Gulf of Alaska SAFE report

Report of the
Gulf of Alaska Groundfish
Plan Team meeting
Nov 16th-19th, 2021

GOA Plan Team Members

James Ianelli (co-chair)	AFSC
Chris Lunsford (co-chair)	AFSC
Sara Cleaver	NPFMC
Nat Nichols	ADFG
Jan Rumble	ADFG
Marysia Szymkowiak	AFSC/REFM
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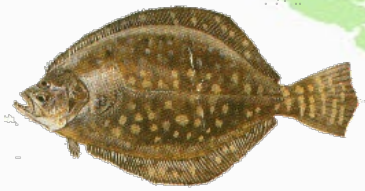
Sandra Lowe	AFSC/REFM
Paul Spencer	AFSC/REFM
Craig Faunce	AFSC/FMA
Kresimir Williams	AFSC/RACE
Obren Davis	AKRO
Andrew Olson	ADFG

Flatfish ABC Summary



Species	2021 catch	ABC 2021	ABC 2022	Change
Pollock	98,769	115,870	144,444	up 28,574 (25%)
Pacific Cod	12,272	23,627	24,043	up 416 (2%)
Sablefish	14,115	21,475	22,794	up 1,319 (6%)
Flatfish	2,717	116,883	115,834	down 1,049 (1%)
Arrowtooth flounder	9,517	126,970	119,779	down 7,191 (6%)
Rockfish	35,882	55,107	56,554	up 1,447 (3%)
Atka mackerel	940	4,700	4,700	same (0%)
Skates	2,609	6,670	6,563	down 107 (2%)
Sharks	1,639	3,755	3,755	same (0%)
Octopus	51	980	980	same (0%)
Total	178,511	476,037	499,446	up 23,409 (5%)

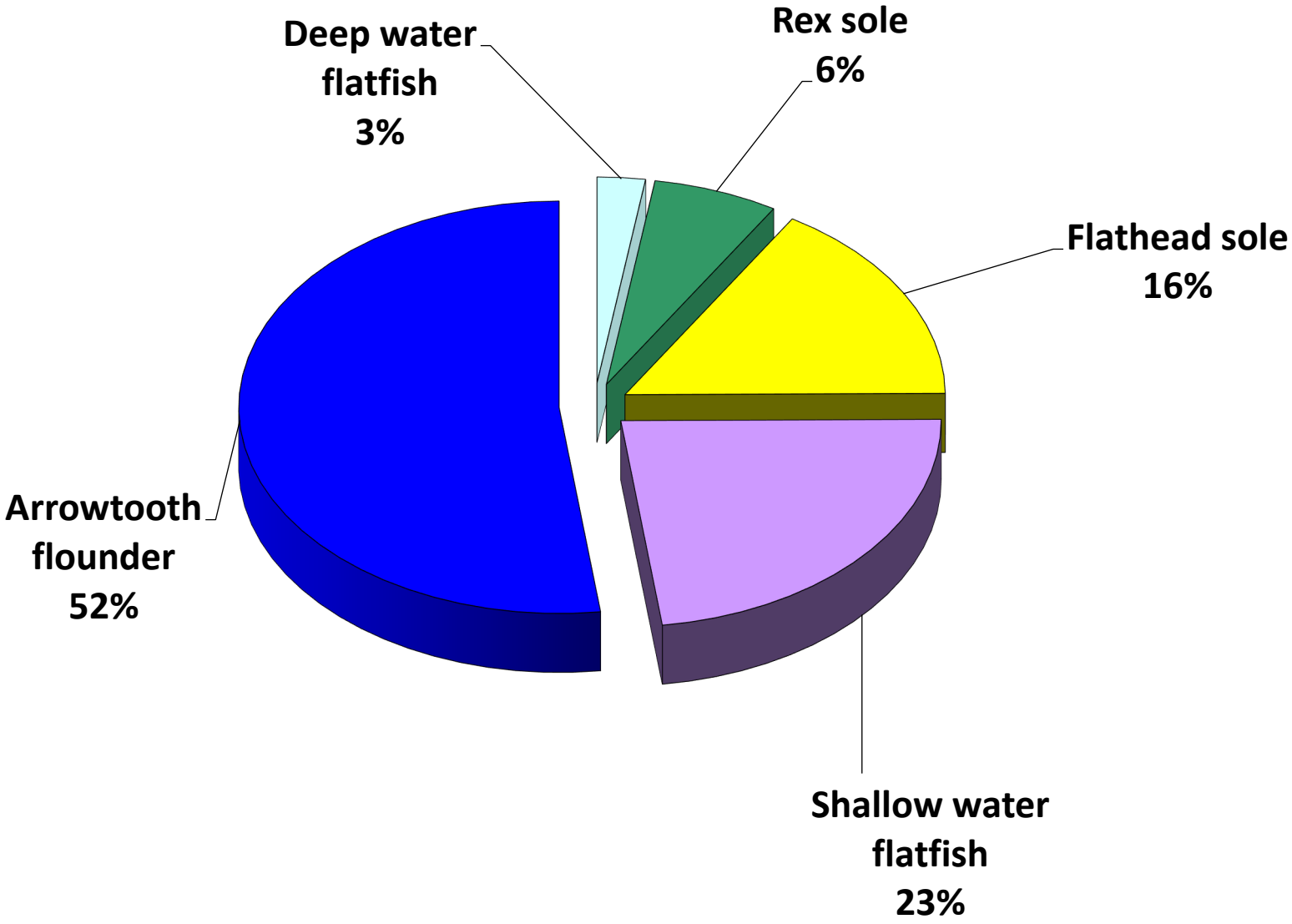
Flatfish ABC's

Species	2021 ABC	2022 ABC	Change
Shallow water flatfish	56,164	50,610	down 5,554 (10%)
Rex sole	15,416	19,141	up 3,725 (24%)
Deep water flatfish	5,926	5,908	down 18 (0%)
Flathead sole	39,377	40,175	up 798 (2%)
Arrowtooth flounder	126,970	119,779	down 7,191 (6%)
Subtotal	243,853	235,613	down 8,240 (3%)
Subtotal (without ATF)	116,883	115,834	down 1,049 (1%)

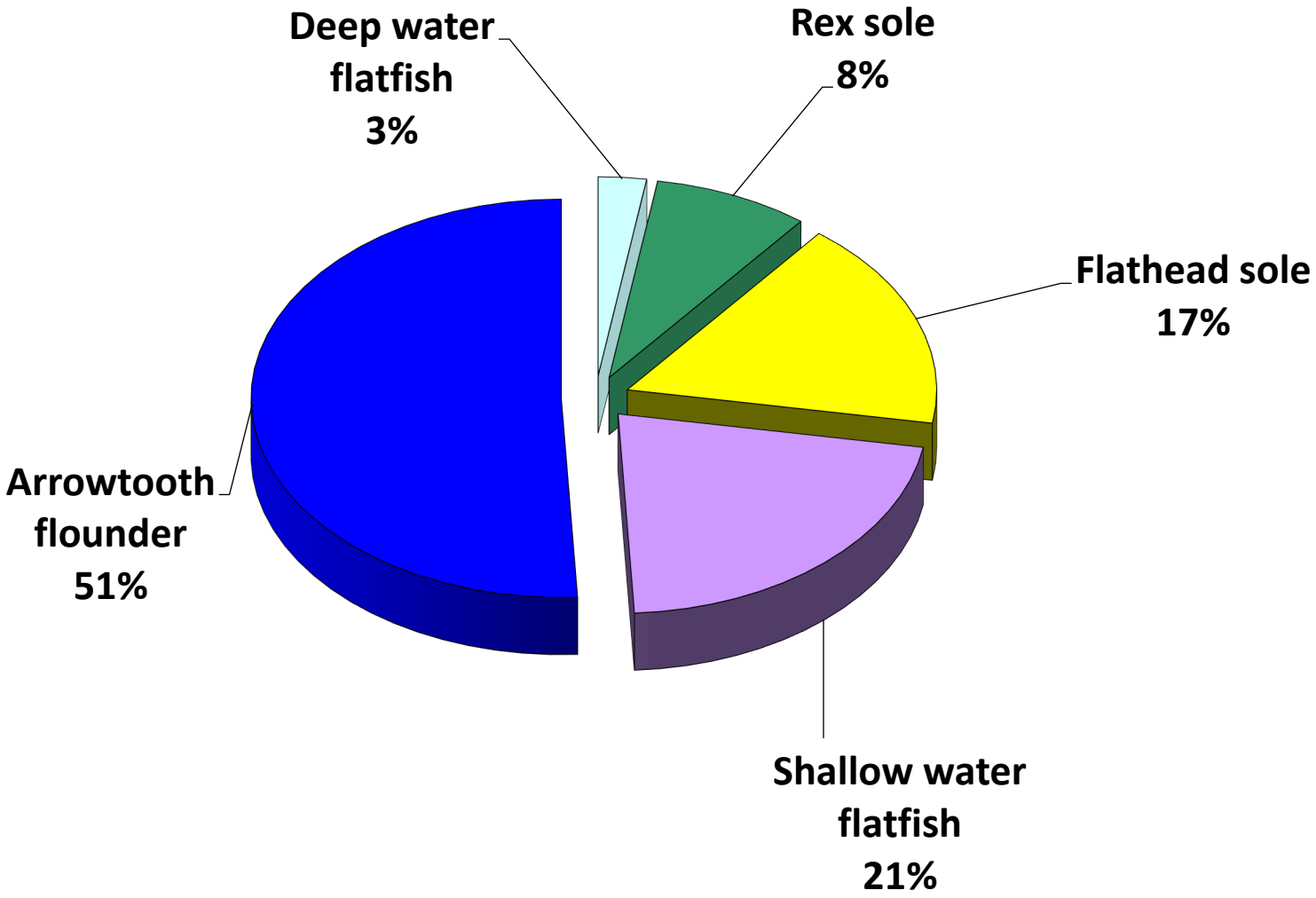
Deep-water ABC from Dover assessment Tier 3 + others Tier 6

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

Flatfish 2021 ABC's
243,853 t combined



Flatfish 2021 ABC's
235,613 t combined



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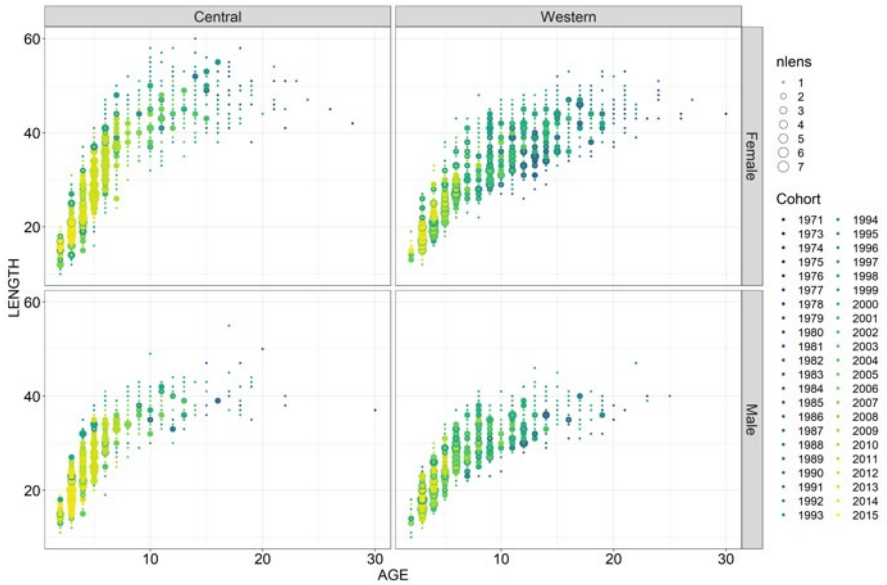
Shallow water flats: N and S rock sole Tier 3, others Tier 5

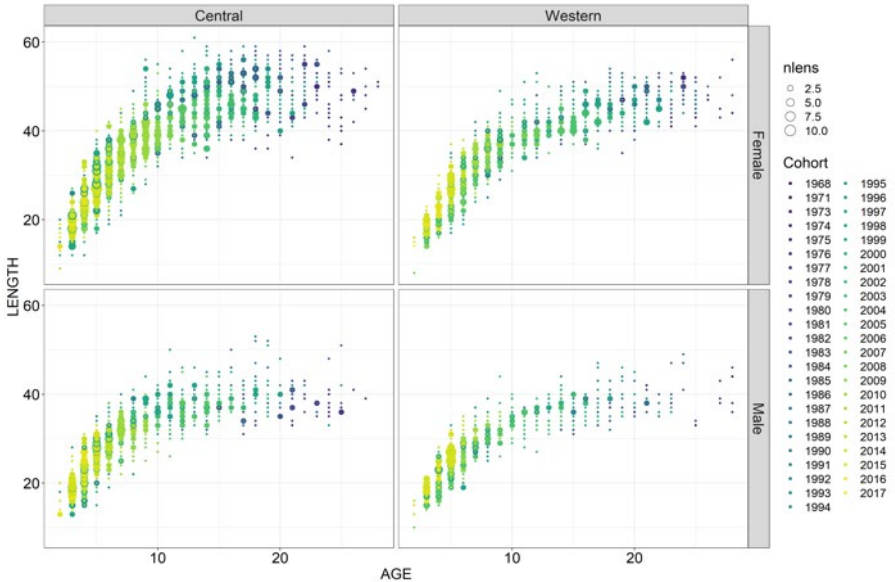
Rock sole assessments

Where we left off

Northern rock sole



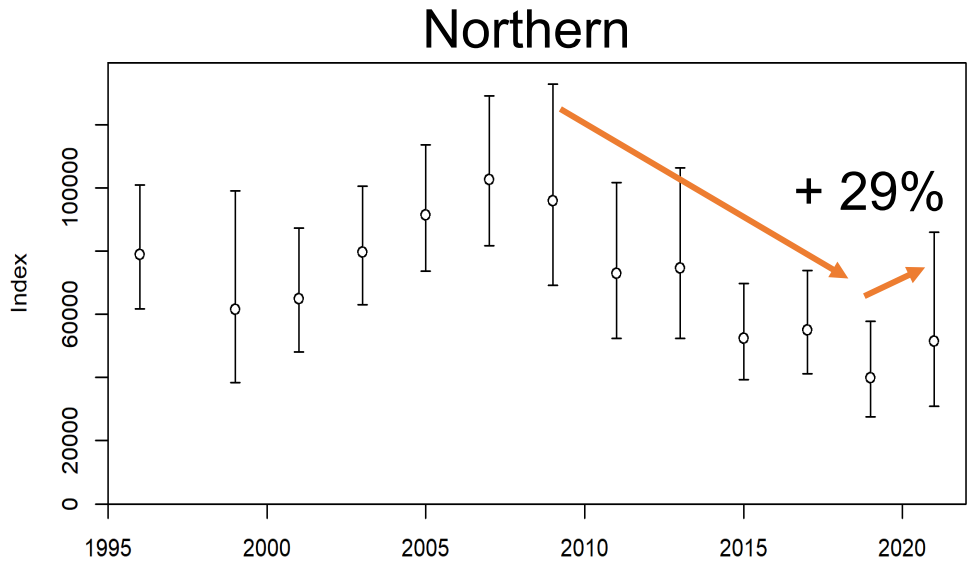
Southern rock sole

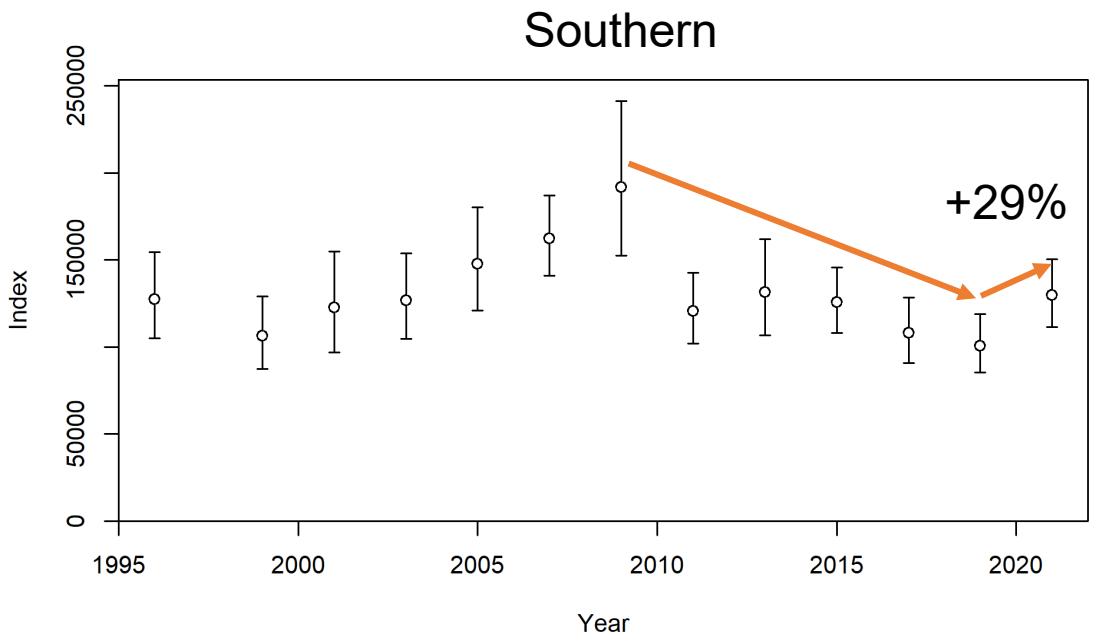


Differences in growth by area

2-area model accounts for differences in growth between central and western GOA

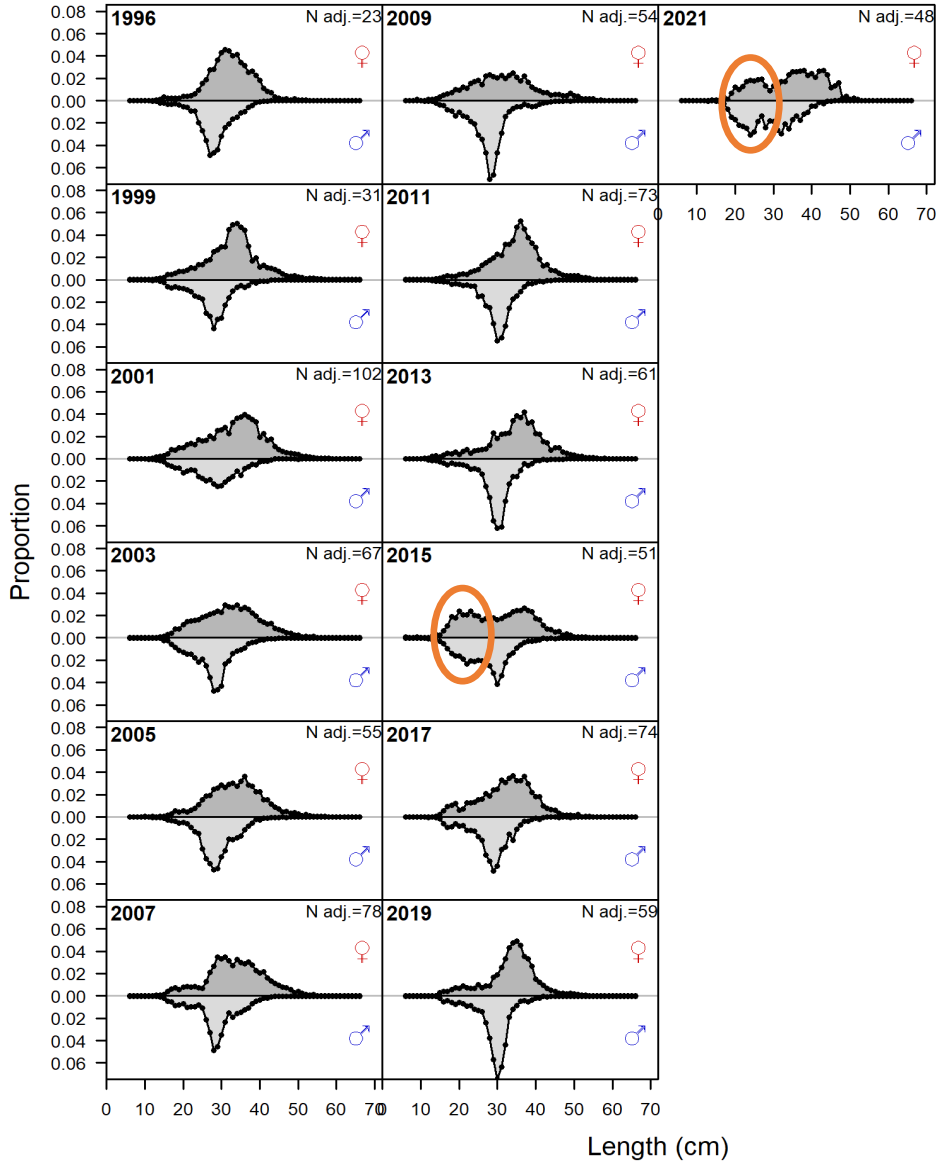
Rock soles survey biomass



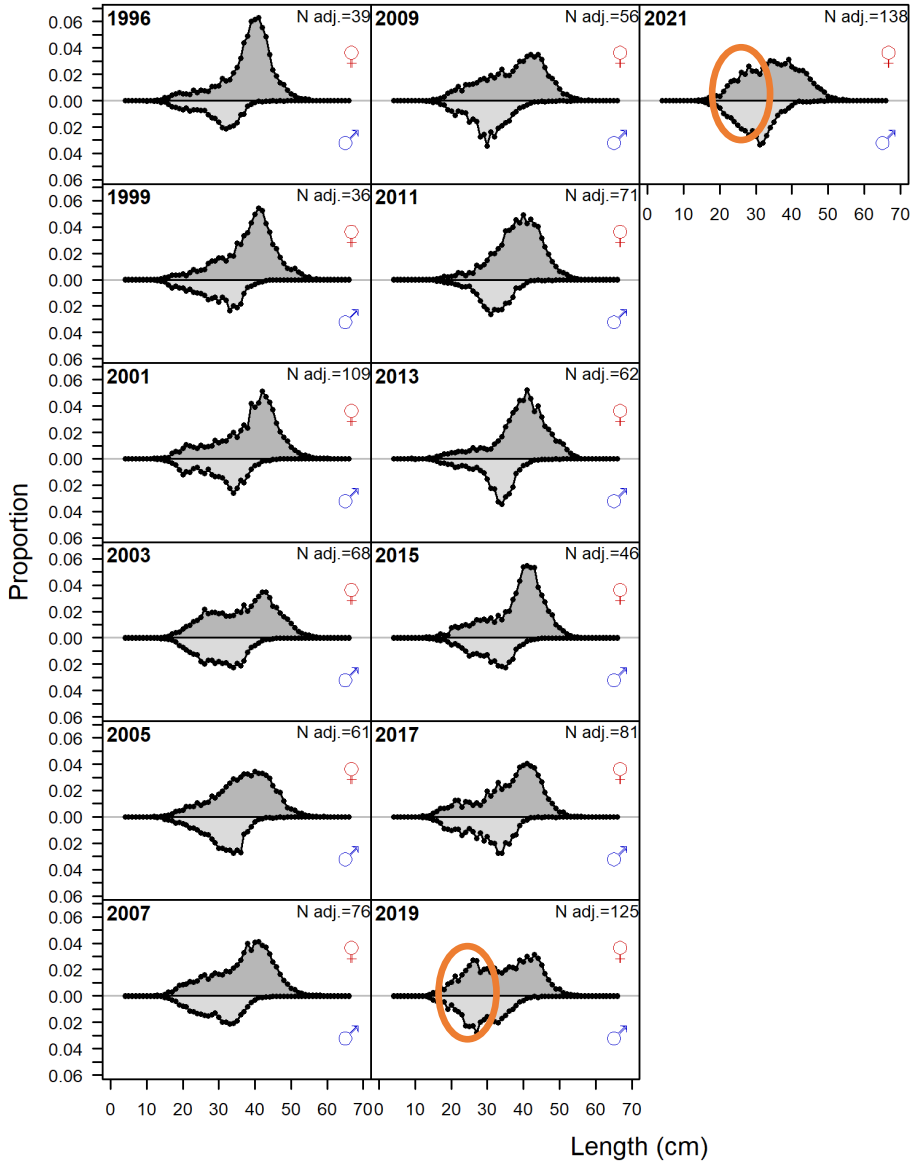


GOA bottom trawl survey lengths

Northern rock sole



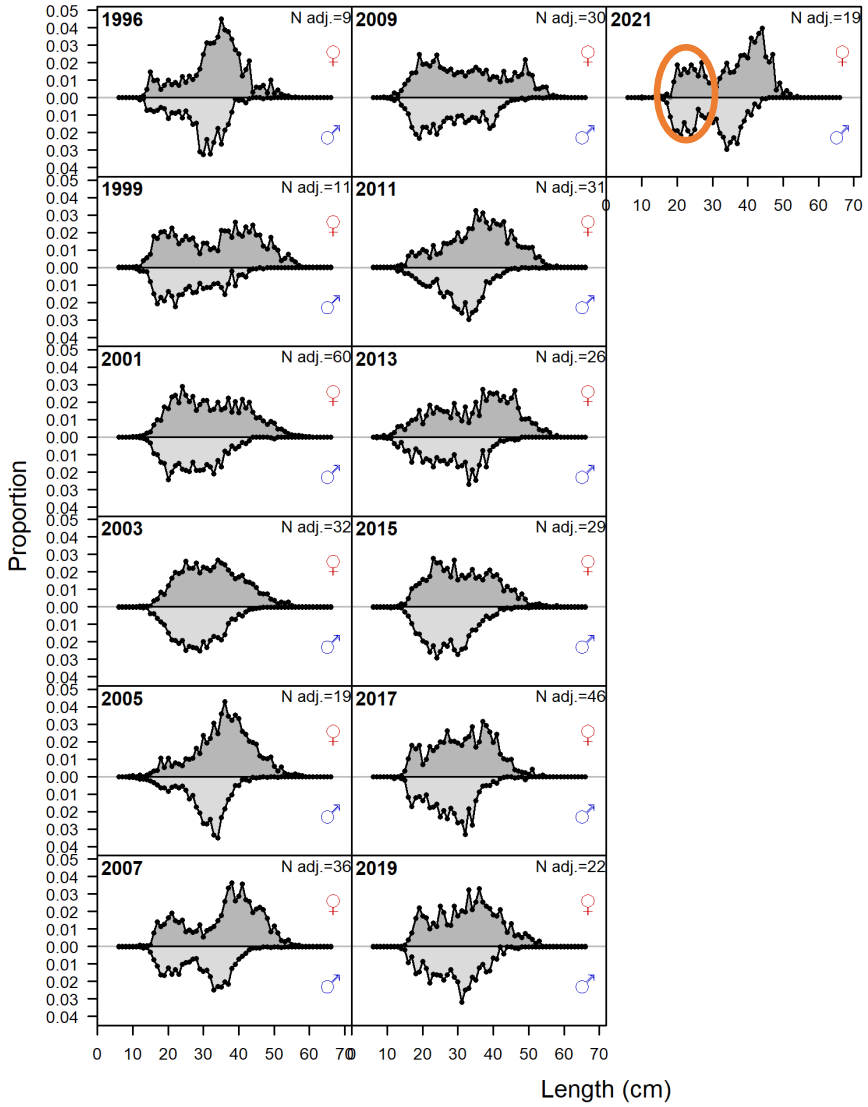
Southern rock sole



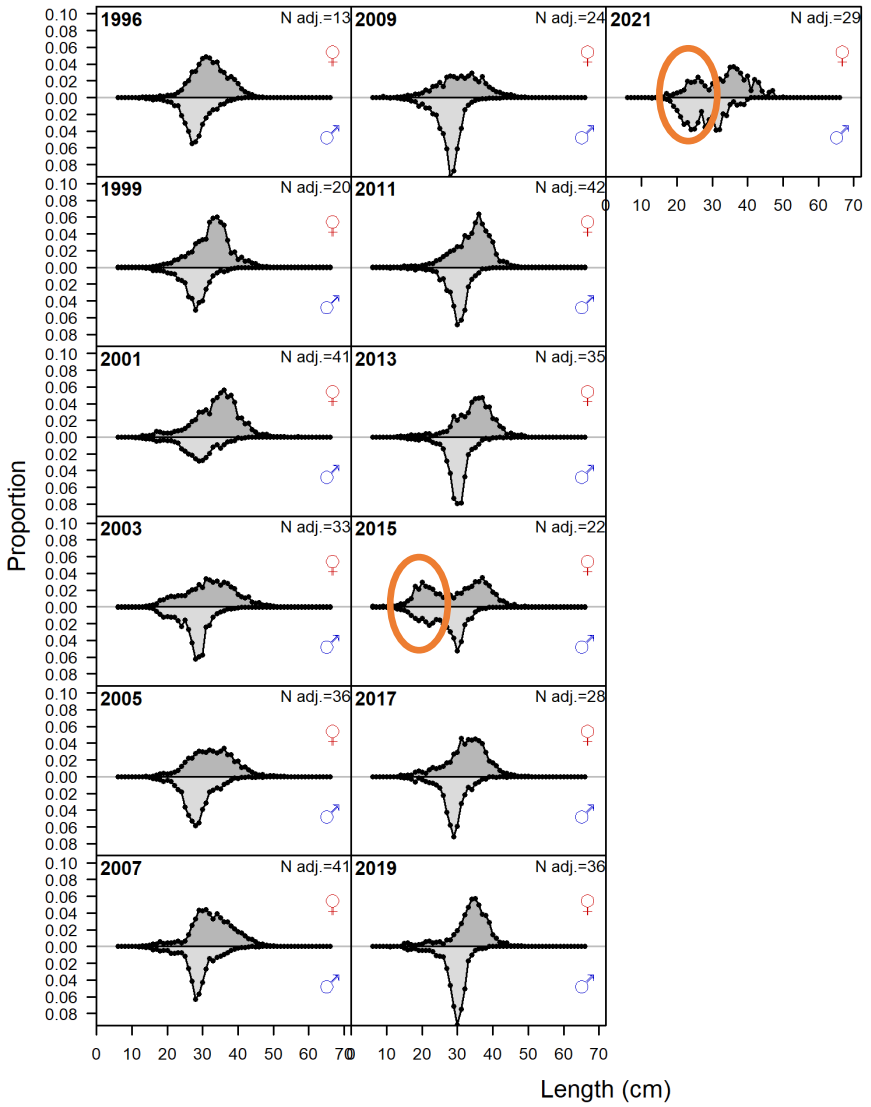
GOA bottom trawl survey lengths

Northern rock sole

central GOA



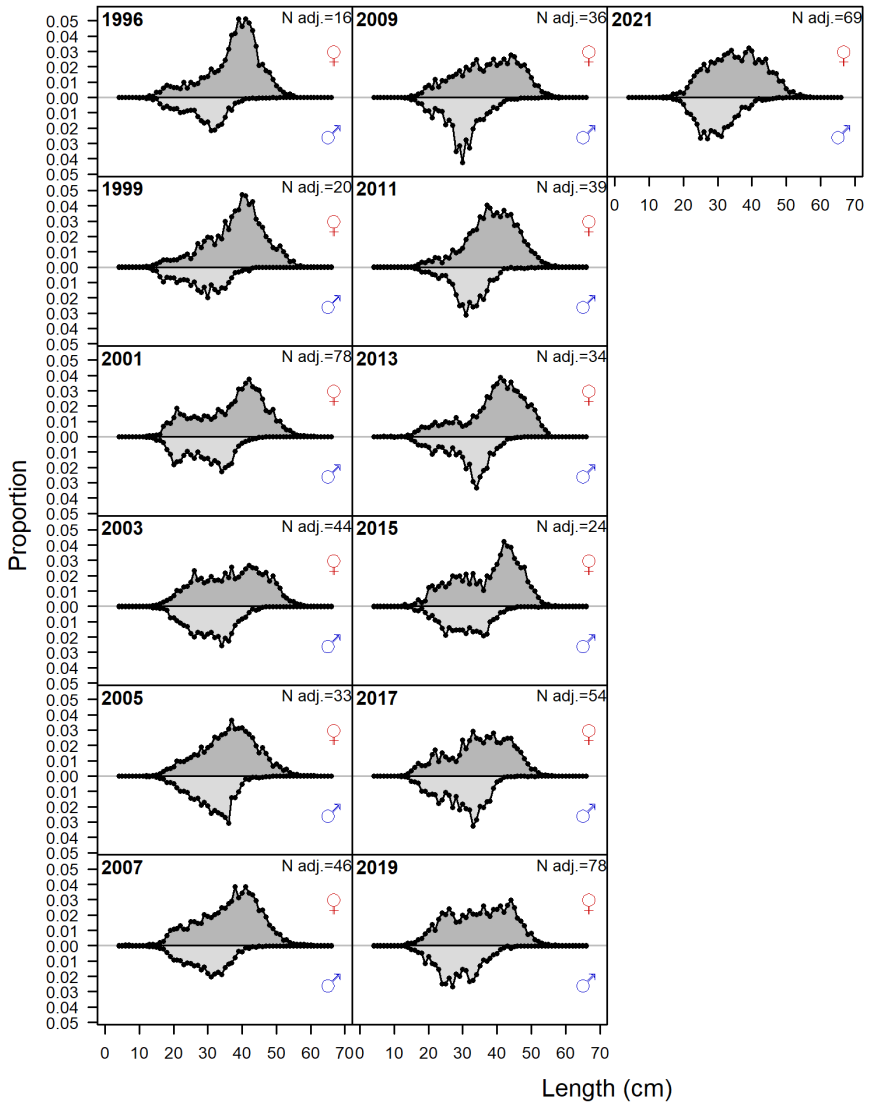
western GOA



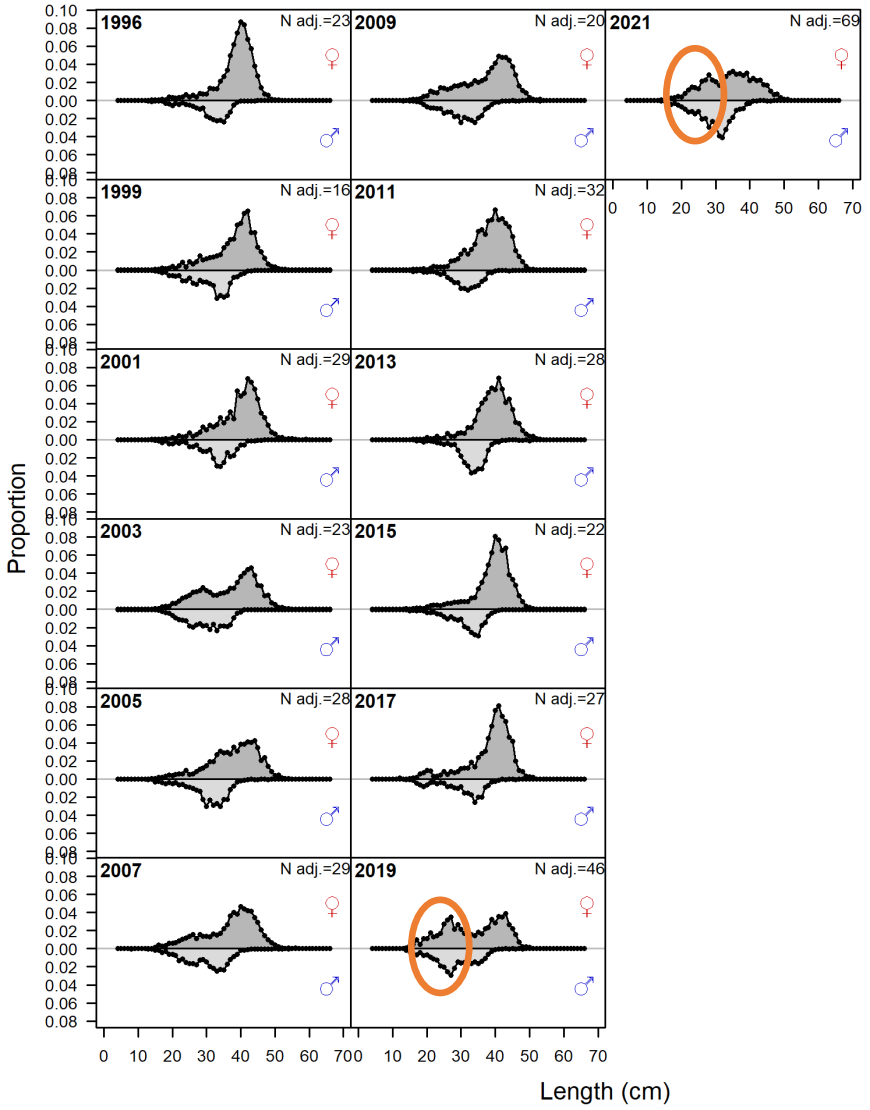
GOA bottom trawl survey lengths

Southern rock sole

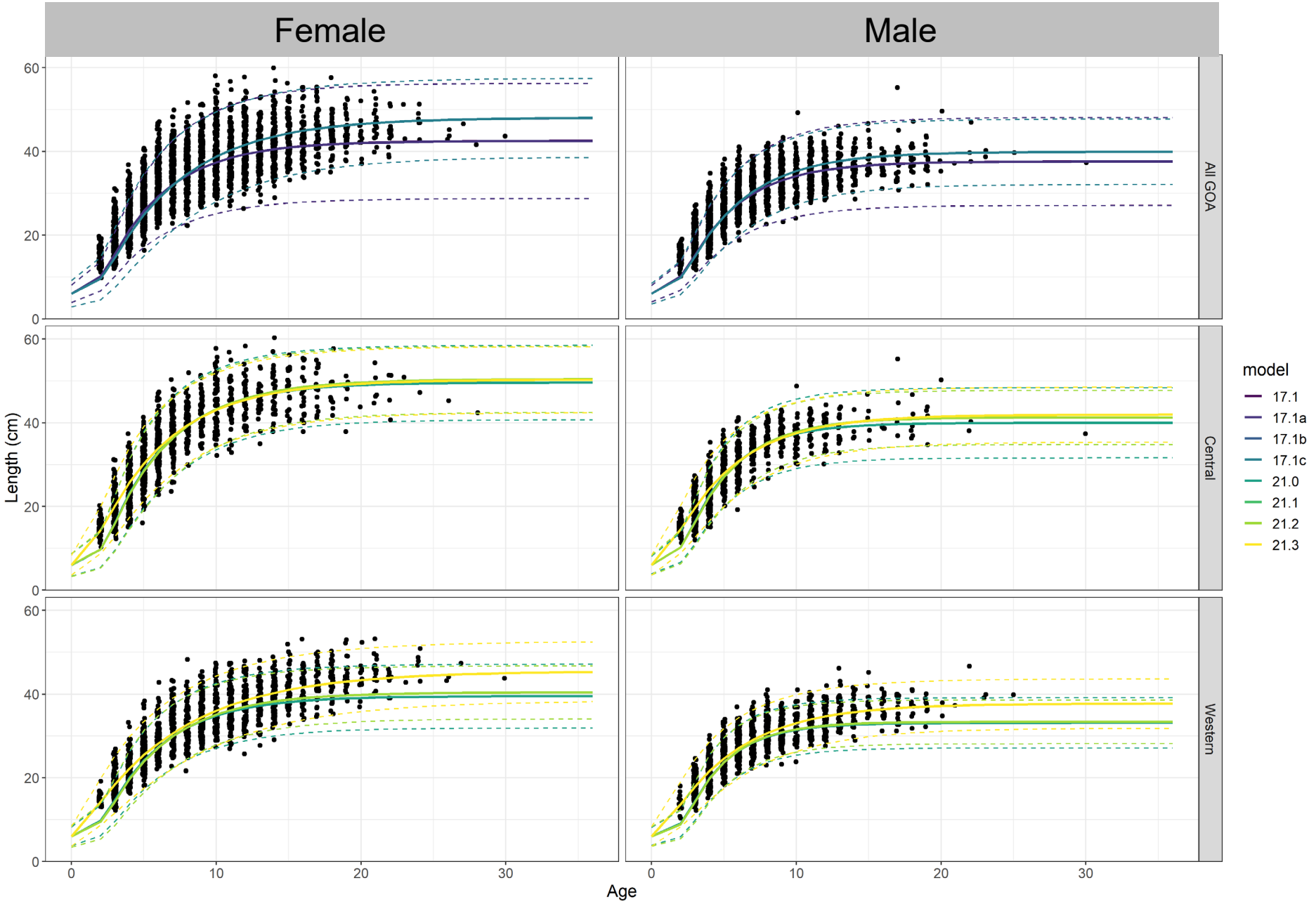
central GOA



western GOA



CAAL – northern rock sole

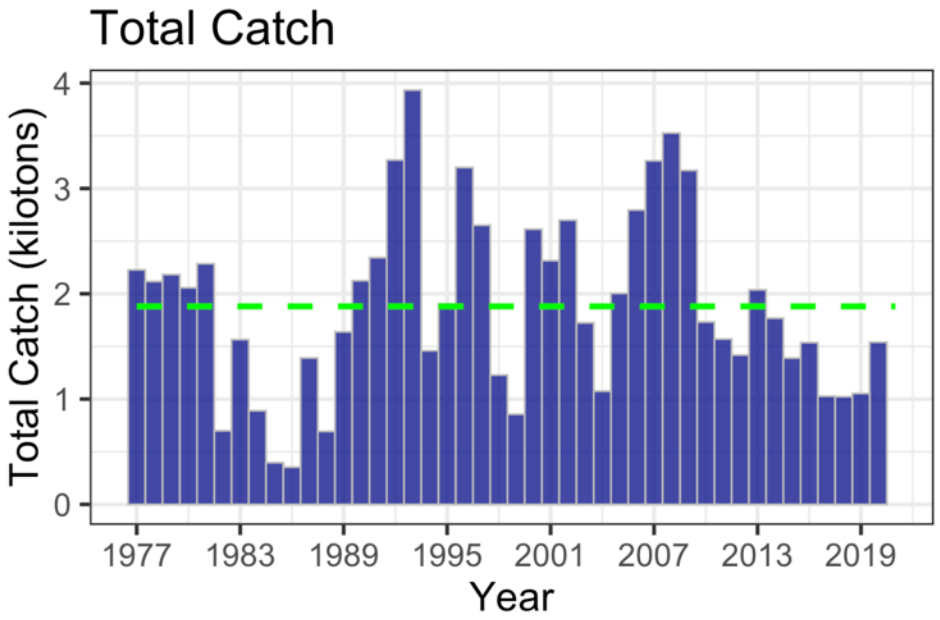


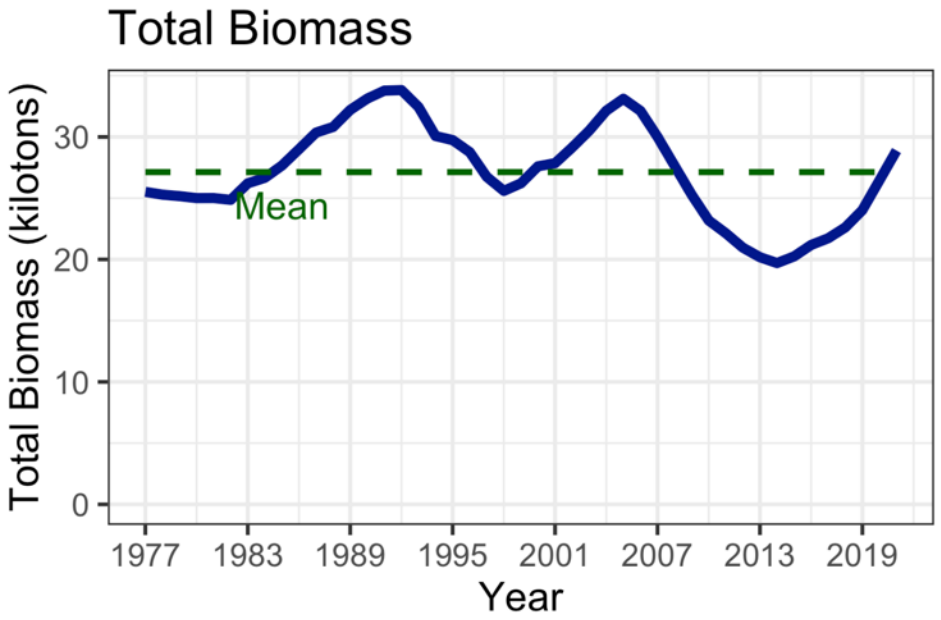
Summary–northern rock sole

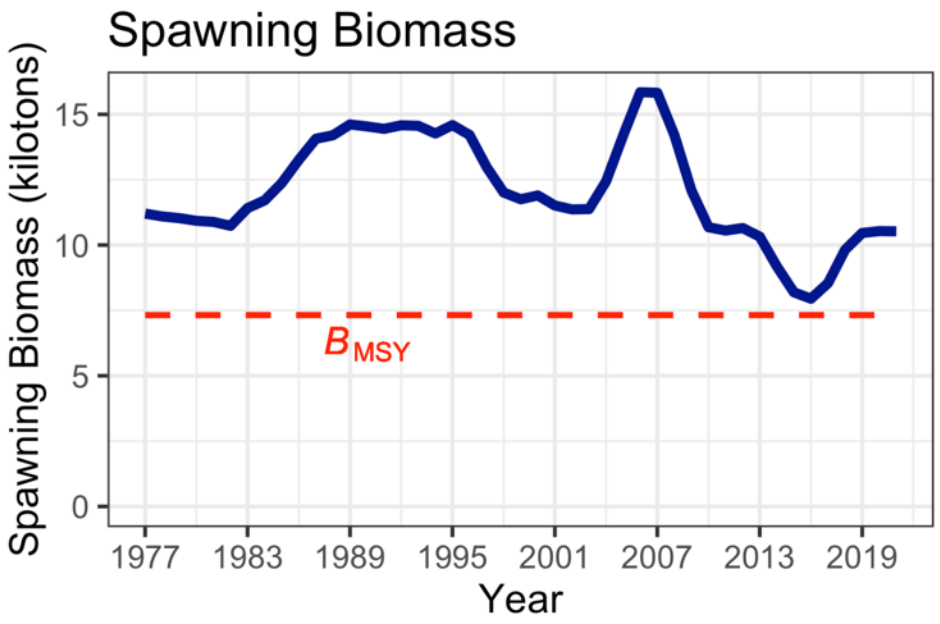
- Overall fits to data were similar among the models
  - Some improvement in the fit to survey biomass by 2-area model
    - Indications of non-stationarity for all models
  - All models underestimate peak of male length distribution from survey
- Retrospective results were similar among models
- Preferred model – Model 21.2
  - Biologically appropriate given difference in growth between central and western GOA
  - Estimated growth of central GOA growth morph better described
    - Majority of catch is from central GOA
    - Important for estimating reference points

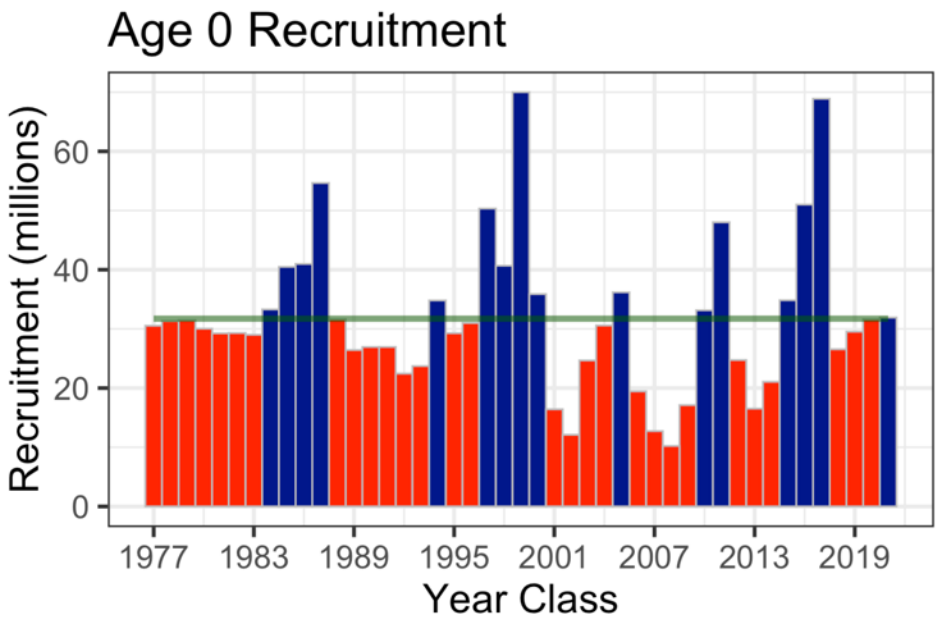
The Team agreed with this choice

Northern rock sole-central GOA

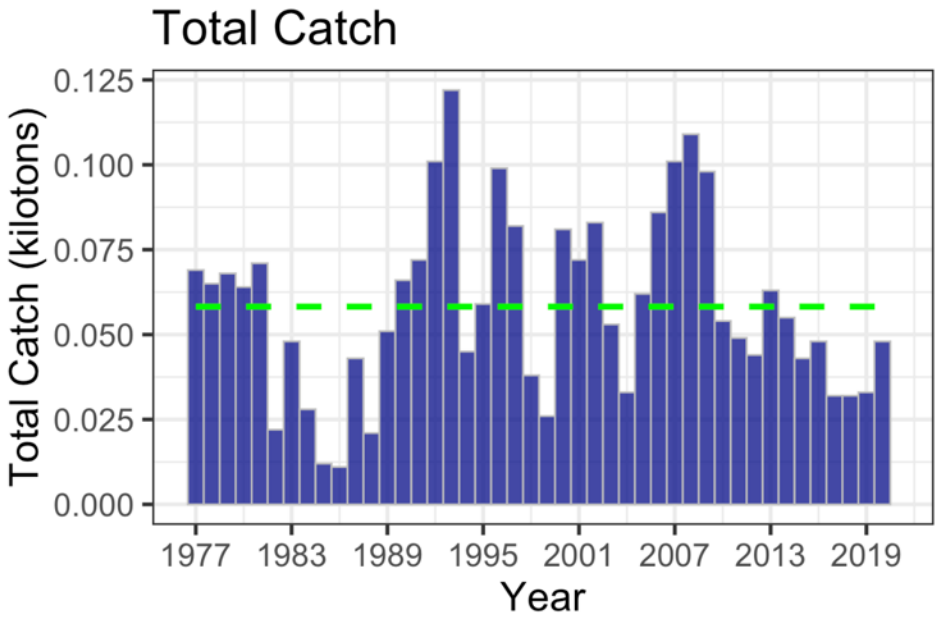


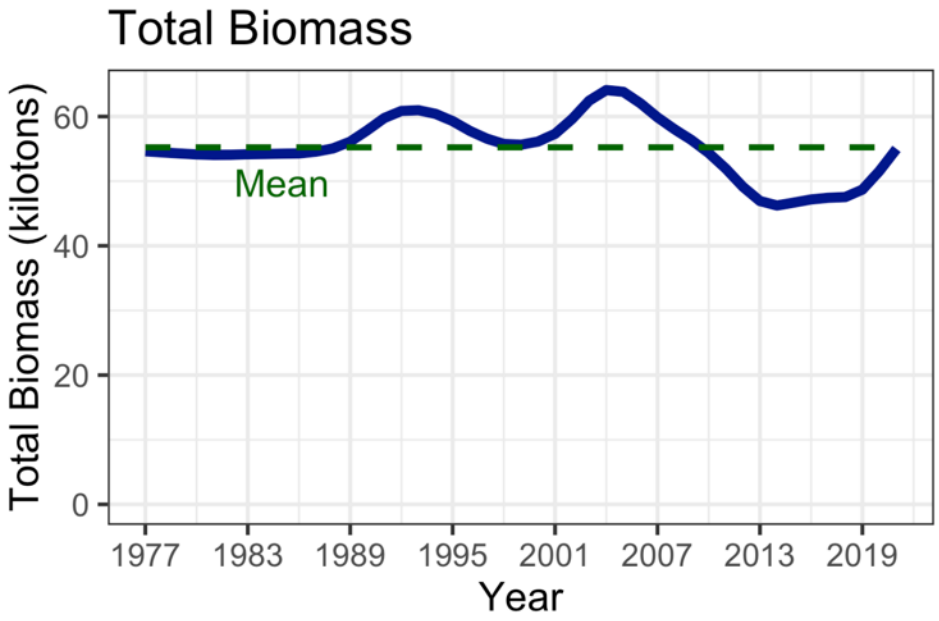


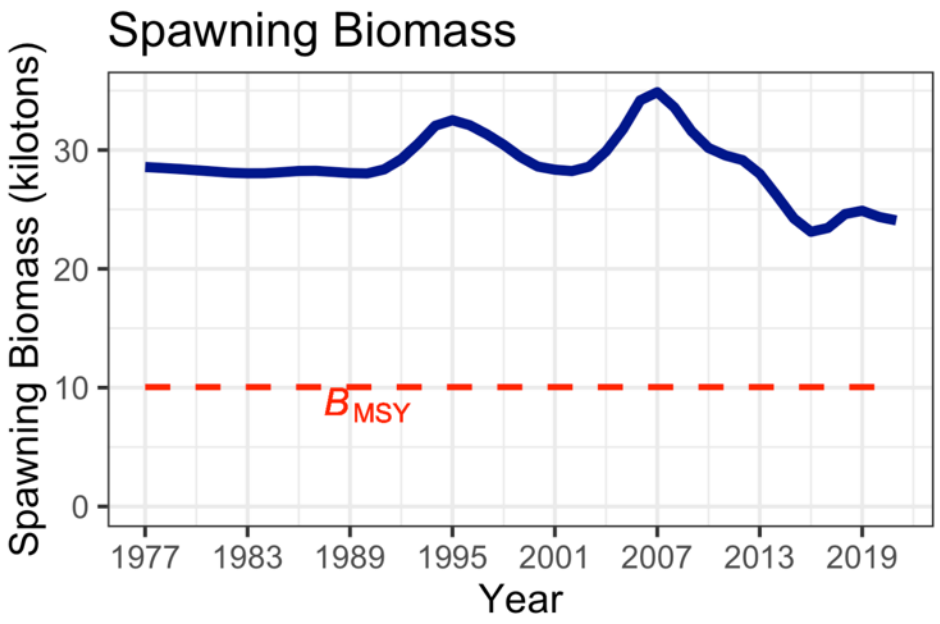


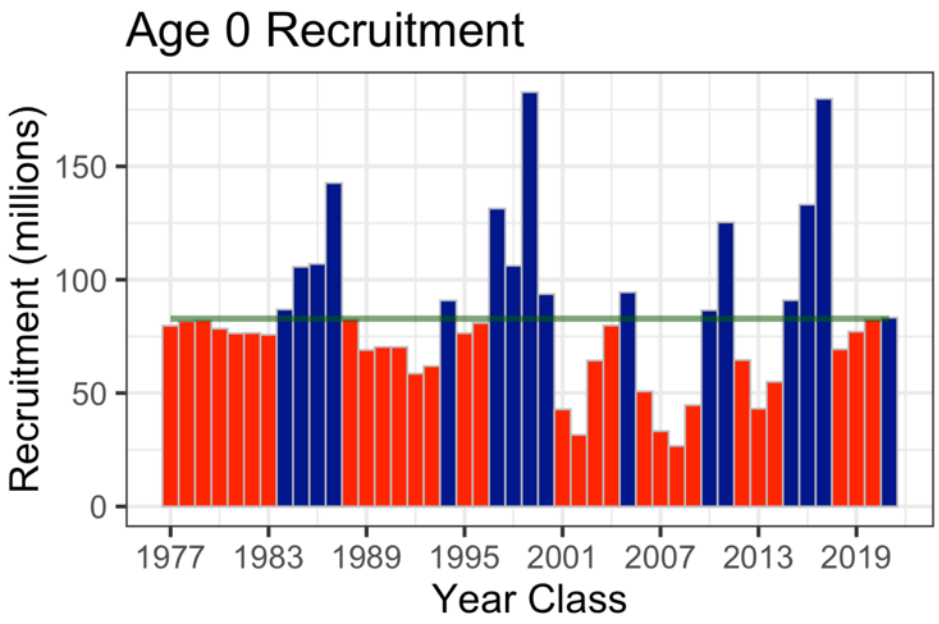


Northern rock sole-western GOA

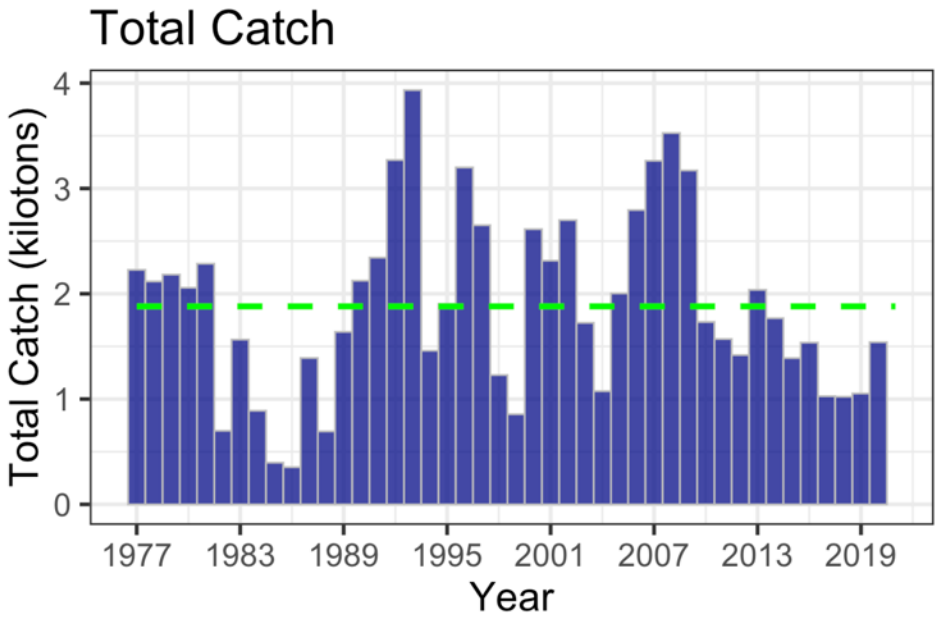


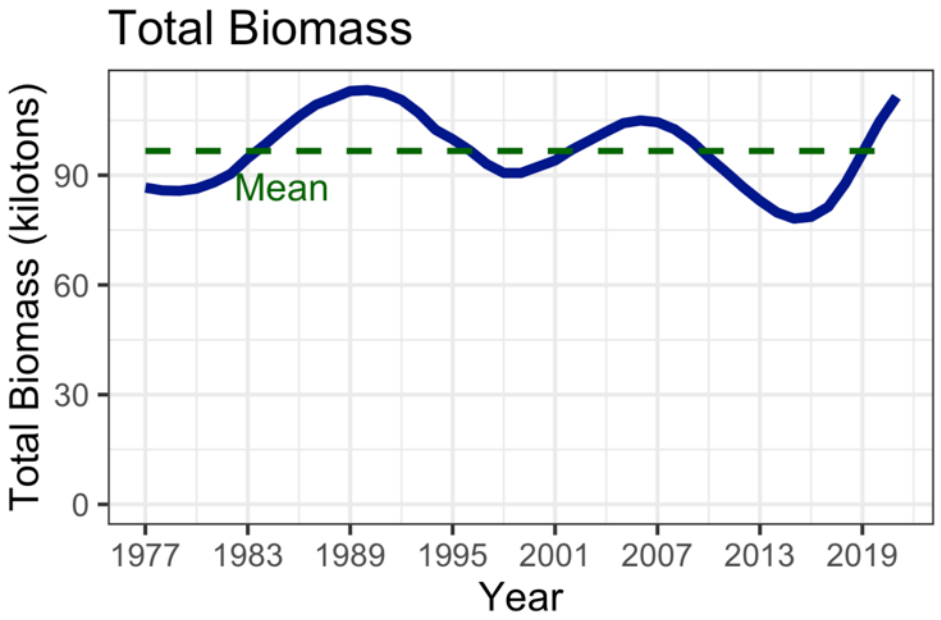


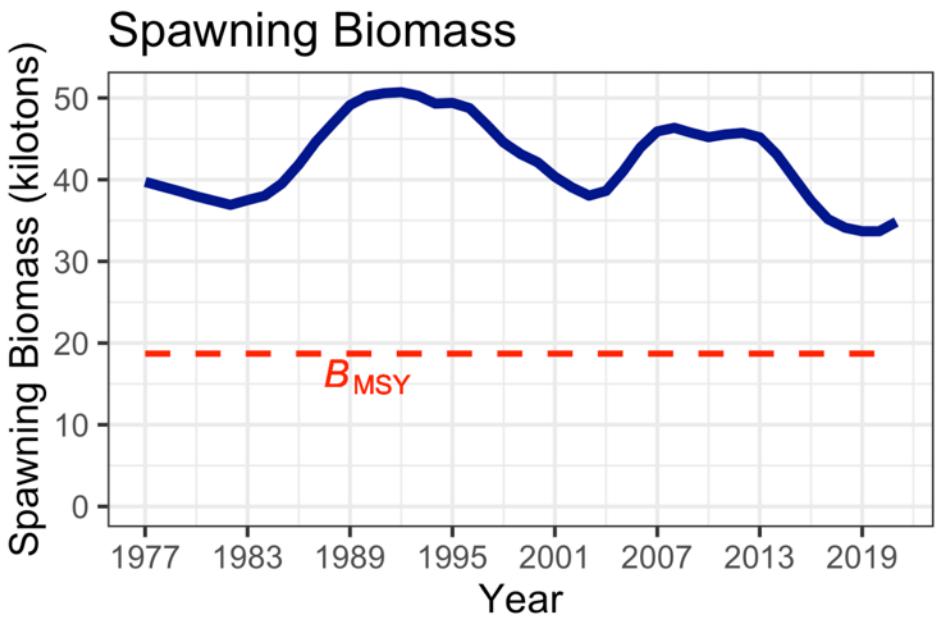


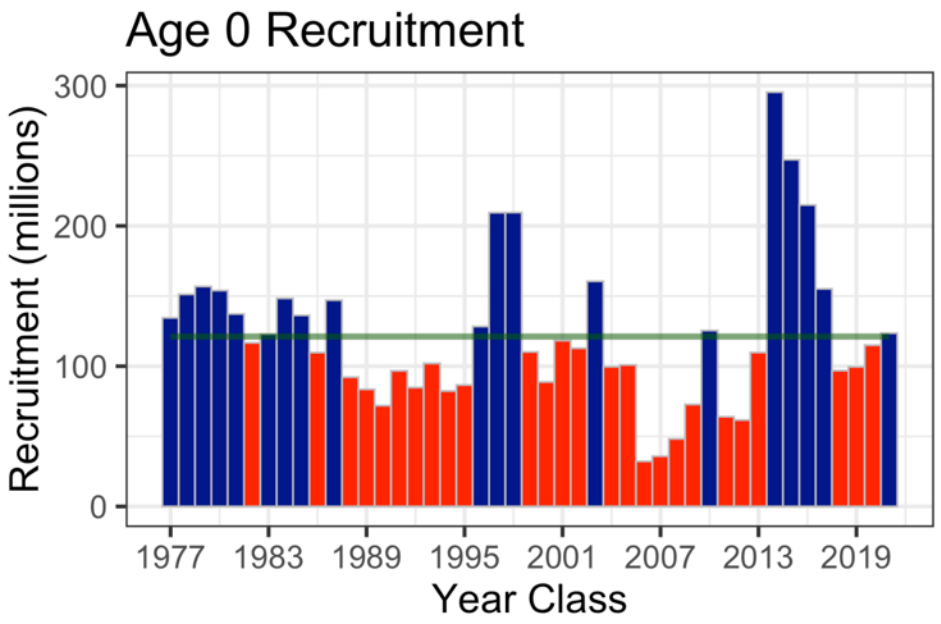


Southern rock sole-central GOA

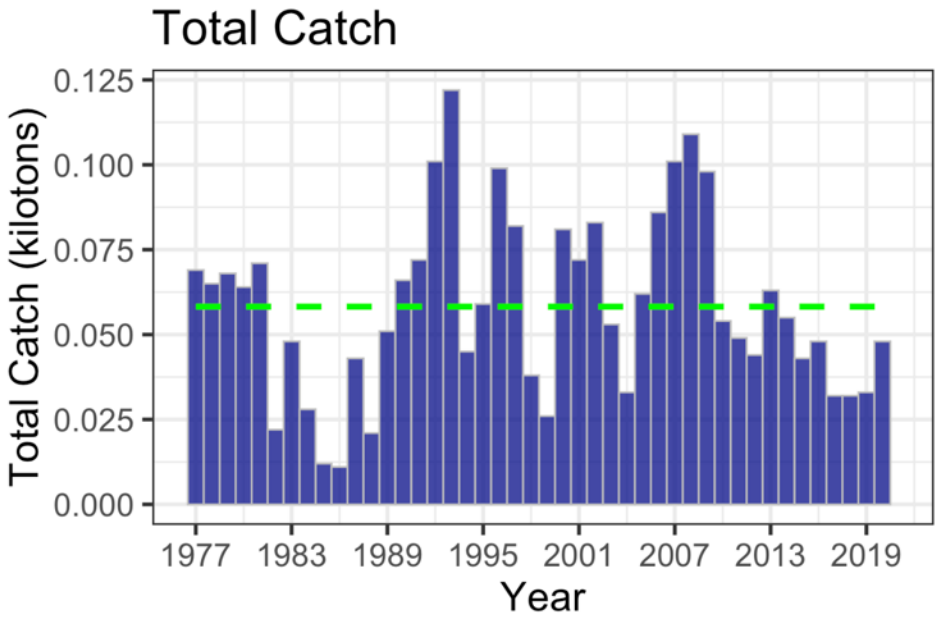


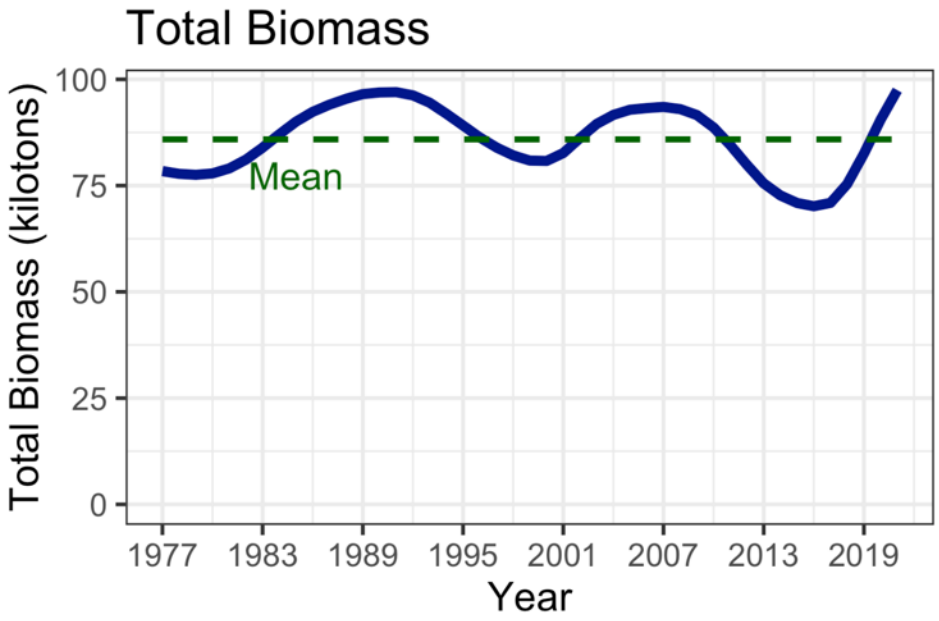


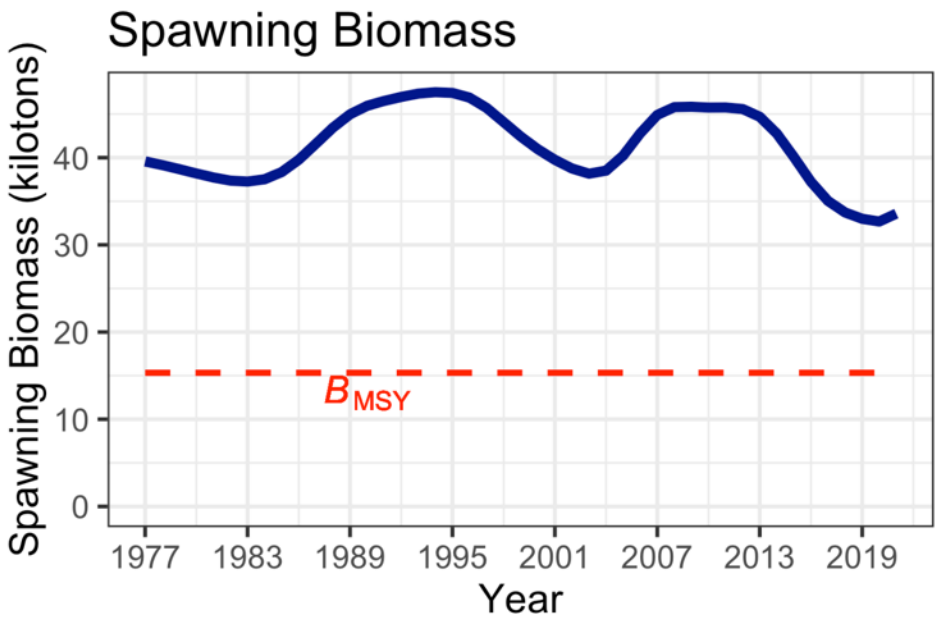


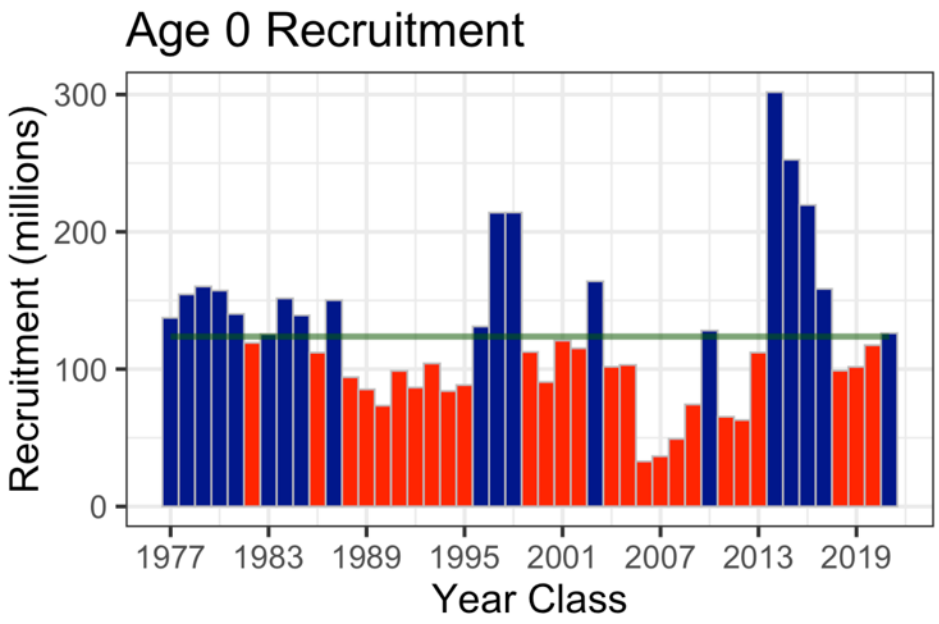


Southern rock sole-western GOA





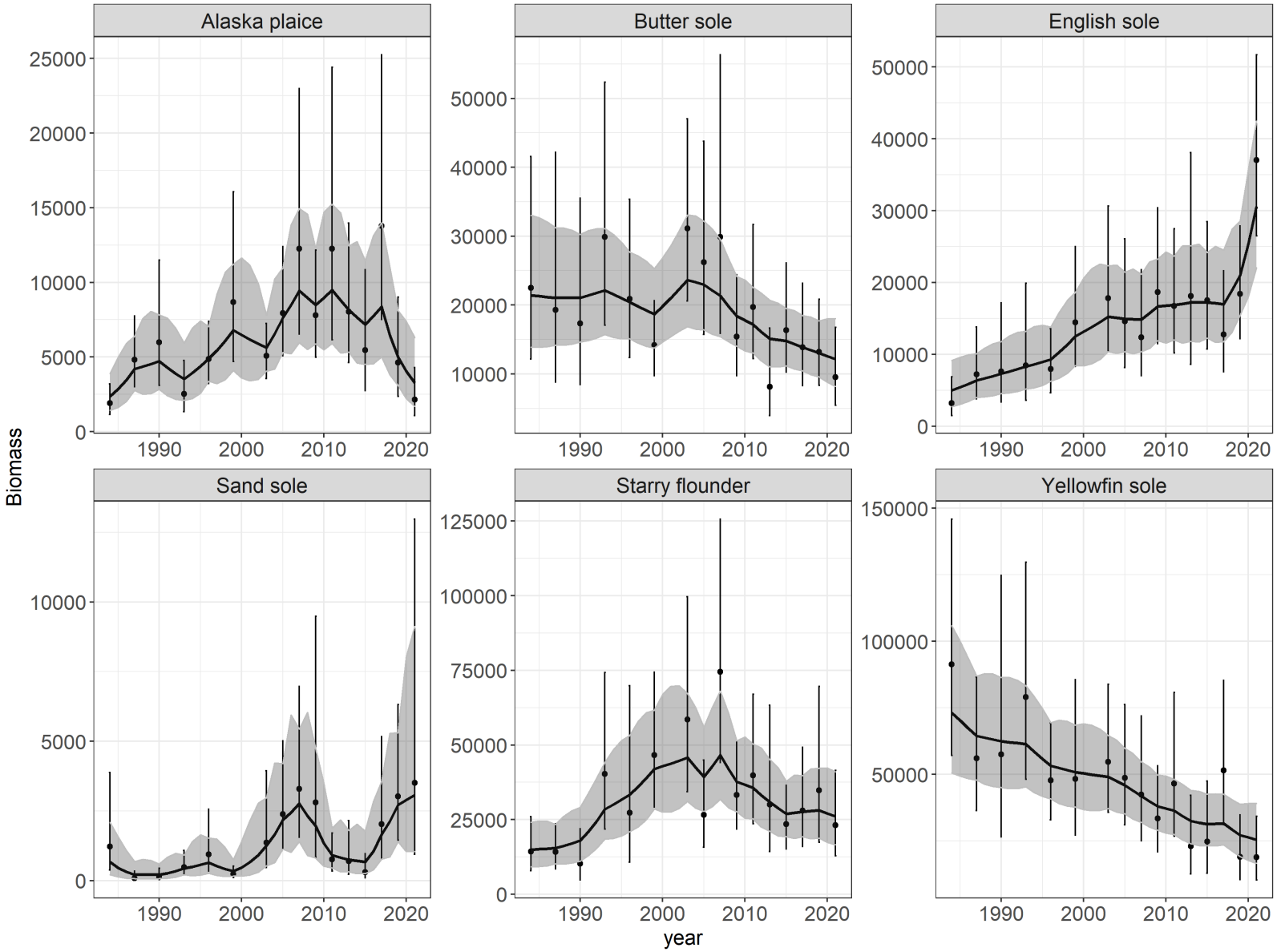




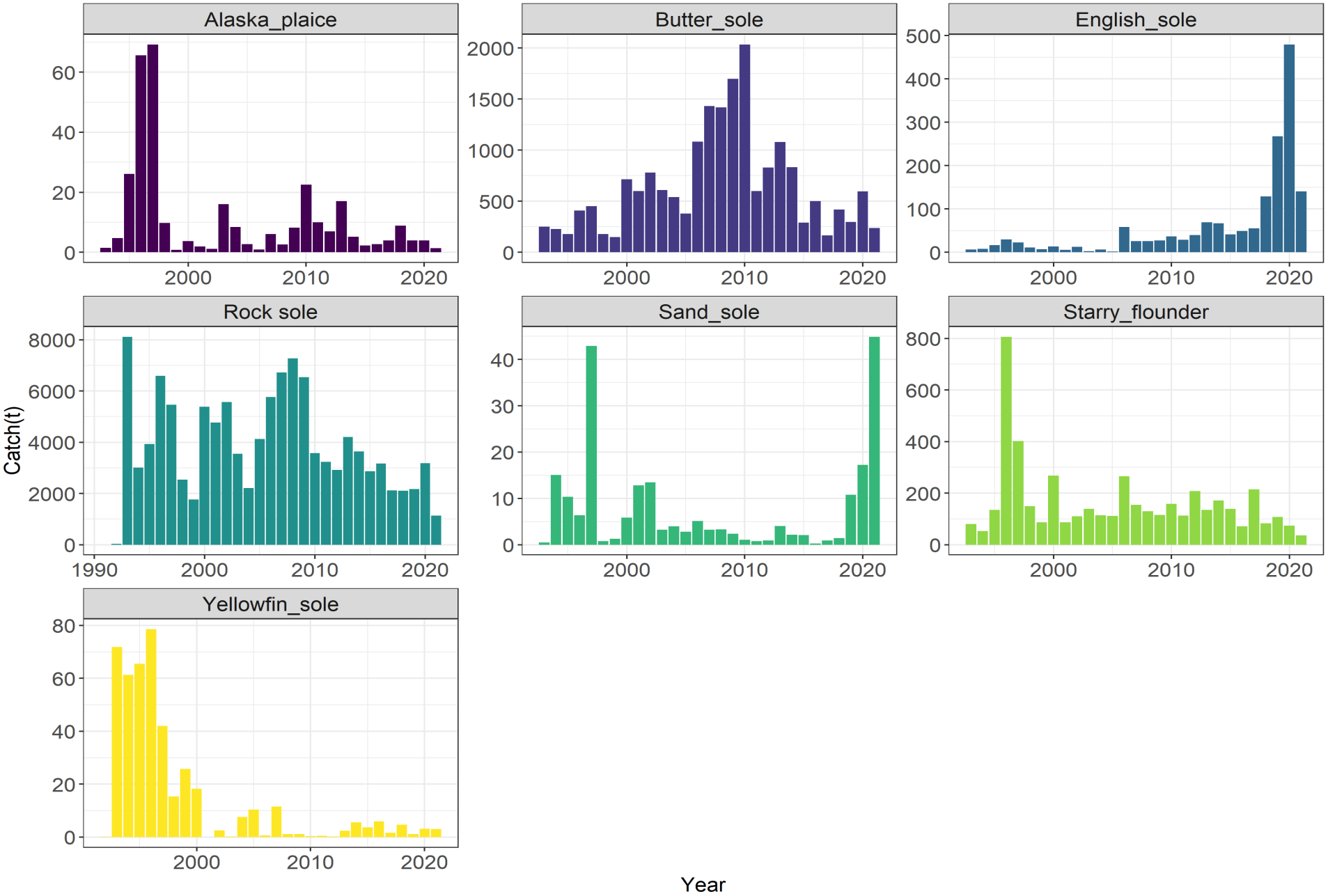
4. Shallow-water flatfish

Full assessment

Many components



4. Shallow-water flatfish catch



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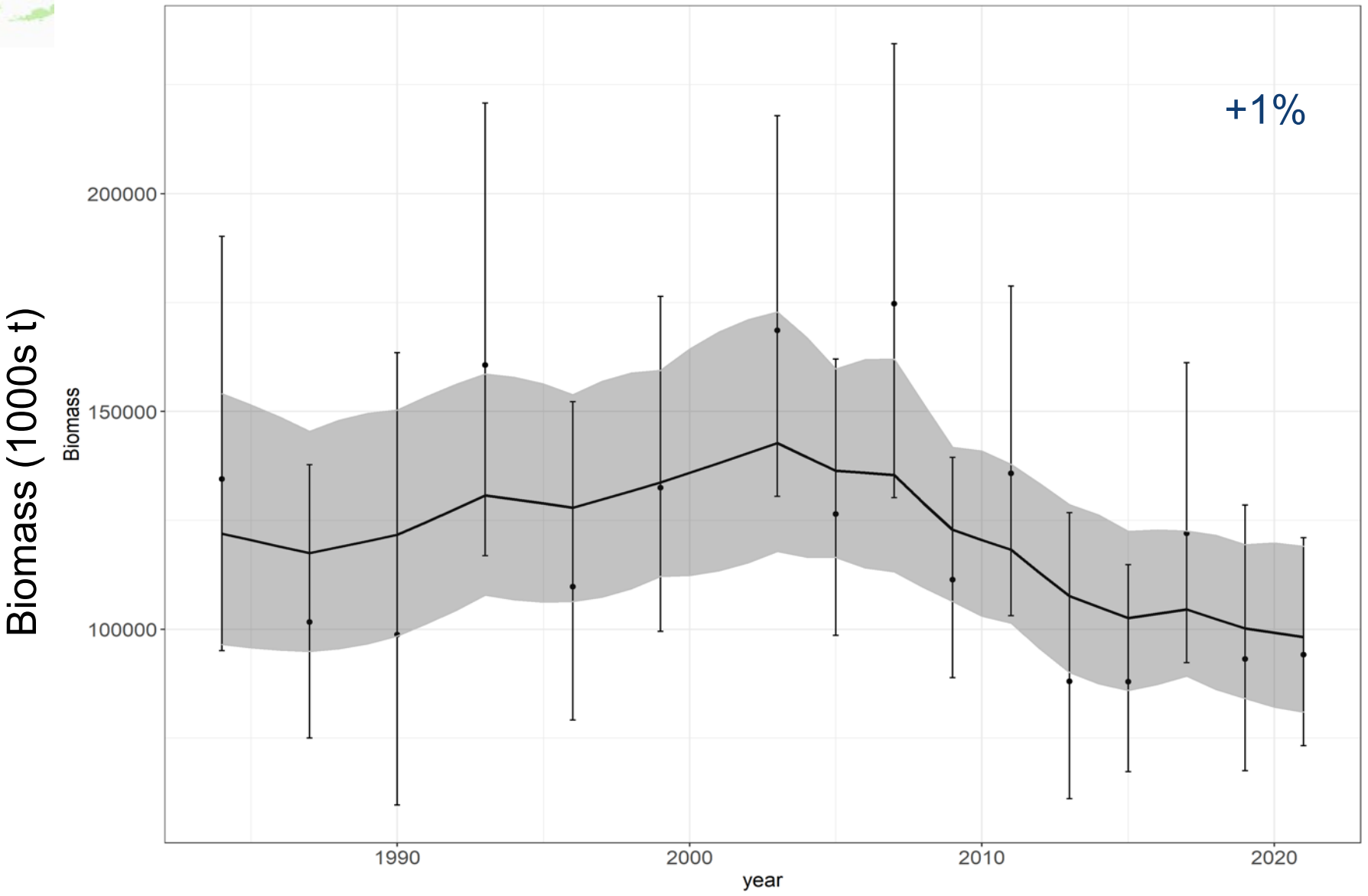
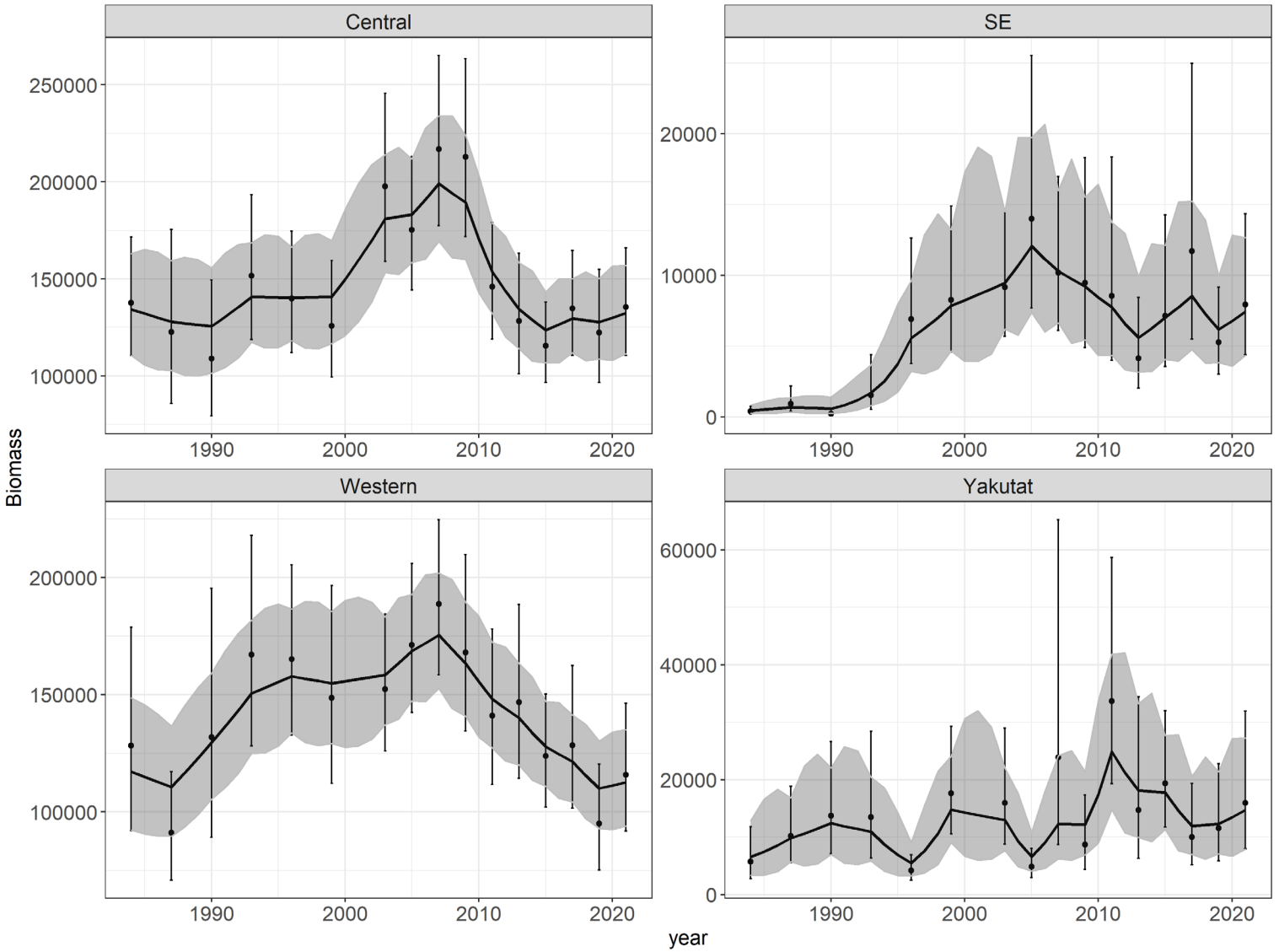


4. Shallow-water flatfish

Apportionments updated



4. Shallow-water flatfish

Plan Team discussions

- Area-specific model for two species of rock soles appropriate
- Other component stocks incidental catch seem consistent with survey trends

Flatfish ABC's

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Subtotal	243,853	235,613	down 8,240 (3%)
Subtotal (without ATF)	116,883	115,834	down 1,049 (1%)

Next full **Deepwater flatfish** assessment due in 2023, only some book-keeping on species inclusions

Projection model run w/ updated catches, minor change in ABC

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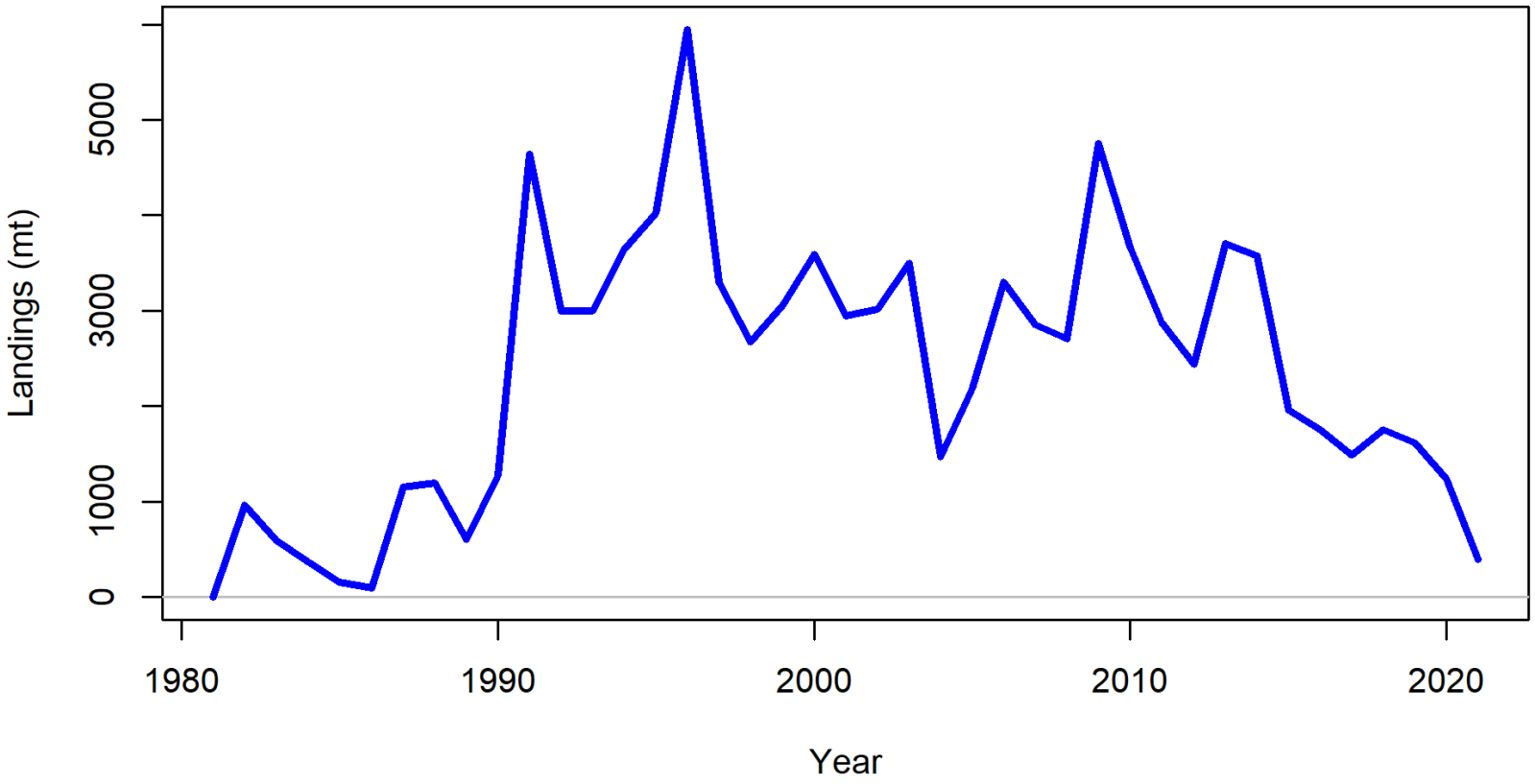
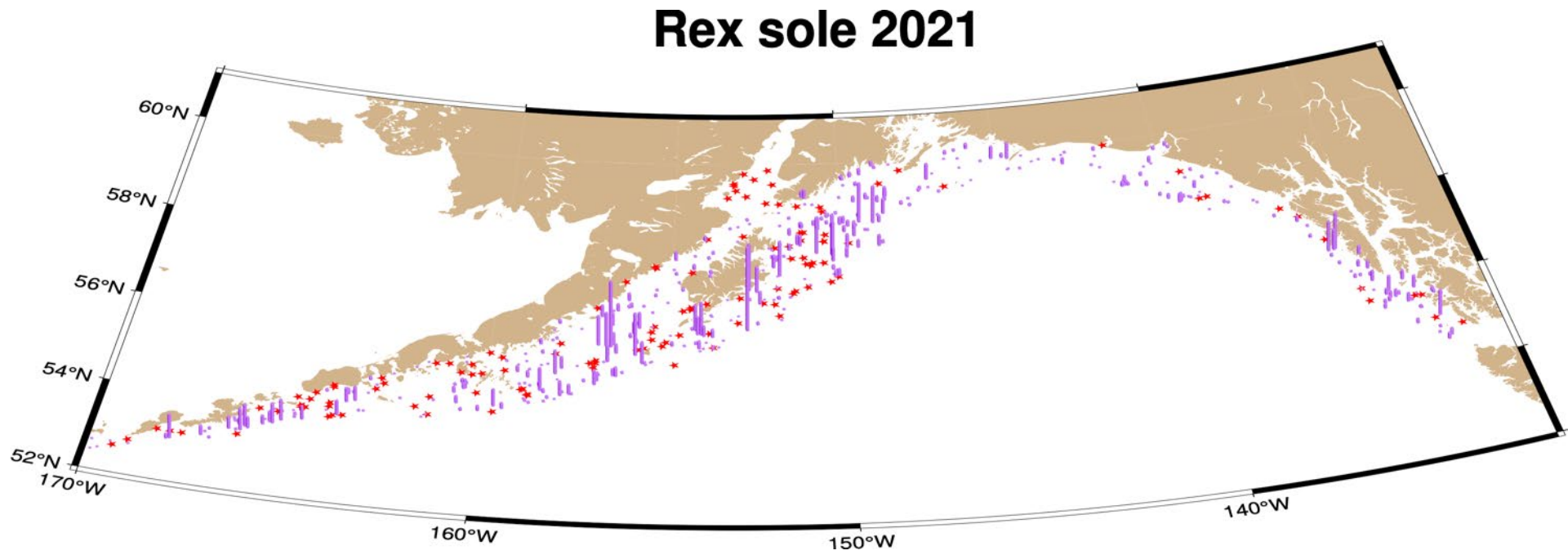
Shallow water flats: N and S rock sole Tier 3, others Tier 5

6. GOA Rex sole



6. GOA Rex sole

Survey CPUE



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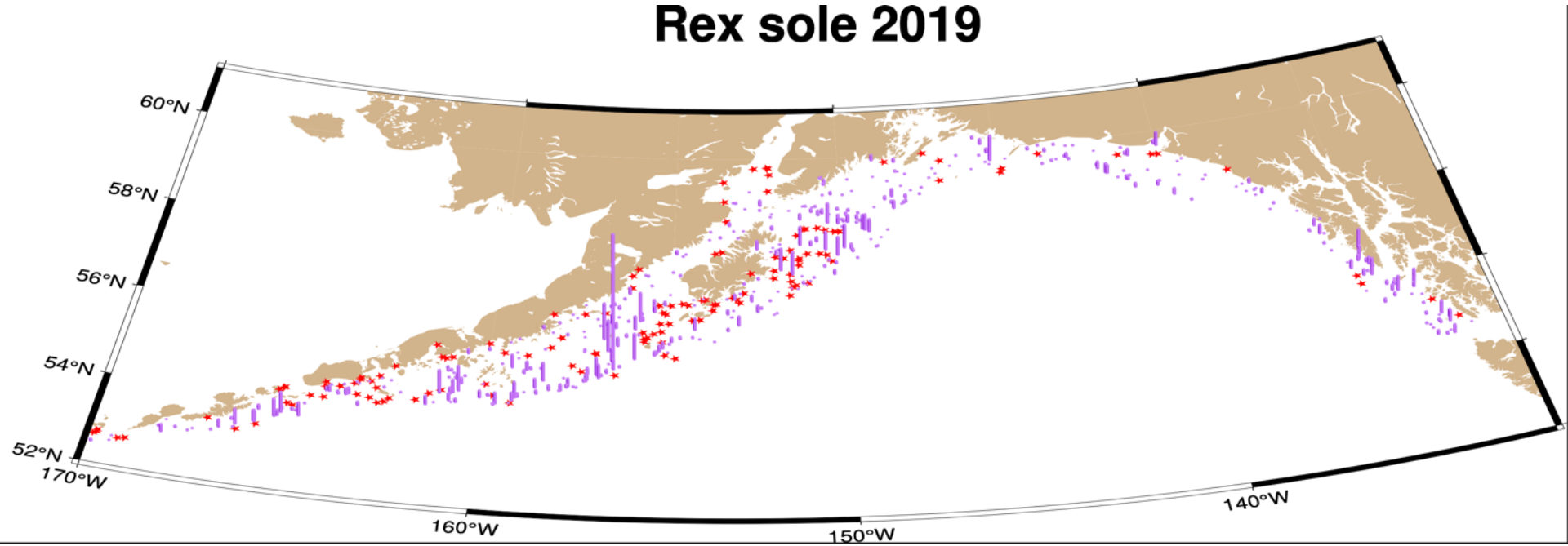

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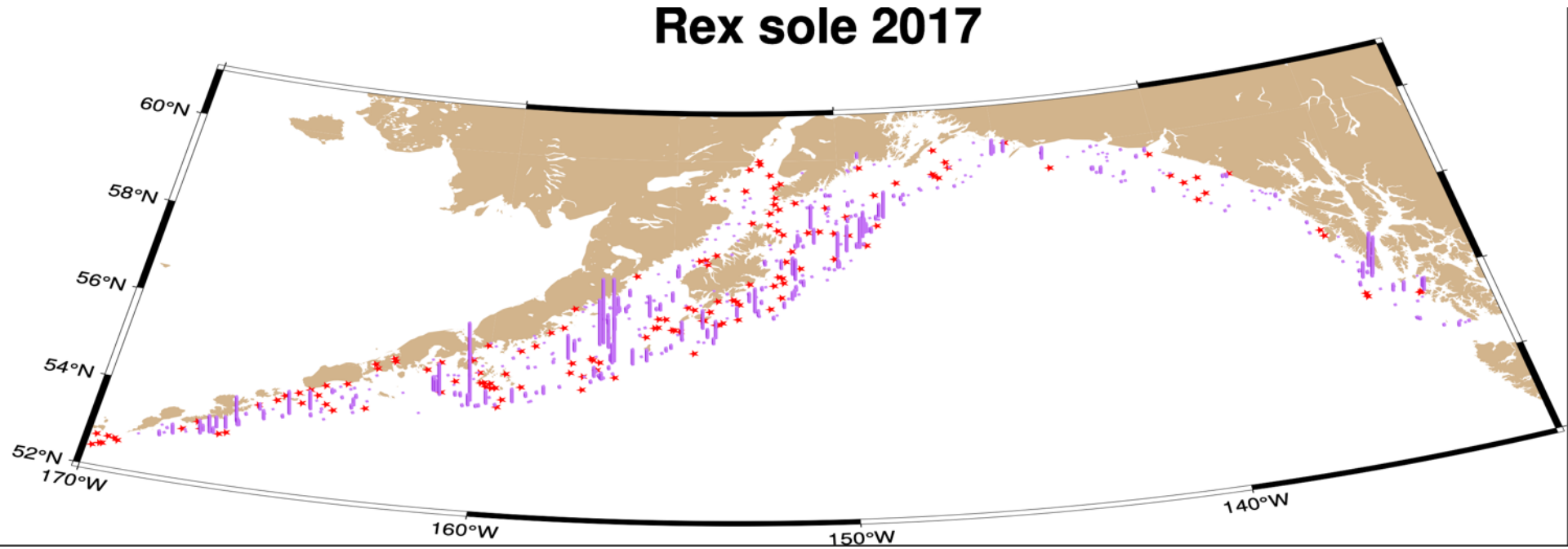
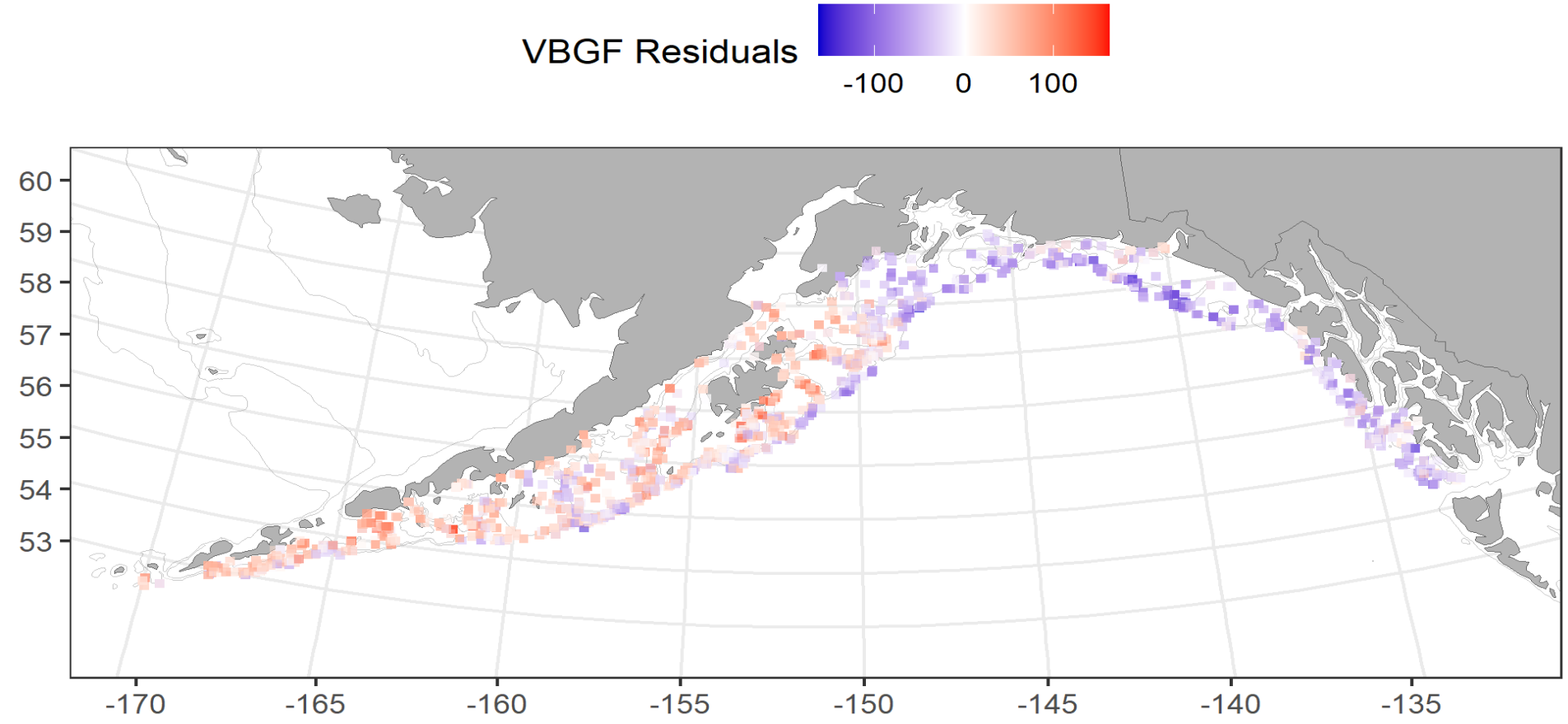
Survey CPUE



6. GOA Rex sole

Spatial differences in growth rates



6. GOA Rex sole models

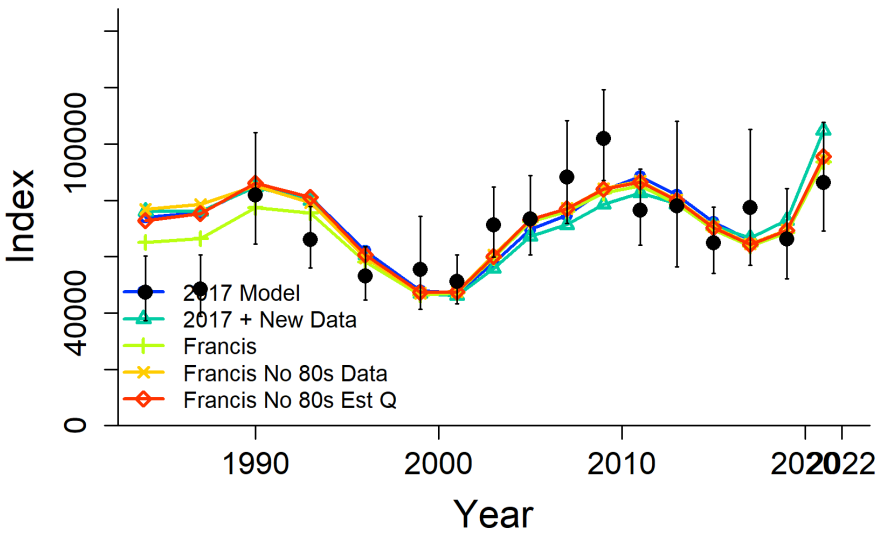
- Two area model; Growth estimated (internally) by area

Model 21 changes

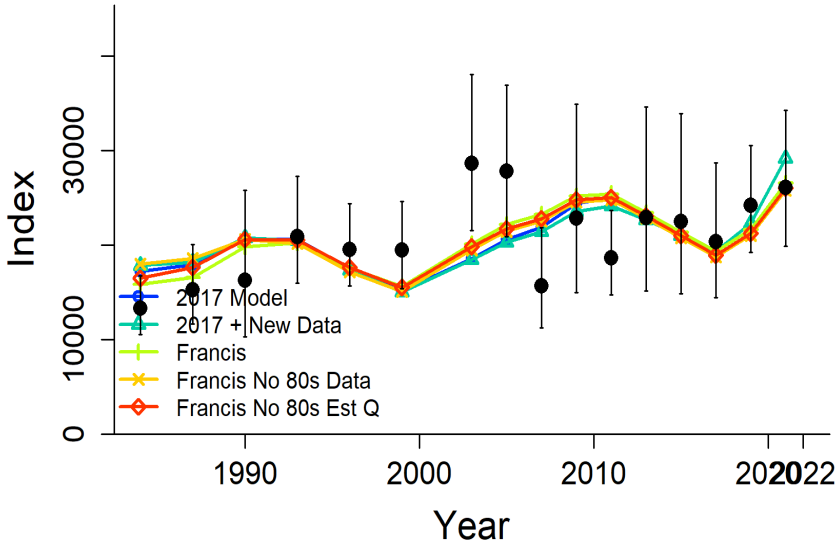
- Francis data weighting
- Omitted 1984 and 1987 survey data
- Survey catchability prior based on survey efficiency studies

Bridging analyses

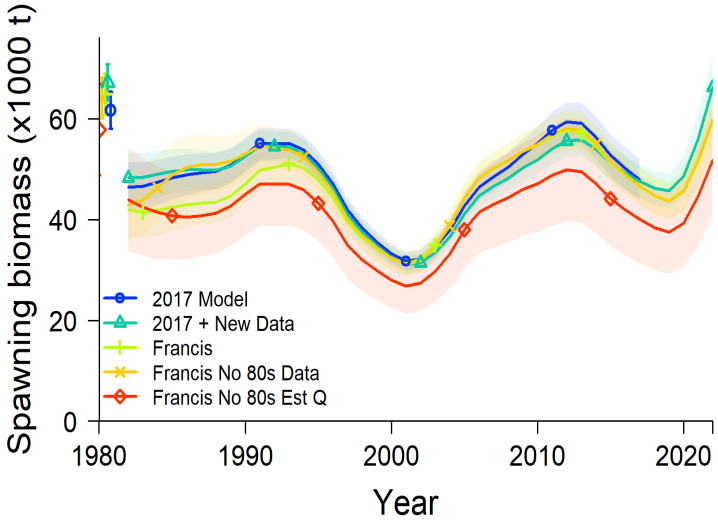
Western-Central GOA

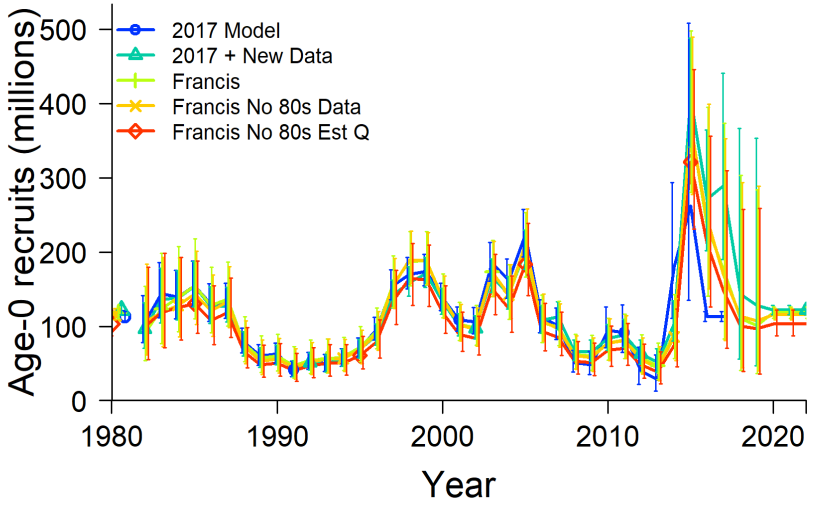


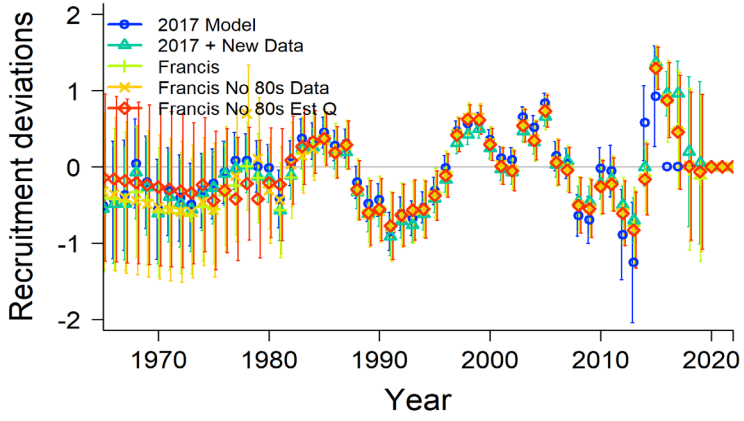
Eastern GOA

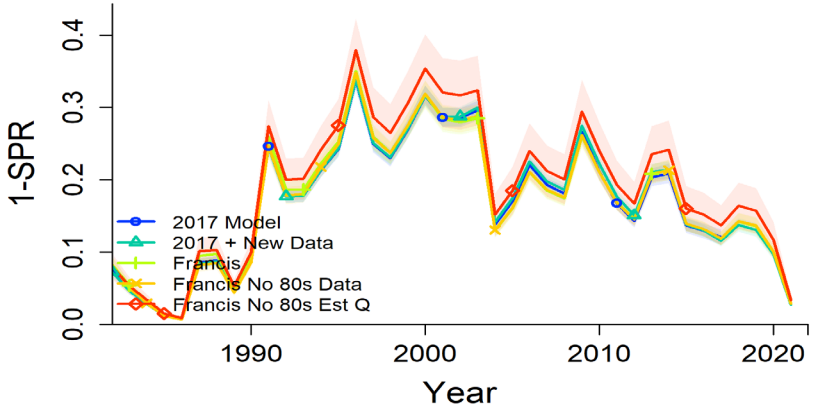


6. GOA Rex sole models: bridging







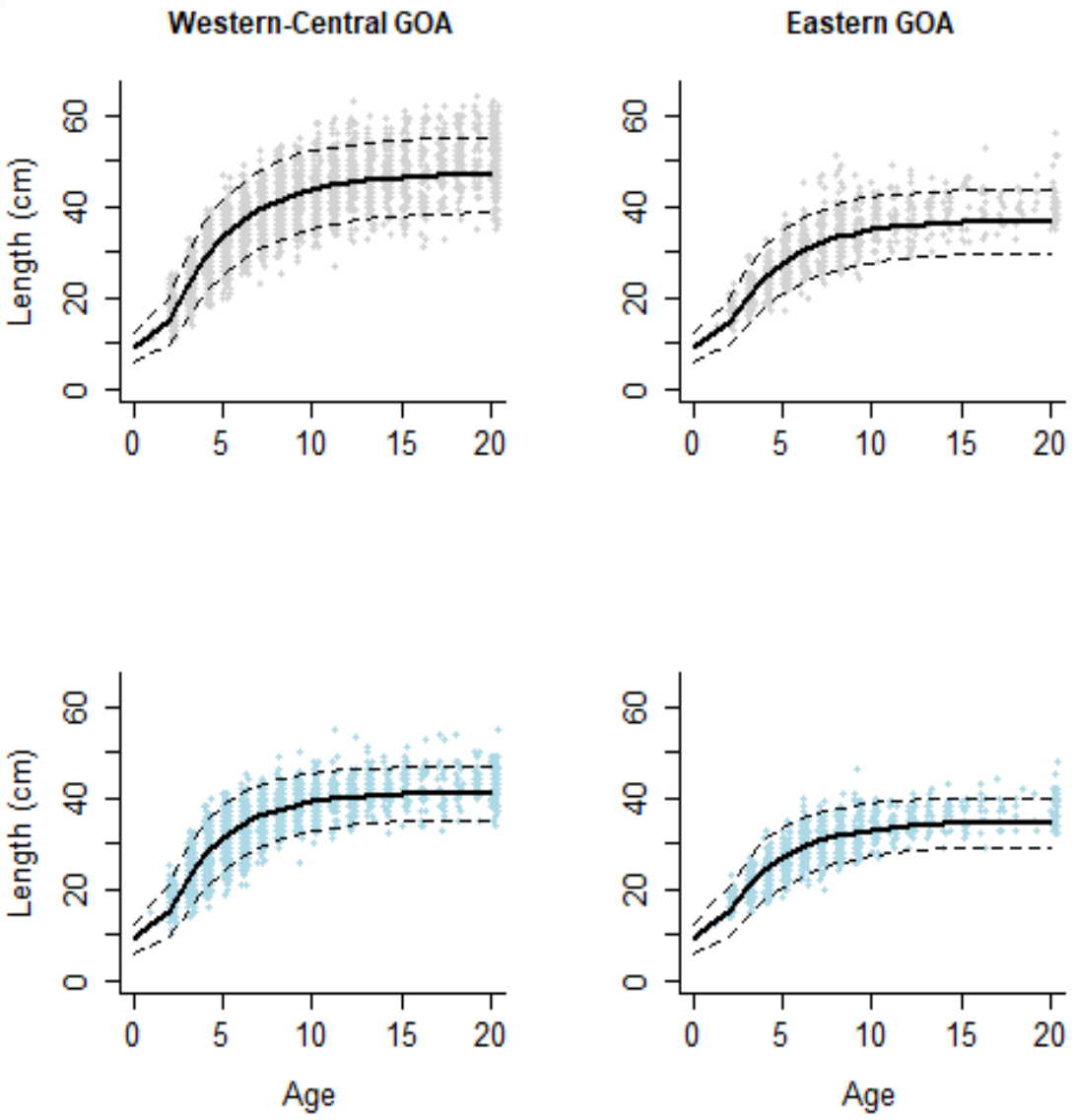


6. GOA Rex sole growth

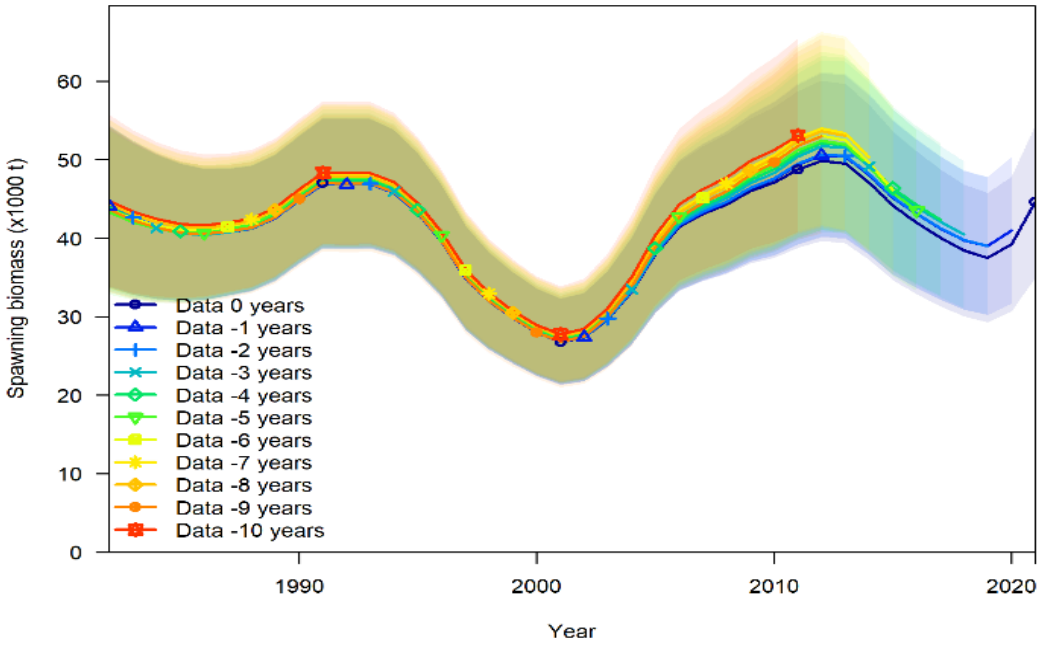
Fits to age-length data, aggregated over years, Model 21.0

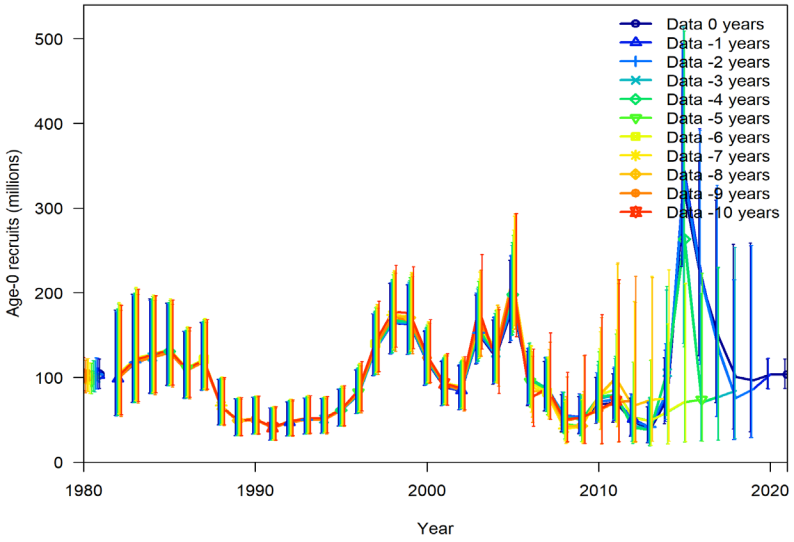
Females

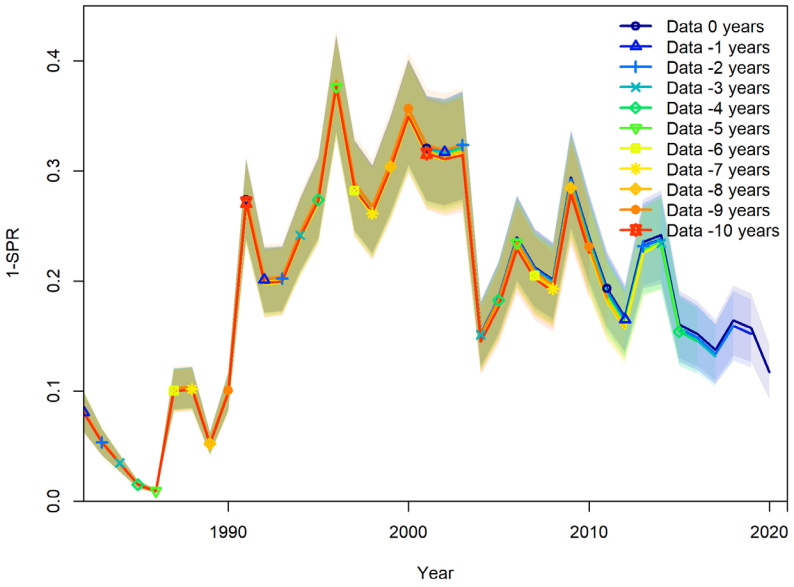
Males



6. GOA Rex sole Retrospective analysis







Mohn's rho

Spawning Biomass	Recruitment	Fishing Mortality
0.057	-0.073	-0.055

6. GOA Rex sole
Executive summary tables (Model 21.0)

Quantity	As estimated or *specified this* year for:		As estimated or *recommended this* year for:	
	2021	2022	2022*	2023*
M (natural mortality rate)	0.17	0.17	0.17	0.17
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	101,244	101,244	124,543	126,939
Female spawning biomass (t)	44,500	44,500	51,713	56,777
$B_{100\%}$				
$B_{40\%}$				
$B_{35\%}$	See area-specific tables below		See area-specific tables below	
F_{OFL}				
$maxF_{ABC}$				
F_{ABC}				
OFL (t)	18,779	18,779	23,302	25,049
maxABC (t)	15,416	15,416	19,141	20,594
ABC (t)	15,416	15,416	19,141	20,594
Status	As determined *last* year for:		As determined *this* year for:	
	2019	2020	2020	2021
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

6. GOA Rex sole Plan Team discussion

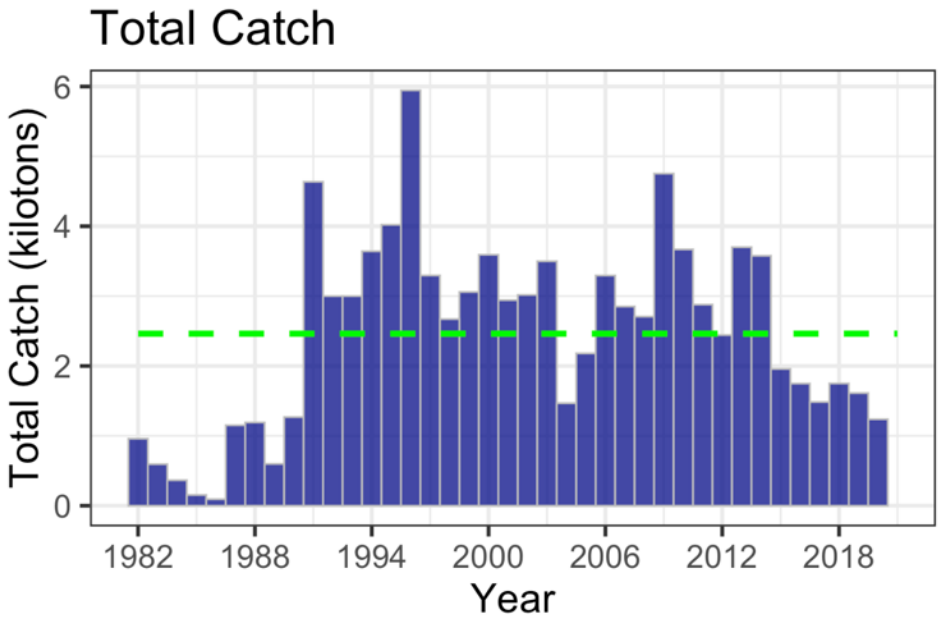
Table 10. Likelihood components for each model. The likelihood components and total likelihood cannot be directly compared among models. The likelihood components for Model 21.0 can be compared to those for the same model without estimation of survey catchability. The survey likelihood component can be compared between Model 17.2 and the same model using Francis data weighting.

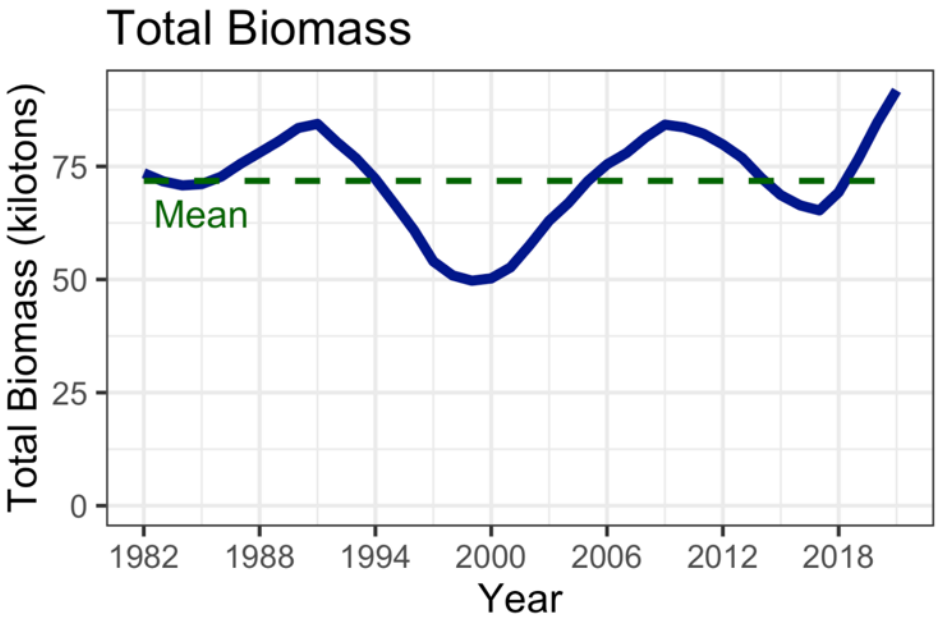
Likelihood Component	Old Model 17.2	Model 17.2 (Old 17.2 + new data)	17.2 but Francis weighting	17.2 but Francis weighting and leave out 80s survey data	Model 21.0, Francis weighting, leave out 80s survey data, estimate q
TOTAL	2,543	2,848	654	583	547
Survey	-12.10	-13.22	-34.80	-33.02	-34.79
Length_comp	488	583	159	171	144
Age comp	2,067	2,279	531	447	442
Recruitment	-1.522	-1.695	-1.551	-0.838	-4.024

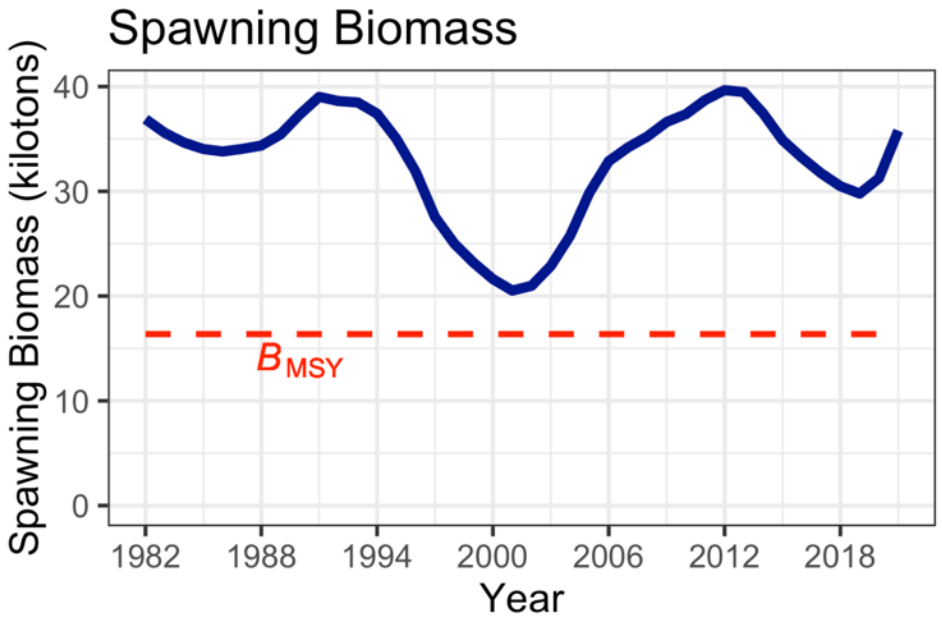
The Team supports Model 21.0

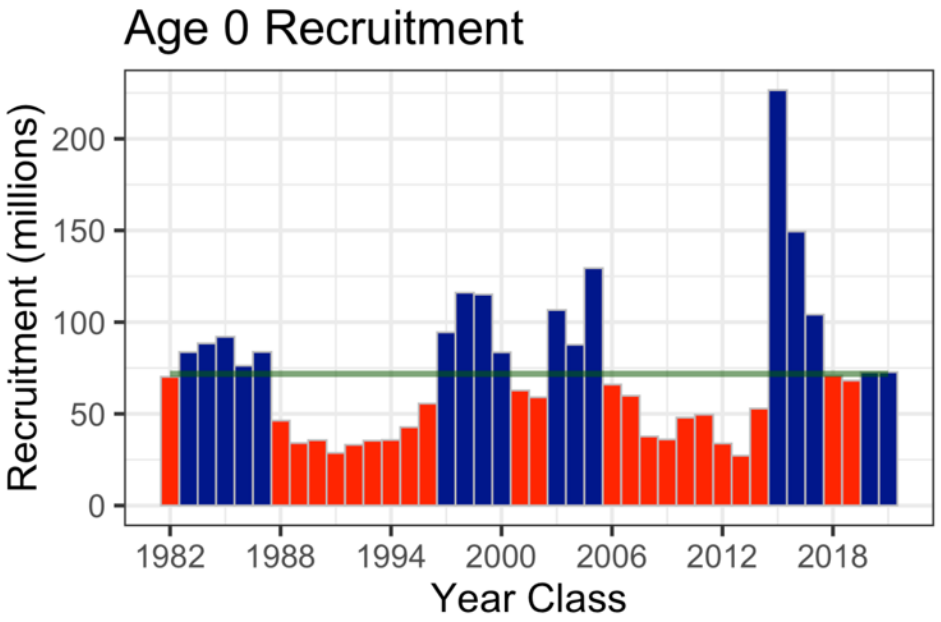
Encouraged pursuing maturity studies, developing an ageing error matrix, and exploring natural mortality rate alternatives.

6. Rex sole


Total Catch
Total Catch (kilotons)
0
2
4
6
1982
1988
1994
2000
2006
2012
2018
Year


Total Biomass
Total Biomass (kilotons)
0
25
50
75
Mean
1982
1988
1994
2000
2006
2012
2018
Year


Spawning Biomass
Spawning Biomass (kilotons)
0
10
20
30
40
B_{MSY}
1982
1988
1994
2000
2006
2012
2018
Year

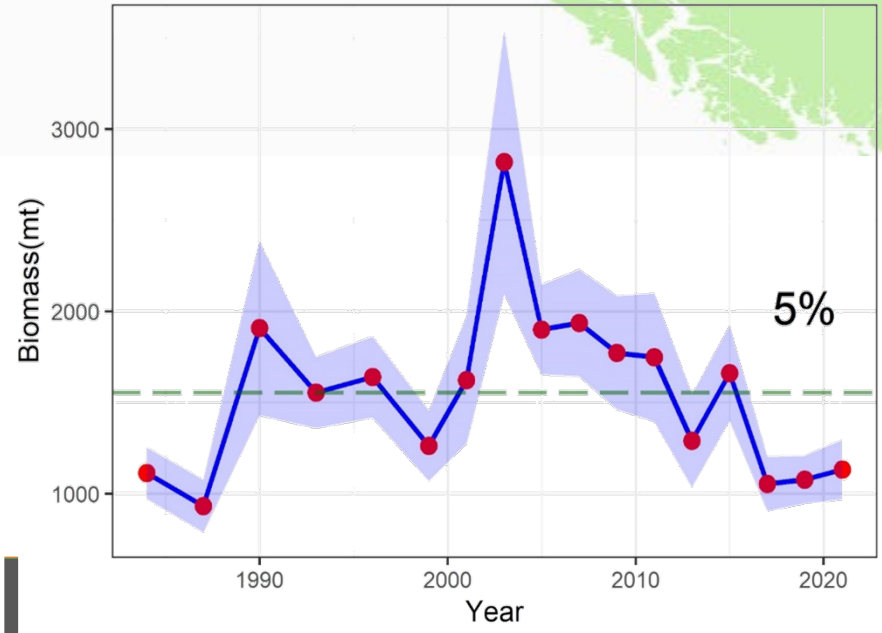

Age 0 Recruitment
Recruitment (millions)
0
50
100
150
200
1982
1988
1994
2000
2006
2012
2018
Year Class

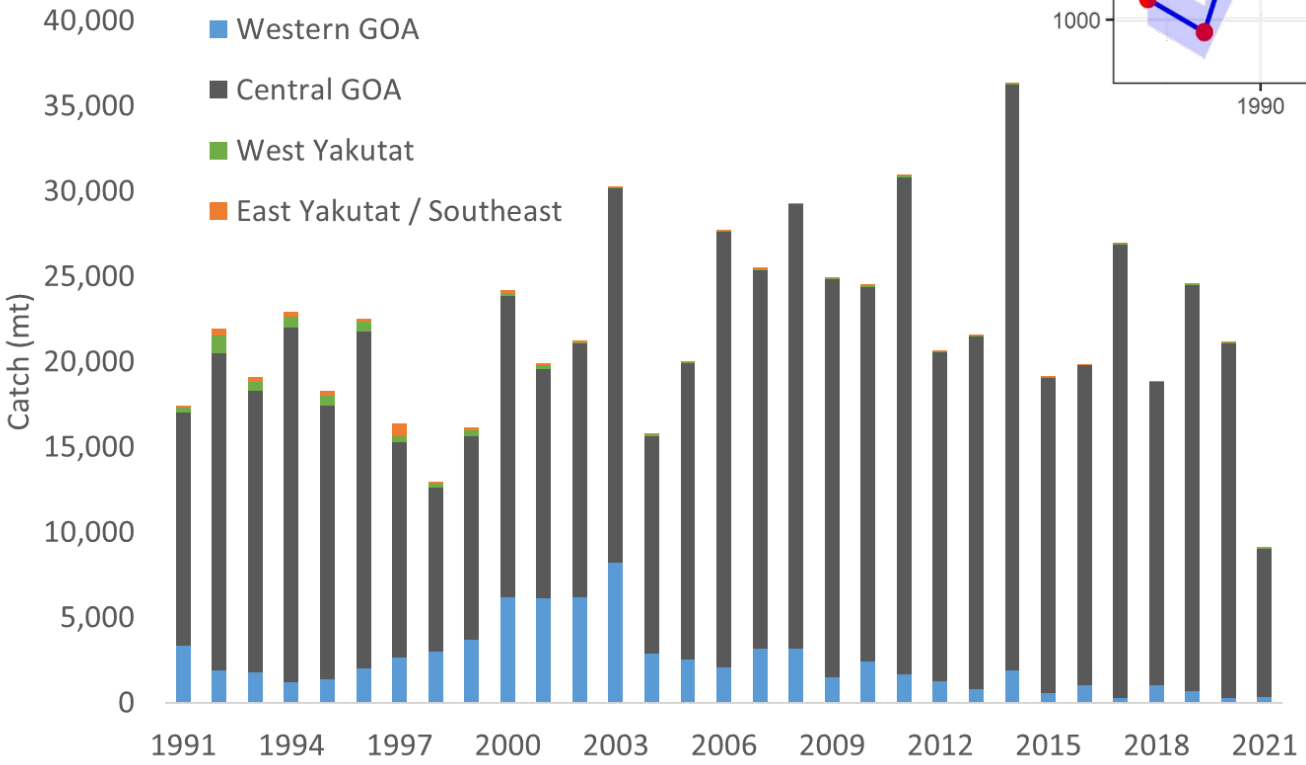
Flatfish ABC's

Species	2021 ABC	2022 ABC	Change
Shallow water flatfish	56,164	50,610	down 5,554 (10%)
Rex sole	15,416	19,141	up 3,725 (24%)
Deep water flatfish	5,926	5,908	down 18 (0%)
Flathead sole	39,377	40,175	up 798 (2%)
Arrowtooth flounder	126,970	119,779	down 7,191 (6%)
Subtotal	243,853	235,613	down 8,240 (3%)
Subtotal (without ATF)	116,883	115,834	down 1,049 (1%)

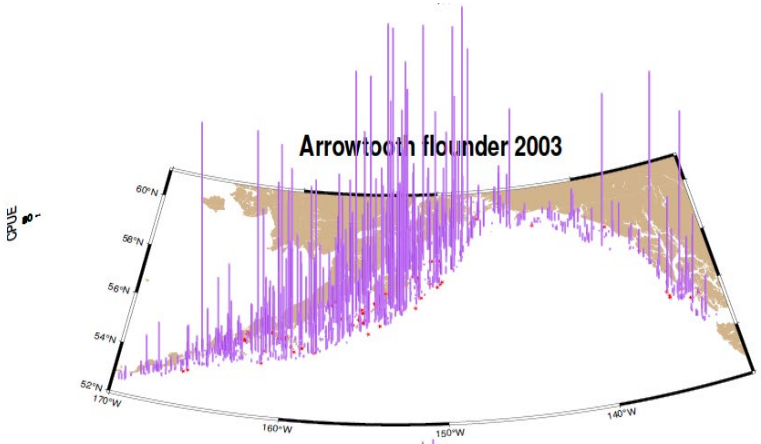
9. Arrowtooth flounder

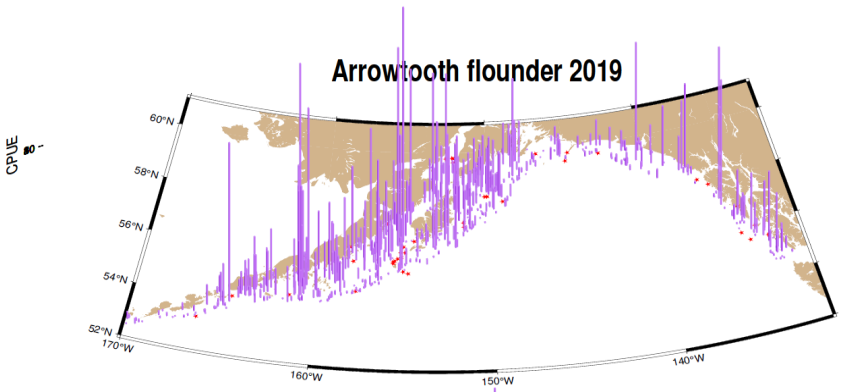
- Full assessment in odd years
  - Tier 3
  - New catch, survey, age/length comps, no model changes

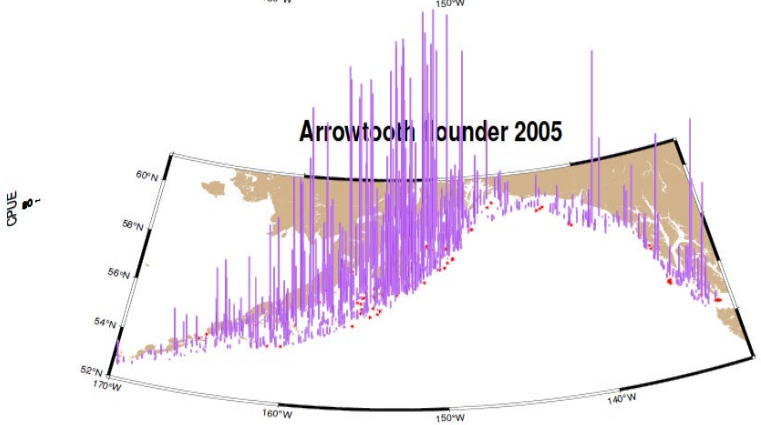


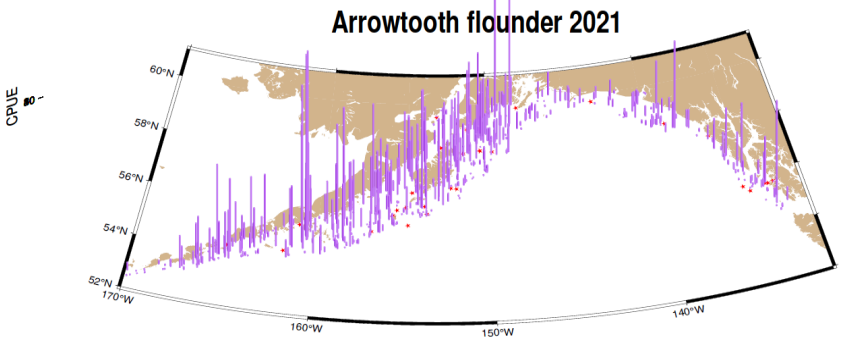


9. Arrowtooth flounder



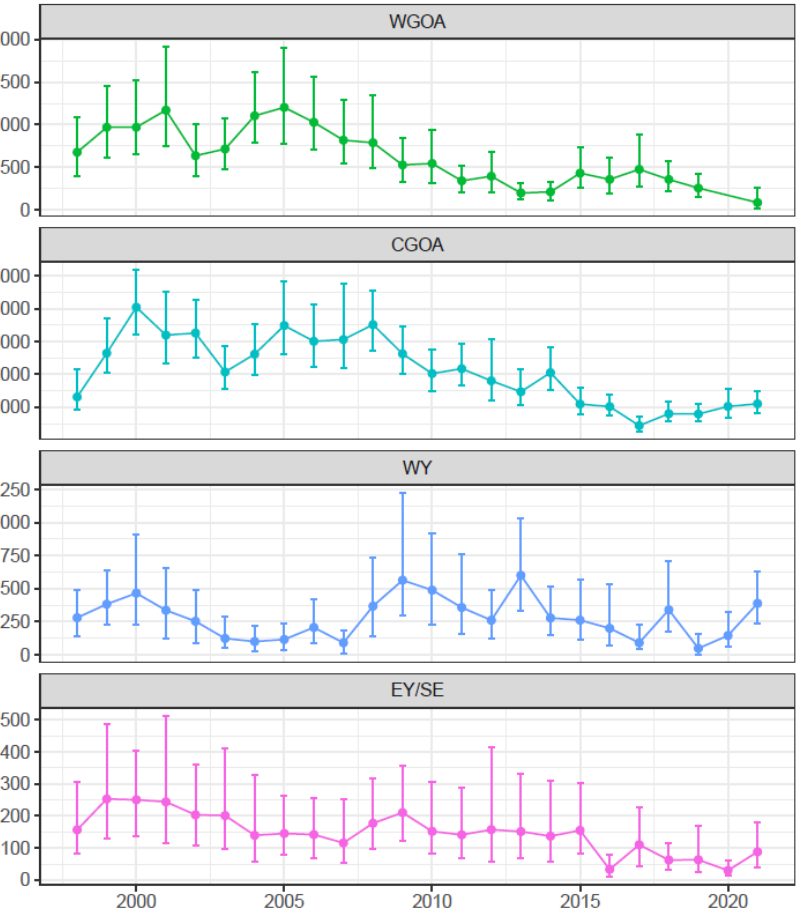


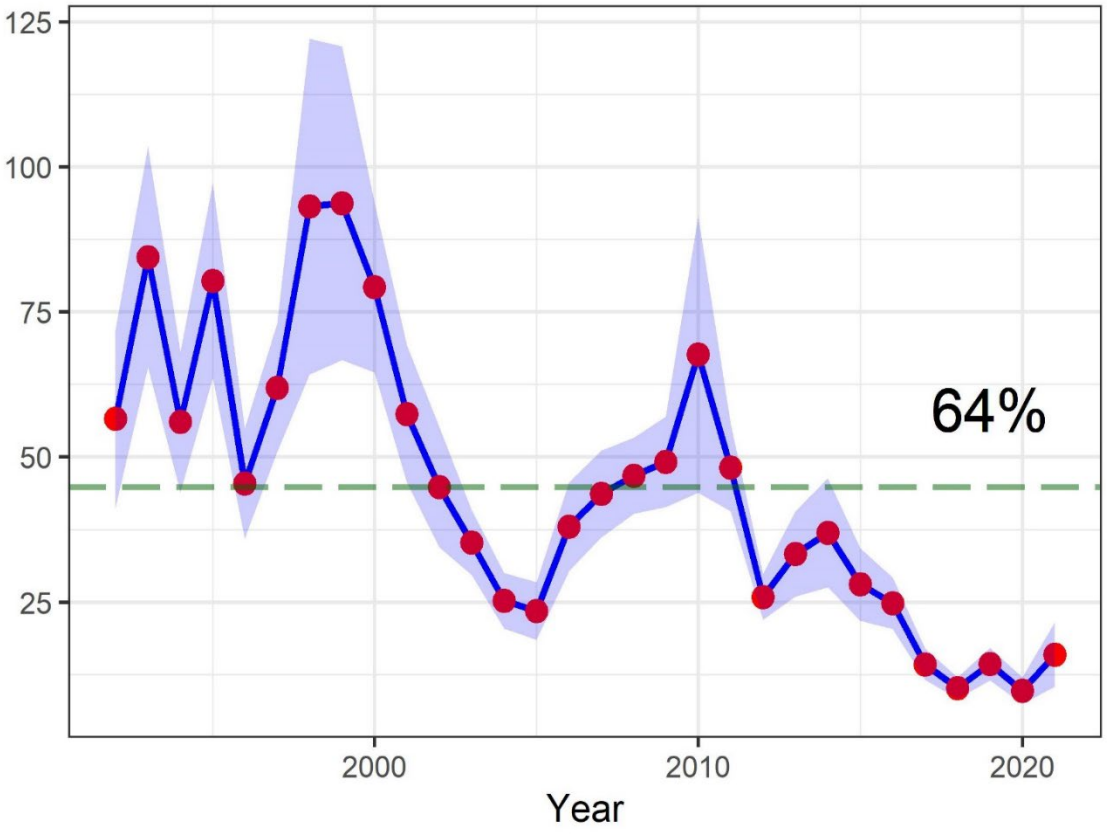




9. Arrowtooth flounder

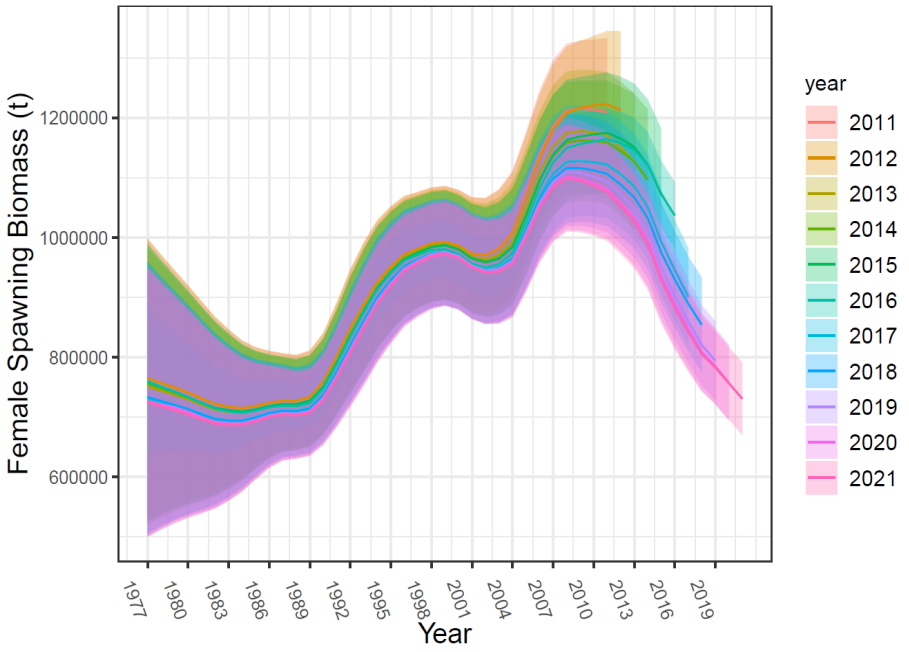
- AFSC Longline survey RPN

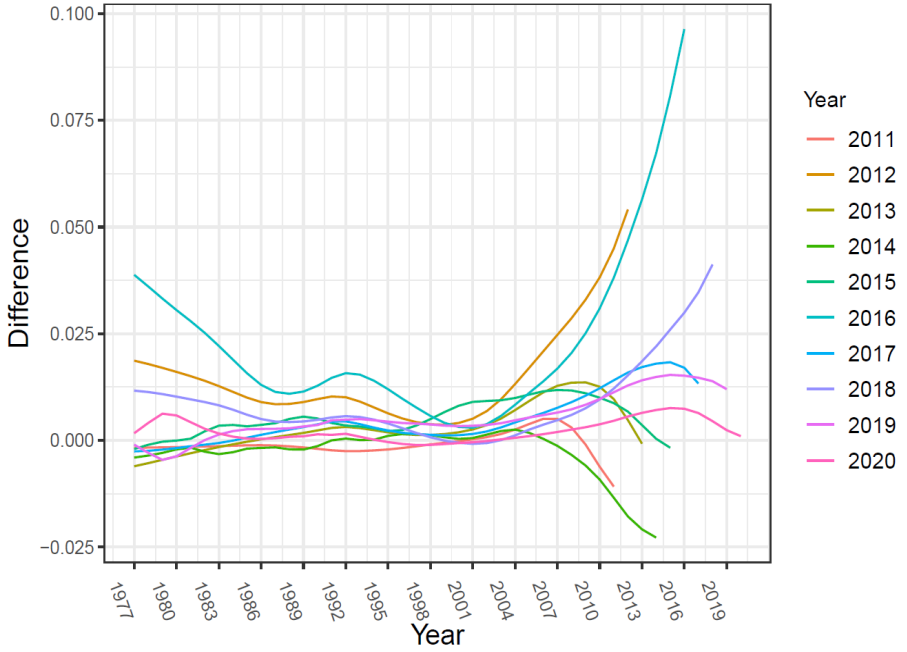




9. Arrowtooth flounder

- Retrospective



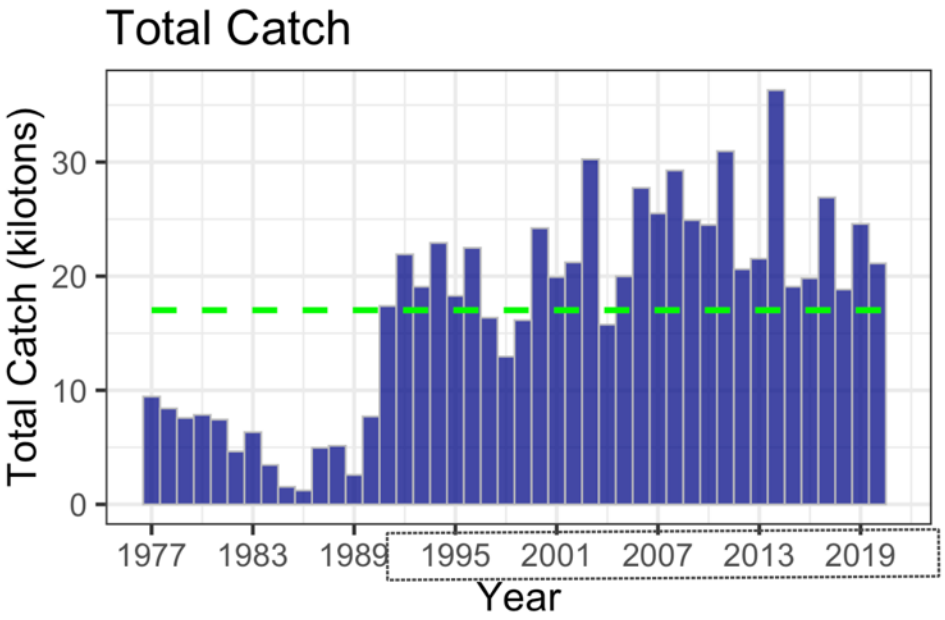


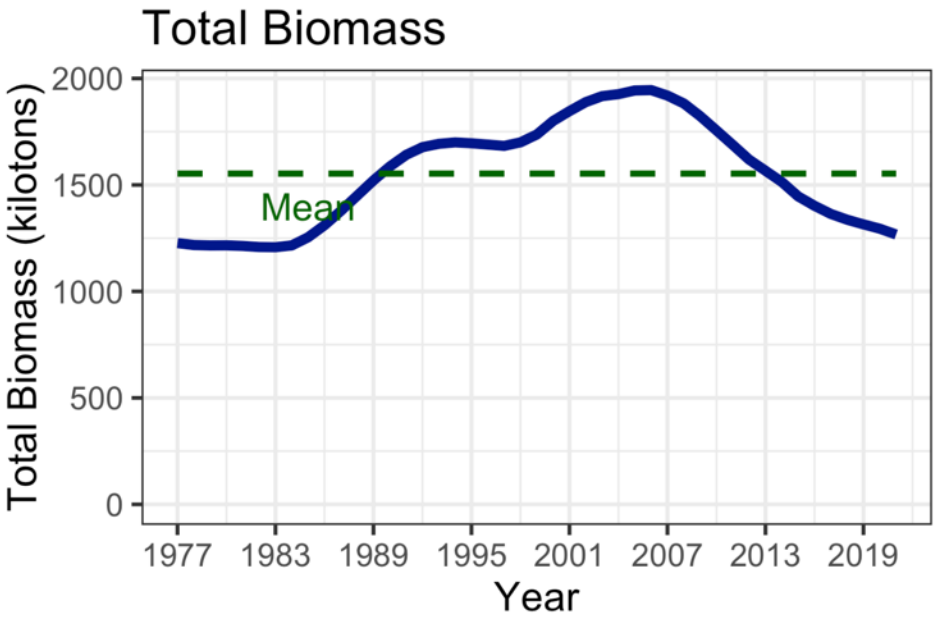
Mohn's Rho = 0.018

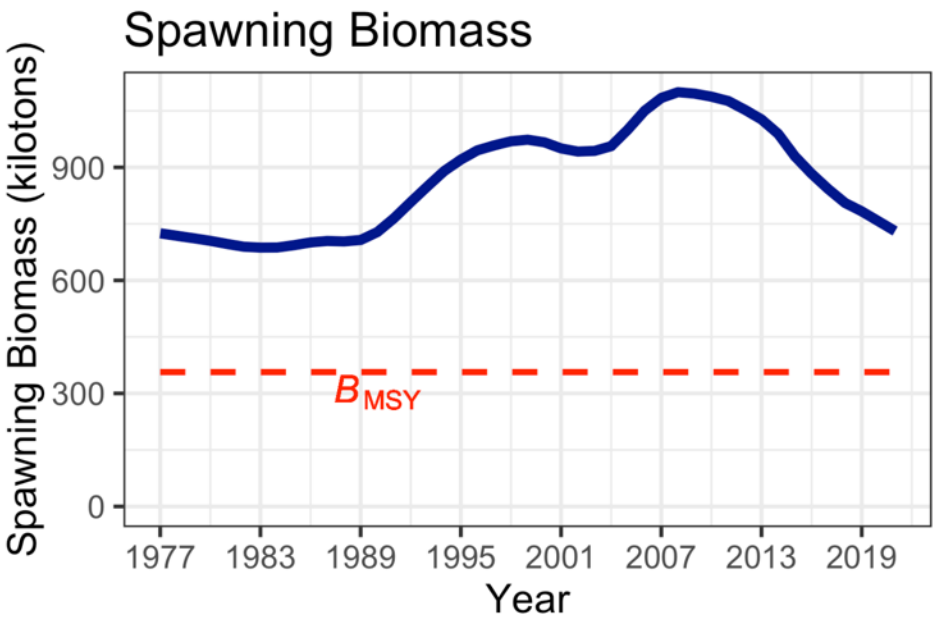
9. Arrowtooth flounder

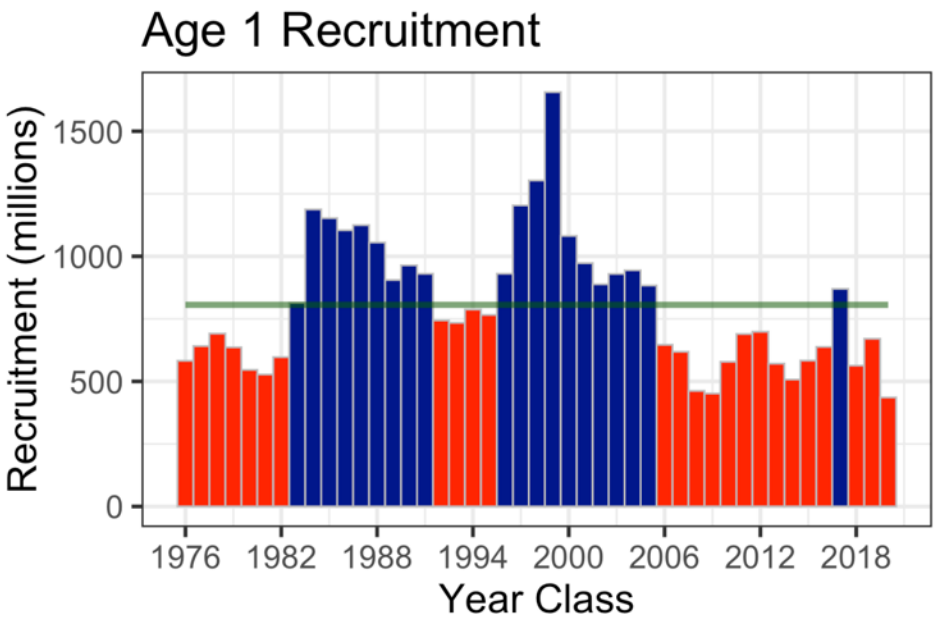
- Plan Team discussions
  - Agreed with recommended ABC/OFL
- Noted research topics:
  - Investigate lack of fit in female survey age and fishery length compositions, (differential female natural mortality)
  - Consider GOA CEATTLE model (G. Adams), include efforts to streamline data pulls and processing between single and multi-species models
  - Re-examine growth assumptions, update age-length conversion matrices, consider alternative surveys and VAST estimates

9. Arrowtooth flounder









Flatfish ABC's

Species	2021 ABC	2022 ABC	Change
Shallow water flatfish	56,164	50,610	down 5,554 (10%)
Rex sole	15,416	19,141	up 3,725 (24%)
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Flathead sole	39,377	40,175	up 798 (2%)
Arrowtooth flounder	126,970	119,779	down 7,191 (6%)
Subtotal	243,853	235,613	down 8,240 (3%)
Subtotal (without ATF)	116,883	115,834	down 1,049 (1%)

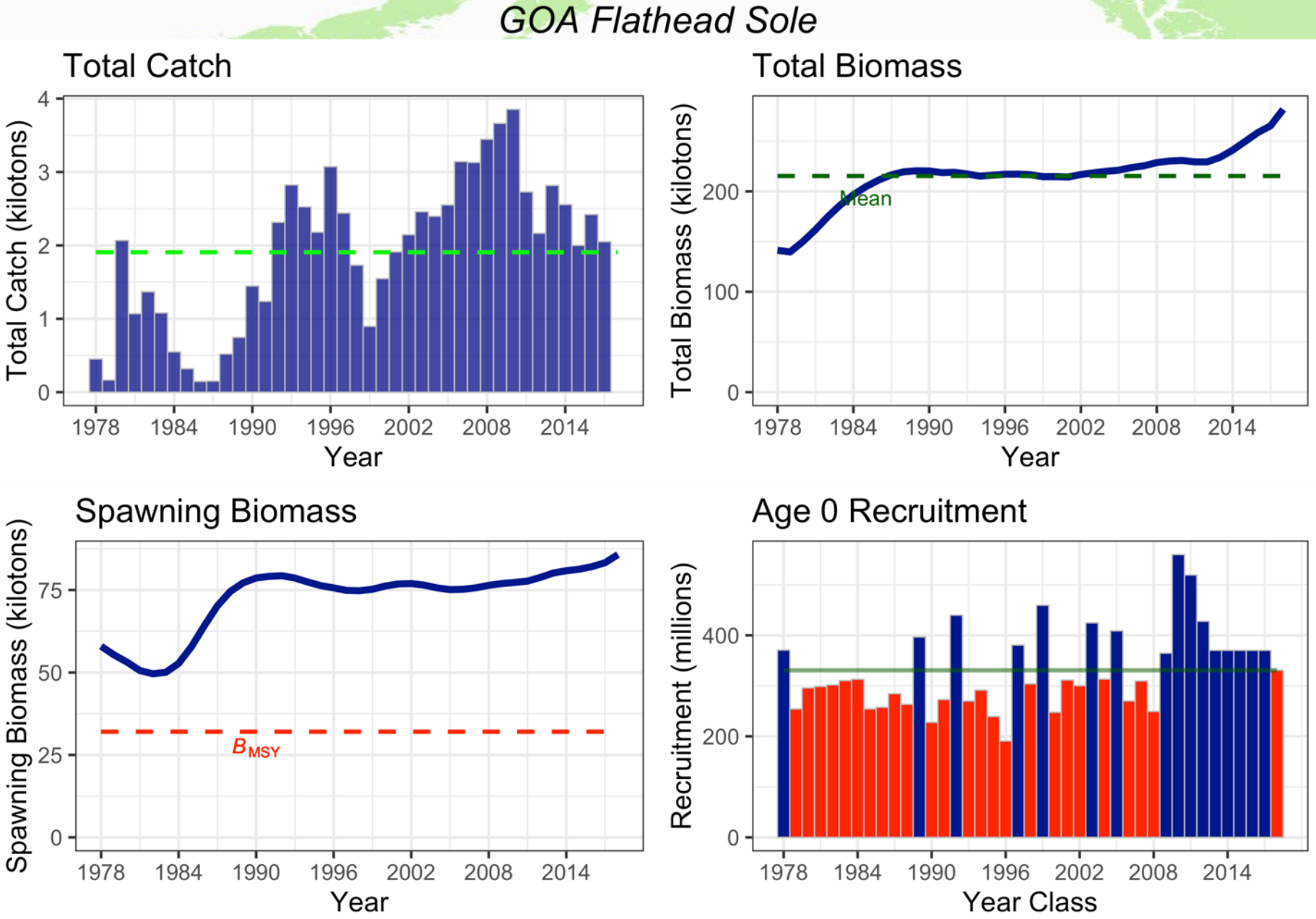
8. Flathead sole

- Partial assessment
- Catches about 1% of survey biomass estimates
- Apportionments updated

Plan Team Discussion

- Apportionment issue: updated during an “on year” and whether appropriate given projections based on less current data
  - Team accepted this year but indicated that generally unnecessary for stocks on an 4-year cycle

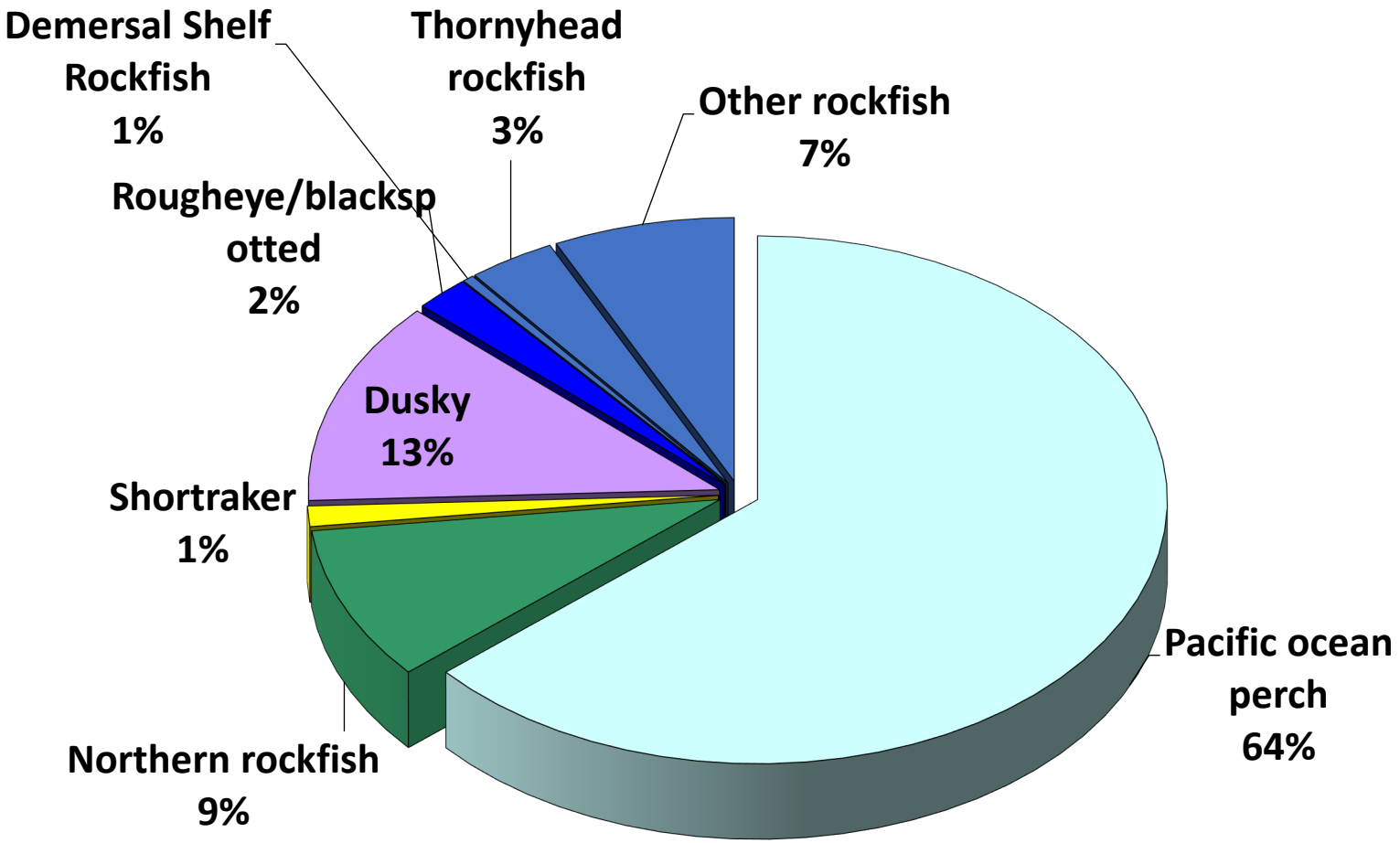
8. Flathead sole



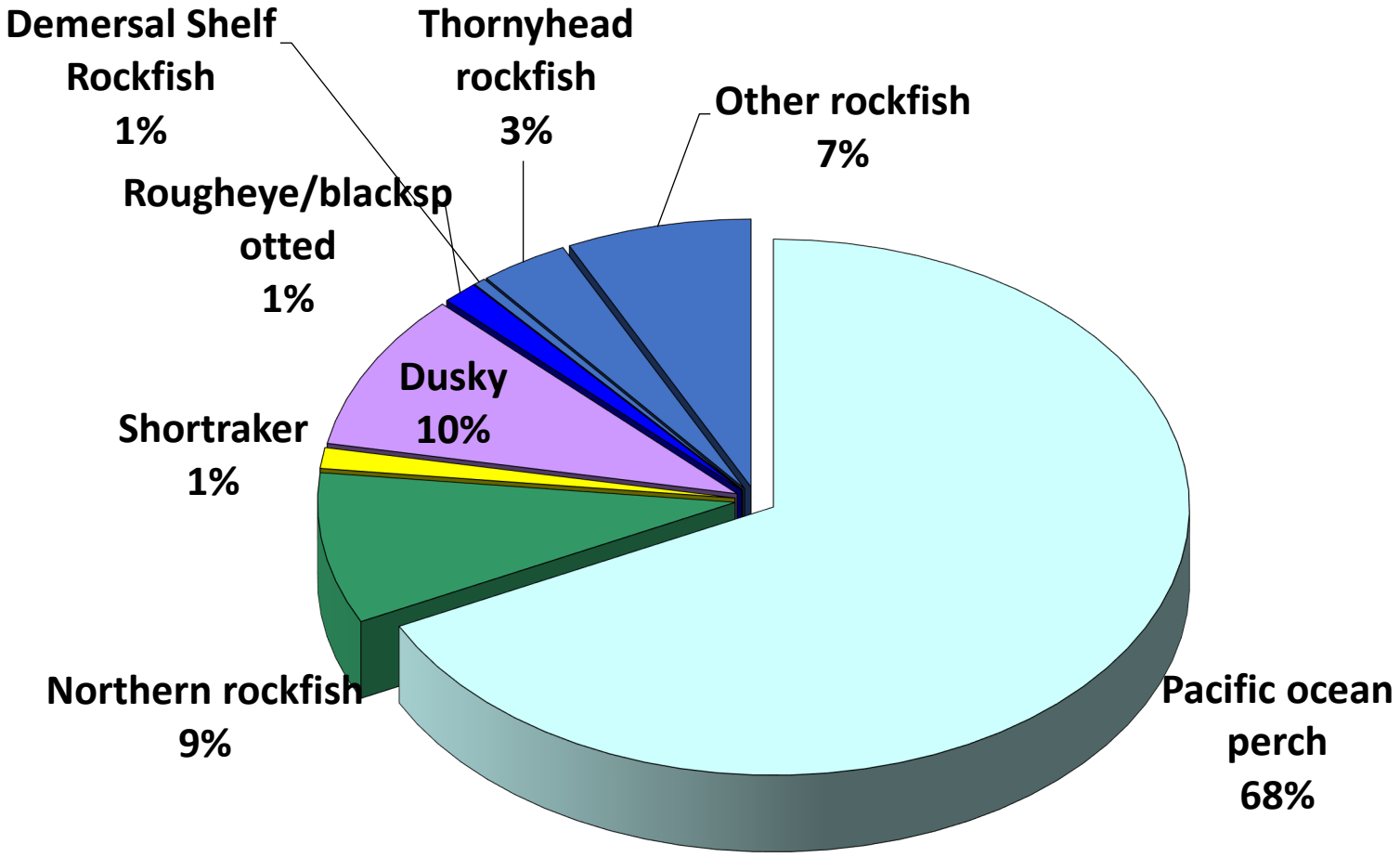
GOA Rockfish

Species	2021 catch	ABC 2021	ABC 2022	Change
Pollock	98,769	115,870	144,444	up 28,574 (25%)
Pacific Cod	12,272	23,627	24,043	up 416 (2%)
Sablefish	14,115	21,475	22,794	up 1,319 (6%)
Flatfish	2,717	116,883	115,834	down 1,049 (1%)
Arrowtooth flounder	9,517	126,970	119,779	down 7,191 (6%)
Rockfish	35,882	55,107	56,554	up 1,447 (3%)
Atka mackerel	940	4,700	4,700	same (0%)
Skates	2,609	6,670	6,563	down 107 (2%)
Sharks	1,639	3,755	3,755	same (0%)
Octopus	51	980	980	same (0%)
Total	178,511	476,037	499,446	up 23,409 (5%)

Rockfish 2021 ABC's 55,107 t total



Rockfish 2022 ABC's
56,554 t total



Rockfish ABC Summary

Species	ABC 2021	ABC 2022	Change
POP	36,177	38,268	up 2,091 (6%)
northern rockfish	5,358	5,146	down 212 (4%)
Shortraker Rockfish	708	705	down 3 (0%)
Dusky	5,389	5,372	down 17 (0%)
Rougheye and Blackspotted Rockfish	1,212	788	down 424 (35%)
Demersal shelf	257	268	up 11 (4%)
Thornyhead	1,953	1,953	same (0%)
Other rock	4,053	4,054	up 1 (0%)
Sub Total	55,107	56,554	up 1,447 (3%)

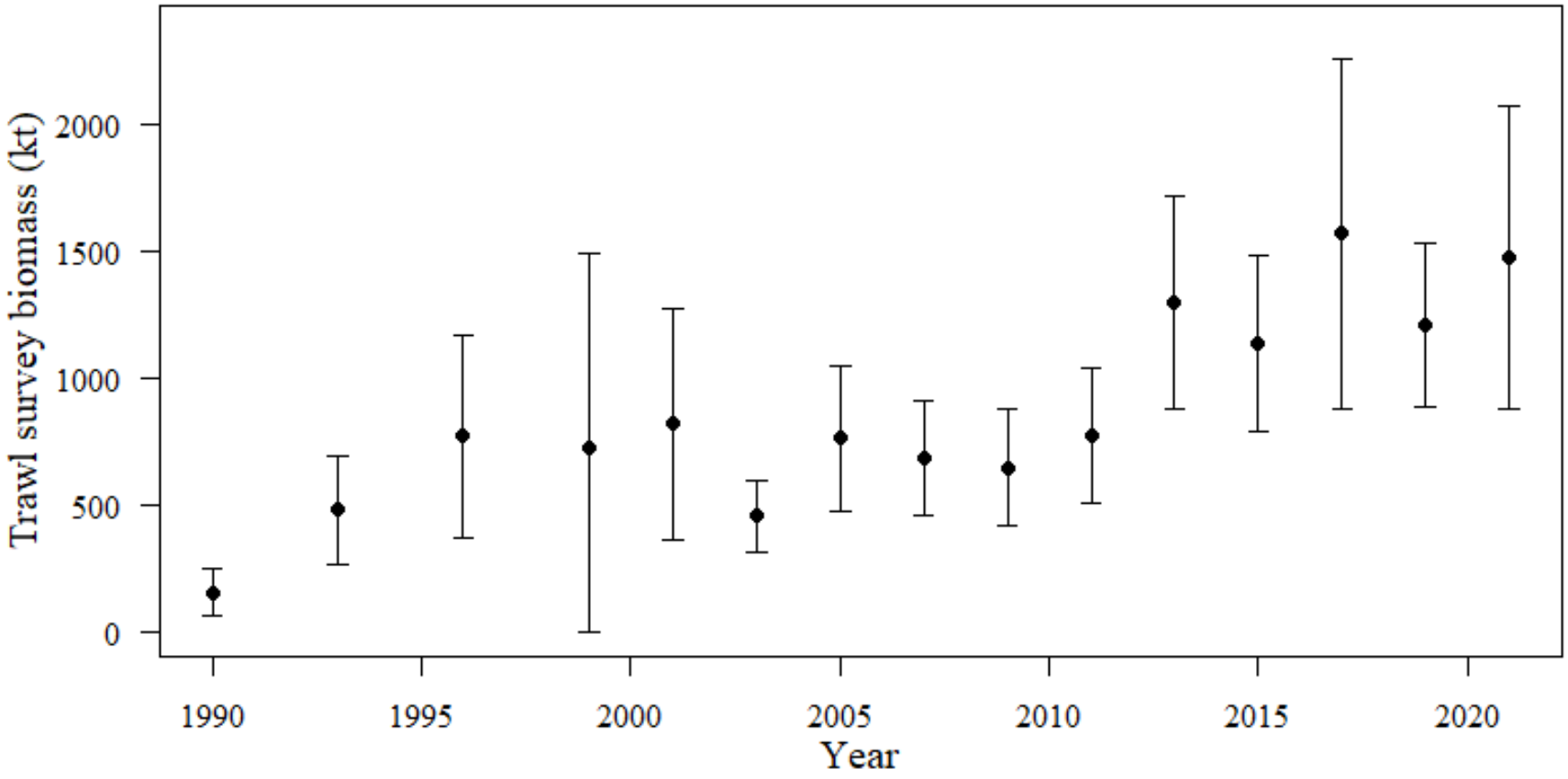
9. Pacific ocean perch

- Full assessment,
- Application of model developed and presented in 2020, and in Sept 2021

- No change in models (uses 2020 accepted model)

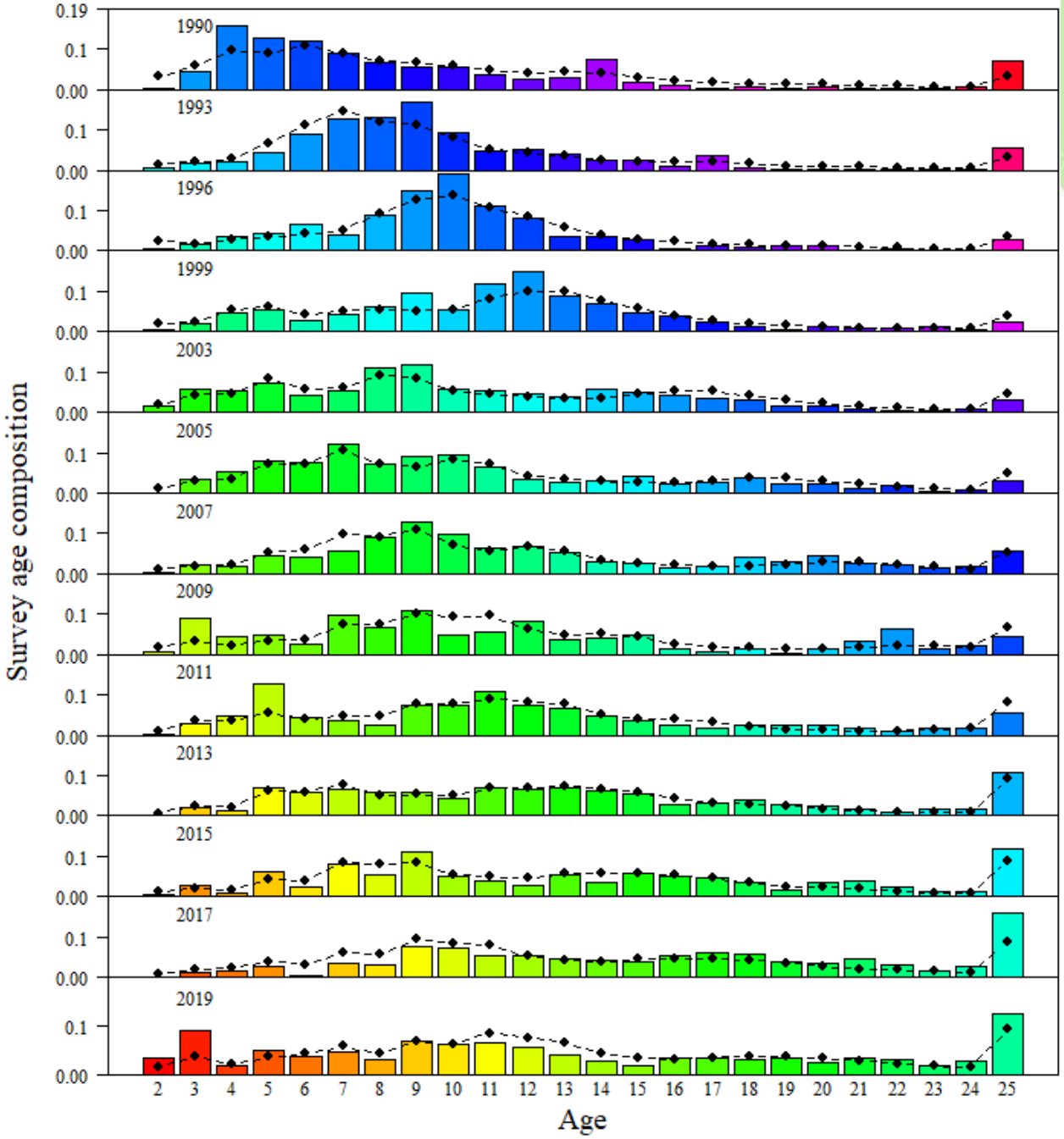
GOA POP
Trawl survey biomass

2021 2nd largest in time series (CV=21%)



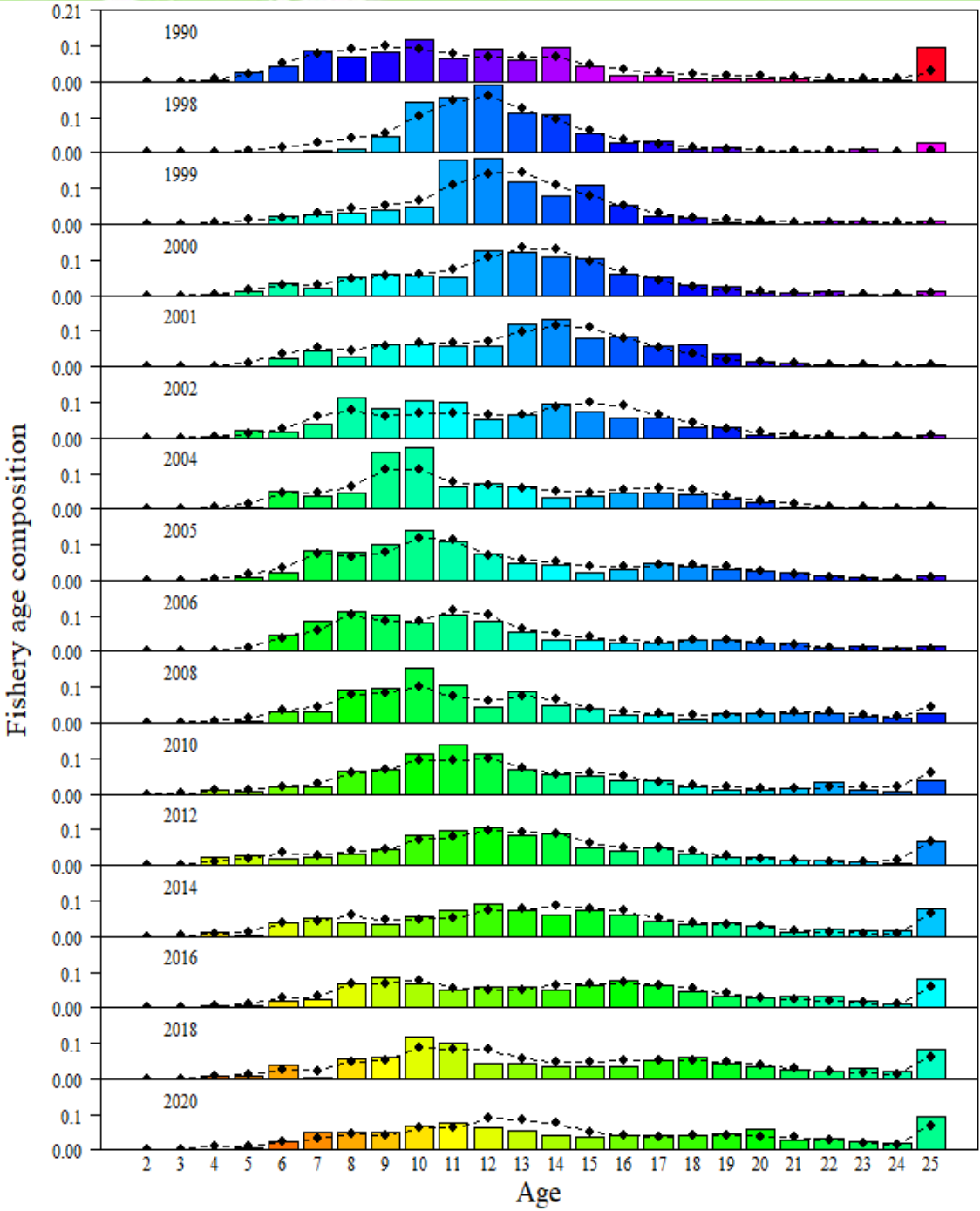
POP Survey age comp fit

- Fit of 2016 year class poor



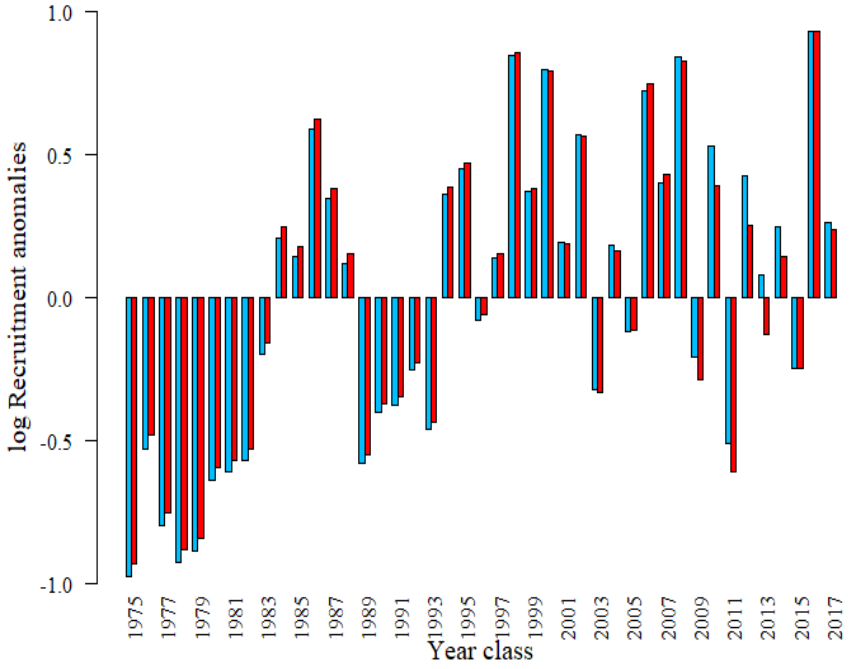
Fishery age comp fit

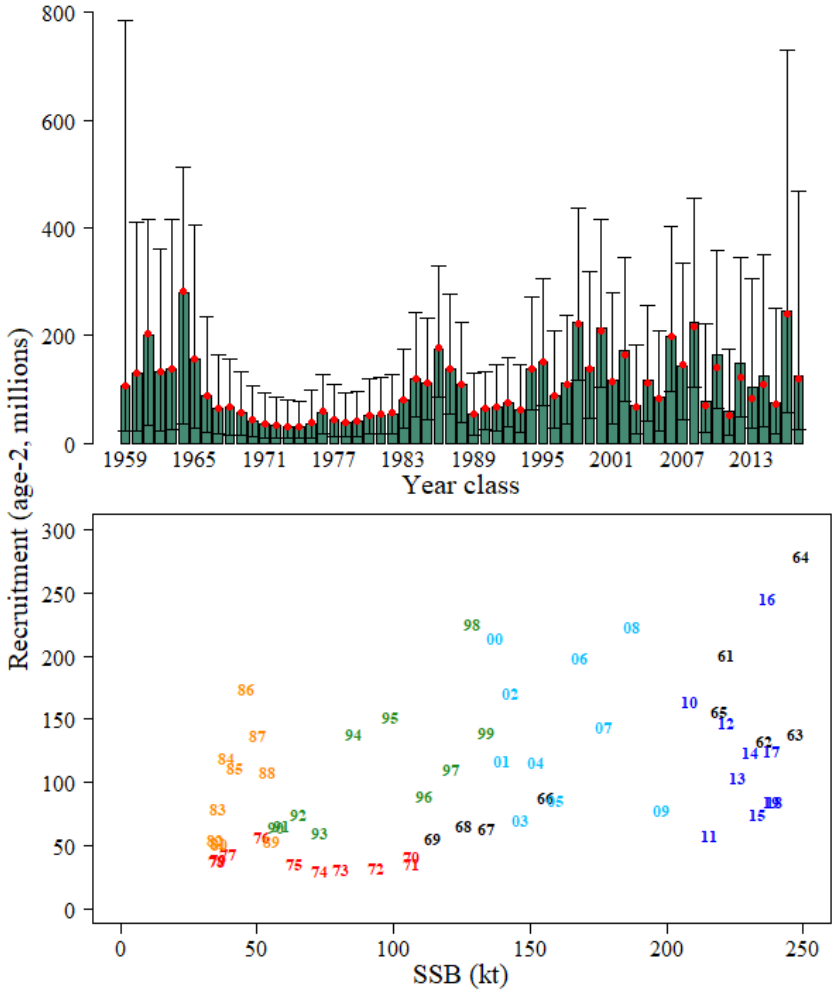
In 2020, age-10s from 2018 (now 12) absent

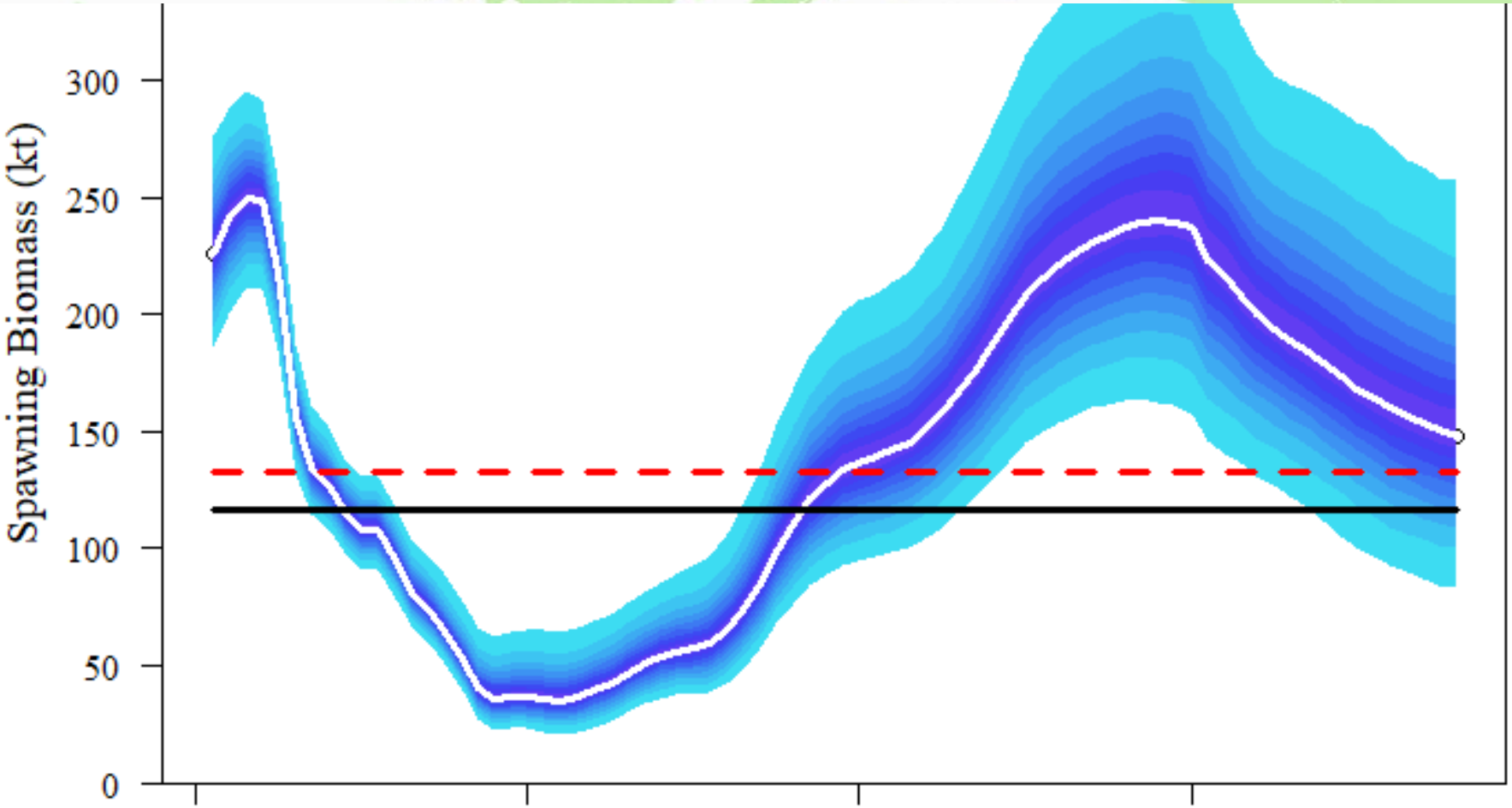


POP Recruitment

Similar to 2020 assessment estimates



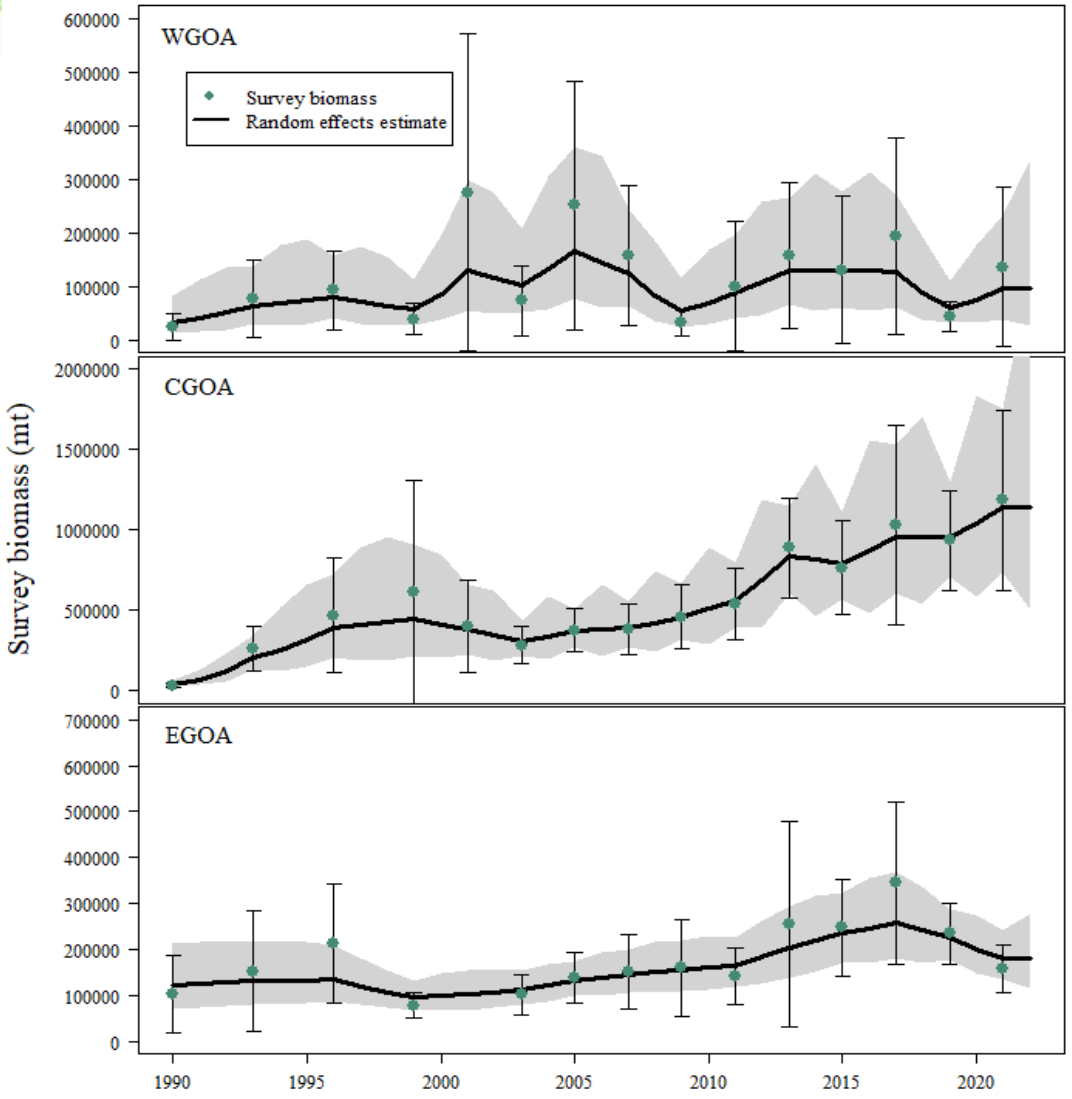


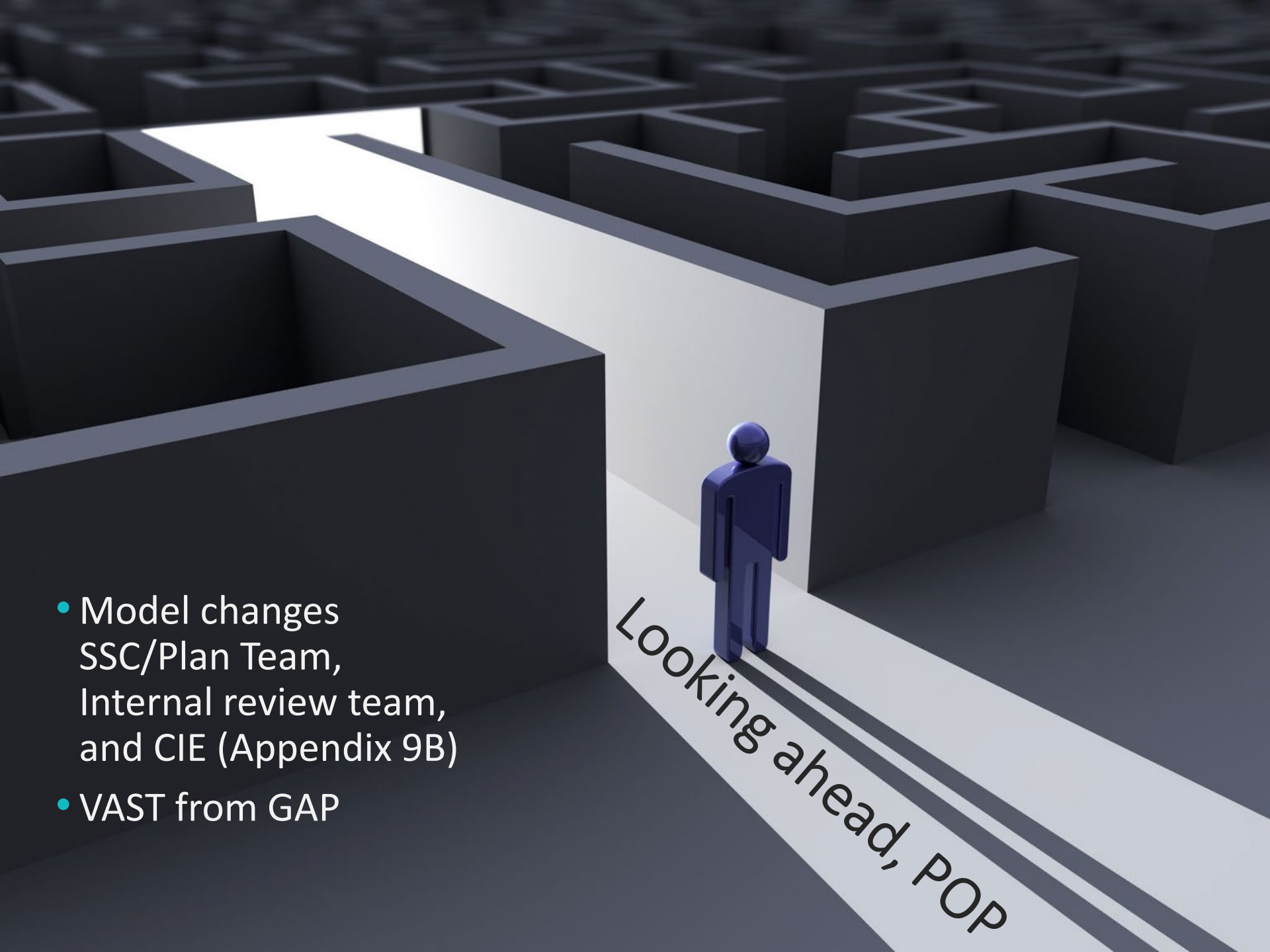


POP Projections

Decrease expected

POP Apportionment



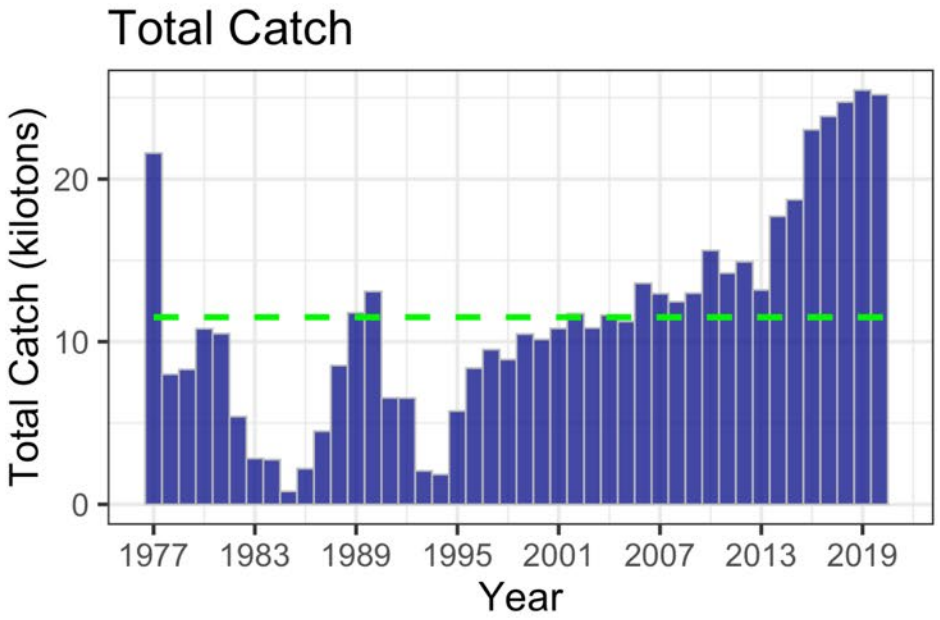


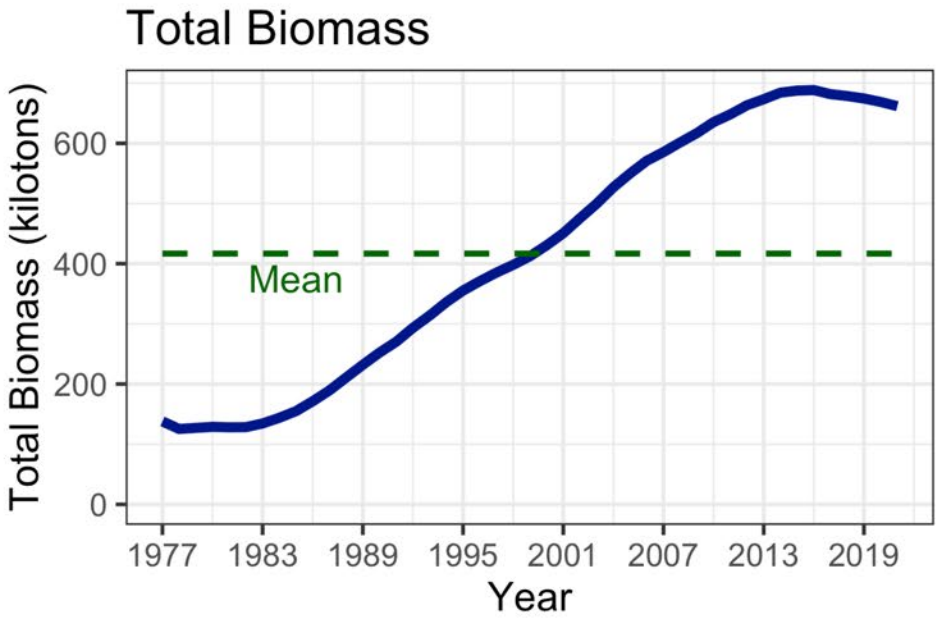
- Model changes SSC/Plan Team, Internal review team, and CIE (Appendix 9B)
- VAST from GAP

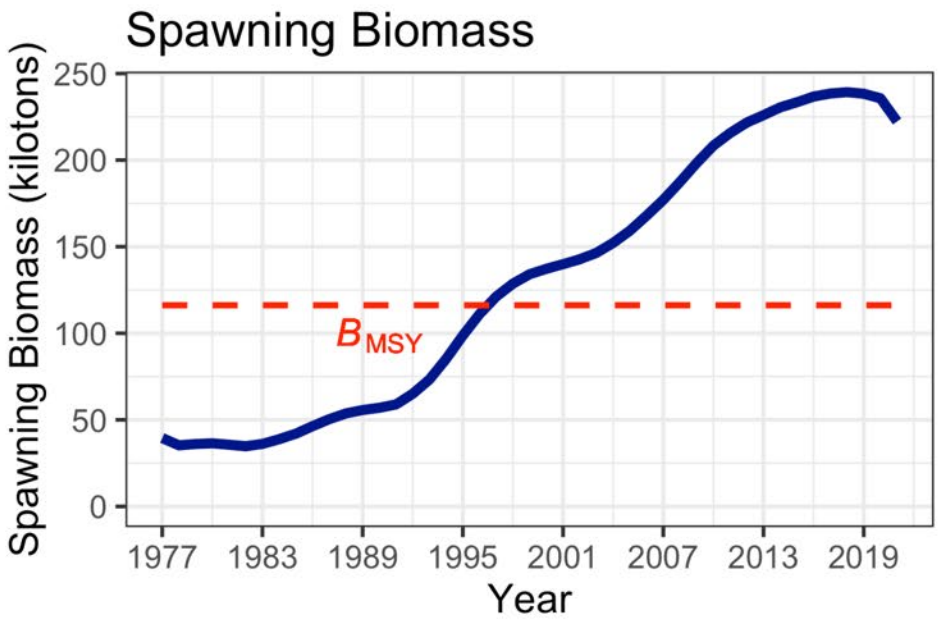
9. Pacific ocean perch

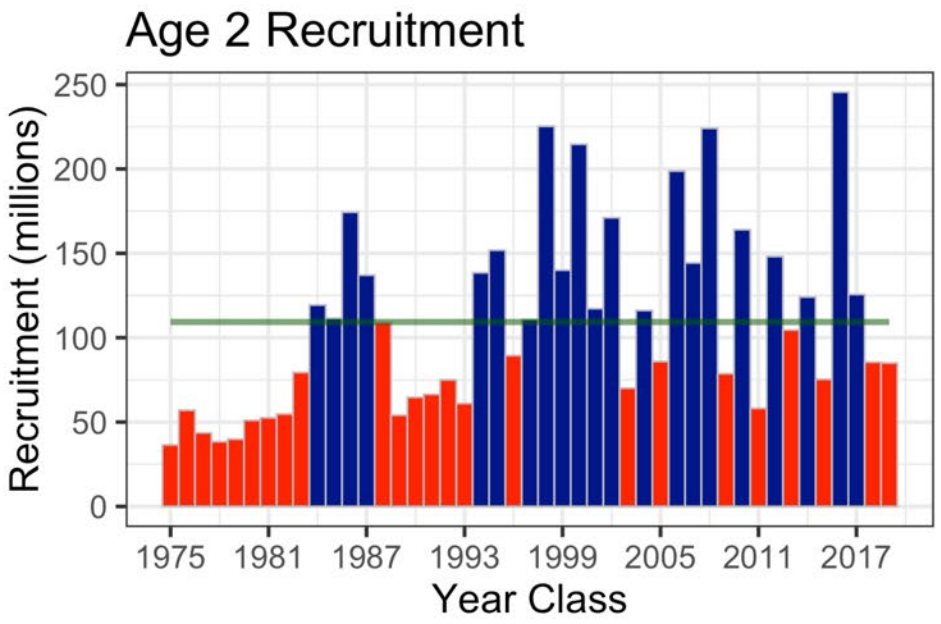
- Plan Team discussion
  - The Model presented was well developed stemming from multiple Plan Team meetings, CIE reviews, and SSC
  - Some risk-table scores of 2, but Team agreed with Author's recommendation (maxABC)
  - As noted by the author, fieldwork on untrawlable area and VAST research on survey index important
  - Further work from CIE well categorized and planned (App. 9b)

9. GOA Pacific ocean perch









Rockfish ABC Summary

Species	ABC 2021	ABC 2022	Change
POP	36,177	38,268	up 2,091 (6%)
northern rockfish	5,358	5,146	down 212 (4%)
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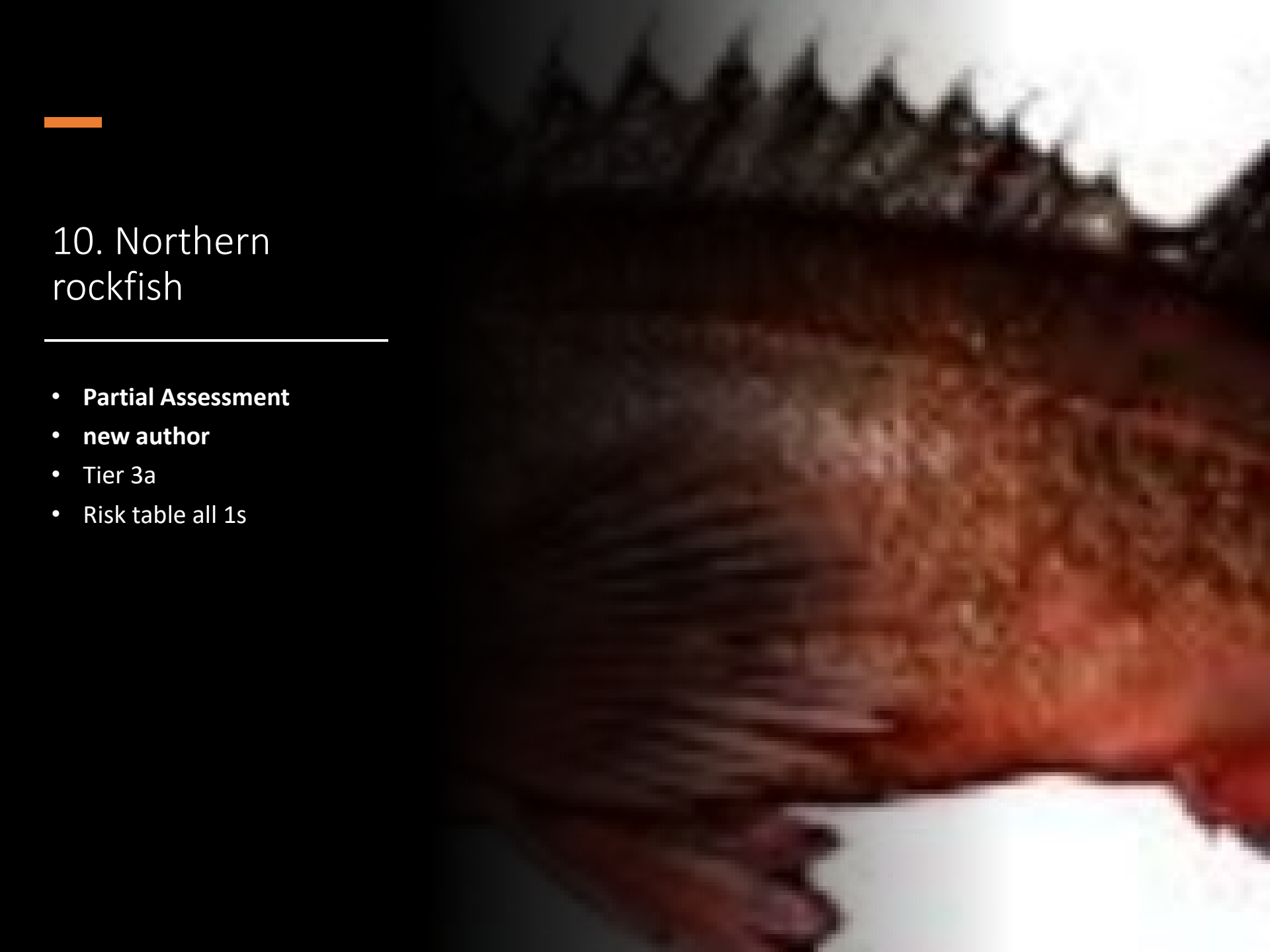
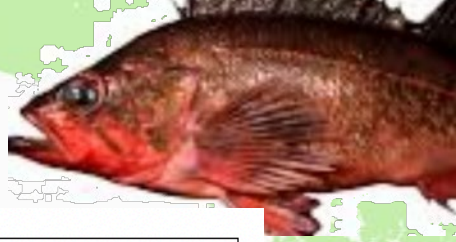
Thornyhead	1,953	1,953	same (0%)
Other rock	4,053	4,054	up 1 (0%)
Sub Total	55,107	56,554	up 1,447 (3%)

10. Northern rockfish

- **Partial Assessment**
- **new author**
- Tier 3a
- Risk table all 1s



10. Northern rockfish



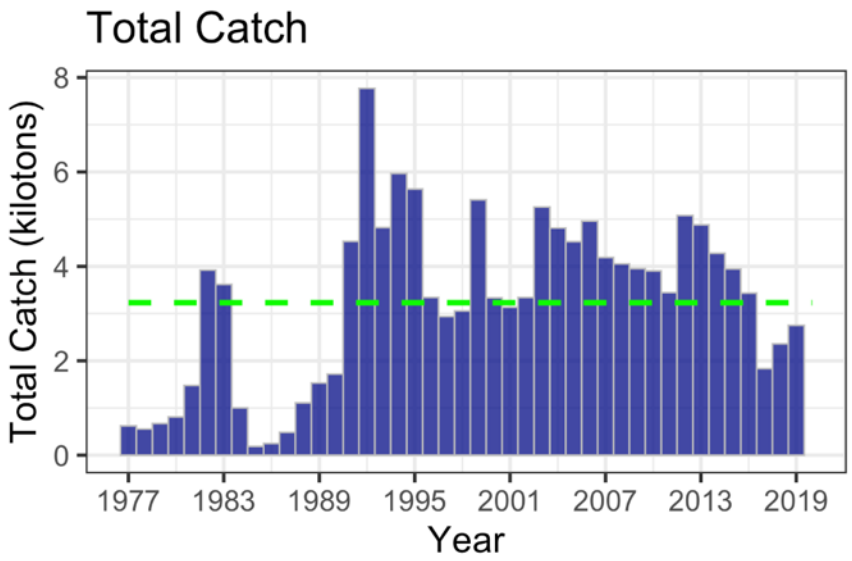
Quantity/Status	As estimated or specified *last* year for: 2021	2022	As estimated or specified *this* year for: 2022*	2023*
M (natural mortality)	0.059	0.059	0.059	0.059
Tier	3a	3a	3a	3a
Projected total (age 2+) biomass (t)	102,715	99,957	100,371	96,045
Projected female spawning biomass (t)	42,791	40,462	40,474	37,408
$B_{100\%}$	84,832	84,832	84,832	84,832
$B_{40\%}$	33,933	33,933	33,933	33,933
$B_{35\%}$	29,691	29,691	29,691	29,691
F_{OFL}	0.073	0.073	0.073	0.073
$maxF_{ABC}$	0.061	0.061	0.061	0.061
F_{ABC}	0.061	0.061	0.061	0.061
OFL	6,396	6,088	**6,143**	5,874
maxABC (t)	5,358	5,100	**5,147**	4,921
ABC (t)	5,358	5,100	**5,147**	4,921
Status	As determined *last* year for: 2019	2020	As determined *this* year for: 2020	2021
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfishing	n/a	No	n/a	No

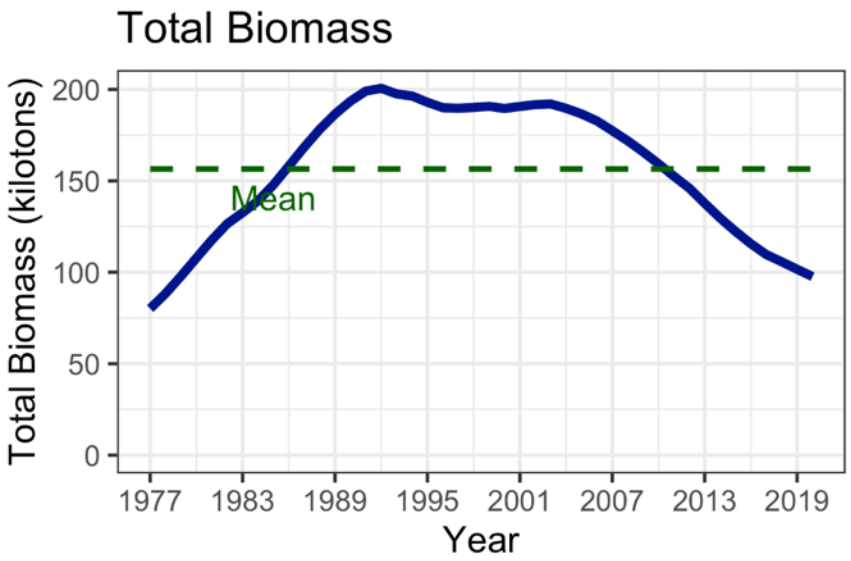
10. Northern rockfish

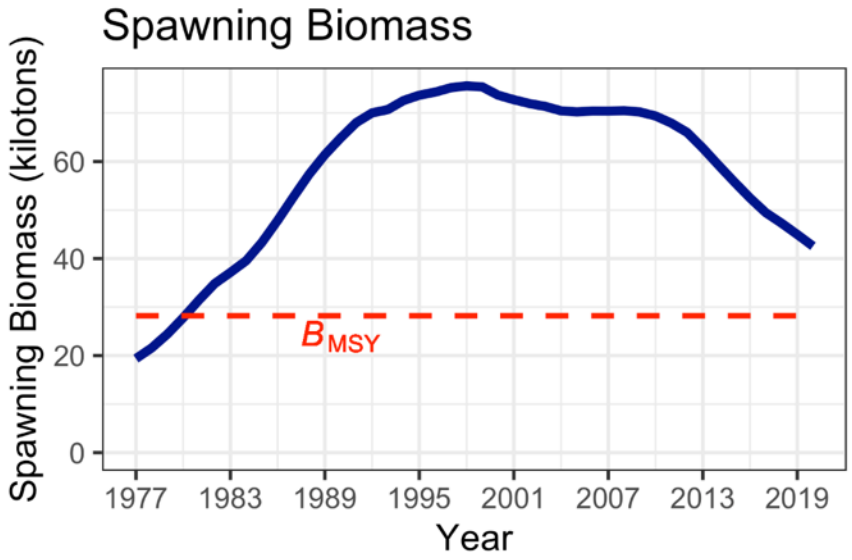
Team noted

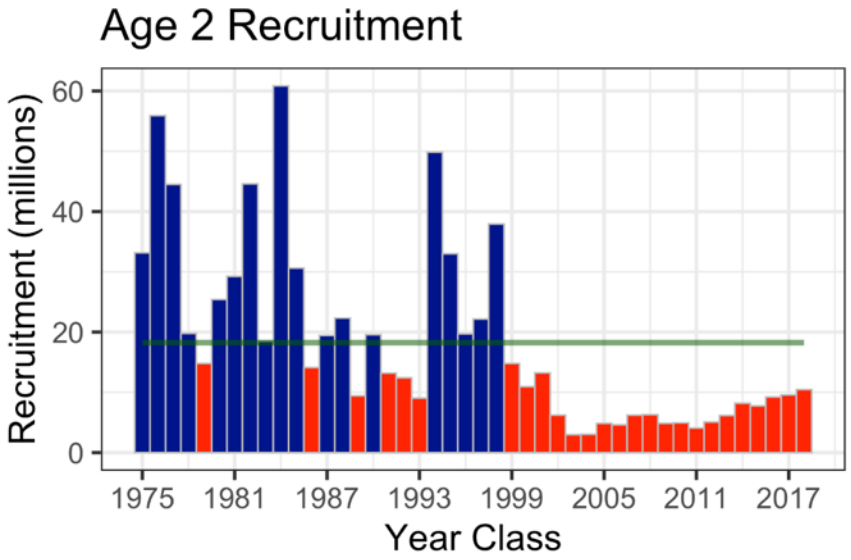
- Continue to evaluate/consider GAP VAST estimates

10. Northern rockfish









Rockfish ABC Summary

Species	ABC 2021	ABC 2022	Change
POP	36,177	38,268	up 2,091 (6%)
northern rockfish	5,358	5,146	down 212 (4%)
Shortraker Rockfish	708	705	down 3 (0%)
Dusky	5,389	5,372	down 17 (0%)
Rougheye and Blackspotted Rockfish	1,212	788	down 424 (35%)
Demersal shelf	257	268	up 11 (4%)
Thornyhead	1,953	1,953	same (0%)
Other rock	4,053	4,054	up 1 (0%)
Sub Total	55,107	56,554	up 1,447 (3%)

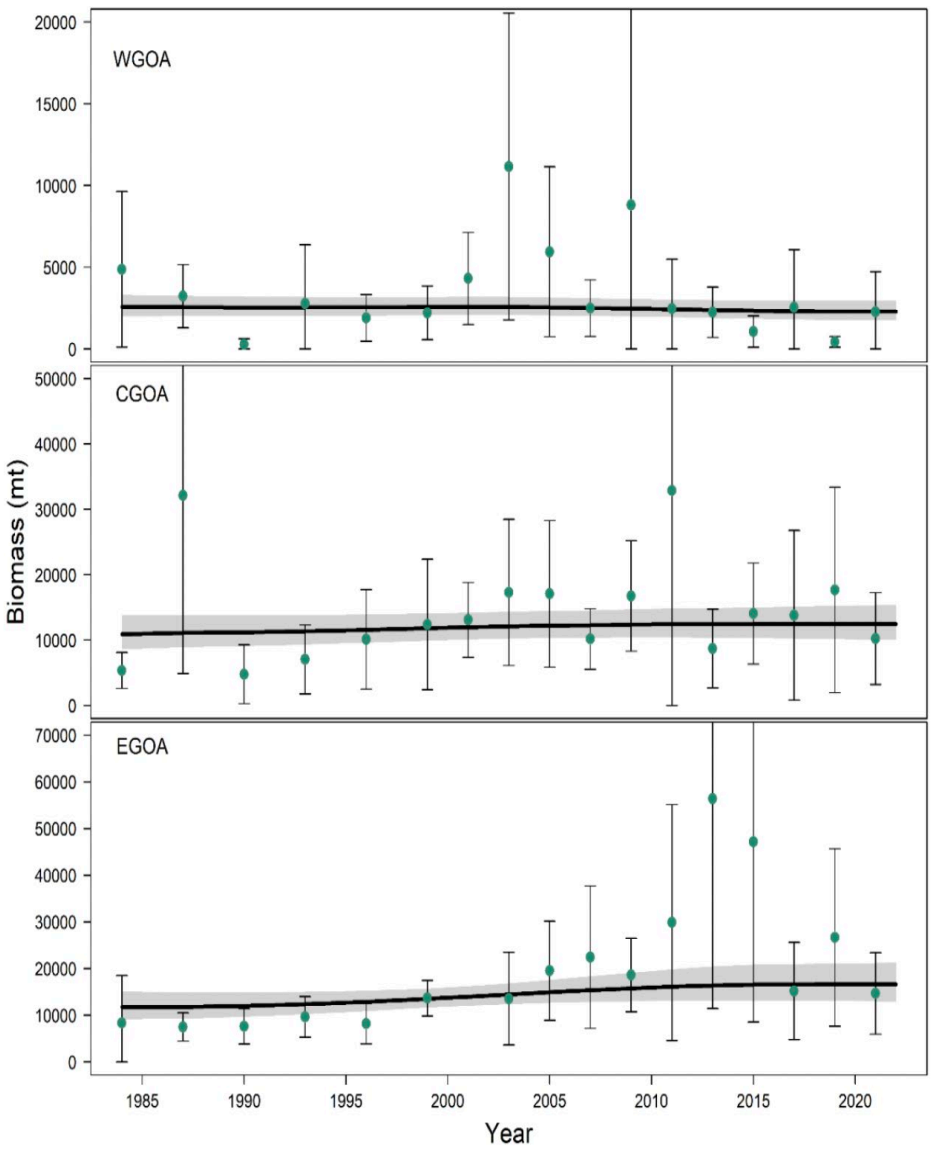
11. GOA Shortraker rockfish

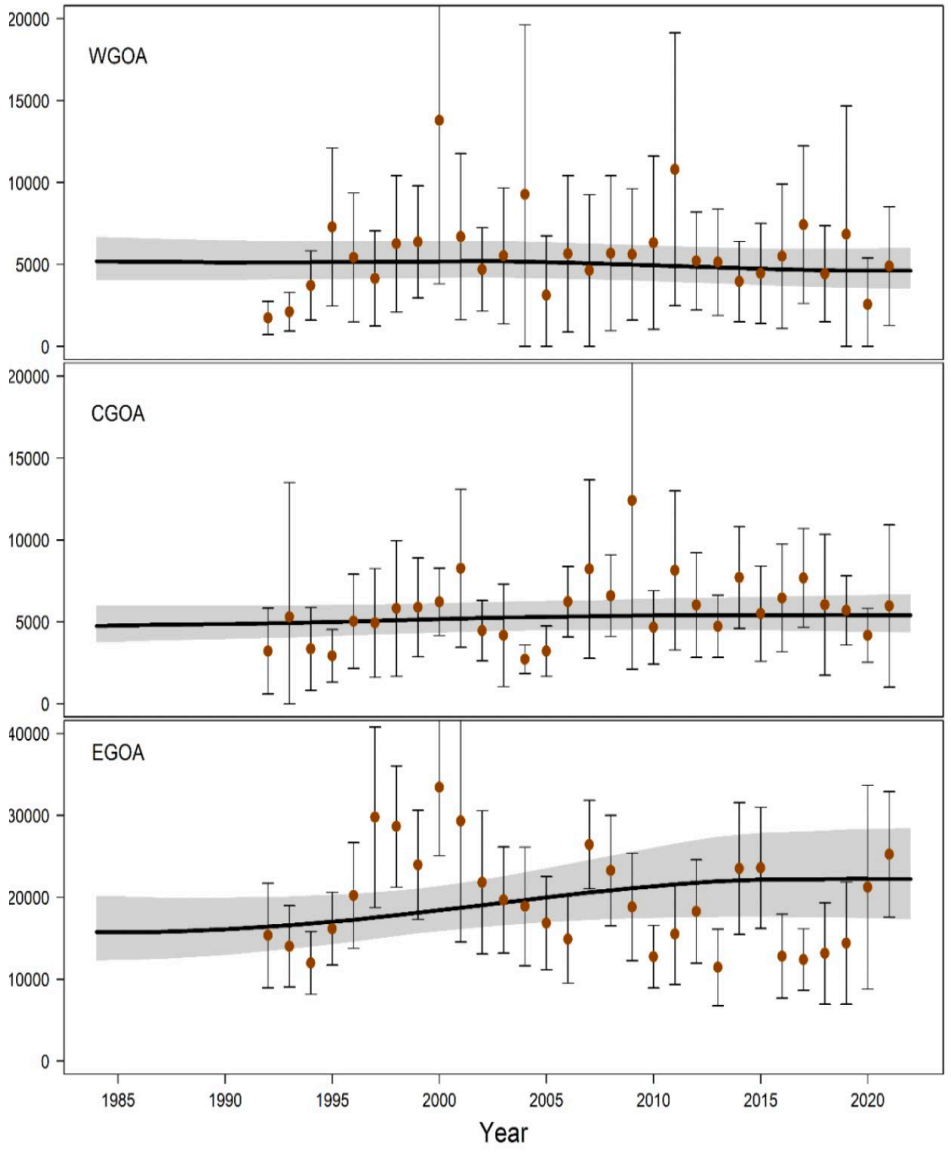
- Tier 5 full assessment

Quantity	As estimated or *specified last* year for: 2021	2022	As estimated or *recommended this* year for: 2022	2023
M (natural mortality rate)	0.03	0.03	0.03	0.03
Tier	5	5	5	5
Biomass (t)	31,465	31,465	31,331	31,331
F_{OFL}	$F=M=0.03$	$F=M=0.03$	$F=M=0.03$	$F=M=0.03$
$maxF_{ABC}$	$0.75M=0.0225$	$0.75M=0.0225$	$0.75M=0.0225$	$0.75M=0.0225$
F_{ABC}	0.0225	0.0225	0.0225	0.0225
OFL (t)	944	944	**940**	940
maxABC (t)	708	708	705	705
ABC (t)	708	708	**705**	705
Status	As determined *last* year for: 2019	2020	As determined *this* year for: 2020	2021
Overfishing	No	n/a	No	n/a

11. GOA Shortraker rockfish

- Tier 5 full assessment





11. GOA Shortraker rockfish

Plan Team discussion

- **The Team recommends that the authors look at alternative natural mortality estimation approaches**

Rockfish ABC Summary

Species	ABC 2021	ABC 2022	Change
POP	36,177	38,268	up 2,091 (6%)
northern rockfish	5,358	5,146	down 212 (4%)
Shortraker Rockfish	708	705	down 3 (0%)
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Demersal shelf	257	268	up 11 (4%)
Thornyhead	1,953	1,953	same (0%)
Other rock	4,053	4,054	up 1 (0%)
Sub Total	55,107	56,554	up 1,447 (3%)

12. GOA dusky rockfish

Quantity/Status	As estimated or specified *last* year for: 2021	2022	As estimated or specified *this* year for: 2022*	2023*
M (natural mortality)	0.07	0.07	0.07	0.07
Tier	3a	3a	3a	3a
Projected total (age 4+) biomass (t)	97,702	98,825	95,682	92,310
Projected female spawning biomass (t)	38,362	37,530	38,371	36,853
$B_{100\%}$	60,855	60,855	60,855	60,855
$B_{40\%}$	24,342	24,342	24,342	24,342
$B_{35\%}$	21,299	21,299	21,299	21,299
F_{OFL}	0.114	0.114	0.114	0.114
$maxF_{ABC}$	0.093	0.093	0.093	0.093
F_{ABC}	0.093	0.093	0.093	0.093
OFL	8,655	8,423	**8,614**	8,146
maxABC (t)	5,389	5,295	**7,069**	6,686
ABC (t)	5,389	5,295	**5,372**	5,181
Status	As determined *last* year for: 2019	2020	As determined *this* year for: 2020	2021
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfishing	n/a	No	n/a	No

*Projections are based on an estimated catch of 2,986 t for 2021, and estimates of 4,725 t and 4,337 t used in place of maximum permissible ABC for 2022 and 2023.

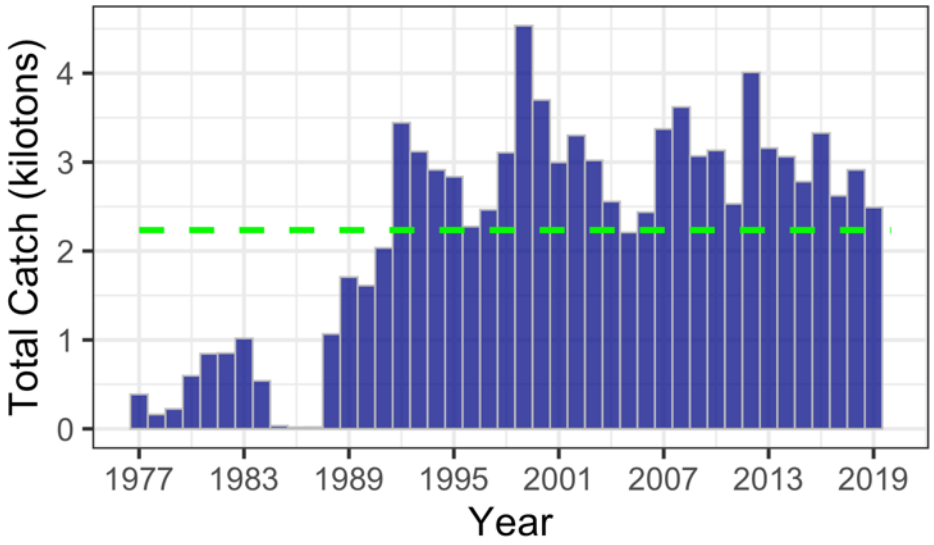
12. GOA dusky rockfish

Plan Team discussions

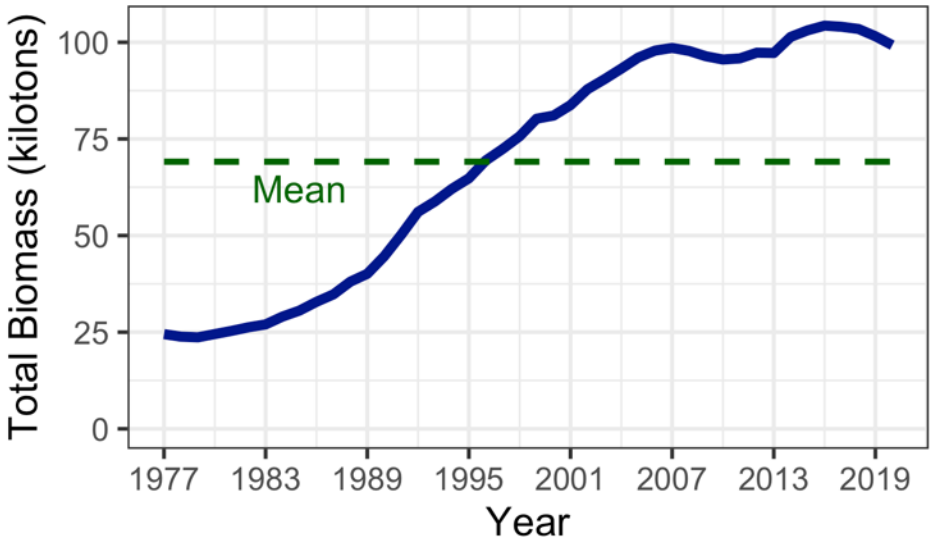
- See comments for VAST / GAP collaborations
- SSC's stair-step approach recommended

GOA Dusky Rockfish

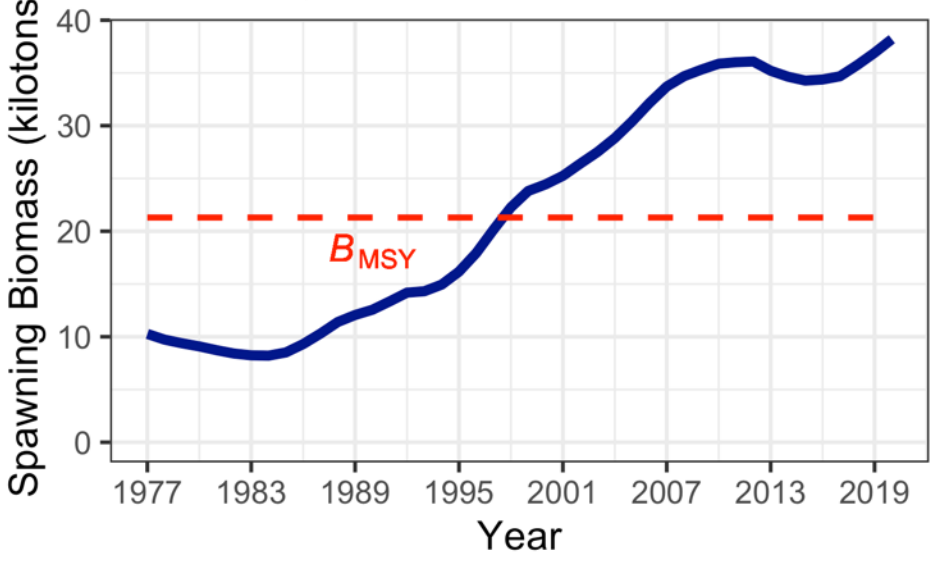
Total Catch



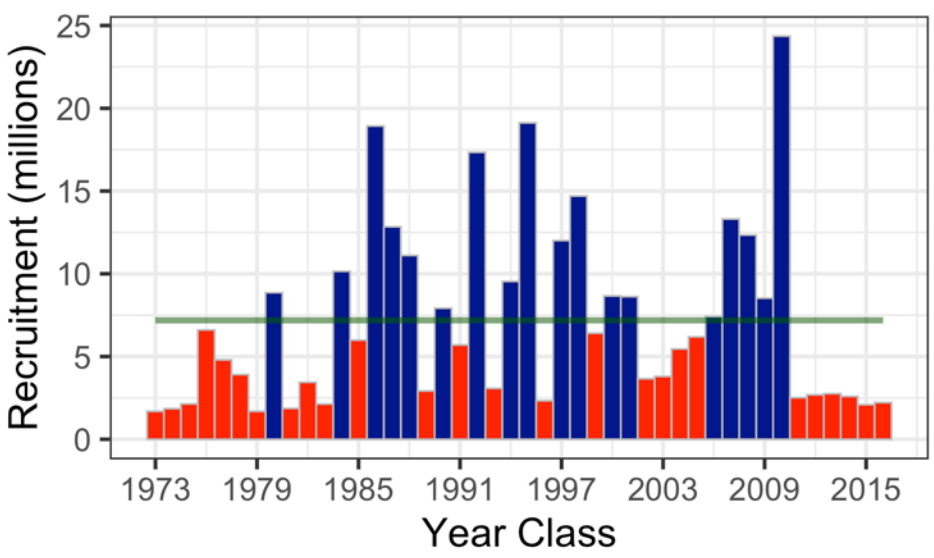
Total Biomass



Spawning Biomass



Age 4 Recruitment



Rockfish ABC Summary

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Thornyhead	1,953	1,953	same (0%)
Other rock	4,053	4,054	up 1 (0%)
Sub Total	55,107	56,554	up 1,447 (3%)

13. GOA Blackspotted/Rougheye Rockfish

Full assessment

- Tier 3 species – 2021 full assessment
  - No model changes since 2015
  - Uses two surveys (NMFS bottom trawl & NMFS longline) for model and apportionment
  - New data: new/updated catch, new trawl/longline survey, new fishery/longline survey sizes

jane.sullivan@noaa.gov

13. GOA Blackspotted/Rougheye Rockfish

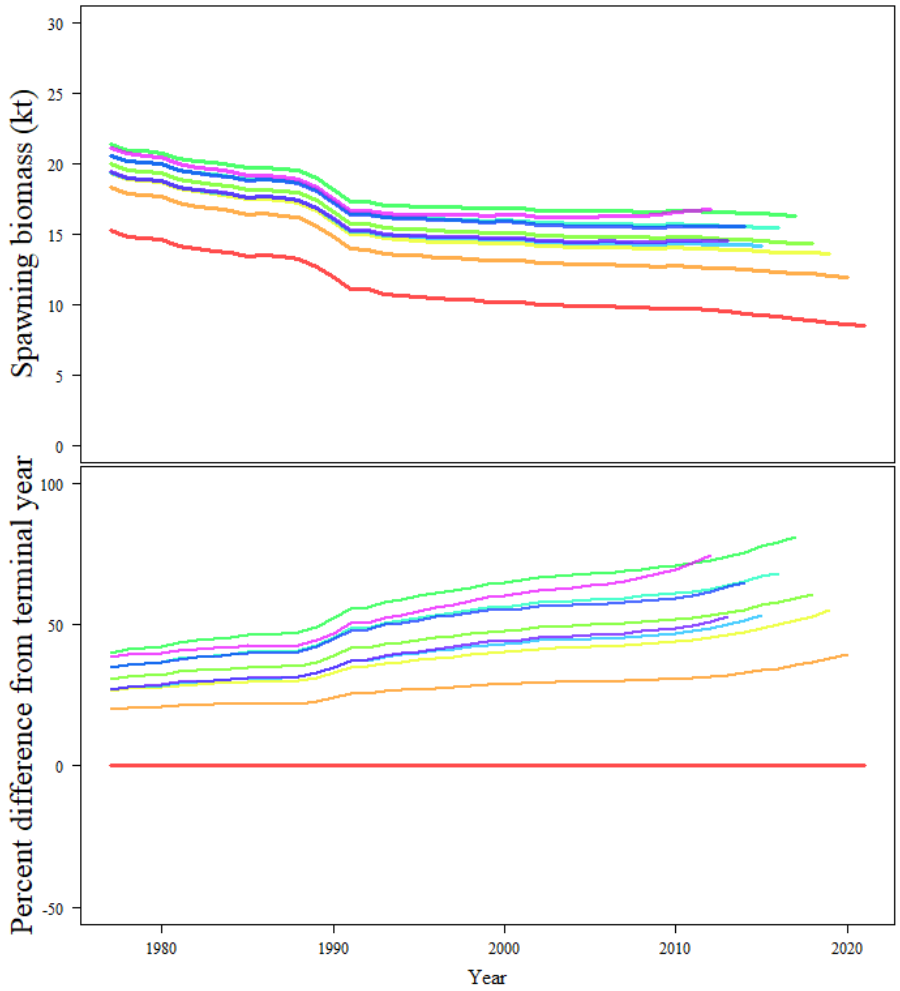
Summary

Declines in both trawl and longline survey indices

Uncertainty in global scaling parameters

Mohn's rho = 0.61 (Risk level 2 for assessment)

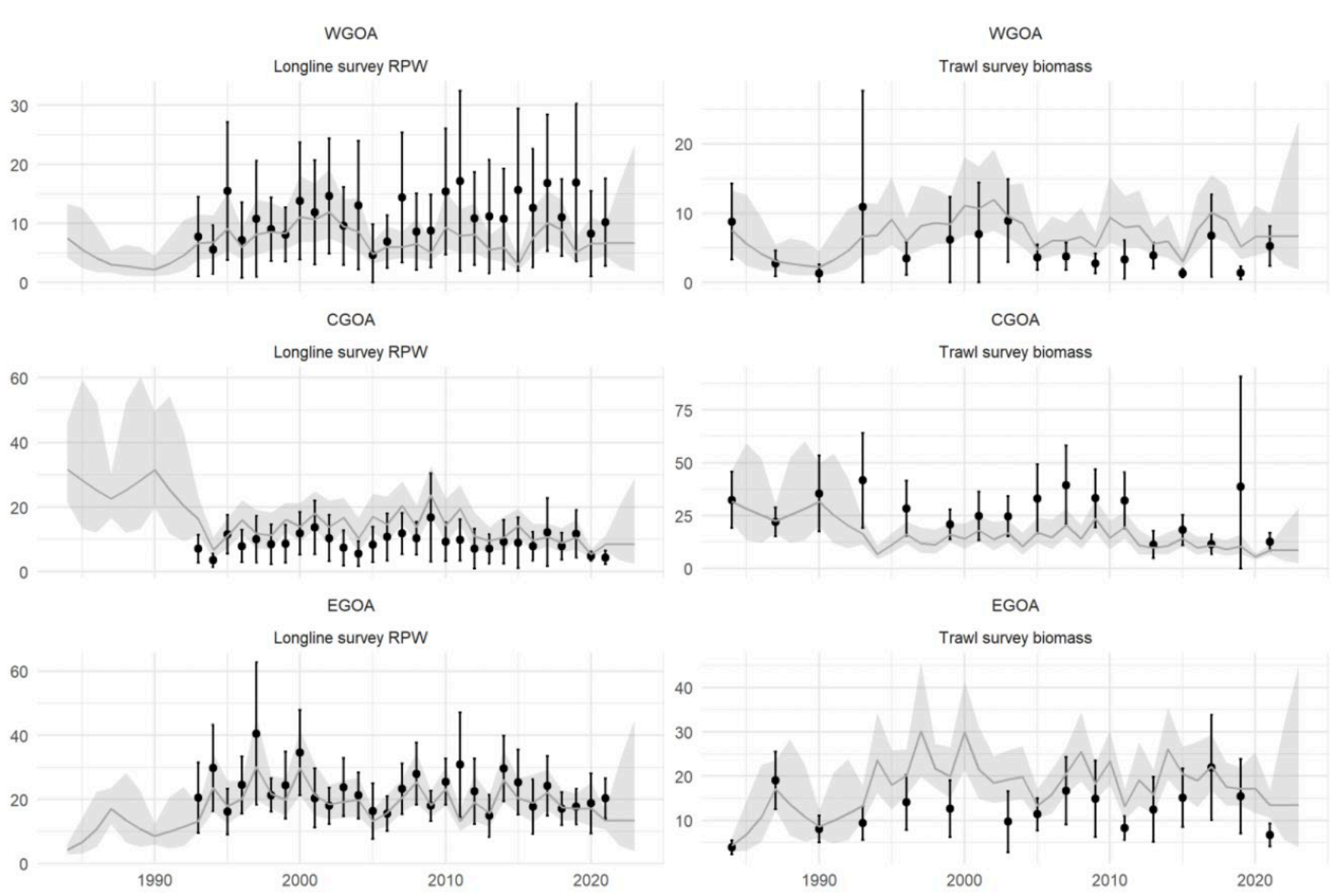
Recommended 2022 max ABC a 35% decrease from 2021



13. GOA Blackspotted/Rougheye Rockfish

Quantity/Status	As estimated or specified *last* year for: 2021	2022	As estimated or recommended *this* year for: 2022	2023
M (natural mortality)	0.036	0.036	0.034	0.034
Tier	3a	3a	3a	3a
Projected total (age 3+) biomass (t)	40,432	40,454	26,060	25,997
Projected female spawning biomass (t)	12,540	12,563	8,648	8,627
$B_{100\%}$	20,658	20,658	14,776	14,776
$B_{40\%}$	8,263	8,263	5,911	5,911
$B_{35\%}$	7,230	7,230	5,172	5,172
F_{OFL}	0.048	0.048	0.046	0.046
$maxF_{ABC}$	0.040	0.040	0.038	0.038
F_{ABC}	0.040	0.040	0.038	0.038
OFL (t)	1,456	1,467	**947**	937
max ABC (t)	1,212	1,221	**788**	781
ABC (t)	1,212	1,221	**788**	781

13. GOA Blackspotted/Rougheye Rockfish



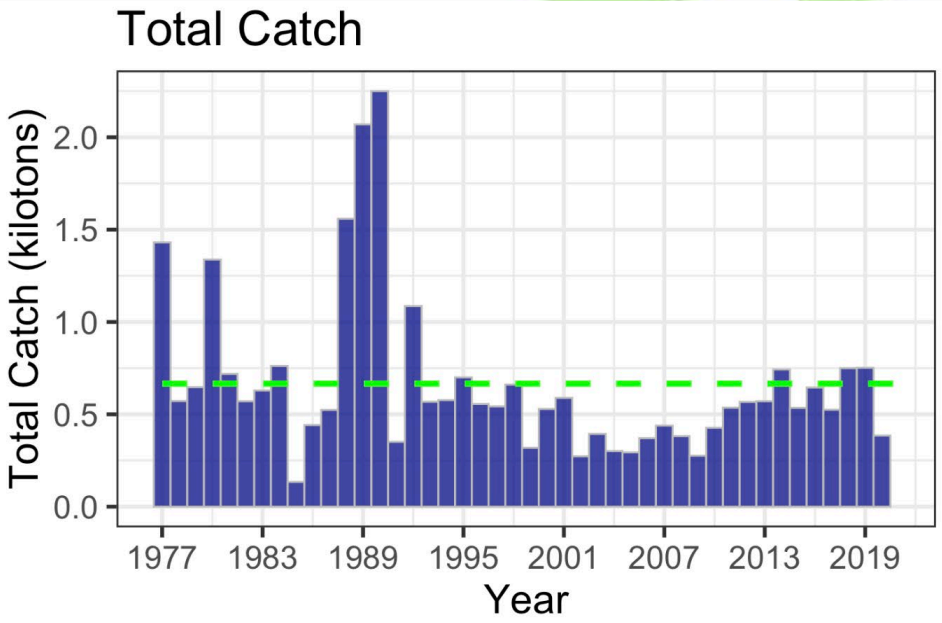
13. GOA Blackspotted/Rougheye Rockfish

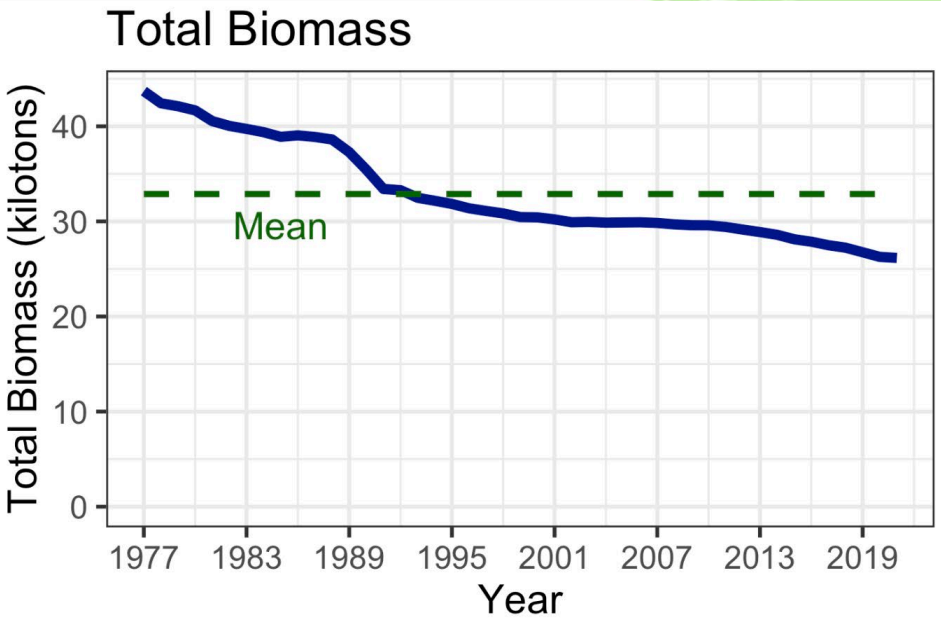
Plan Team discussions

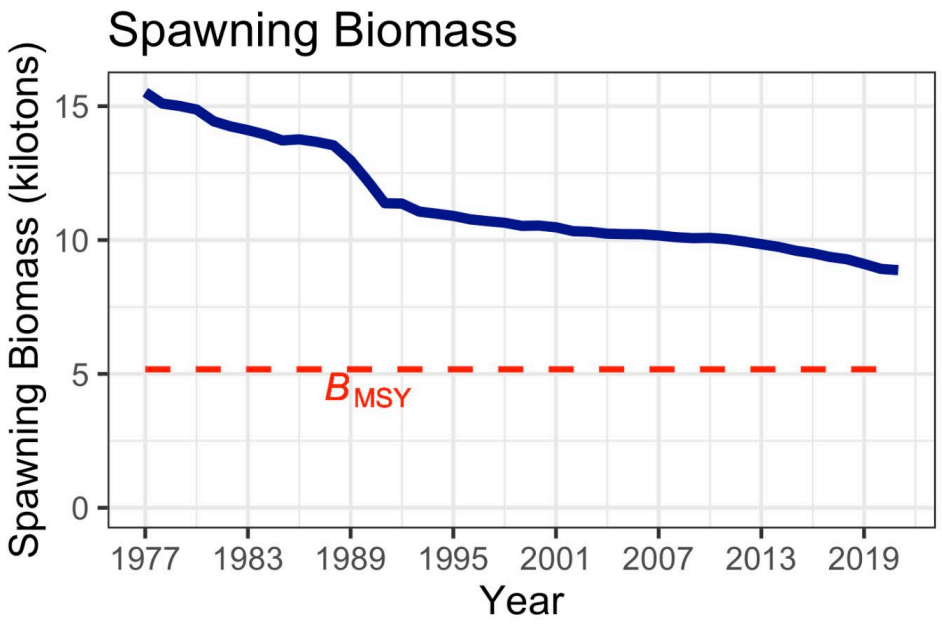
- Team agreed with author-recommended, noting consistency with available data
- The Team noted that the estimated dome shape of the selectivity should be evaluated in the future.
- The Team agreed with the data and model issues raised by the author including:
  - data weighting,
  - trawl survey length data,
  - survey index refinements, and
  - parameterizations for survey catchabilities and selectivities.

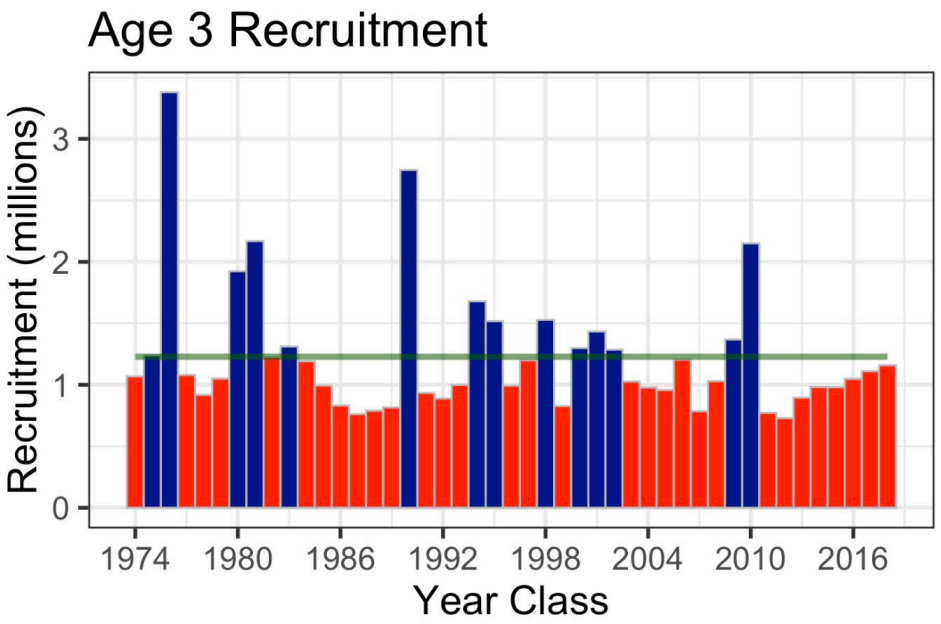
- The Team continued to place a high priority on developing robust **species identification methods** and in estimating composition data.

13. Rougheye/blackspotted rockfish









Rockfish ABC Summary

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Other rock	4,053	4,054	up 1 (0%)
Sub Total	55,107	56,554	up 1,447 (3%)

14. Demersal shelf rockfish

Kellii Wood
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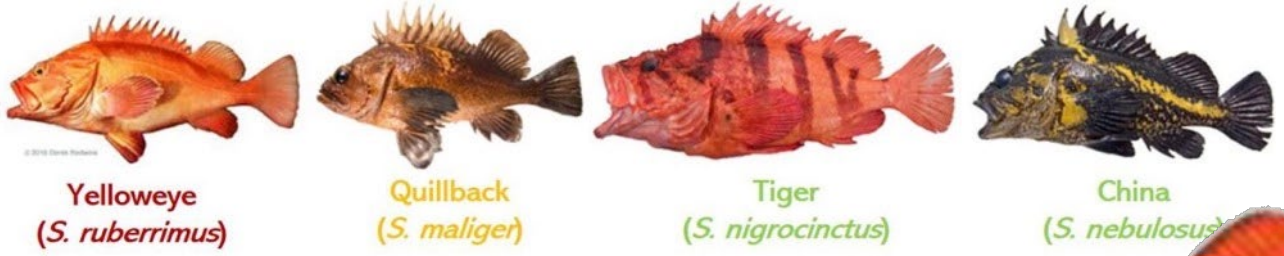
- Full Assessment, Tier 4 (yelloweye) and Tier 6 (6 other species)



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

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

Stock Assessment Survey

Four Management Areas:

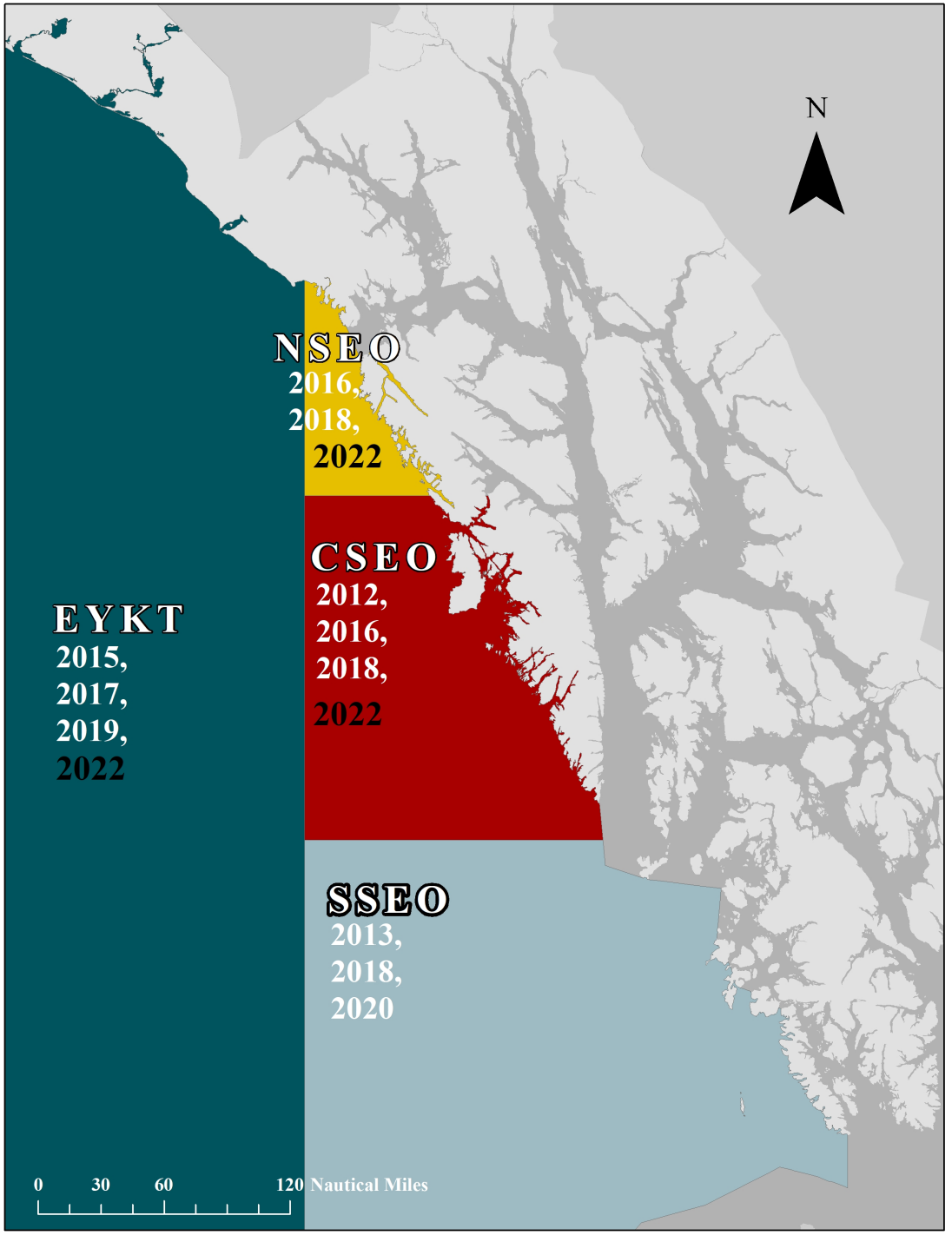
Eastern Yakutat (EYKT)

Northern Southeast Outside (NSEO)

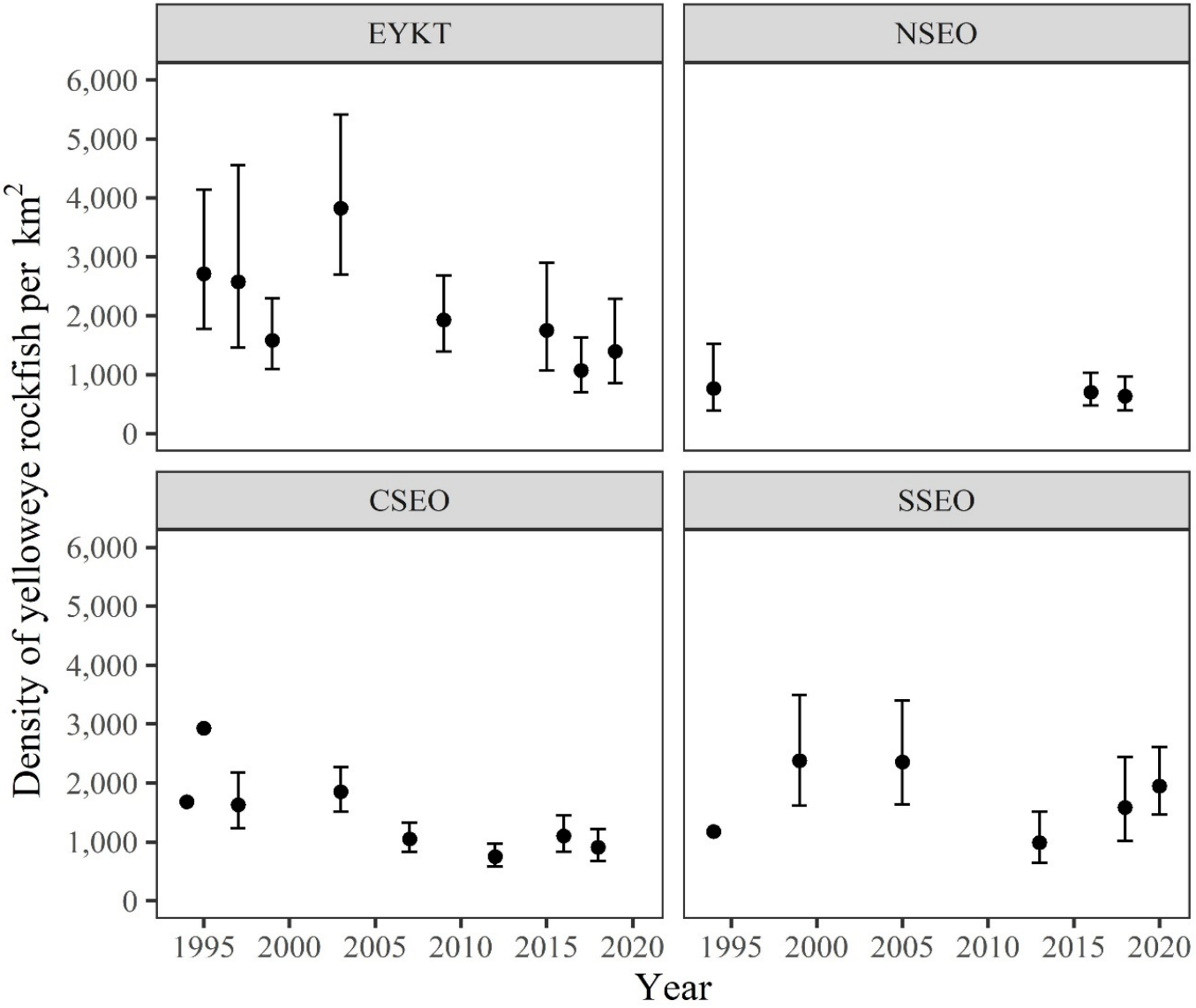
Central Southeast Outside (CSEO)

Southern Southeast Outside (SSEO)

Photo credit: ADF&G



Sub/ROV Density Estimates (95% CI)



14. Demersal shelf rockfish

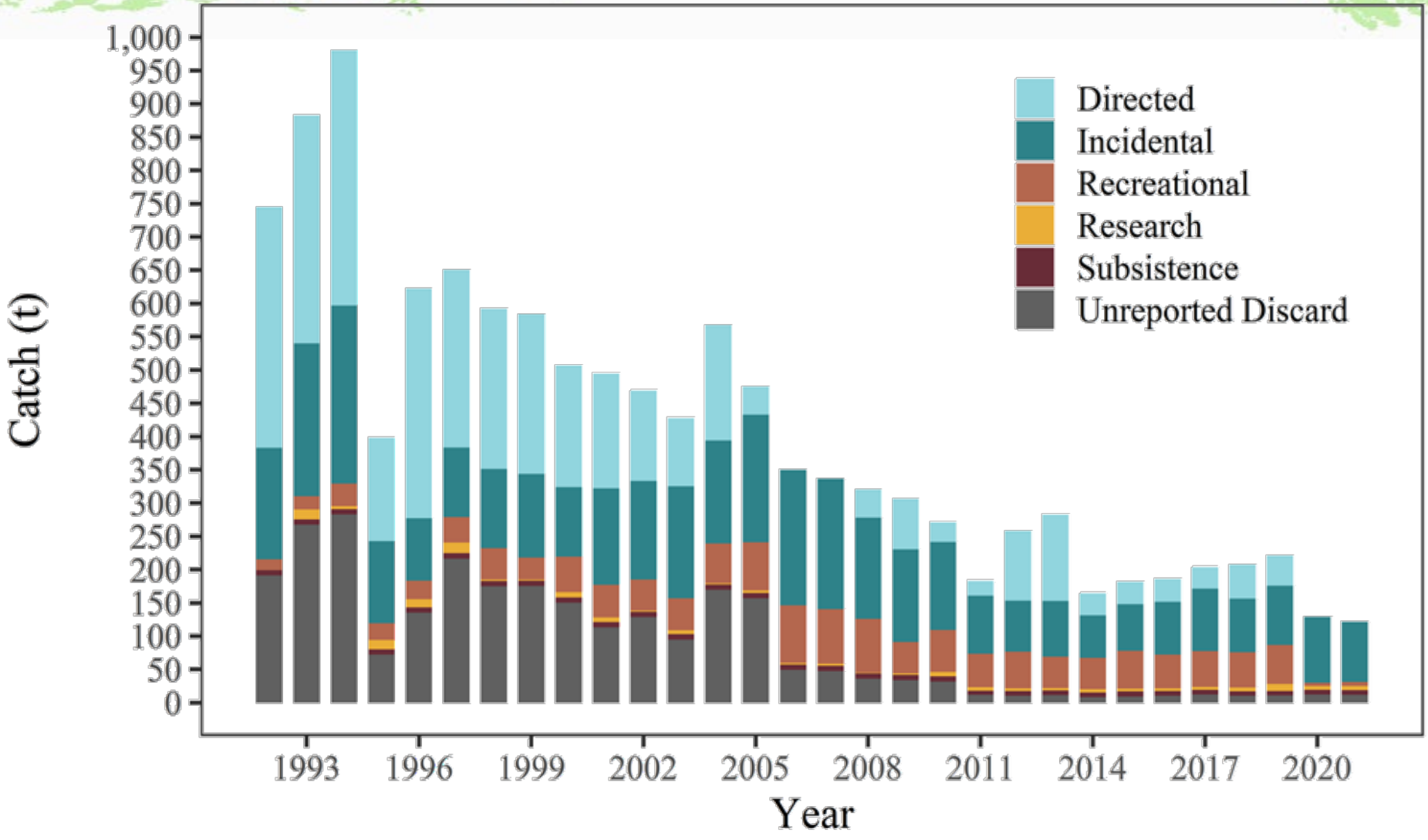
Model Input Data and Methods

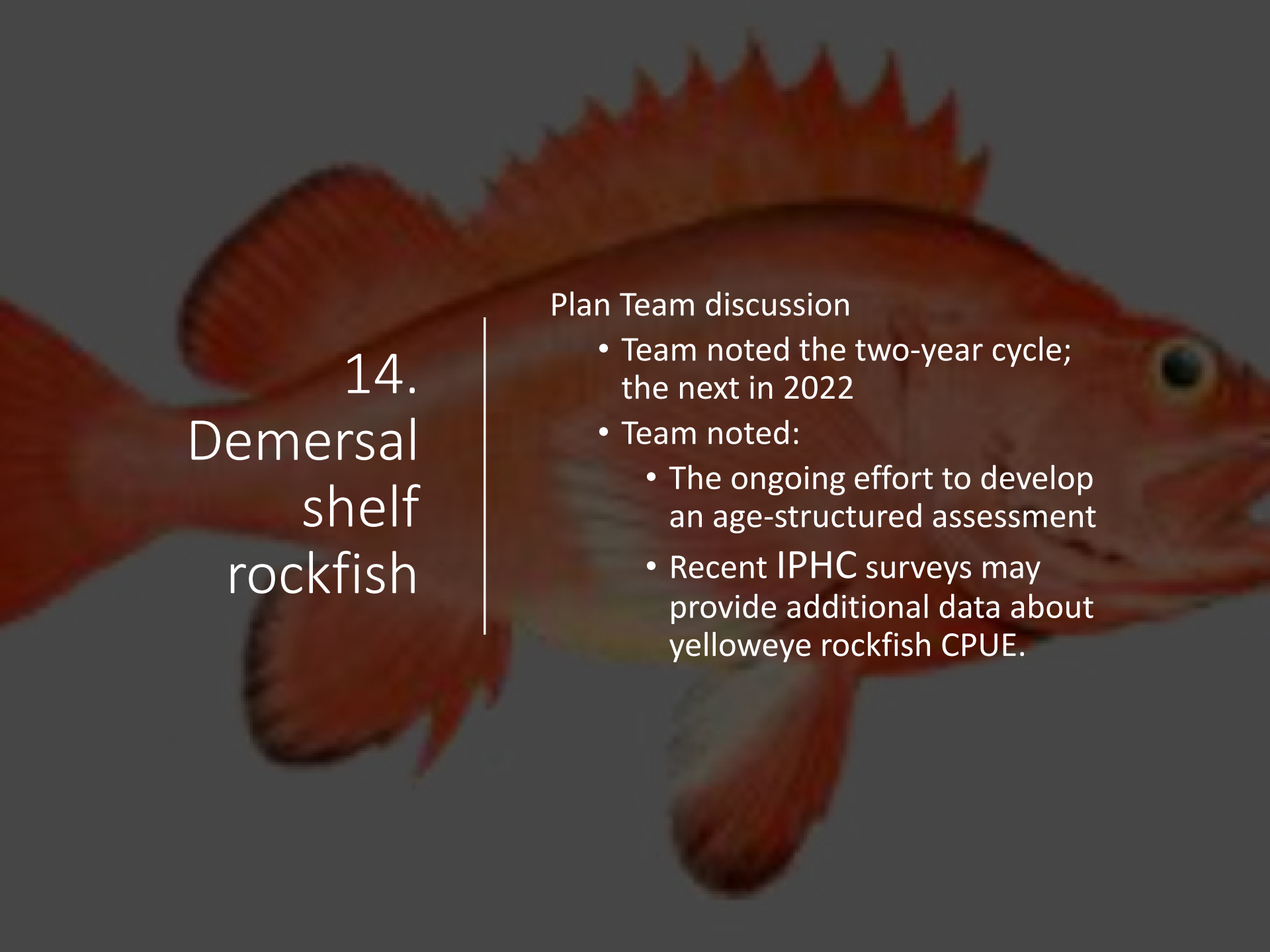
DATA INPUT
Ave weights from port sampling

METHODOLOGY
Tier 4 yelloweye rockfish + Tier 6 other DSR calculations

Quantity	As estimated or *specified last* year for: 2021	2022	As estimated or *recommended this* year for: 2022	2023
M (natural mortality rate)	0.02	0.02	0.02	0.02
Tier	4	4	4	4
Yelloweye Biomass (t)	10,648		12,388	
$F_{OFL}=F_{35\%}$	0.032	0.032	0.032	0.032
$maxF_{ABC}$	0.026	0.026	0.026	0.026
F_{ABC}	0.020	0.020	0.020	0.020
DSR OFL (t)	**405**	**405**	**422**	**422**
DSR max ABC (t)	328	328	342	342
Recommended ABC (t)	**257**	**257**	**268**	**268**
Status	As determined last year for: 2019	2020	As determined this year for: 2020	2021
Overfishing	No	n/a	No	n/a

SEO DSR Catch by Sector





14. Demersal shelf rockfish

Plan Team discussion

- Team noted the two-year cycle; the next in 2022
- Team noted:
  - The ongoing effort to develop an age-structured assessment
  - Recent IPHC surveys may provide additional data about yelloweye rockfish CPUE.

Rockfish ABC Summary

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Thornyhead	1,953	1,953	same (0%)
Other rock	4,053	4,054	up 1 (0%)
Sub Total	55,107	56,554	up 1,447 (3%)

No thornyhead rockfish assessment in 2021

Rockfish ABC Summary

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POP	36,177	38,268	up 2,091 (6%)
northern rockfish	5,358	5,146	down 212 (4%)
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Sub Total	55,107	56,554	up 1,447 (3%)

16. Other rockfish

Summary

Tier 4: Sharpchin

Tier 5: 17 slope sub-group species

Tier 6: 7 demersal sub-group, 2 slope species

Changes to the input data

- Catch updated through Oct 1, 2021
- NMFS bottom trawl survey data updated
- Updated random effects biomass model
- Reported catch from “unidentified rockfish”

Changes in assessment methodology

- None

Addressed SSC and Plan Team comments

16. Other rockfish

- Exceeded combined Western/Central GOA ABC

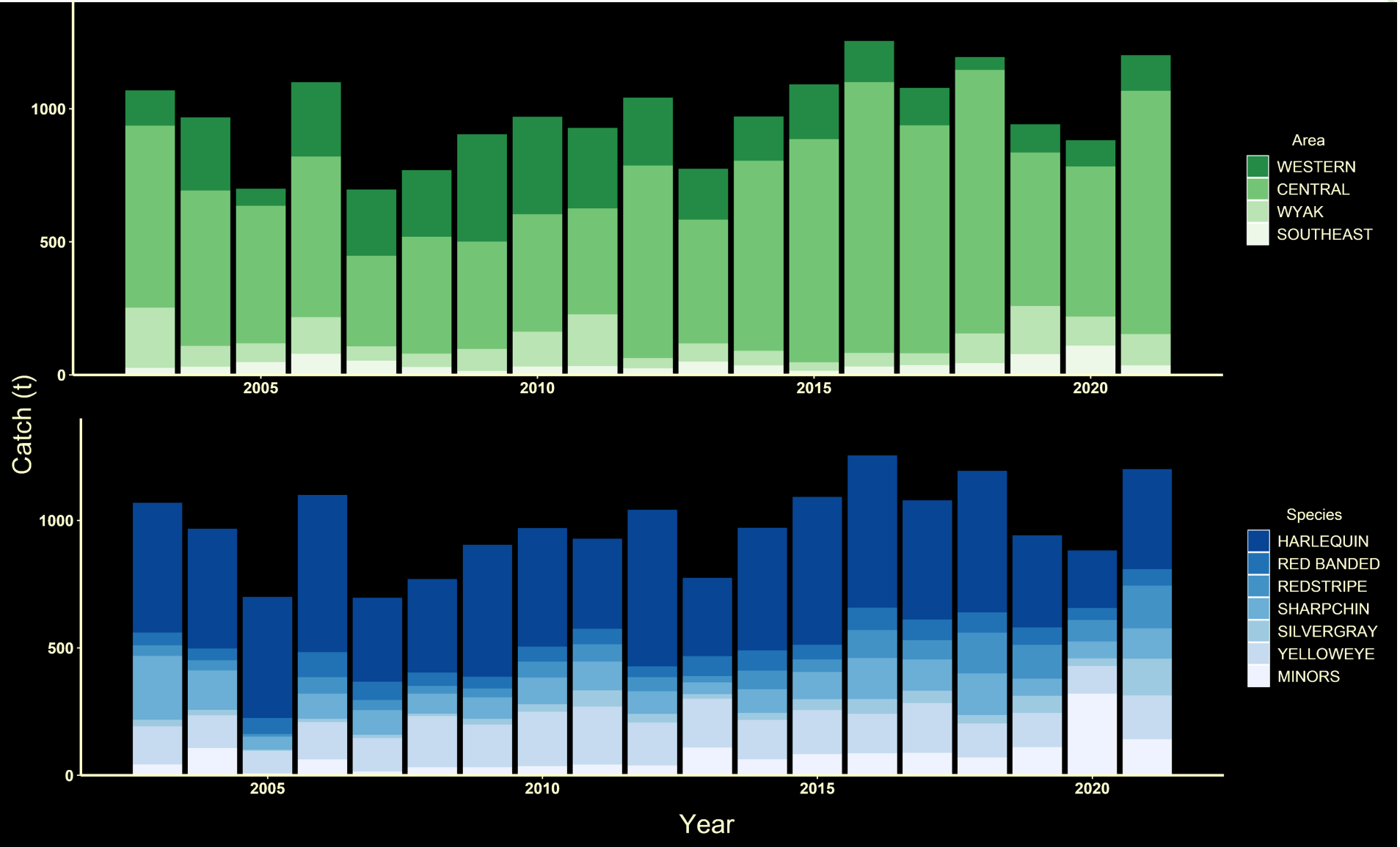
Area		2021 OFL	ABC	TAC	Catch
WGOA/CGOA			940	940	1,048
EGOA	WY		369	369	118
	EY/SE		2,744[$]	2,744[#]	36
Total		5,320	4,053	4,053	1,201*

*Catch as of Oct 1, 2021

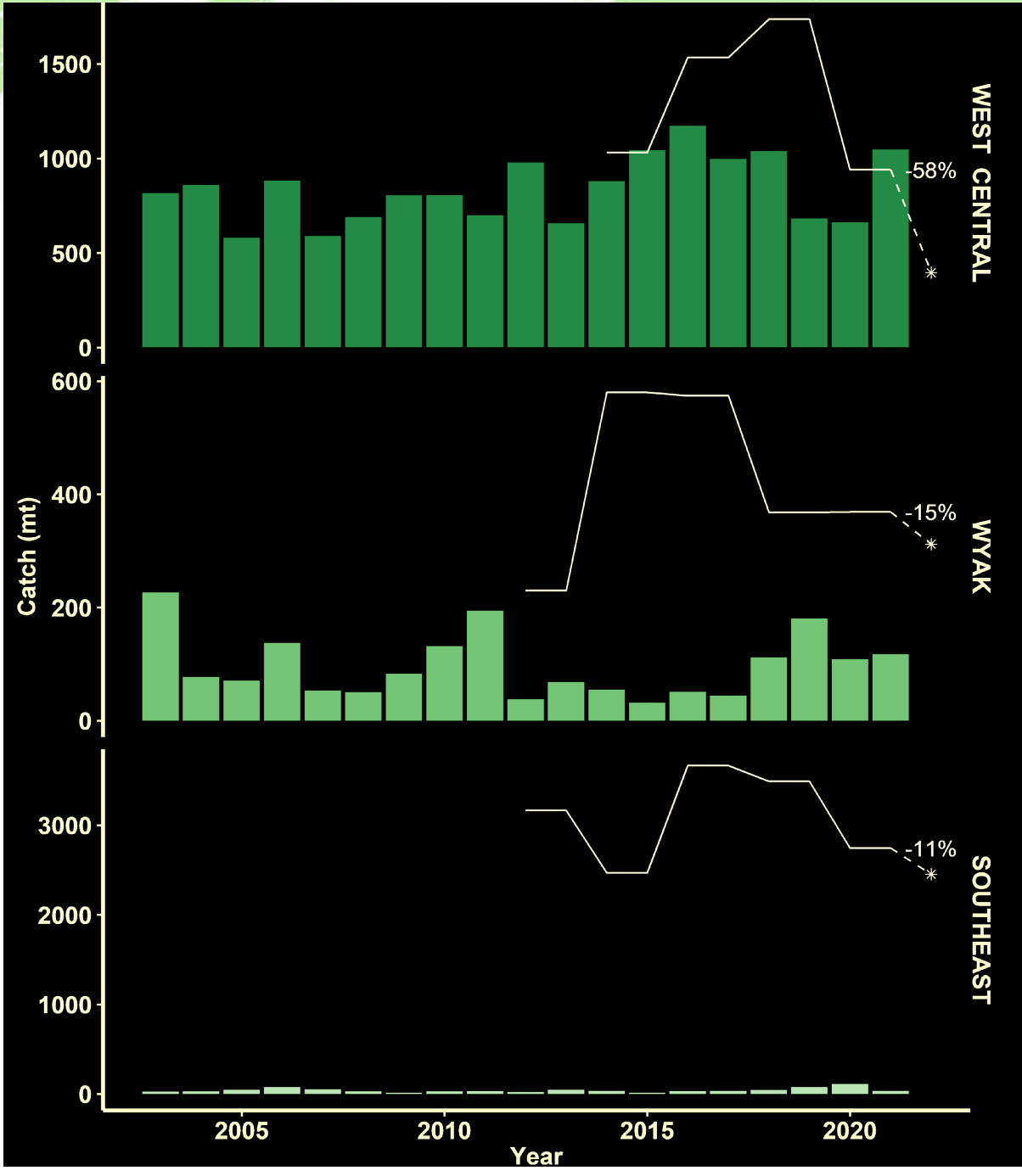
[#]historically TAC set well below ABC in EY/SE, but not for 2020/2021

[$]Does not include ABC from northern rockfish

16. Other rockfish



16. Other rockfish



16. Other rockfish

Plan Team summary

- Appreciated the efforts to align *M* with the species mix but result was extreme variability due to survey. The survey has proven to be inaccurate in tracking the species biomass and mix of species…so:
  - **The Team recommended rolling over harvest recommendations from 2021 due to the discrepancy between catch and survey biomass and the estimation of weighted *M* being influenced by a few species that have patchy distributions and survey catchability/availability issues.**
- **The Team recommends the author further explore issues with using the current method of weighted *M* biomass estimates.**
- **The Team continues to support an earlier recommendation that the DSR subgroup be moved into the DSR assessment and make the DSR assessment GOA-wide pending a Council analysis on spatial management implications.**
- The Team is encouraged that a working group is planning on addressing some of these issues and look forward to the outcomes.
- **The Team recommends incorporating 1 t of the northern rockfish ABC apportionment for EGOA to be combined with OR in the WYAK management area and added for management purposes.**

17. Atka mackerel

Species	2021 catch	ABC 2021	ABC 2022	Change
Pollock	98,769	115,870	144,444	up 28,574 (25%)
Pacific Cod	12,272	23,627	24,043	up 416 (2%)
Sablefish	14,115	21,475	22,794	up 1,319 (6%)
Flatfish	2,717	116,883	115,834	down 1,049 (1%)
Arrowtooth flounder	9,517	126,970	119,779	down 7,191 (6%)
Rockfish	35,882	55,107	56,554	up 1,447 (3%)
Atka mackerel	940	4,700	4,700	same (0%)
Skates	2,609	6,670	6,563	down 107 (2%)
Sharks	1,639	3,755	3,755	same (0%)
Octopus	51	980	980	same (0%)
Total	178,511	476,037	499,446	up 23,409 (5%)

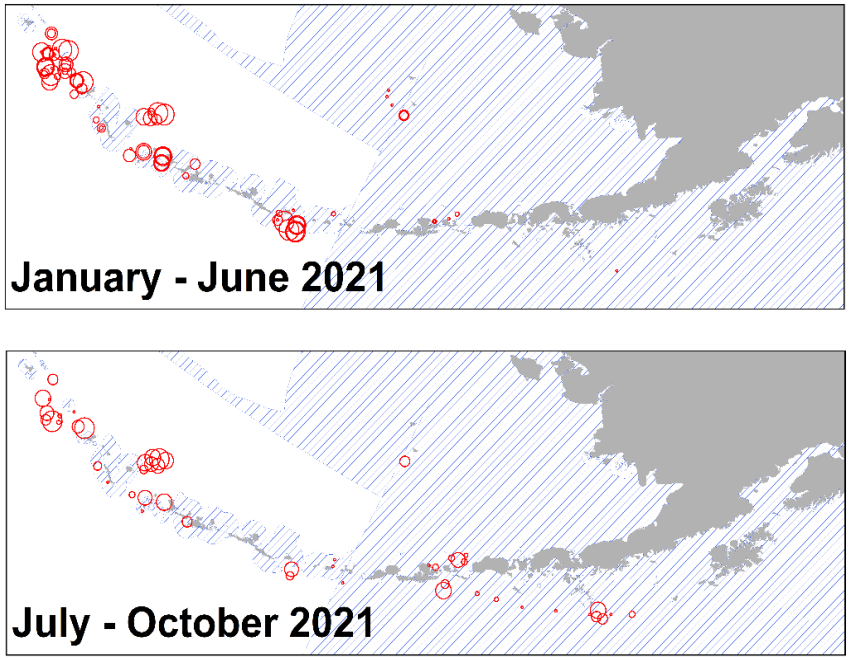
17. GOA Atka mackerel

2020 TAC
• 3,000 t

2020 Catch
• 608 t

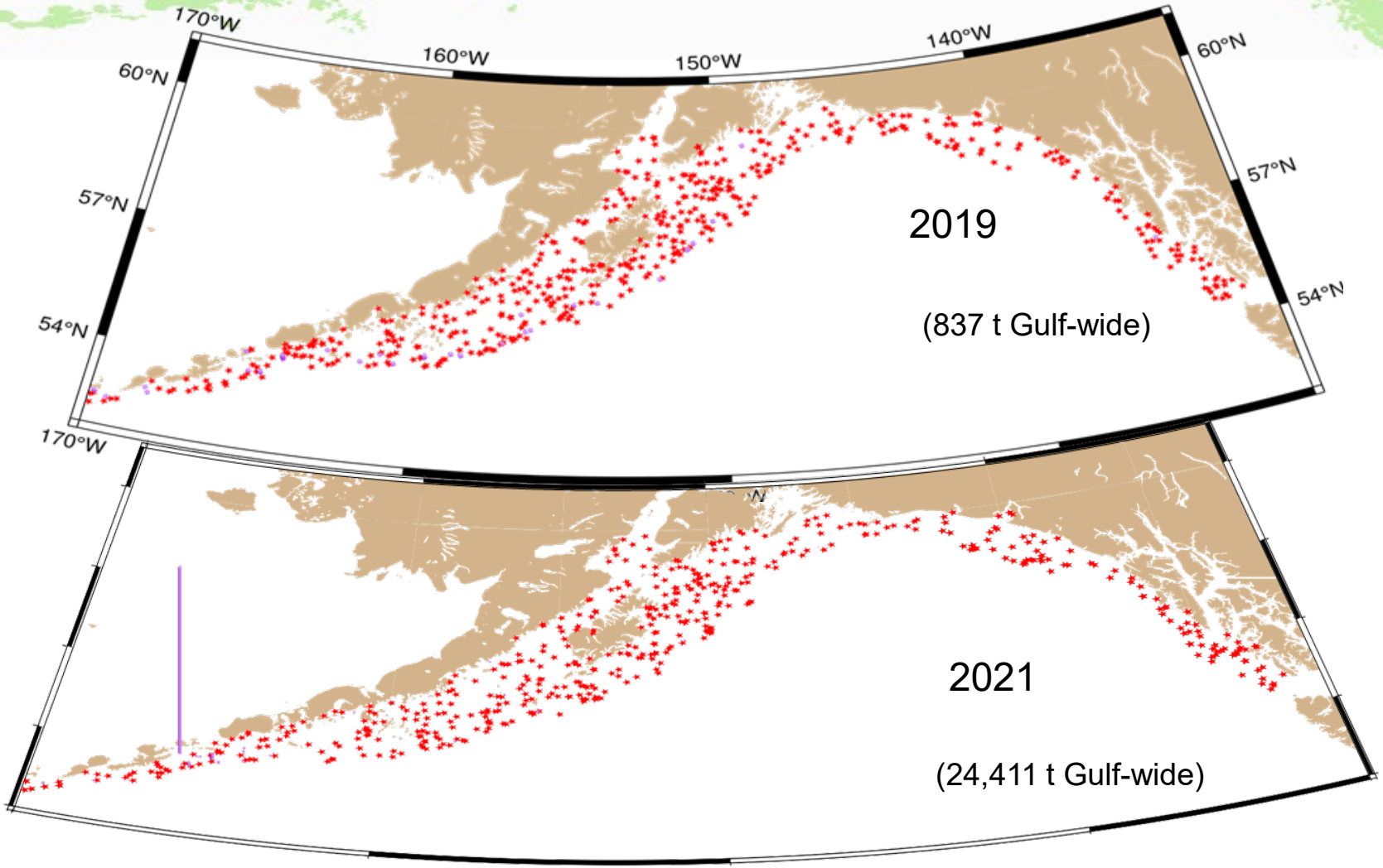
2021 TAC
• 3,000 t

2021 Catch
• 940 t
(11/1/21)



2021 observed catches of Atka mackerel summed for 20 km^2 cells. Shaded areas represent areas closed to directed Atka mackerel fishing (all of GOA).

17. GOA Atka mackerel



Atka mackerel survey CPUE by station for 2019 and 2021.

★ stars represent tows where Atka mackerel were absent, height of bars is proportional to CPUE by weight.

17. GOA Atka mackerel

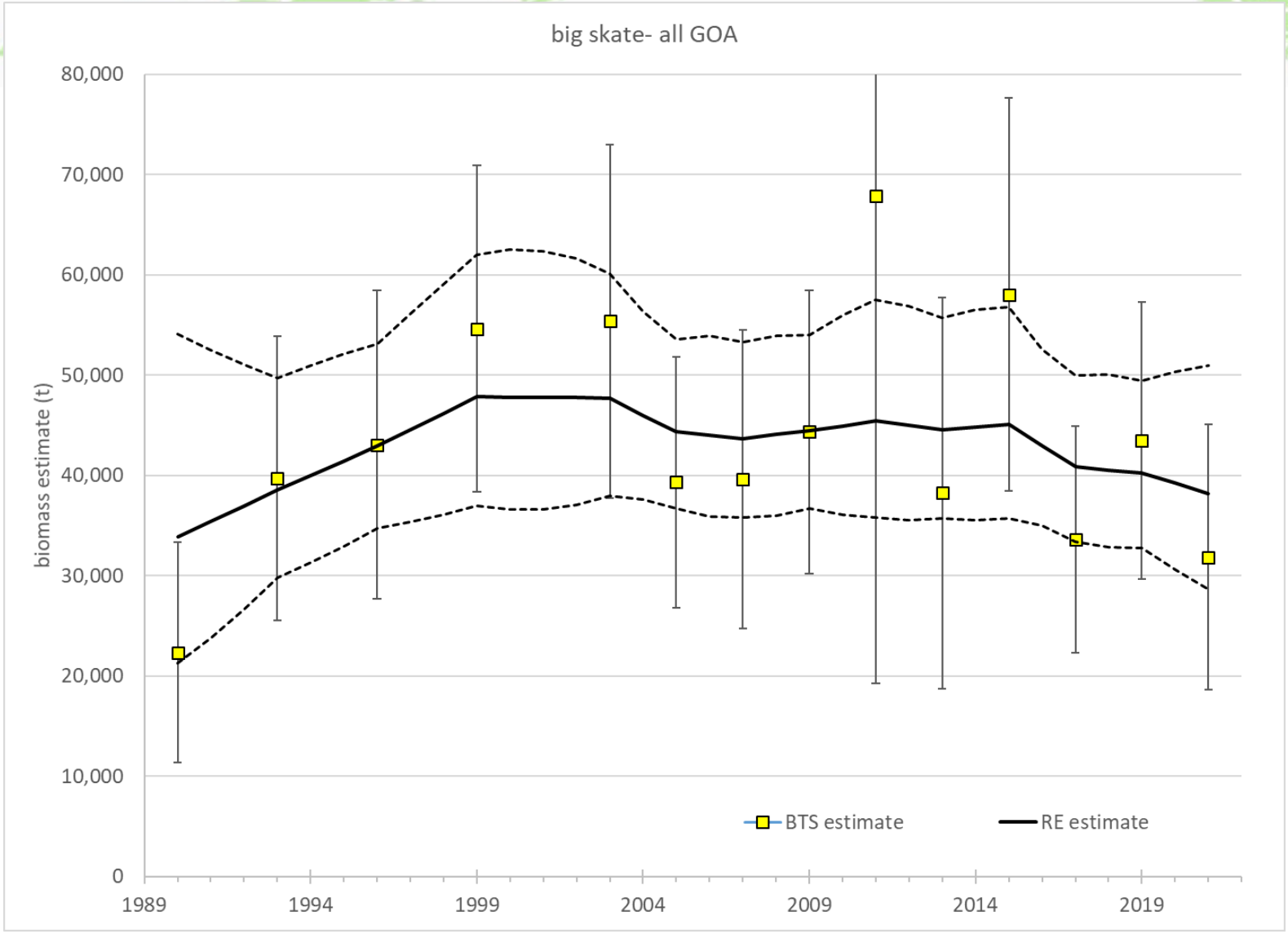
Quantity	As estimated or *specified last* year for: 2021	2022	As estimated or *recommended this* year for: **2022**	2023
Tier	6	6	**6**	6
OFL (t)	6,200	6,200	**6,200**	6,200
maxABC (t)	4,700	4,700	**4,700**	4,700
ABC (t)	4,700	4,700	**4,700**	4,700
Status	As determined *last* year for: 2017	2018	As determined *this* year for: 2018	2019
Overfishing	n/a	n/a	**n/a**	n/a

19. GOA sharks (no assessment in 2021)

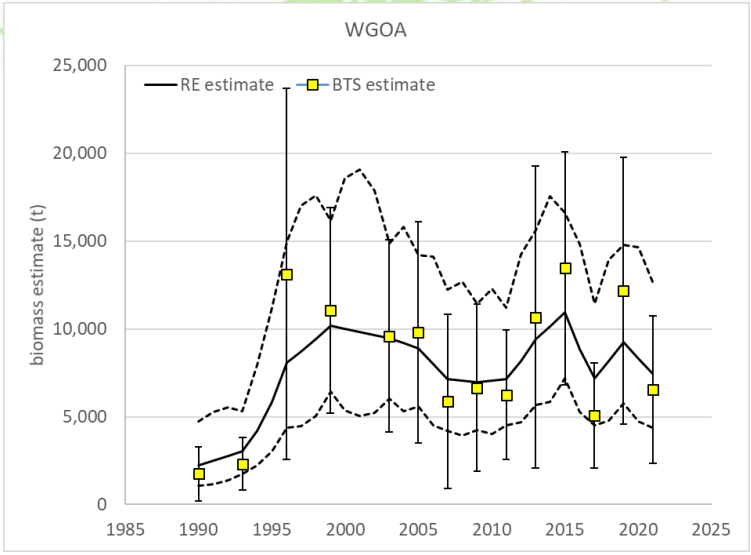
Species	2021 catch	ABC 2021	ABC 2022	Change
Pollock	98,769	115,870	144,444	up 28,574 (25%)
Pacific Cod	12,272	23,627	24,043	up 416 (2%)
Sablefish	14,115	21,475	22,794	up 1,319 (6%)
Flatfish	2,717	116,883	115,834	down 1,049 (1%)
Arrowtooth flounder	9,517	126,970	119,779	down 7,191 (6%)
Rockfish	35,882	55,107	56,554	up 1,447 (3%)
Atka mackerel	940	4,700	4,700	same (0%)
Skates	2,609	6,670	6,563	down 107 (2%)
Sharks	1,639	3,755	3,755	same (0%)
Octopus	51	980	980	same (0%)
Total	178,511	476,037	499,446	up 23,409 (5%)

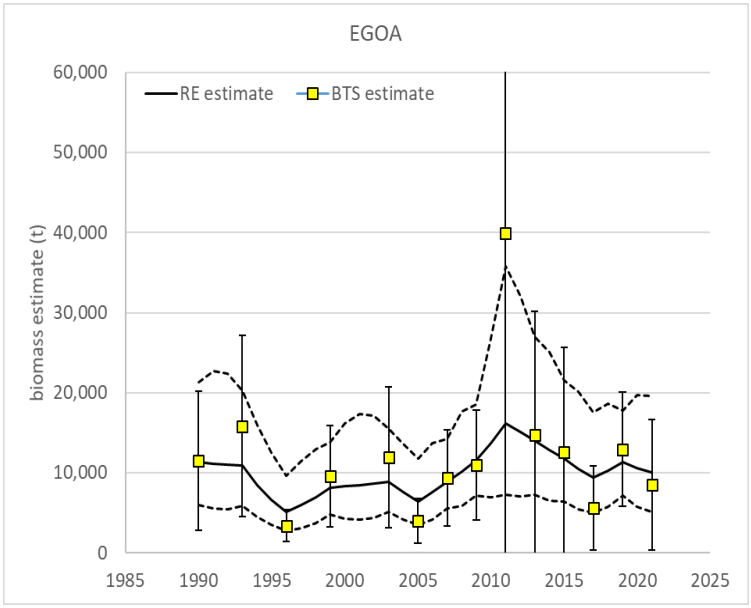
18. GOA Skates

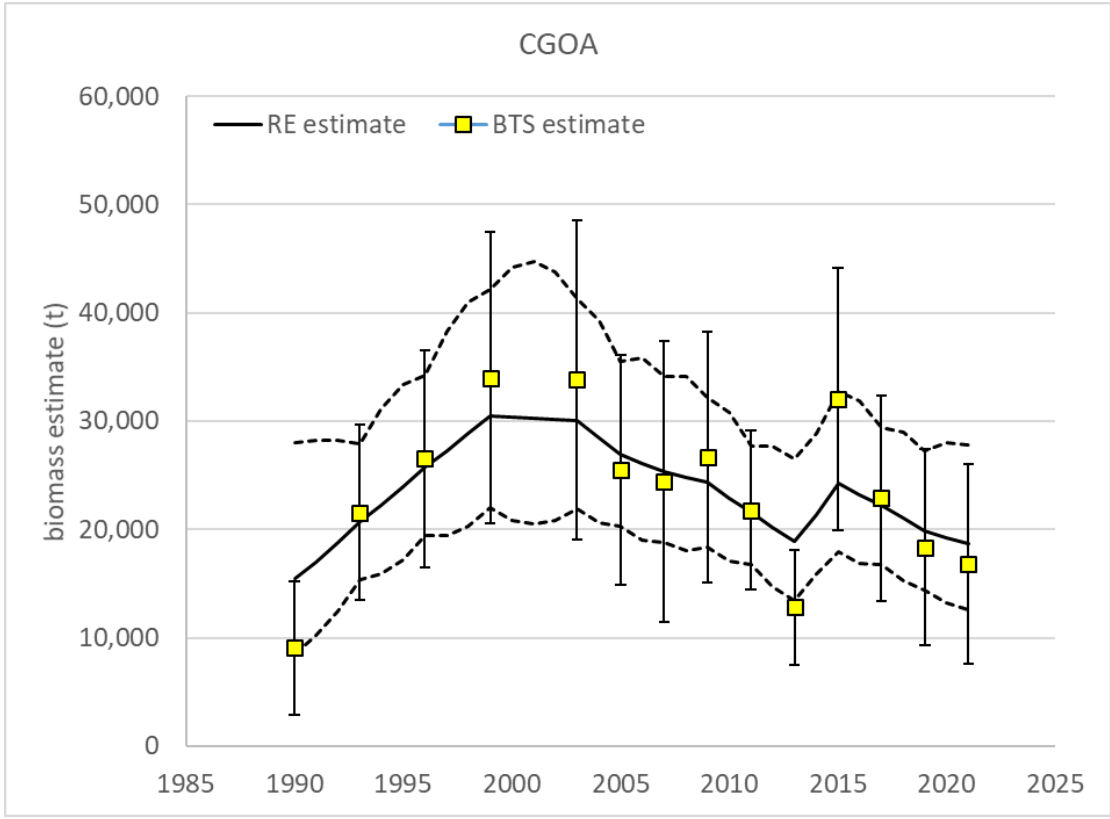
AFSC BTS biomass – big skate



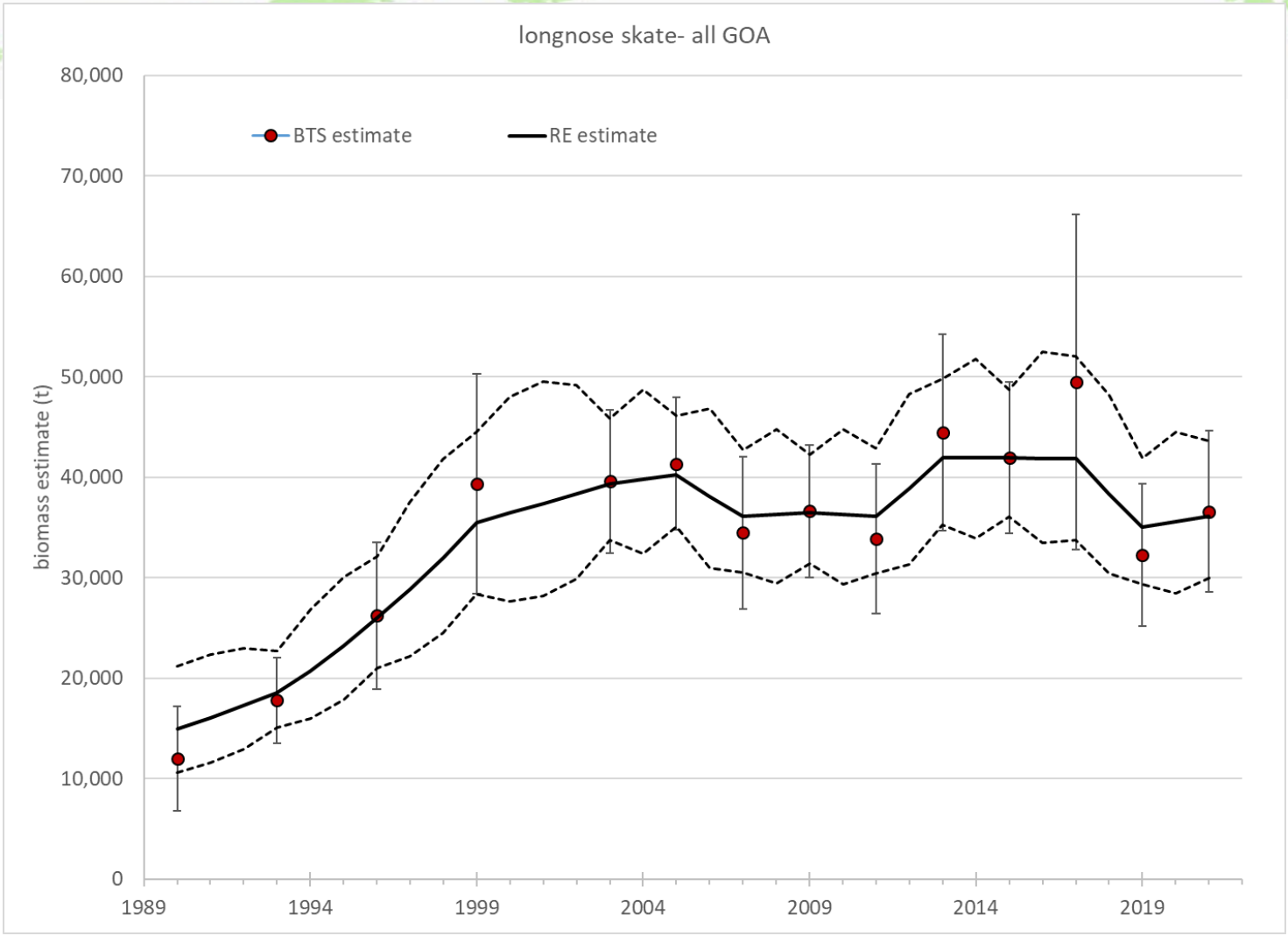
big skate biomass by area



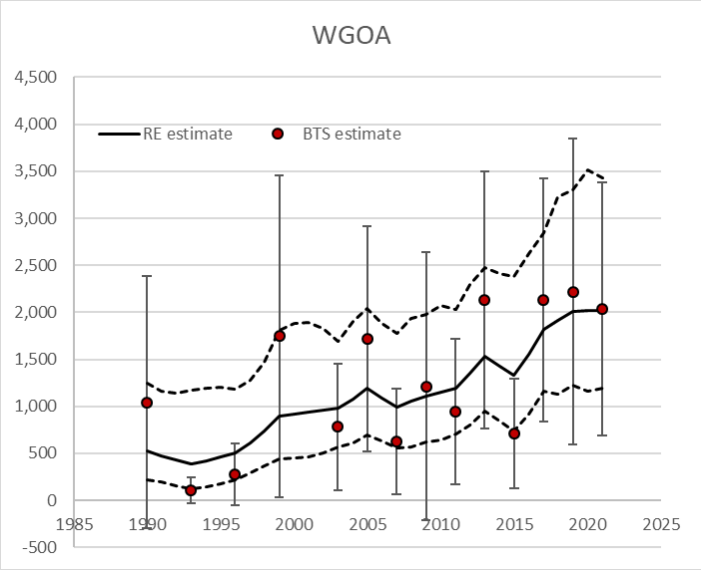


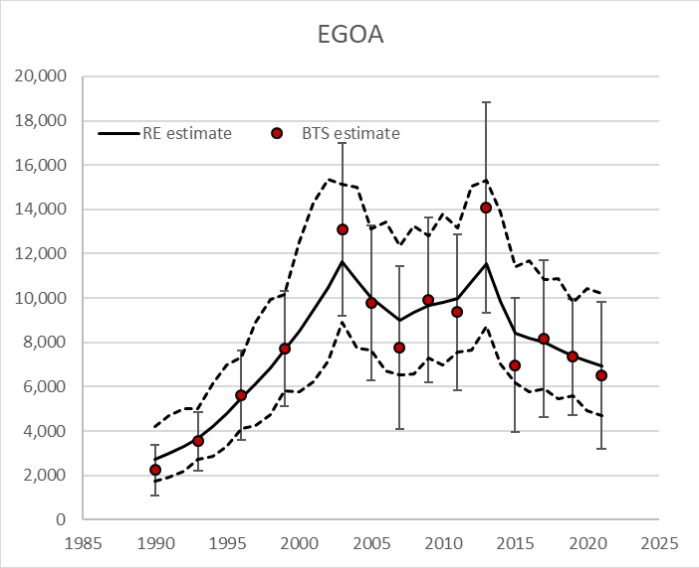


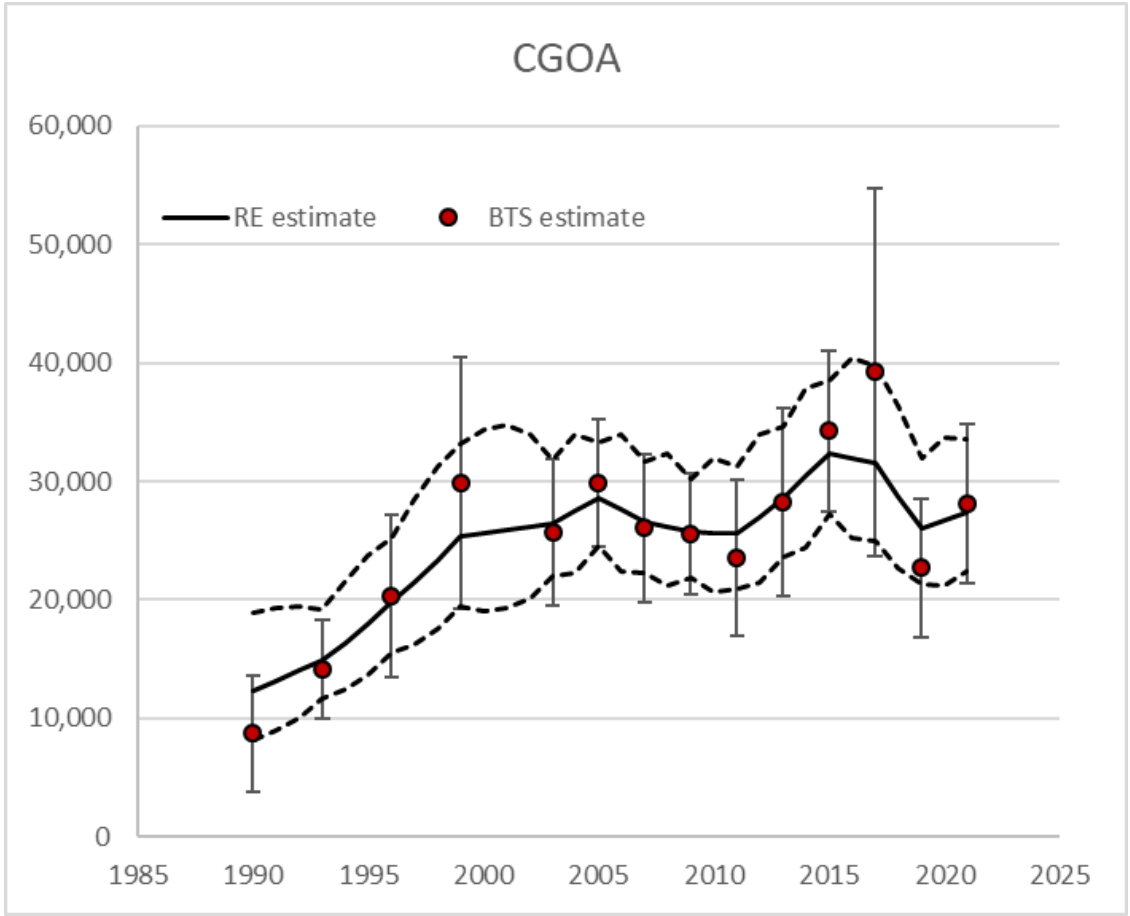
AFSC BTS biomass – longnose skate



longnose skate biomass by area

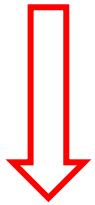






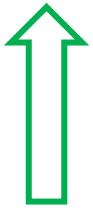
harvest recs – big skate

big skate (*Beringraja binoculata*)					
		As estimated or *specified last full assessment* for		As estimated or *recommended this* year for:	
Quantity		2020	2021	**2022**	2023
M (natural mortality)		0.1	0.1	**0.1**	0.1
Specified/recommended Tier		5	5	**5**	5
Biomass (t)	W	10,109	10,109	**7,882**	7,882
	C	20,798	20,798	**19,756**	19,756
	E	11,861	11,861	**10,581**	10,581
	GOA-wide	42,779	42,779	**38,220**	38,220
F_{OFL} ($F=M$)		0.1	0.1	**0.1**	0.1
$maxF_{ABC}$ ($F=0.75*M$)		0.075	0.075	**0.075**	0.075
F_{ABC}		0.075	0.075	**0.075**	0.075
OFL (t)	GOA-wide	4,278	4,278	**3,822**	**3,822**
Maximum permissible ABC (t)	W	758	758	**591**	591
	C	1,560	1,560	**1,482**	1,482
	E	890	890	**794**	794
Recommended ABC (t)	W	758	758	**591**	591
	C	1,560	1,560	**1,482**	1,482
	E	890	890	**794**	794
		As determined *last* year for:		As determined *this* year for:	
Status		2018	2019	**2020**	2021
Overfishing?		*no*	*na*	**no**	na
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)					



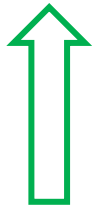
harvest recs – longnose skate

longnose skate (*Raja rhina*)					
Quantity		As estimated or *specified last full assessment* for 2020	2021	As estimated or *recommended this* year for: **2022**	2023
M (natural mortality)		0.1	0.1	**0.1**	0.1
Specified/recommended Tier		5	5	**5**	5
Biomass (t)	W	2,156	2,156	**2,013**	2,013
	C	25,583	25,583	**27,258**	27,258
	E	7,558	7,558	**6,890**	6,890
	GOA-wide	34,487	34,487	**36,162**	36,162
F_{OFL} ($F=M$)		0.1	0.1	**0.1**	0.1
$maxF_{ABC}$ ($F=0.75*M$)		0.075	0.075	**0.075**	0.075
F_{ABC}		0.075	0.075	**0.075**	0.075
OFL (t)	GOA-wide	3,449	3,449	**3,616**	3,616
Maximum permissible ABC (t)	W	158	158	**151**	151
	C	1,875	1,875	**2,044**	2,044
	E	554	554	**517**	517
Recommended ABC (t)	W	158	158	**151**	151
	C	1,875	1,875	**2,044**	2,044
	E	554	554	**517**	517
Status		As determined *last* year for: 2018	2019	As determined *this* year for: **2020**	2021
Overfishing?		*no*	*na*	**no**	na
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)					



harvest recs – other skate

other skates (*Bathyraja* species)					
Quantity		As estimated or *specified last full assessment* for 2020	2021	As estimated or *recommended this* year for: **2022**	2023
M (natural mortality)		0.1	0.1	**0.1**	0.1
Specified/recommended Tier		5	5	**5**	5
Biomass (t)	GOA-wide	11,662	11,662	13,114	13,114
F_{OFL} (*F=M*)		0.1	0.1	**0.1**	0.1
$maxF_{ABC}$ *(F=0.75*M)*		0.075	0.075	**0.075**	0.075
F_{ABC}		0.075	0.075	**0.075**	0.075
OFL (t)	GOA-wide	1,166	1,166	1,311	1,311
Maximum permissible ABC (t)	GOA-wide	875	875	984	984
Recommended ABC (t)	GOA-wide	875	875	984	984
Status		As determined *last* year for: 2018	2019	As determined *this* year for: **2020**	2021
Overfishing?		*no*	*na*	**no**	na
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)					



18. Skates

Plan Team discussion

- Some notes about state management in Prince William Sound
- Agreed with recommended ABCs/OFLs
- The Team noted natural mortality review could be worthwhile

19. GOA sharks (no assessment in 2021)

Species	2021 catch	ABC 2021	ABC 2022	Change
Pollock	98,769	115,870	144,444	up 28,574 (25%)
Pacific Cod	12,272	23,627	24,043	up 416 (2%)
Sablefish	14,115	21,475	22,794	up 1,319 (6%)
Flatfish	2,717	116,883	115,834	down 1,049 (1%)
Arrowtooth flounder	9,517	126,970	119,779	down 7,191 (6%)
Rockfish	35,882	55,107	56,554	up 1,447 (3%)
Atka mackerel	940	4,700	4,700	same (0%)
Skates	2,609	6,670	6,563	down 107 (2%)
Sharks	1,639	3,755	3,755	same (0%)
Octopus	51	980	980	same (0%)
Total	178,511	476,037	499,446	up 23,409 (5%)

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Sharks	1,639	3,755	3,755	same (0%)
Octopus	51	980	980	same (0%)
Total	178,511	476,037	499,446	up 23,409 (5%)

20. GOA Octopus

- Tier 6, no change

Harvest Recommendations				
	As estimated or *specified in the last assessment* for:		As estimated or *recommended this* year for:	
Quantity	2020	2021	2022	2023
Tier 6 (max. historical catch) maximum historical catch	1,307	1,307	**1,307**	1,307
OFL (t)	1,307	1,307	**1,307**	1,307
Maximum ABC (t)	980	980	**980**	980
ABC (t)	980	980	**980**	980
	As determined *last* year for:		As determined *this* year for:	
Status	2018	2019	2020	2021
Overfishing	no	n/a	no	n/a

20. Octopus

Plan Team discussion

- Noted different approaches used in BSAI for octopus
- Current Tier 6 appears sufficiently precautionary