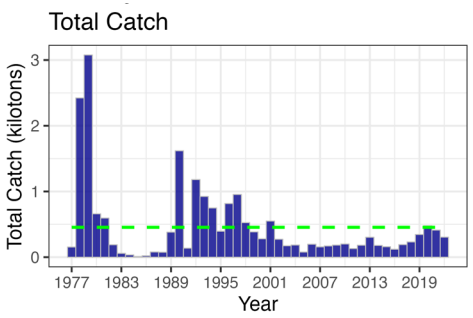
- New model(s): yes; change from base: no - but; risk table (3,2,1,2)

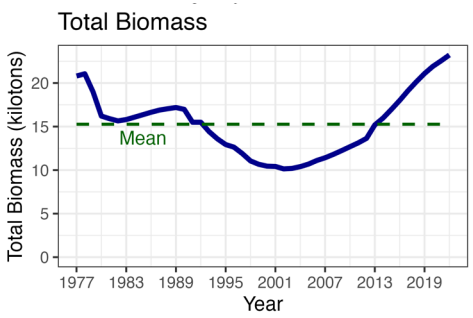
- Team accepted the authors' recommendation
  - Adjusted 2010 recruitment to 2002 value for calculating reference points.
  - Reduction from maximum permissible ABC to 2022 ABC to stabilize ABC until there is more certainty on the 2010 year class.

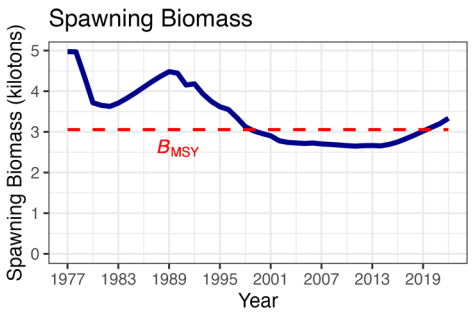
Quantity	Last asmt.	This asmt.	Change
M	0.049	0.05	0%
2022 Tier	3b		
2023 Tier	3a	3b	
2022 age+ biomass	17,774		34%
2023 age+ biomass	17,862	23,856	34%
2022 spawning biomass	3,468		0%
2023 spawning biomass	3,568	3,471	-3%
B_0	8,811	8,733	-1%
2023 F_{OFL}	0.039	0.040	3%
2023 F_{ABC}	0.033	0.030	-9%
2022 OFL	531		18%
2023 OFL	548	626	14%
2022 ABC	453		3%
2023 ABC	467	467	0%

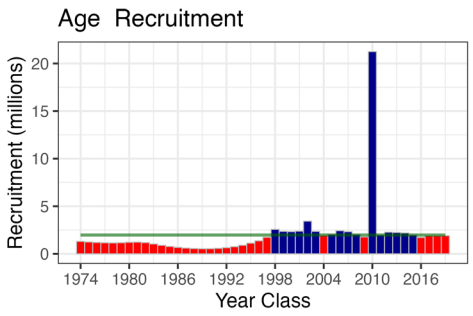
CHAPTER 14
AI BLACKSPOTTED & ROUGHEYE ROCKFISH

- New model(s): yes; change from base: no - but; risk table (3,2,1,2)









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B_0	8,811	8,733	-1%
2023 F_{OFL}	0.039	0.040	3%
2023 F_{ABC}	0.033	0.030	-9%
2022 OFL	531		18%
2023 OFL	548	626	14%
2022 ABC	453		3%
2023 ABC	467	467	0%

CHAPTER 14
EBS BLACKSPOTTED & ROUGHEYE ROCKFISH

- Team accepted the authors' recommendation

Quantity	Last asmt.	This asmt.	Change
M	0.049	0.05	2%
2022 tier	5		
2023 tier	5	5	
Biomass	1,371	1,544	11%
2023 F_{OFL}	0.049	0.050	2%
2023 F_{ABC}	0.037	0.037	0%
2022 OFL	67		15%
2023 OFL	67	77	15%
2022 ABC	50		16%
2023 ABC	50	58	16%

CHAPTER 14
BLACKSPOTTED & ROUGHEYE ROCKFISH

Spatial apportionment

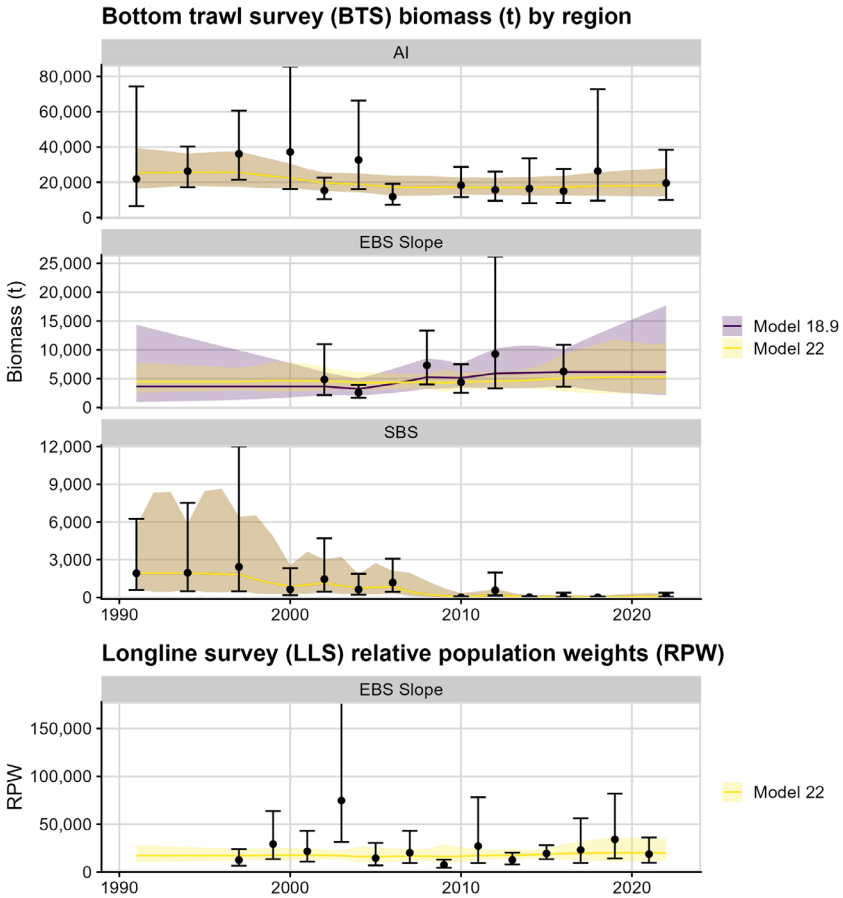
	Area				
	WAI	CAI	EAI	SBS	EBS slope
Smoothed biomass	1,671	2,887	8,282	534	1,010
percentage (within AI subarea)	13.0%	22.5%	64.5%		

MSSCs

	Area				
	WAI	CAI	WAI/CAI	EAI/EBS	Total
Year	MSSC	MSSC	ABC	ABC	ABC
2023	61	105	166	359	525
2024	67	115	182	388	570

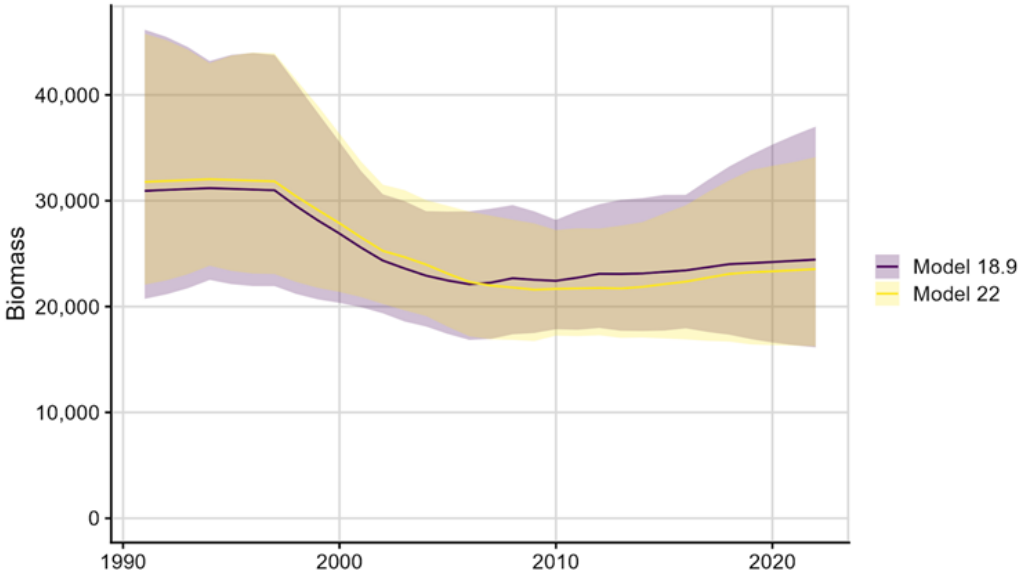
CHAPTER 15
SHORTRAKER ROCKFISH

- New model(s): yes; change from base: yes; risk table (1,1,1,1)
- Model change:
  - REMA
  - Added NMFS longline survey abundance index for shortraker in the EBS slope (no trawl survey since 2016)
- 2021 Catch: 380 t
  - 70% of ABC
- 2022 Biomass: 23,547 t
  - 2% decrease from 2020



CHAPTER 15
SHORTRAKER ROCKFISH

- New model(s): yes; change from base: yes; risk table (1,1,1,1)
- Team agreed with author's recommendations

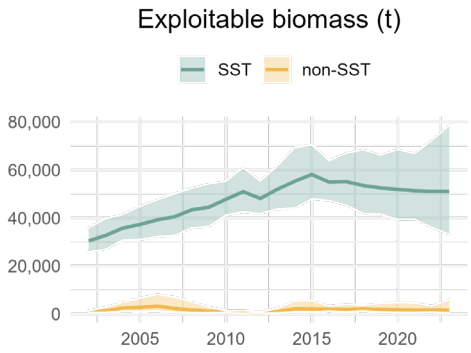


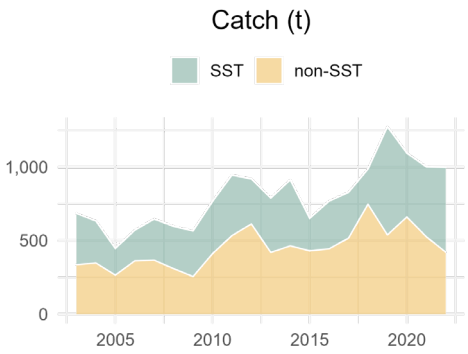
Quantity	Last asmt.	This asmt.	Change
M	0.03	0.03	0
2022 tier	5		
2023 tier	5	5	
Biomass	24,055	23,547	-2%
2023 F_{OFL}	0.030	0.030	0%
2023 F_{ABC}	0.023	0.023	0%
2022 OFL	722		-2%
2023 OFL	722	706	-2%
2022 ABC	541		-2%
2023 ABC	541	530	-2%

CHAPTER 16
OTHER ROCKFISH

- New model(s): yes; change from base: yes; risk table (1,1,1,1)
- SST: shortspine thornyhead (95% of complex)
- non-SST: dusky rockfish and ≥ 11 other species (5% of complex)
- Model change: Added NMFS longline survey abundance index for SST in the EBS slope (no trawl survey since 2016)

Quantity	Last asmt.	This asmt.	Change
M	0.03/0.09	0.03/0.09	0
2022 tier	5		
2023 tier	5	5	
Biomass	53,248	52,733	-1%
2023 F_{OFL}	0.03/0.09	0.03/0.09	0%
2023 F_{ABC}	0.0225/0.0675	0.0225/0.0675	0%
2022 OFL	1,751		-4%
2023 OFL	1,751	1,680	-4%
2022 ABC	1,313		-4%
2023 ABC	1,313	1,260	-4%





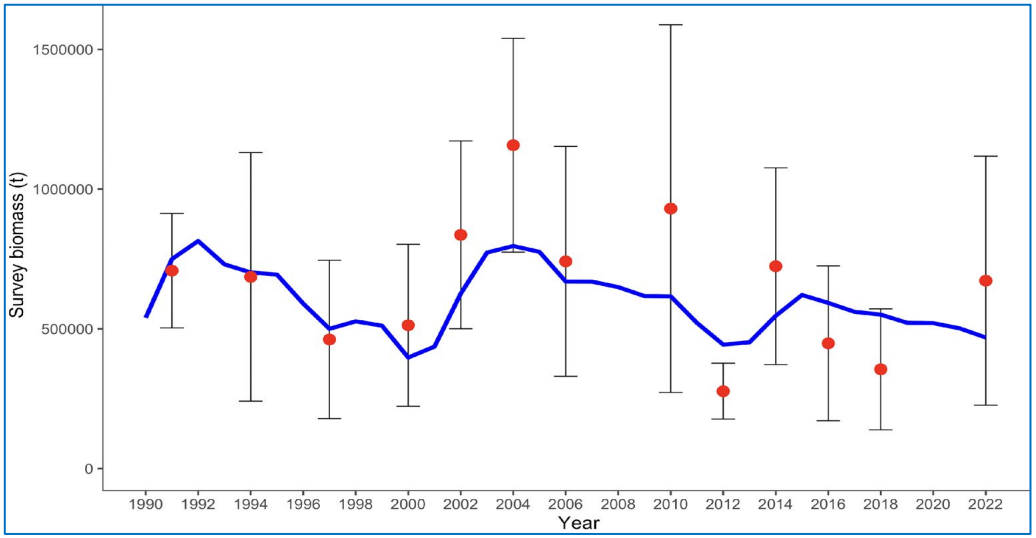
OTHER SUMMARY

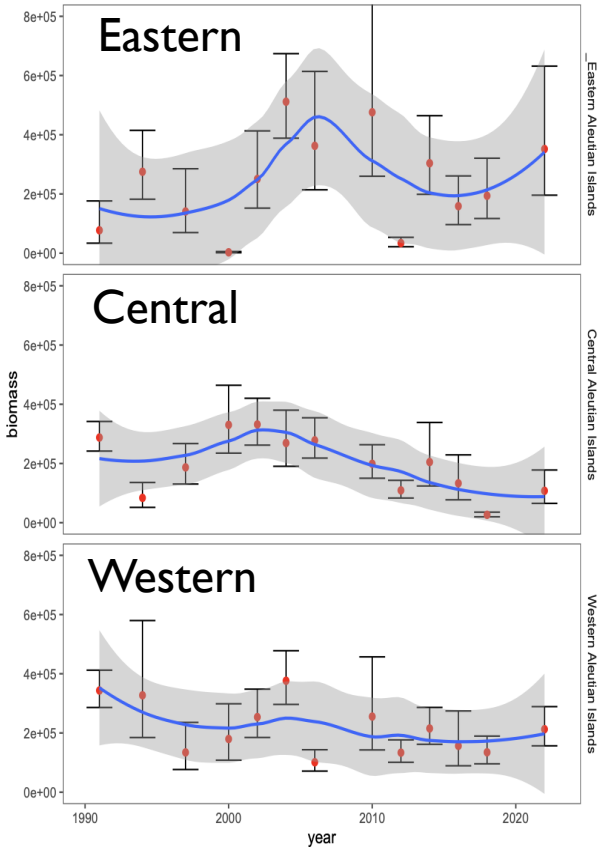
Stock	Tier	2023 ABC (t)	2023 OFL (t)	Change from 2022 ABC
Atka mackerel	3a	98,588	118,787	26%
Skates (Partial)	3a/5	38,605	46,220	-4%
Sharks	6	**450*(13%)**	689	-13%
Octopus (Partial)	6	3,576	4,769	0%

***xx% Reduced from maximum permissible ABC**

CHAPTER 17
ATKA MACKEREL

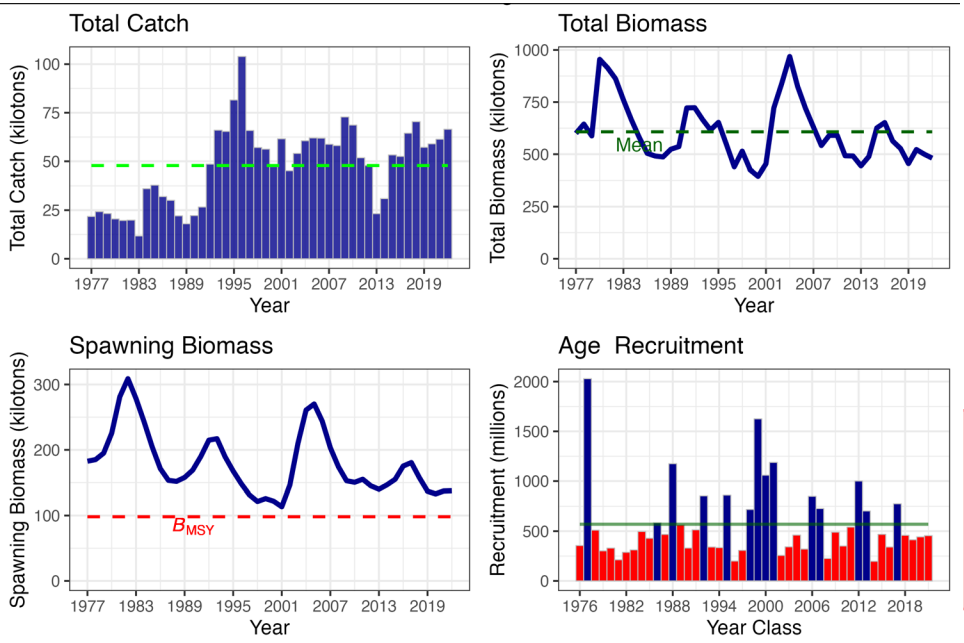
- New model(s): no; change from base: no; risk table (2,1,2,1)
- 89% increase in AI bottom trawl survey biomass
  - Increase across all AI regions





CHAPTER 17
ATKA MACKEREL

- New model(s): no; change from base: no; risk table (2,1,2,1)
- Team accepted the authors' recommendation



Quantity	Last asmt.	This asmt.	Change
M	0.3	0.3	0%
2022 Tier	3a		
2023 Tier	3a	3a	
2022 age+ biomass	554,490		11%
2023 age+ biomass	570,080	615,027	8%
2022 spawning biomass	109,360		12%
2023 spawning biomass	103,330	122,541	19%
B_0	278,670	280,456	1%
2023 F_{OFL}	0.650	0.760	17%
2023 F_{ABC}	0.540	0.610	13%
2022 OFL	91,870		29%
2023 OFL	84,440	118,787	41%
2022 ABC	78,510		26%
2023 ABC	71,990	98,588	37%

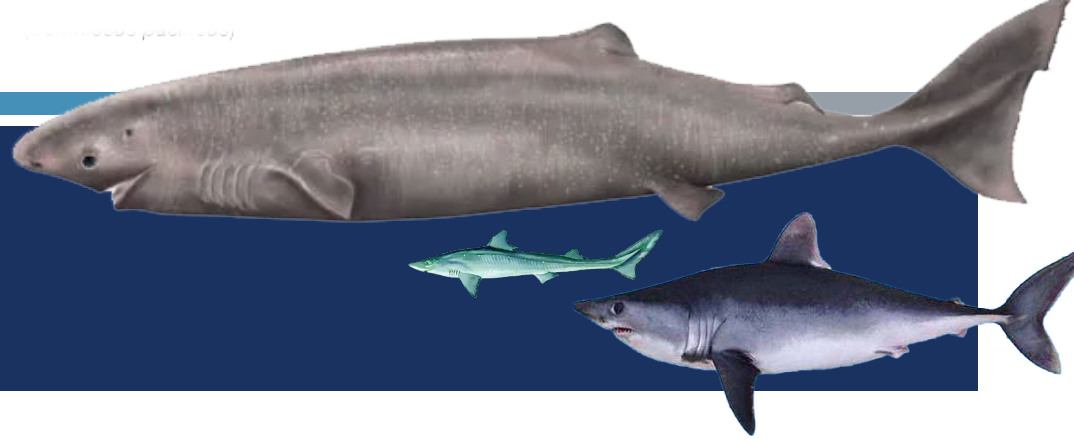
CHAPTER 17
ATKA MACKEREL RECOMMENDATIONS

- Area apportionment:
  - Except for the 2016 and 2017 assessments, when apportionments were based on the Tier 5 RE model, apportionments of Atka mackerel since the 2001 assessment have been based on a 4-survey weighted average, with weights of 8:12:18:27

Weighted Average (Recommended)

	Survey Year				2023 & 2024 Apportionment	**2023 ABC**	**2024 ABC**
	2014	2016	2018	2022			
541	42%	35%	38%	52%	0.44	43,280	37,958
542	28%	30%	7%	16%	0.18	17,351	15,218
543	30%	35%	55%	39%	0.8	38,956	33,289
Weights	8	12	18	27	1.00		
Total ABC						98,588	86,464

CHAPTER 19
SHARKS

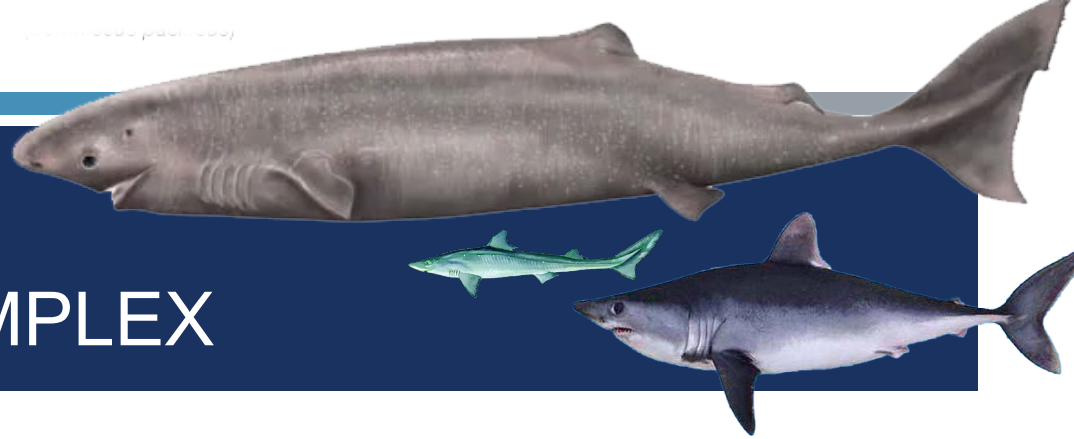


- New model(s): yes; change from base: no - but; risk table (3*,2,1,1)
- Switch to authors' presentation (Team comments will follow)

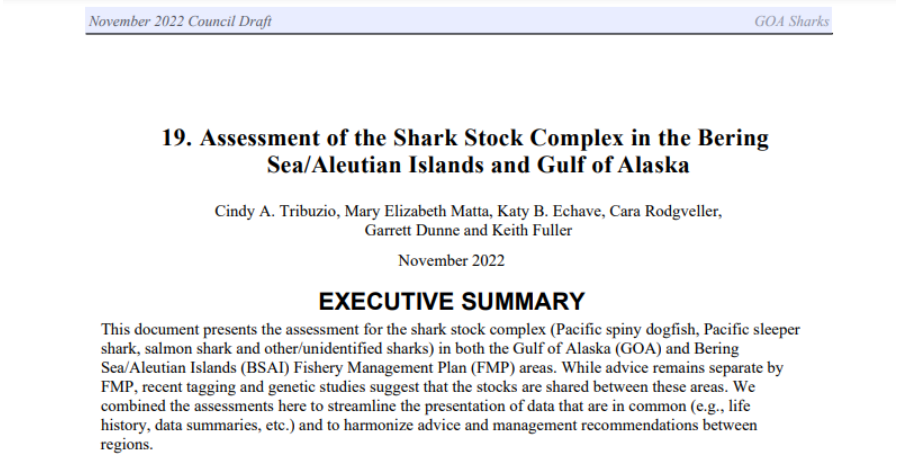
SHARK STOCK COMPLEX

SSC Presentation
December 2022
Cindy Tribuzio*, Mary Elizabeth Matta, Katy B Echave, Cara Rodgveller, Garrett Dunne and Keith Fuller

SHARK STOCK COMPLEX



- Combined SAFE document
- Separate FMP management advice
- Responses to comments



November 2022 Council Draft *GOA Sharks*

19. Assessment of the Shark Stock Complex in the Bering Sea/Aleutian Islands and Gulf of Alaska

Cindy A. Tribuzio, Mary Elizabeth Matta, Katy B. Echave, Cara Rodgveller, Garrett Dunne and Keith Fuller

November 2022

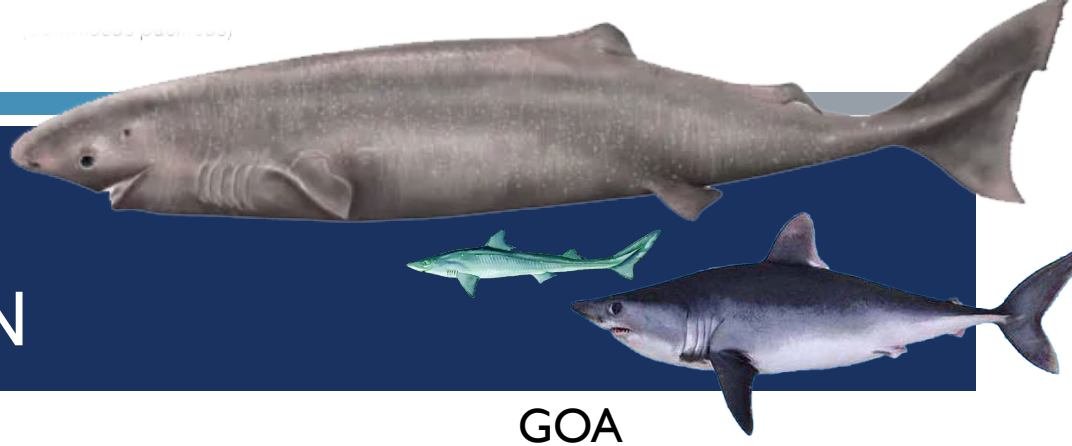
EXECUTIVE SUMMARY

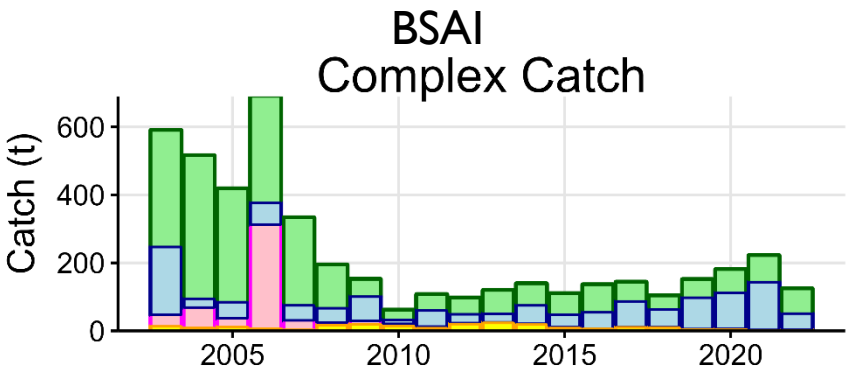
This document presents the assessment for the shark stock complex (Pacific spiny dogfish, Pacific sleeper shark, salmon shark and other/unidentified sharks) in both the Gulf of Alaska (GOA) and Bering Sea/Aleutian Islands (BSAI) Fishery Management Plan (FMP) areas. While advice remains separate by FMP, recent tagging and genetic studies suggest that the stocks are shared between these areas. We combined the assessments here to streamline the presentation of data that are in common (e.g., life history, data summaries, etc.) and to harmonize advice and management recommendations between regions.

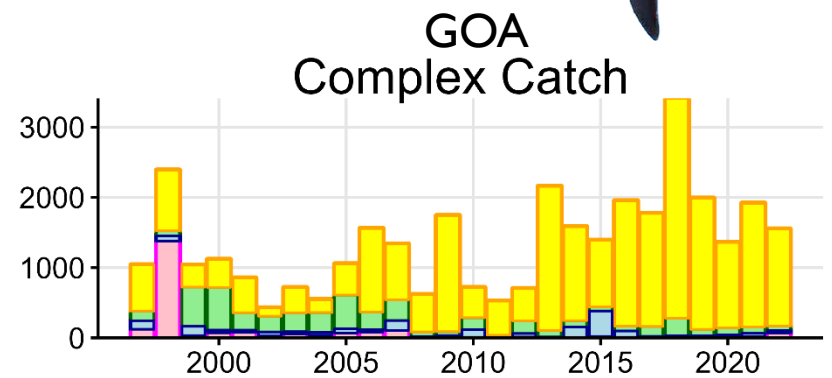
Two Primary Issues

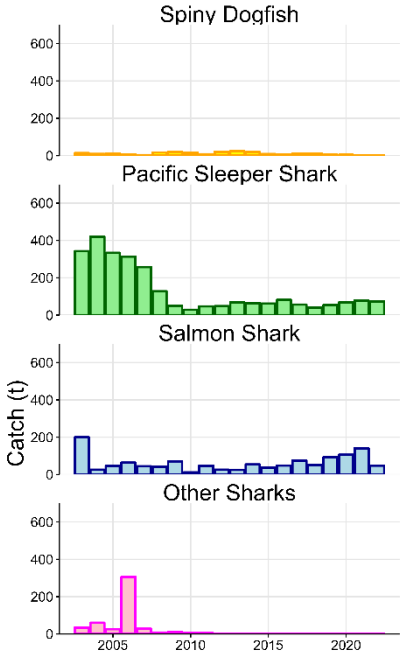
1. Rare species with likely erroneous catch estimates
2. Improving assessment of Pacific sleeper shark

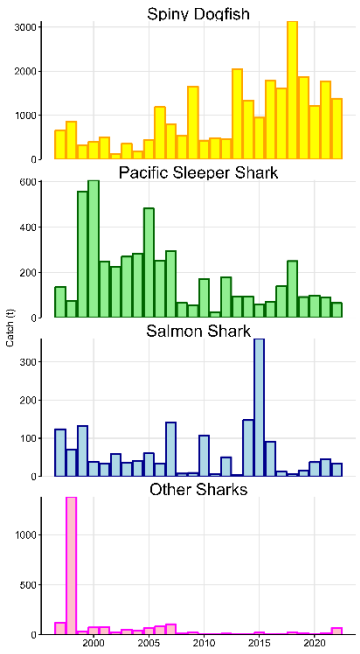
SLIDE ORIENTATION





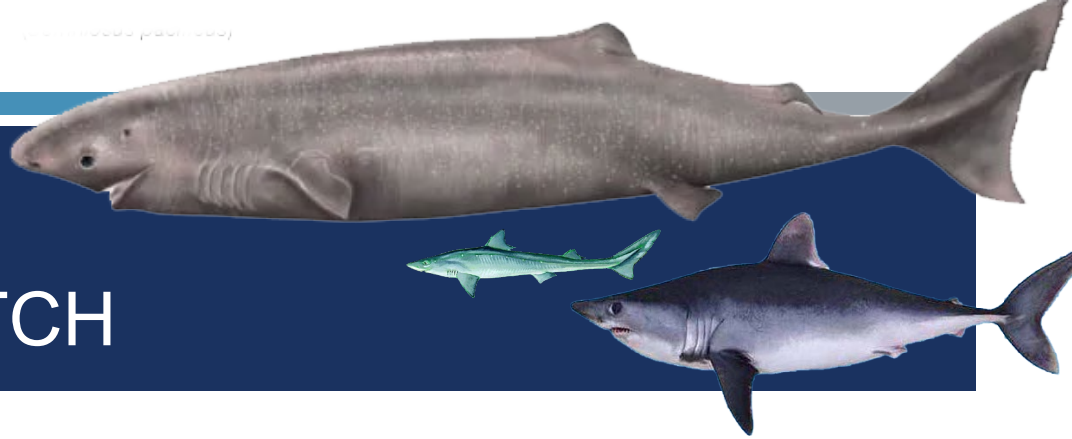




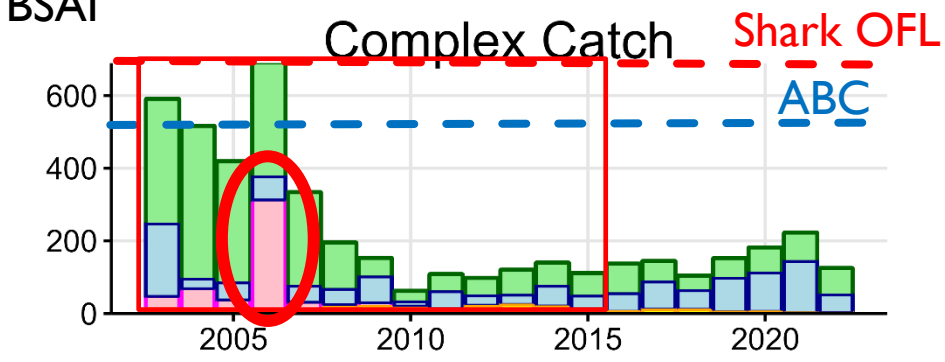


- Species colors consistent
- BSAI always on top
- Scale changes

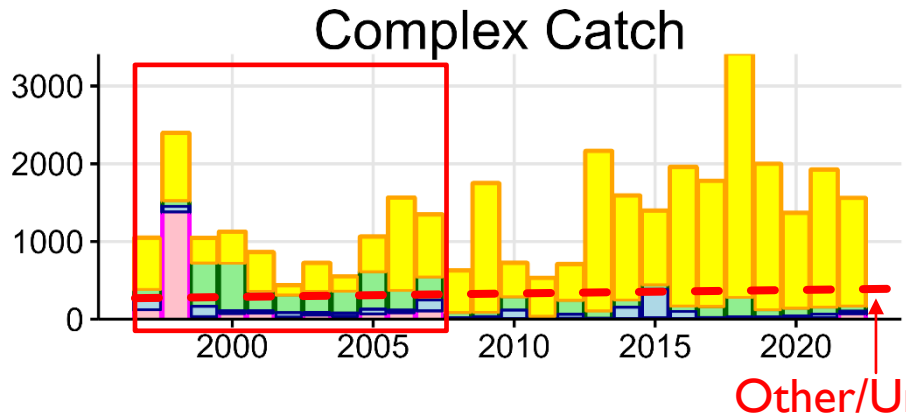
RARE SPECIES CATCH



BSAI



GOA

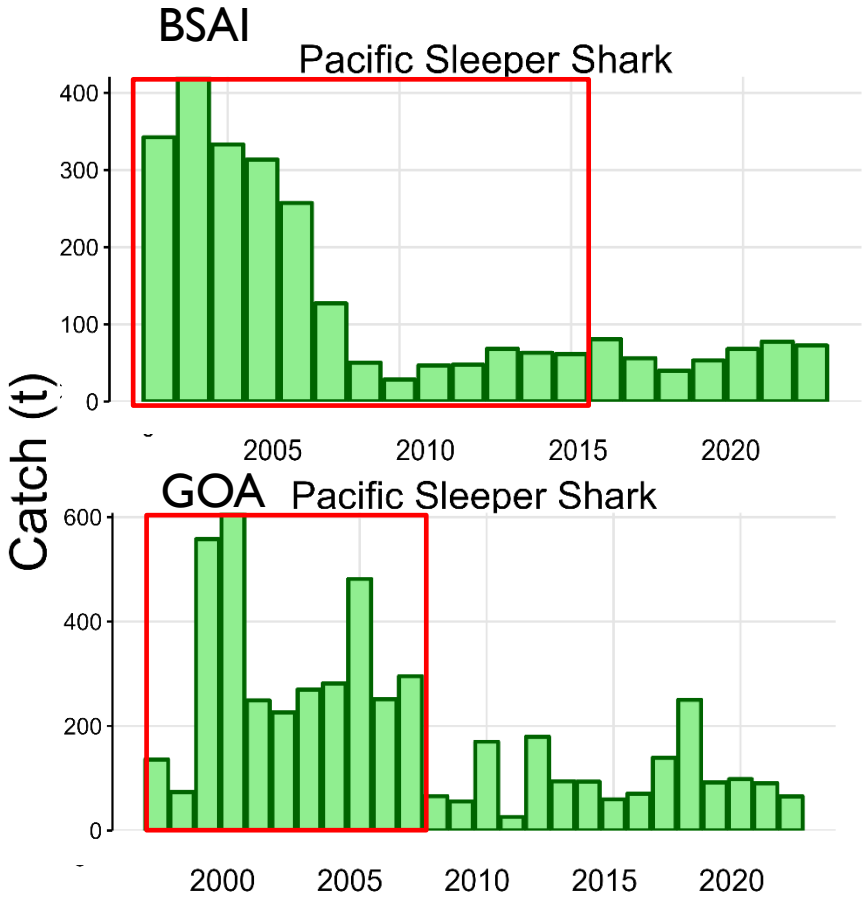


- Due to extrapolation procedure, rare hauls with “large” shark catches can extrapolate to likely erroneous catch estimates
- BSAI issue: status quo is max COMPLEX catch
- Proposed 90th percentile of time series to reduce impact of large extrapolations
- BSAI Other/Unid and spiny dogfish
- GOA Other/Unid

PACIFIC SLEEPER SHARK

PSS Status Quo Concerns:

- Time series needs to be based on period of stable catch
- Maximum or Mean catch scalars have high risk of overfishing
- Does not allow for inclusion of other information



PACIFIC SLEEPER SHARK

Explored many data-limited approaches

Only Reliable Catch Series (ORCS)

- Expert judgment used to qualitatively score attributes (Table 19.7)
- Flexible to additional attributes
- Robust to assumptions of stock status
- Allows for incorporation of uncertainty of input information

NOAA Technical Memorandum NMFS-SEFSC-616

CALCULATING ACCEPTABLE BIOLOGICAL CATCH FOR STOCKS THAT HAVE RELIABLE CATCH DATA ONLY (Only Reliable Catch Stocks – ORCS)

Fisheries Research 193 (2017) 60–70

Contents lists available at ScienceDirect

Fisheries Research

journal homepage: www.elsevier.com/locate/fishres

Full length article

The refined ORCS approach: A catch-based method for estimating stock status and catch limits for data-poor fish stocks

Christopher M. Free[a,*], Olaf P. Jensen[a], John Wiedenmann[b], Jonathan J. Deroba[c]

[a] Department of Marine and Coastal Sciences, Rutgers University, New Brunswick, NJ, USA
[b] Department of Ecology, Evolution, and Natural Resources, Rutgers University, New Brunswick, NJ, USA
[c] NOAA Fisheries, Northeast Fisheries Science Center, Woods Hole, MA, USA

PACIFIC SLEEPER SHARK

	Attribute	BSAI	GOA	Justification
1	Status of assessed stocks in fishery	1	1	0% of fishery stocks are overfished
2	Behavior affecting capture	2	2	Species does not exhibit significant aggregating behaviors
3	Discard rate	3	3	Discard rates are 88% (BSAI) and 99% (GOA)
4	Targeting intensity	1	1	All sharks are non-targeted
5	M compared to dominant species	3	3	M is >20% than dominant species in BSAI, likely 20% lower that the dominant species in the GOA
6	Occurrence in catch	1	1	Occurs in <2% of observed hauls

- Table 19.9 and described in detail in model results section

PACIFIC SLEEPER SHARK

	Attribute	BSAI	GOA	Justification
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6	Occurrence in catch	1	1	Occurs in <2% of observed hauls

- Table 19.9 and described in detail in model results section
- ORCS is designed to encompass both discarded and retained stocks, Free et al. (2017) included both in analyses

PACIFIC SLEEPER SHARK

	Attribute	BSAI	GOA	Justification
7	Value	1	1	Little to no market value
8	Recent trend in catch	2	2	No significant trends
9	Habitat loss	1	1	Species does not occupy identified threatened habitats
10	Recent trend in effort	2	2	No significant trends
11	Recent trend in abundance index	NA	2	No data in BSAI, No recent trend in GOA IPHC survey
12	Proportion of population protected	3	3	No specific protection measures
13	Life history considerations	3	3	Low productivity and large proportion of catch is immature

- Table 19.9 and described in detail in model results section

PACIFIC SLEEPER SHARK

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- Table 19.9 and described in detail in model results section
- IPHC is best GOA indicator, unable to use IPHC survey since 2019 – future work may change this

PACIFIC SLEEPER SHARK

	Attribute	BSAI	GOA	Justification
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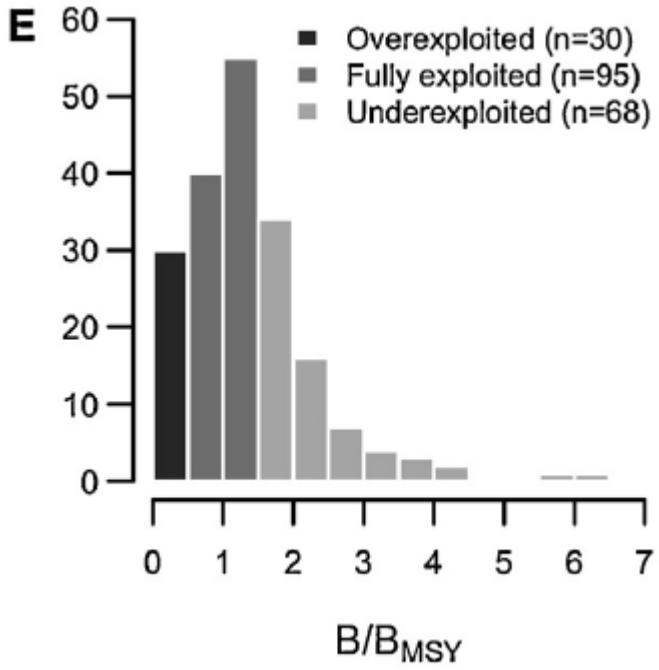
13	Life history considerations	3	3	Low productivity and large proportion of catch is immature

- Table 19.9 and described in detail in model results section
- IPHC is best GOA indicator, unable to use IPHC survey since 2019 – future work may change this
- Added to incorporate maturity of catch and species productivity

PACIFIC SLEEPER SHARK

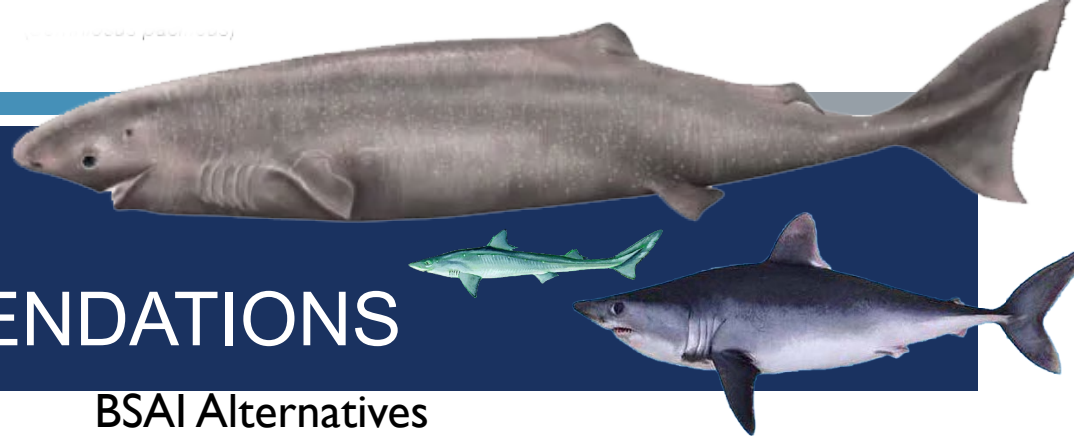
From Free et al. 2017



Mean attribute score determines

(Table 19.8, adapted from Free et al. 2017)

Mean Score	Stock status	Catch statistic	
<1.5	Underexploited	90th percentile, whole time series	1.90
1.5 – 2.5	Fully exploited	25th percentile, previous 10 years	2.16
> 2.5	Overexploited	10th percentile, whole time series	1.56



AUTHOR RECOMMENDATIONS

BSAI Status Quo

Species	Model	OFL (t)	ABC (t)
Pacific Sleeper			
Salmon			
Other/Unid			
Spiny Dogfish			
Shark Stock Complex	16.0	**689**	**517**

BSAI Alternatives

Species	Model	OFL (t)	ABC (t)
Pacific Sleeper	PSS22.0	117	88
Salmon	SS22.0	199	149
Other/Unid	OU22.0	55	41
Spiny Dogfish	SD22.0	20	15
Shark Stock Complex		**391**	**293**

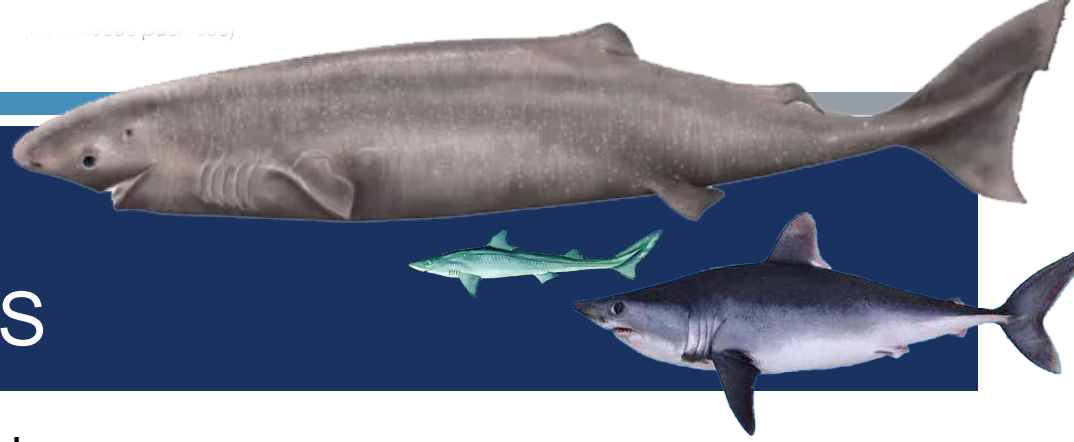
GOA Status Quo

Species	Model	OFL (t)	ABC (t)
Pacific Sleeper	11.0	312	234
Salmon	11.0	70	53
Other/Unid	11.0	188	141
Spiny Dogfish (T5)	SD15.3A	5,951	4,463
Shark Stock Complex		**6,521**	**4,891**

GOA Alternatives

Species	Model	OFL (t)	ABC (t)
Pacific Sleeper	PSS22.0	197	148
Salmon	SS11.0	70	53
Other/Unid	OU22.0	123	92
Spiny Dogfish (T5)	SD15.3A	5,951	4,463
Shark Stock Complex		**6,341**	**4,756**

SHARK RISK TABLES



Author recommended models risk table

Assessment-related	Population dynamics	Enviro/ ecosystem	Fishery Performance
Level 1: no increased concerns	Level 2: Substantially increased concerns	Level 1: no increased concerns	Level 1: no increased concerns

If alternative models selected, no recommended reductions from maximum permissible ABC

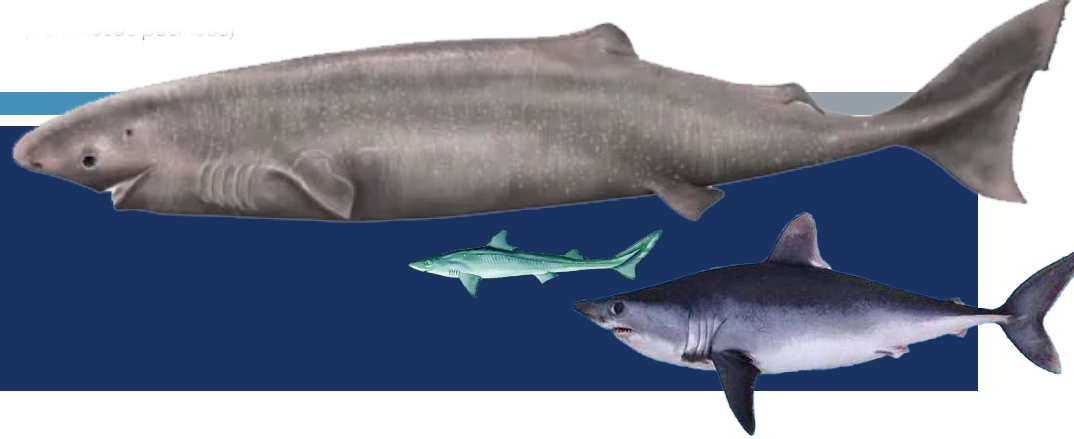
Status quo risk table

Assessment-related	Population dynamics	Enviro/ ecosystem	Fishery Performance
Level 3: major problems with the stock assessment	Level 2: Substantially increased concerns	Level 1: no increased concerns	Level 1: no increased concerns

If status quo, author recommended a reduction from maximum permissible ABC.

Suggest using ORCS output for reduction

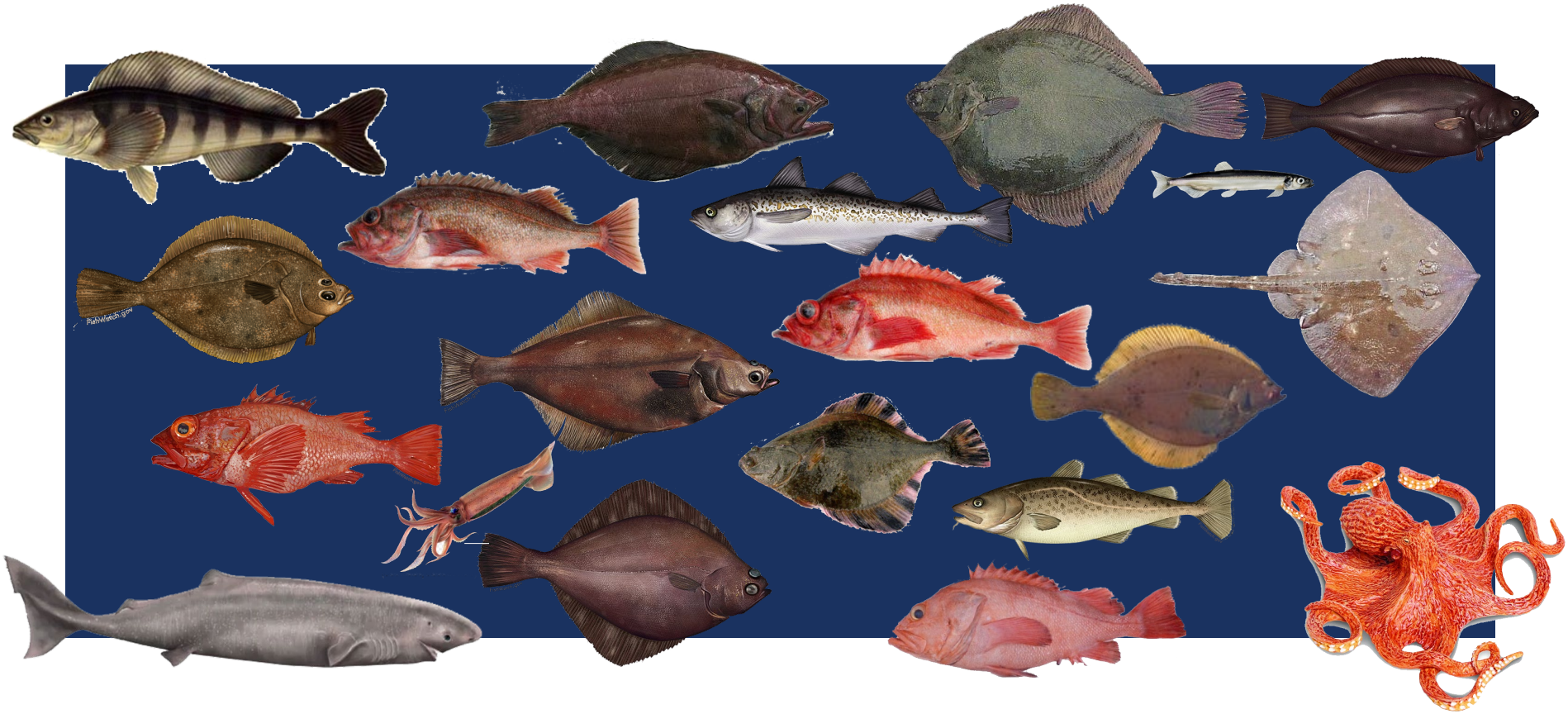
CHAPTER 19
SHARKS



- New model(s): yes; change from base: no - but; risk table (3*,2,1,1)
- The Team recommended the status-quo management approach (Tier 6) with a risk table reduction from maximum permissible ABC to accommodate for the high risk to the Pacific sleeper shark (PSS) component of the complex.
  - OFL = Tier 6 OFL
  - ABC = Tier 6 maxABC × 0.7 + ORCS PSS ABC
    - 0.7 was the proportion of Tier 6 maxABC that was not PSS

	OFL	MaxABC	ABC
BSAI Sharks	689 t	517 t	517×0.7+88 = 450 t

THANK YOU



BSAI TEAM
ESR RECOMMENDATIONS

- **Bering Sea ESR**
  - The Team recommended that pH data be aligned with “survey replicated” dates and locations in the model to further skill evaluations.
  - The Team recommended continuation of display of NBS and EBS data separately and encouraged the addition of composite indices (i.e., EBS, NBS, and EBS+NBS). The Team encouraged authors to include EBS and NBS (where appropriate) as well as EBS+NBS combined for all indices when available, and for authors to clearly label each index domain to facilitate sub-regional assessments.
- **Combined AI and EBS ESR Discussion and recommendations**
  - The Team recommended collection of sablefish diets across groundfish survey regions in the next year(s) in order to help understand mechanisms for, and implications of, increasing abundance of sablefish in response to recent warm conditions.
  - The Team recommended adding the zooplankton time series back into the Report Card.
  - The Team recommended a short presentation next September to the Team to review the methods and tradeoffs in approaches.
  - The Team recommended continuing to identify a common baseline for index or indicator averages and in particular to work with the contributors and the ESR team to establish some guidance for fixed baselines (rather than annually adjusting means).

BSAI TEAM POLLOCK RECOMMENDATIONS

- **EBS Pollock**
  - The Team recommended that the EBS pollock stock be included in any working group developed to investigate appropriate means of dealing with irregular recruitment and alternative harvest control rules.
- **EBS Multi-species Model**
  - The Team recommended that the contributions of the CEATTLE model align with the timing of the risk table evaluation to inform those discussions in the future.
  - The Team also recommended that the methodologies described for providing climate advice be included in the climate change working group.
  - Finally, the Team recommended continued work to align the CEATTLE results with the single species models and to transfer to the Rceattle version when possible.
- **Aleutian Islands pollock**
  - The Team recommended reevaluation of the assessment considerations category risk table score in the next assessment.

BSAI TEAM
PACIFIC COD RECOMMENDATIONS

- **Pacific cod - EBS Ecosystem and Socioeconomic Profile (ESP)**
  - The Team recommended the ESP team investigate options for cooperative research and communication with the fleet and observer program to collect Pacific cod stomachs in the fishery.
- **Pacific cod - EBS**
  - The Team recommended the authors explore the sensitivity of the terminal year fishery size composition data that have not been debriefed or may not be representative of a full year of data.
- **Pacific cod - Aleutian Islands**
  - The Team recommended the author continue to present the age-structured models shown this year for future consideration.
  - The Team recommended that this stock remain on an annual cycle and not be considered for reduction in assessment frequency when the Teams considers stock prioritization.
  - The Team recognized the importance of the survey to the assessment of this stock and recommended that an Aleutian Islands trawl survey be completed as part of its biennial schedule in 2024.

BSAI TEAM
FLATFISH RECOMMENDATIONS

- **Yellowfin sole**
  - The Team recommended to include the recruitment retrospective analysis in the next full assessment.
  - The Team recommended a comparison of the EBS only and the combined EBS+NBS model-based estimates to determine if the inflation of the estimates was due to the VAST method or the addition of the NBS.
- **Greenland turbot**
  - The Team recommended a 6% reduction from maximum permissible ABC, based on the lower range determined by a sensitivity analysis of maturity.
  - The Team recommended the authors revise the interpolation method used to combine the BS and AI longline survey relative population numbers, either based on linear interpolation or new methods under development at the University of Alaska Fairbanks**.**
- **Kamchatka flounder**
  - The Team recommended examining a single length-based selectivity curve in the next assessment cycle. The Team recommended exploring the model sensitivity to the proportion of arrowtooth assigned to Kamchatka prior to 2008.
- **Northern rock sole**
  - The Team recommended the authors put Models 22.1 and 22.2 forward - with likelihood profiles and an evaluation of performance - as alternative models to the base model in the 2024 assessment cycle, to be presented in September 2024.

BSAI TEAM
ROCKFISH RECOMMENDATIONS

- **Blackspotted and rougheye rockfish**
  - The Team discussed the lack of larger fish in fishery composition data and recommended examining the NMFS and IPHC longline survey data to determine if larger fish may be in the population and not showing up in the fishery.
  - The Team also recommended looking at the rate of blackspotted/rougheye to Pacific ocean perch in the survey tows over the time series.

BSAI TEAM
OTHER FISHES RECOMMENDATIONS

- **Sharks**
  - The Team recommended the status-quo management approach with a risk table reduction from maximum permissible ABC to accommodate for the high risk to the Pacific sleeper shark component of the complex.
  - The Team recommended that the authors continue to explore the ORCS approach and to determine customization and weighting methods for the attribute table that are appropriate for the BSAI shark complex.
- **Octopus**
  - The Team recommended that the next author review the consumption model to determine if it is still relevant and applicable.