

BSAI OTHER ROCKFISH GROUND FISH PLAN TEAM, NOV 2022

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FULL ASSESSMENT IN EVEN YEARS

TIER 5 RANDOM EFFECTS MODEL

NEW MODEL WITH LONGLINE SURVEY RPWS FOR SHORTSPINE THORNYHEAD (SST) ON THE EBS SLOPE

RECOMMENDATIONS FOR 2023/24 USING NEW MODEL:

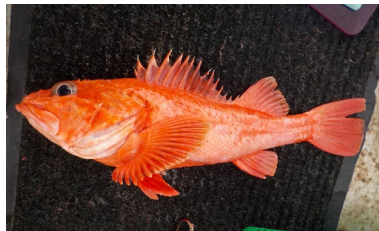
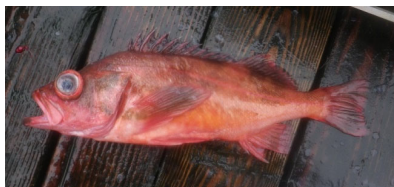
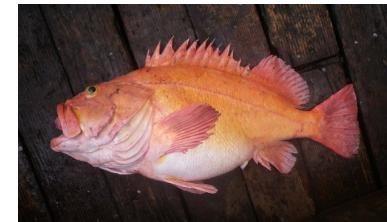
BIOMASS 52,733 T

OFL 1,680 T

ABC 1,260 T (4% DECREASE FROM 2020/21)

WHO ARE THE “OTHER” ROCKFISH?

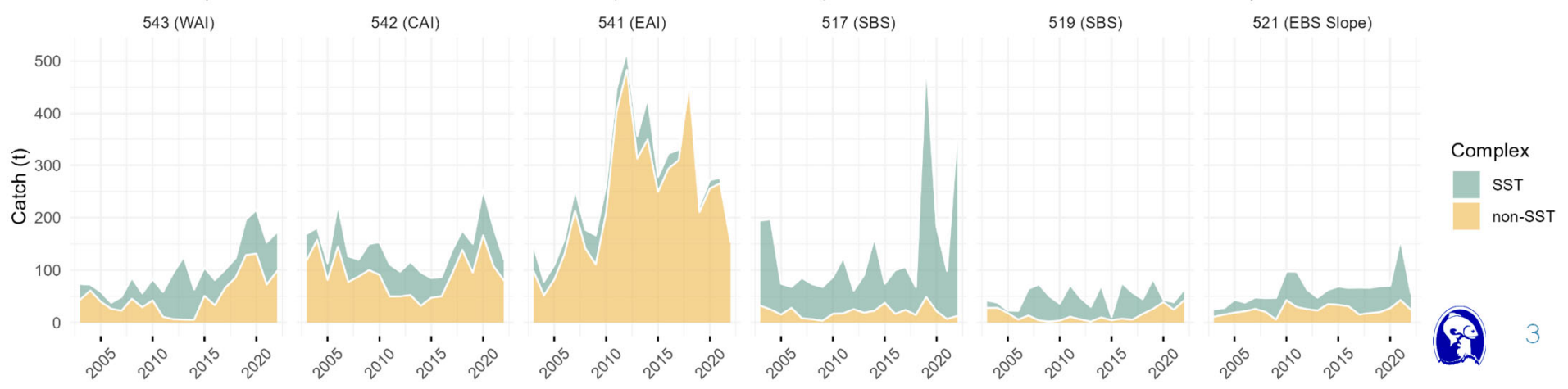
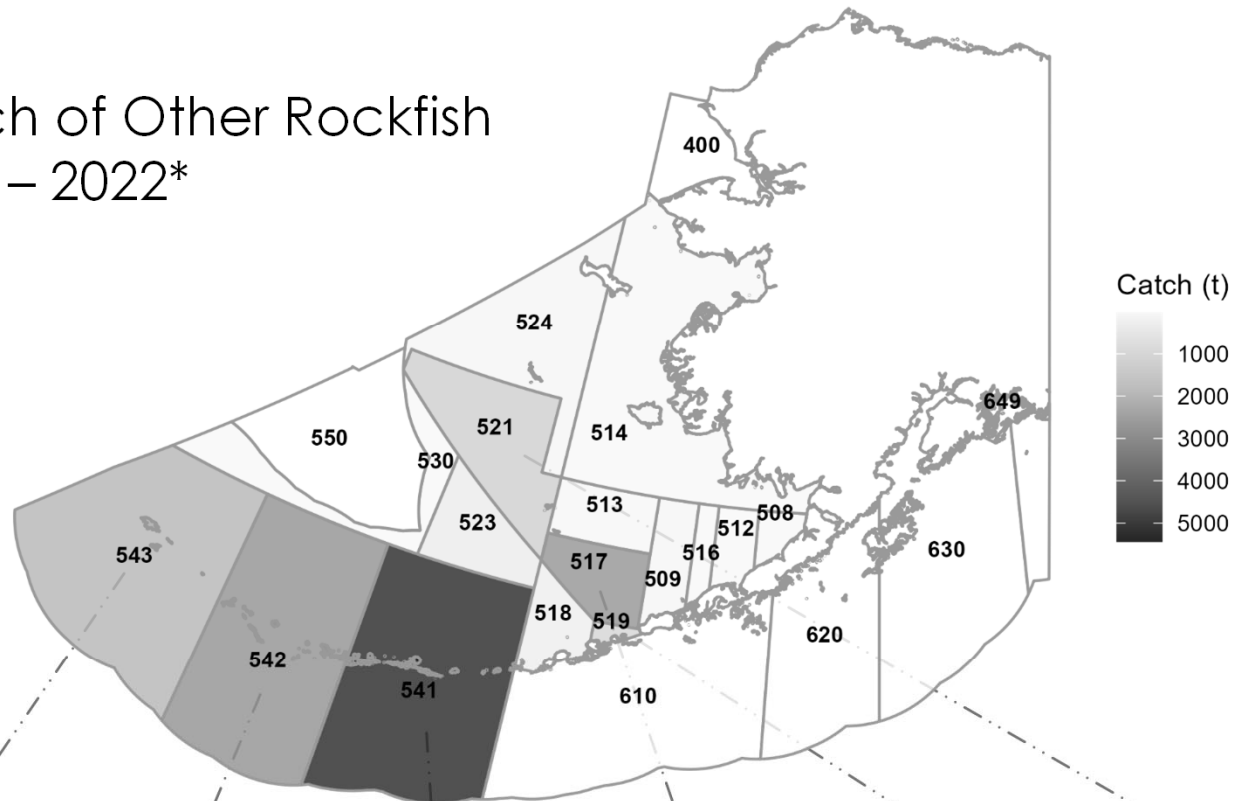
- Everybody except POP, northern, shorttraker, and rougheye rockfish.
- Shortspine thornyhead (**SST**), dusky, and at least 11 other *Sebastes* and *Sebastolobus* spp. (**non-SST**)

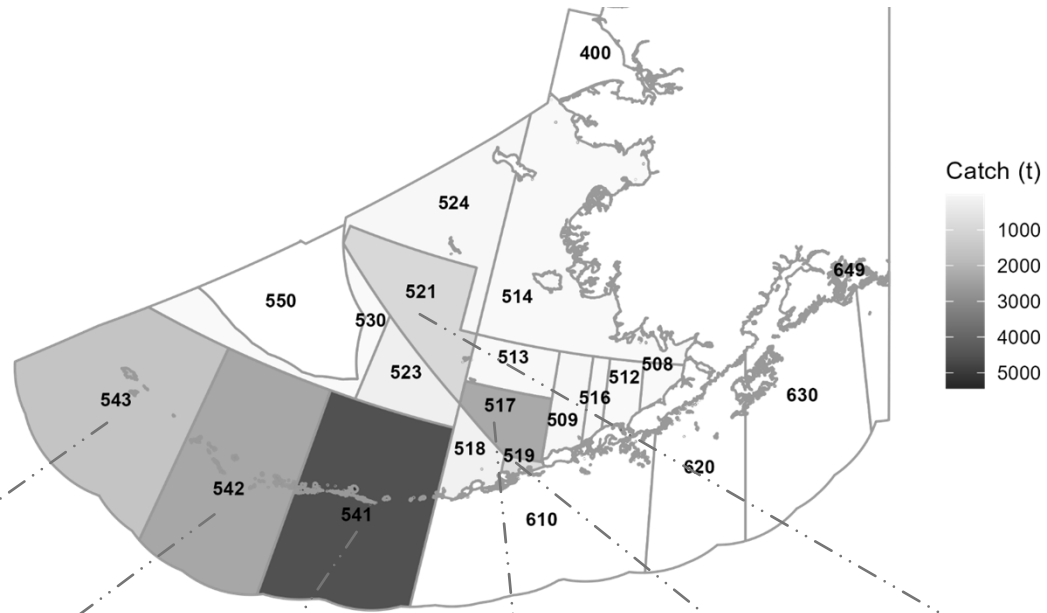


Photos courtesy of Aaron Baldwin

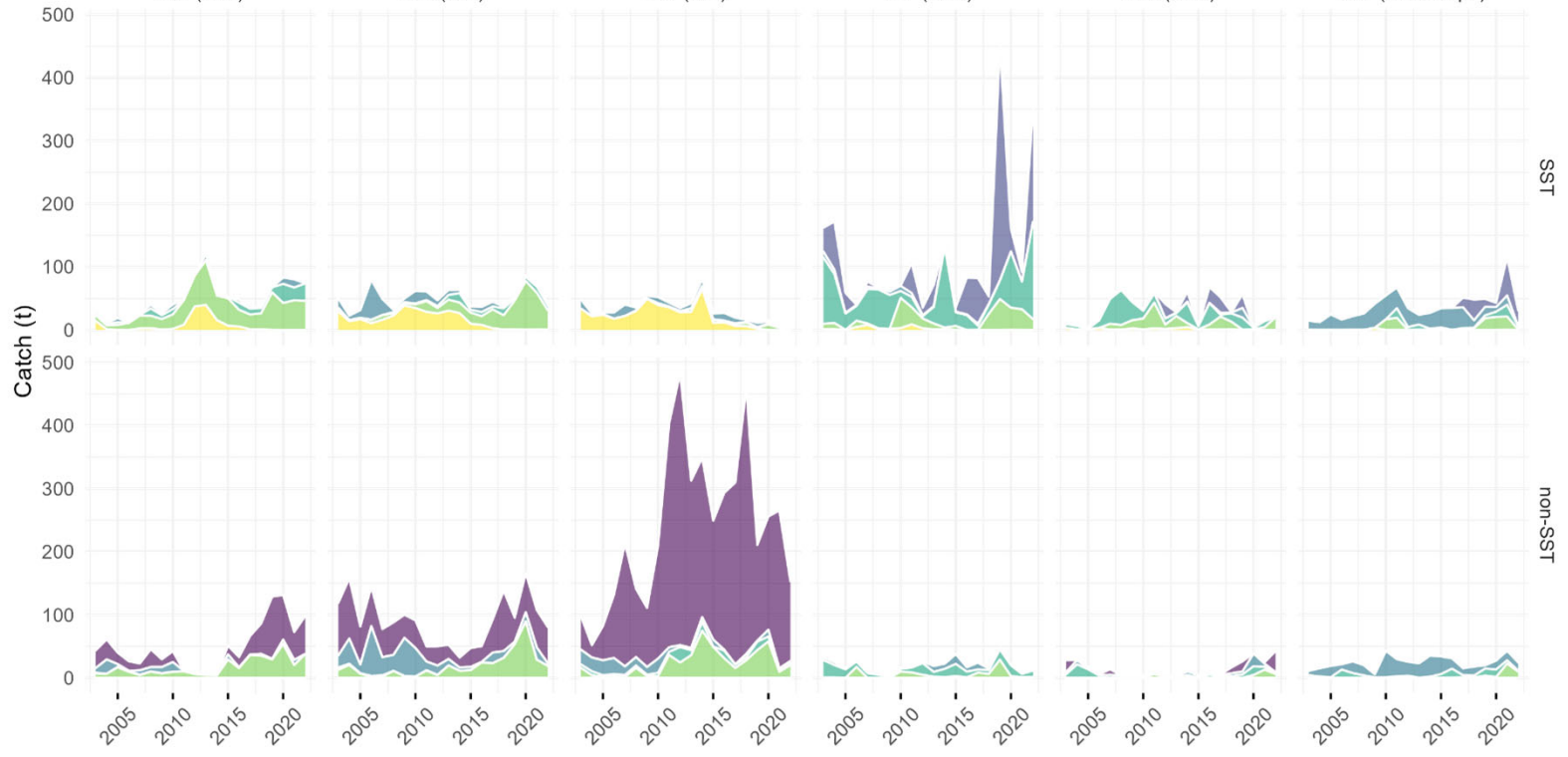


Catch of Other Rockfish 2003 – 2022*





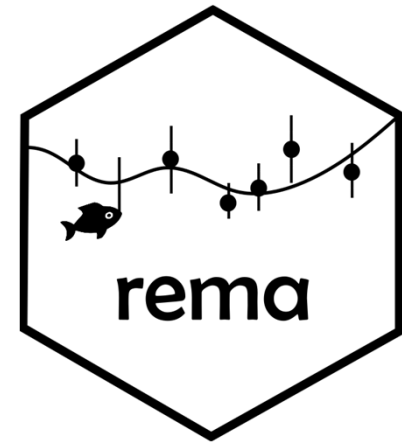
543 (WAI) 542 (CAI) 541 (EAI) 517 (SBS) 519 (SBS) 521 (EBS Slope)



- Fishery**
- Atka mackerel Bottom trawl
 - Flatfish Bottom trawl
 - Other fixed gear
 - Other trawl
 - Rockfish Bottom trawl
 - Sablefish Longline



ANALYTICAL APPROACH

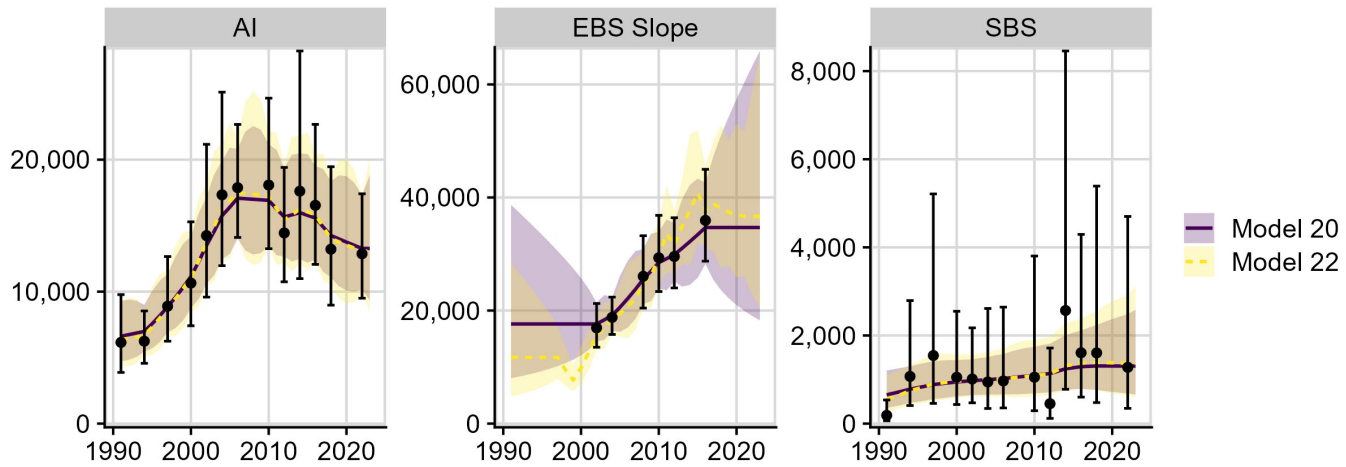


- Split into SST and non-SST
 - SST $M = 0.03$, non-SST $M = 0.09$
- **Model 20** (base): Multivariate version of the random effects (REM) model
- Bottom trawl surveys in the Aleutians (AI), S. Bering Sea (SBS), eastern Bering Sea (EBS) slope (ended in 2016), and EBS shelf (non-SST only)
- New in 2022 – **Model 22**: also fit to AFSC longline survey (LLS) relative population weights (RPW) for SST on the EBS slope (~65% of total biomass)

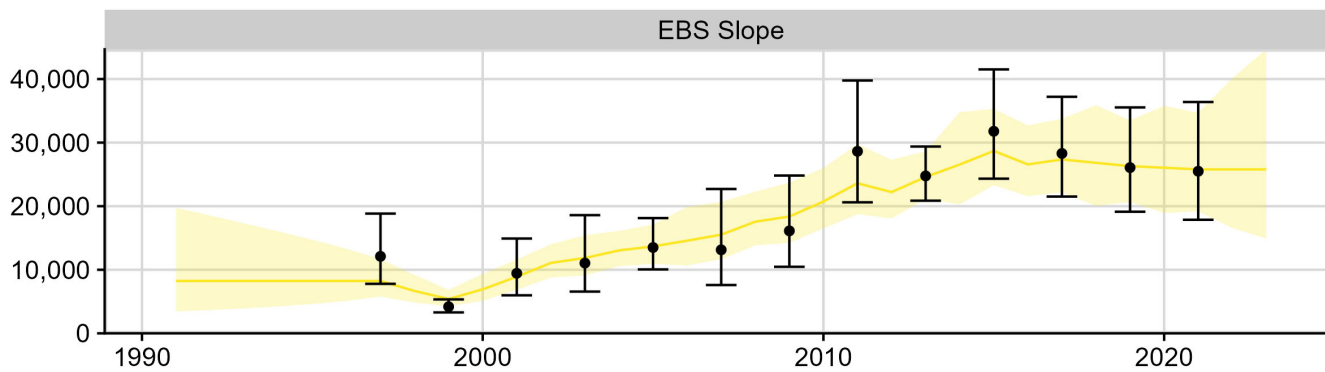


Shortspine thornyhead (SST)

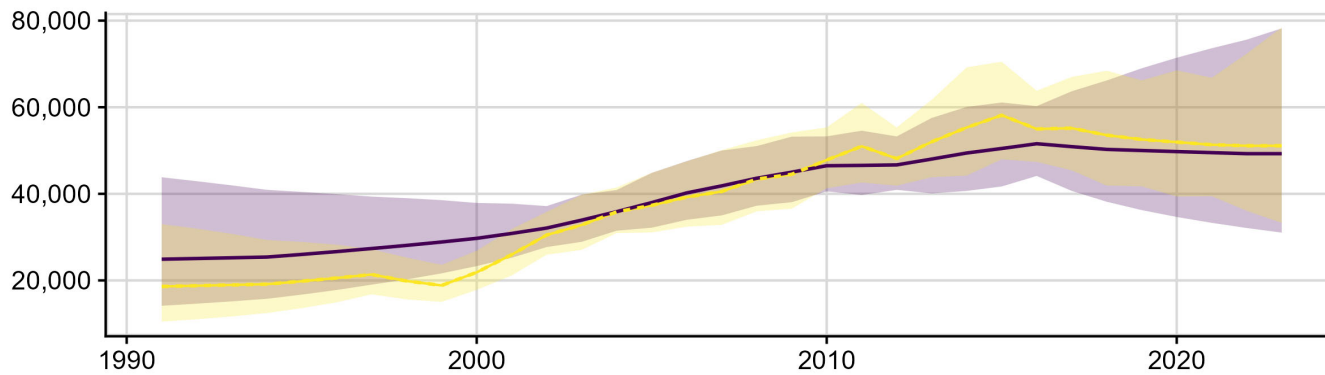
Model fits to bottom trawl survey biomass (t) by region



Model 22 fit to the NMFS longline survey RPWs

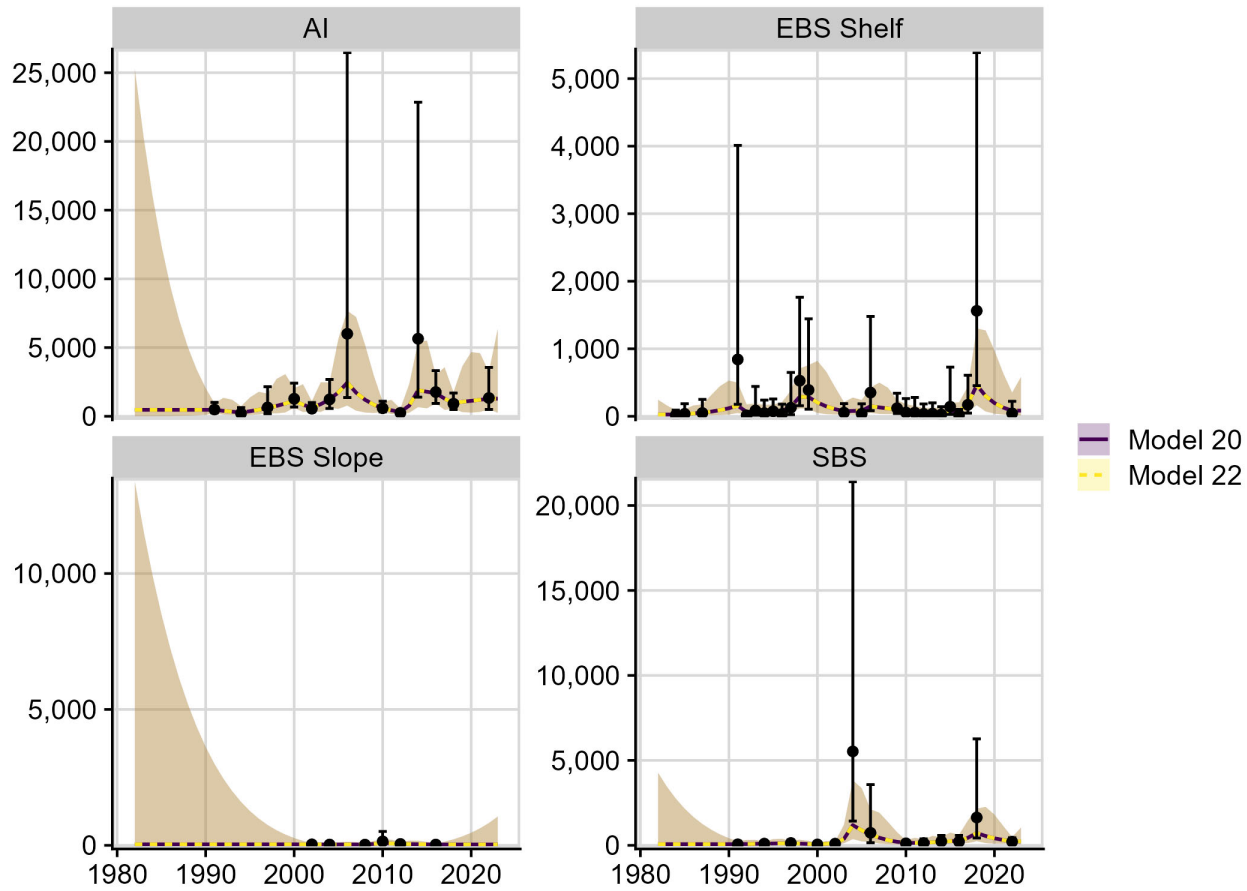


Total predicted biomass (t)

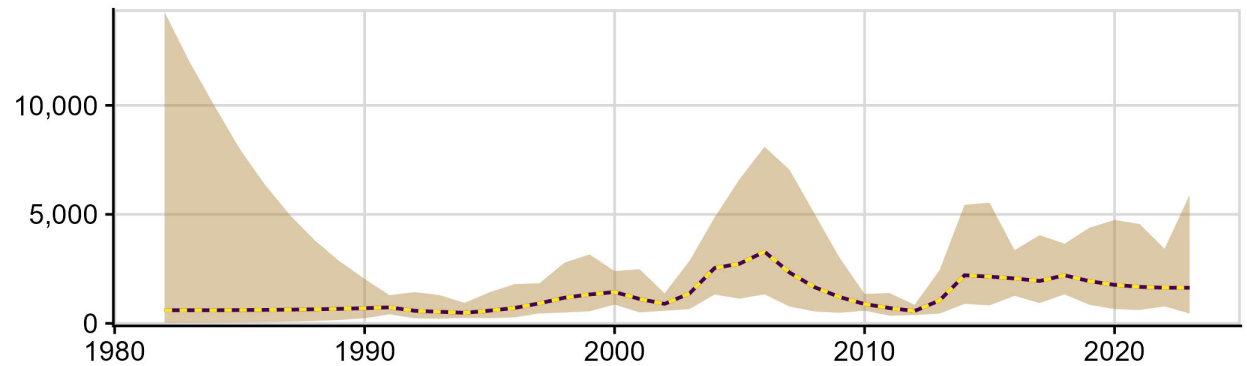


Other non-SST rockfish

Model fits to bottom trawl survey biomass (t) by region



Total predicted biomass (t)



TIER 5 ASSESSMENT METHODS FOR OTHER ROCKFISH ($F_{OFL} = M, F_{ABC} = 0.75M$)

- Recommend Model 22
- ABC = max ABC
- BSAI-wide ABC and OFL for SST + non-SST
- Apportioned to AI and EBS using ratio of estimated biomass in BS and AI

	SST	non-SST	Total Other Rockfish
M	0.03	0.09	-
Biomass	51,098	1,635	52,733
F_{OFL}	0.03	0.09	-
F_{ABC}	0.0225	0.0675	-
OFL	1,533	147	1,680
ABC	1,150	110	1,260
AI ABC	294	87	381
BS ABC	856	24	880

(pg. 14 of the doc)



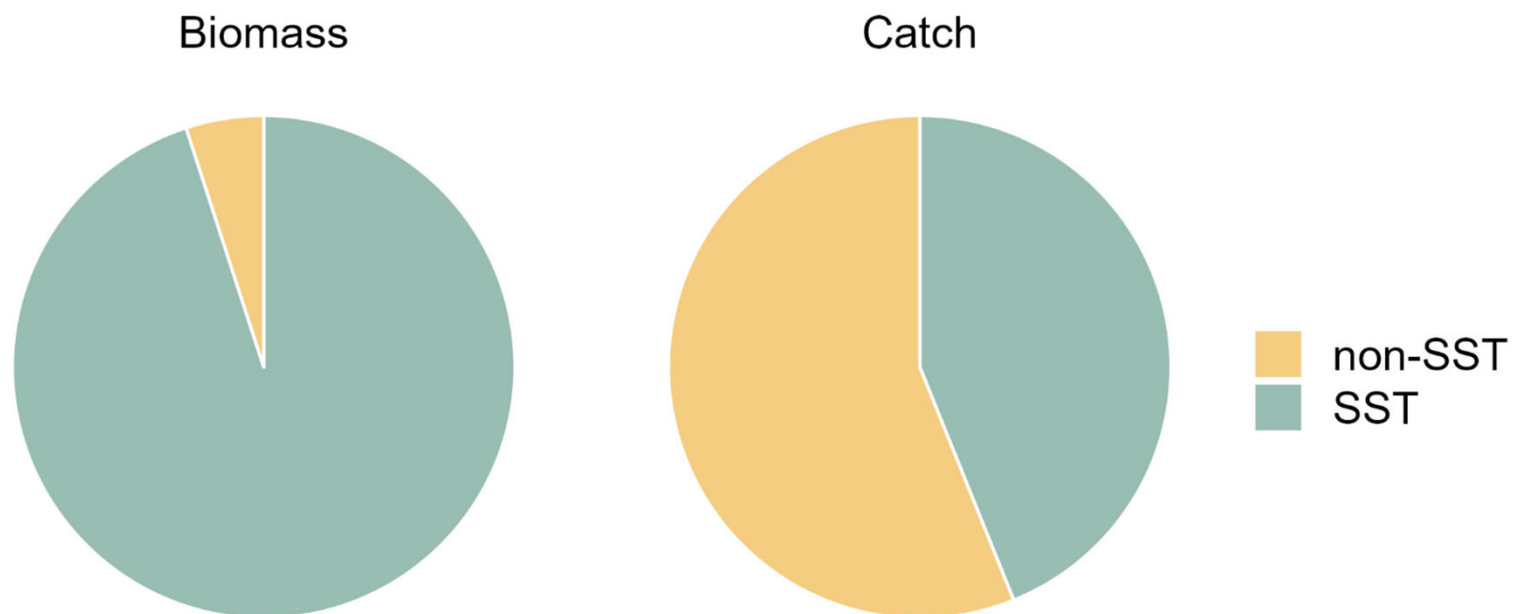
Quantity	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2022	2023	2023	2024
M (natural mortality rate) for SST	0.03	0.03	0.03	0.03
M for non-SST	0.09	0.09	0.09	0.09
Tier	5	5	5	5
RE Model Combined Biomass (t)	53,248	53,248	52,733	52,733
F_{OFL} ($F=M$) for SST	0.03	0.03	0.03	0.03
F_{OFL} ($F=M$) for non-SST	0.09	0.09	0.09	0.09
$maxF_{ABC}$ for SST	0.0225	0.0225	0.0225	0.0225
$maxF_{ABC}$ for non-SST	0.0675	0.0675	0.0675	0.0675
F_{ABC} for SST	0.0225	0.0225	0.0225	0.0225
F_{ABC} for non-SST	0.0675	0.0675	0.0675	0.0675
OFL (t)	1,751	1,751	1,680	1,680
maxABC (t)	1,313	1,313	1,260	1,260
ABC (t)	1,313	1,313	1,260	1,260
Status	As determined <i>last year for:</i>		As determined <i>this year for:</i>	
	2020	2021	2021	2022
Overfishing	No	No	No	n/a

Species	Year	Biomass	OFL	ABC	TAC	Catch
Other rockfish	2021	53,248	1,751	1,313	916	1,002
	2022	53,248	1,751	1,313	1,144	999*
	2023	52,733	1,680	1,260		
	2024	52,733	1,680	1,260		

*Catch as of Oct 3, 2022 (NFMS Alaska Regional office and Alaska Fisheries Information Network)



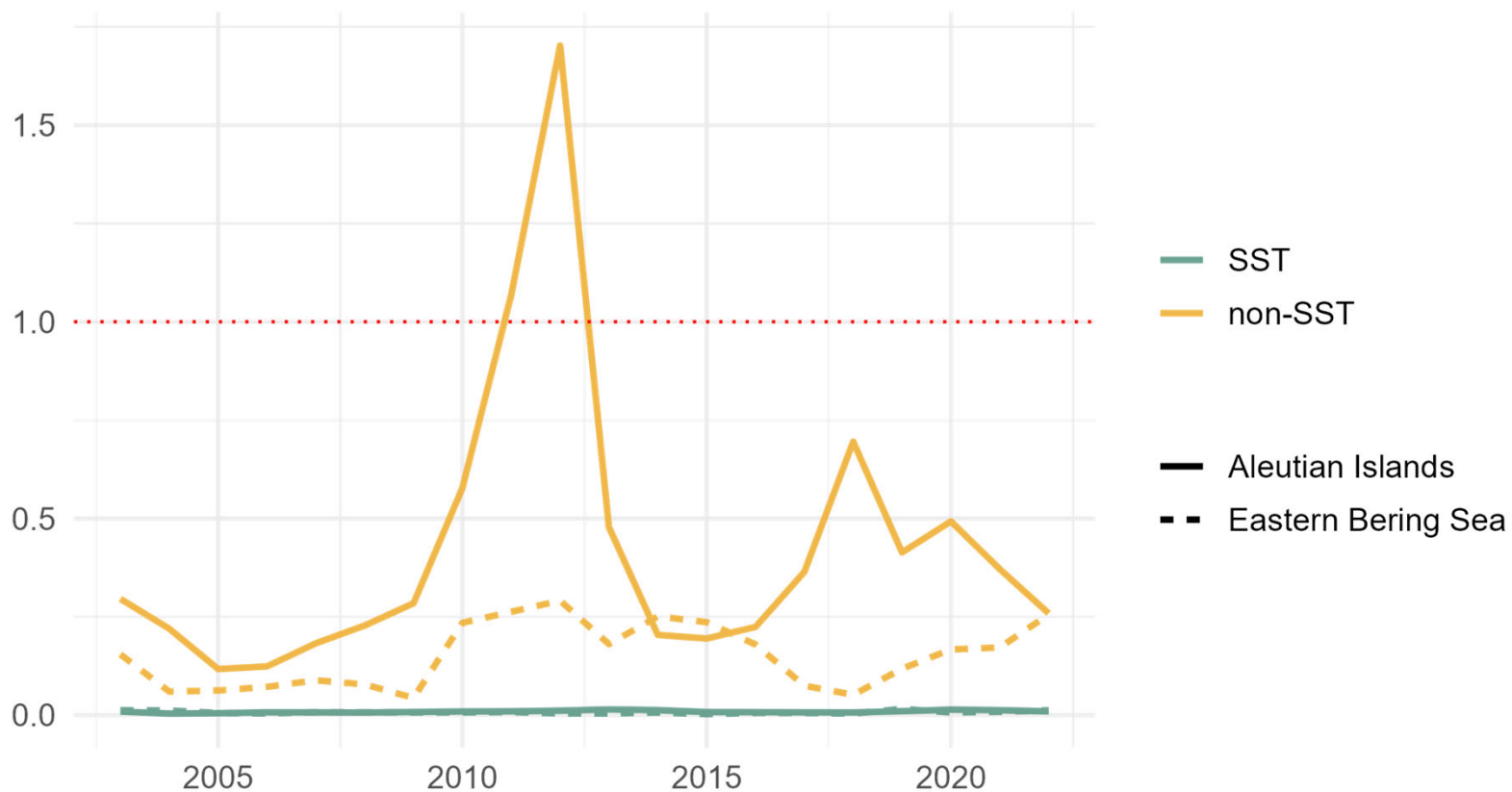
OTHER ROCKFISH SUMMARY



SST are 95% of the estimated biomass but only 44% of the catch. ABC and OFL are for all species combined.



EXPLOITATION RATE (CATCH / BIOMASS)



High catch/biomass for non-SST, especially in AI



RISK TABLE

<i>Assessment-related considerations</i>	<i>Population dynamics considerations</i>	<i>Environmental/ ecosystem considerations</i>	<i>Fishery Performance considerations</i>
Level 1: No apparent concern	Level 1: No apparent concern	Level 1: No apparent concern	Level 1: No apparent concern
Model 22 reduced SST uncertainty on the EBS slope		AI: Marine heatwave in 2022, increasing temperature trends	Bycatch only
Non-SST survey biomass poorly estimated	Continued high catch/biomass for non-SST	EBS slope: above average temperatures since 2015	Increase Atka mackerel effort in hotspot south of Seguam/Amutka



SSC/PLAN TEAM COMMENTS: BYCATCH

The Team recommended that the author do more spatial analysis of AI catch of non-SST rockfish. The Team recommended the author explore the locations, depths, seasons, the encounter rates and concentration of catch (i.e., frequent constant bycatch rates or a smaller number of highly concentrated hauls).

(Nov 2020 BSAI GPT)



Collaboration with Andy Kingham and Matt Callahan

Haul-level data from the observer program, 1996-2021

Atka mackerel and rockfish (POP) trawl target fisheries

Concentration of catch:

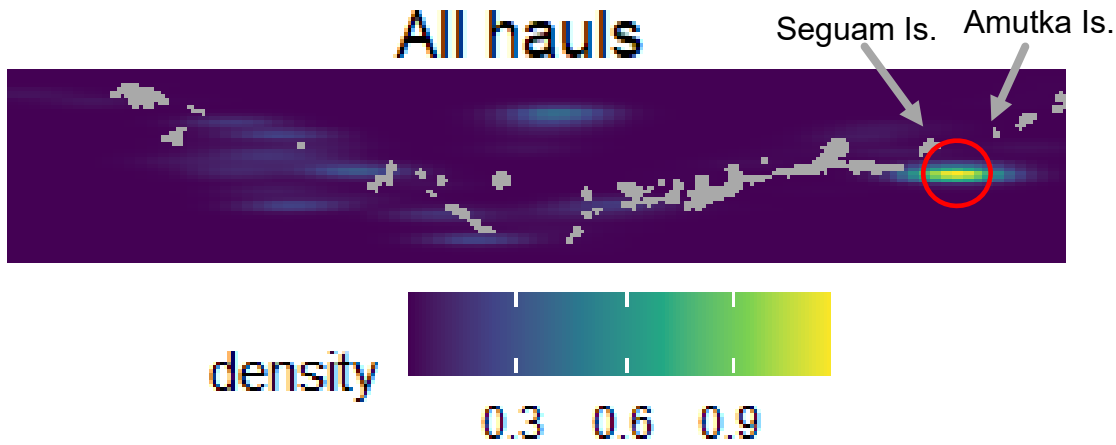
- 1) Distribution of non-SST bycatch highly right skewed (mostly zeros with a few large catches).

Atka mackerel vs. rockfish target hauls:

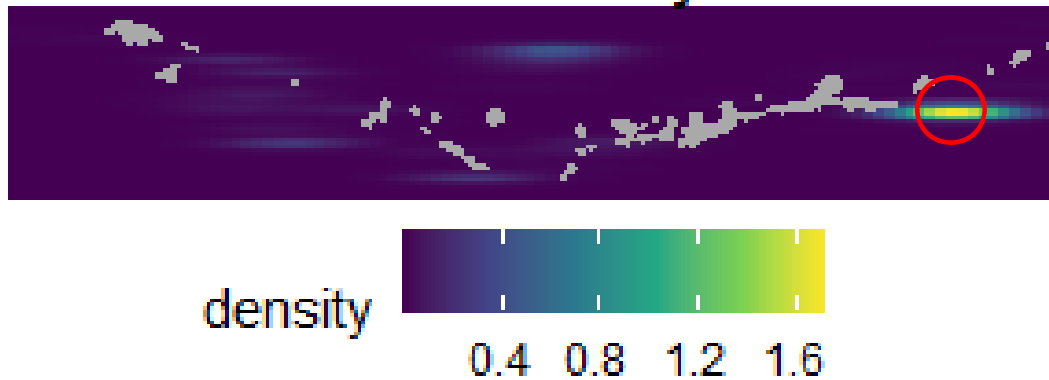
- 1) 74% of all hauls analyzed were Atka mackerel targets.
- 2) 81% of all hauls with non-SST present were Atka mackerel targets, representing 80% of the total non-SST bycatch by weight.



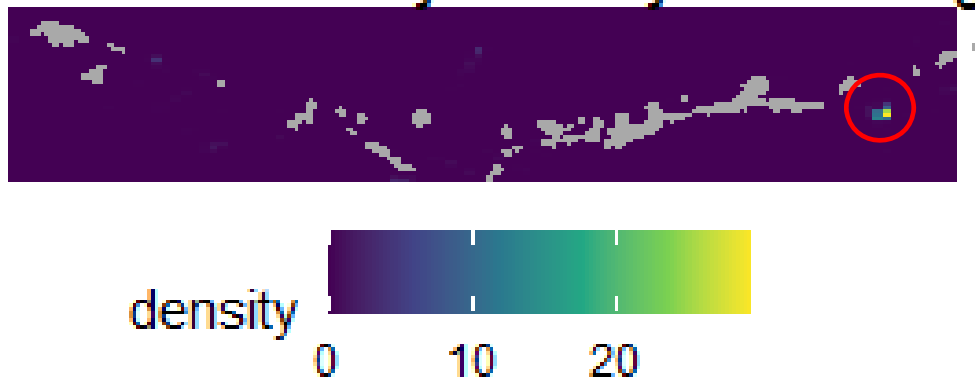
All hauls



Hauls with orox bycatch



Top 10% of hauls by orox bycatch weight



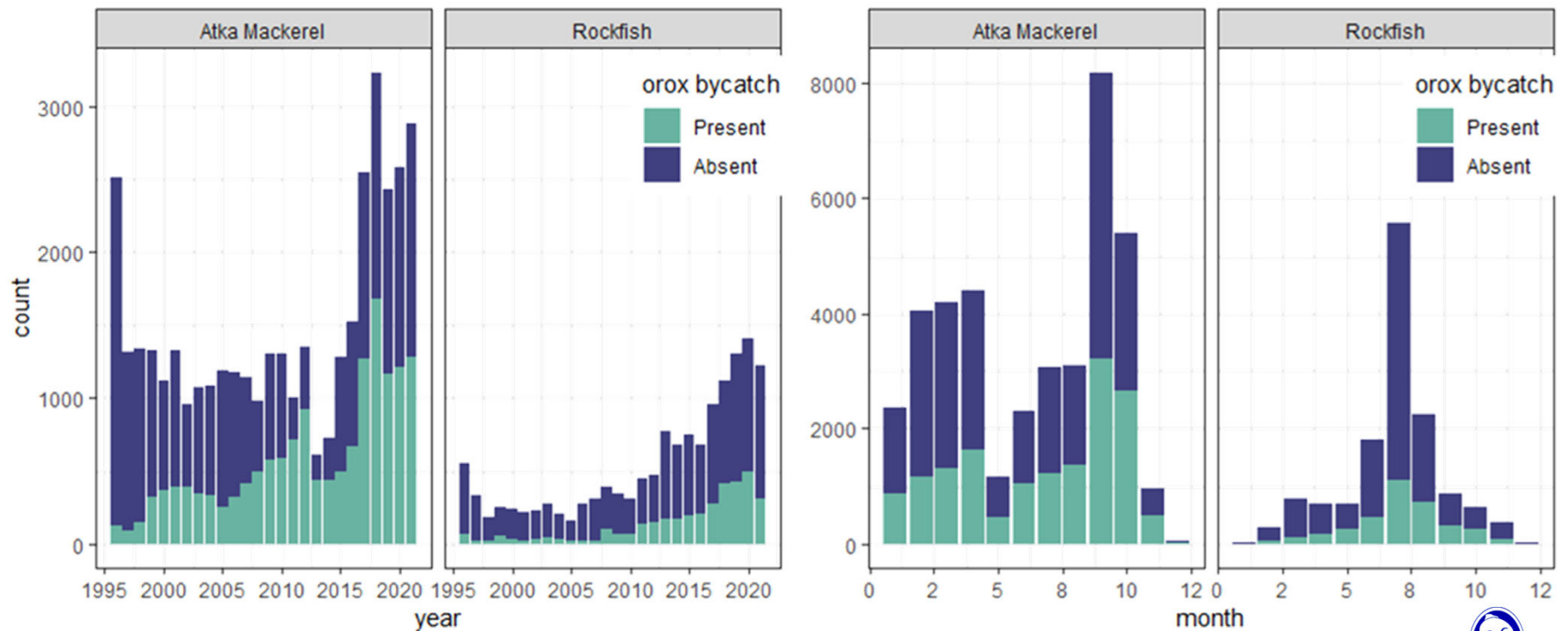
Since 2010, encounter rates of non-SST in the Aleutians averaged 54% in the Atka mackerel fishery and 30% in the rockfish fishery

Over the same time period in the Seguam/Amutka hotspot, encounter rates averaged 64% in the Atka mackerel fishery and 59% in the rockfish fishery



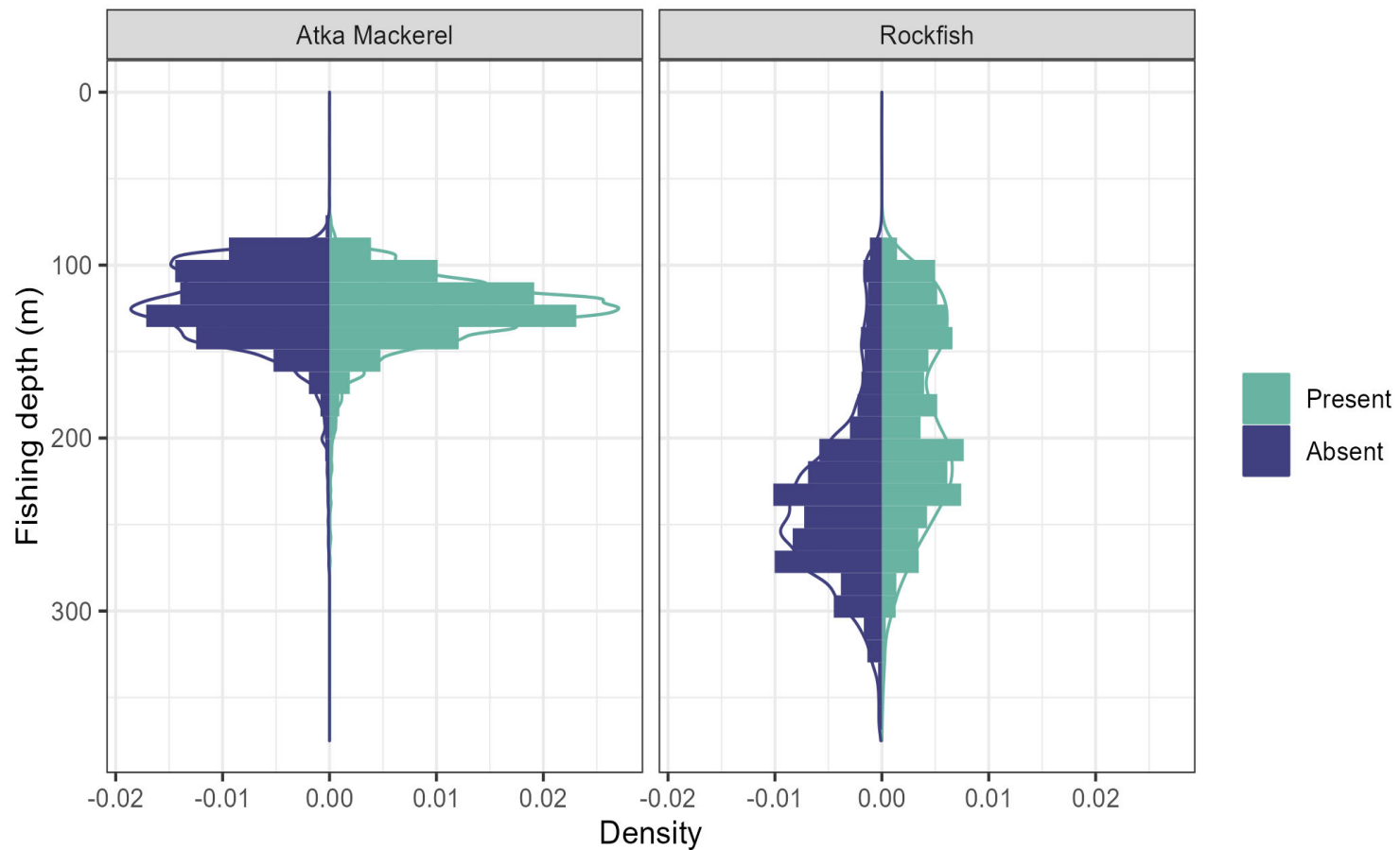
Temporal/seasonal trends:

- 1) Number of hauls (and consequently number of hauls with non-SST present) has increased in recent years
- 2) Peaks in Sep/Oct in Atka mackerel fishery (spawning period) and July in rockfish fishery



Depth:

- 1) Bycatch rates independent of depth in the Atka mackerel fishery (75-175 m)
- 2) Shallow rockfish target hauls (100-200 m) had higher incidences of non-SST bycatch than deeper hauls (>200 m)



QUESTIONS?



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EXTRA SLIDES



SSC/PLAN TEAM COMMENTS: M

The Team recommended that the author consult with other rockfish assessment authors to consider revising M for the non-SST portion of the population.... (November 2020 BSAI GPT)

TenBrink et al. (in prep): AI dusky and harlequin growth, distribution, and M

Sullivan et al. 2022: Tech Memo reviewing life history data and M for 11 AK rockfish

Not available for Sep 2022. Plan to make a recommendation in future assessments.



SSC/PLAN TEAM COMMENTS: ZEROS

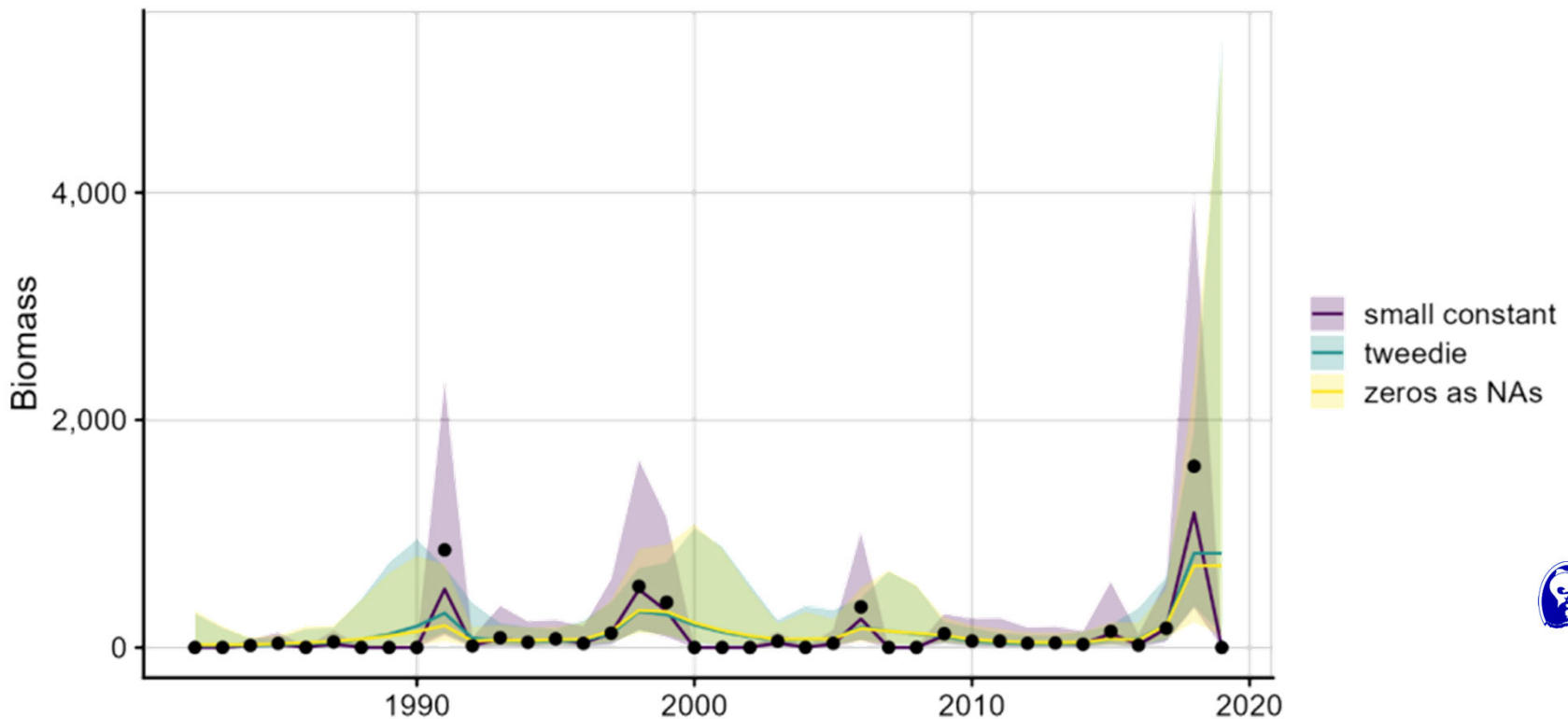
“Specifically, the manner in which biomass estimates of 0 are handled (i.e., currently ignored) should be revisited. (Nov 2020 BSAI GPT)

- ✓ Non-SST have a lot of zeros! (14/39 observations in EBS shelf trawl survey)
- ✓ New *rema* R library options for zeros ([Sullivan et al. 2022](#)):
 - (1) zeros as NAs (defaults to this with a warning)
 - (2) small constant with fixed CV
 - (3) Tweedie distribution for observation likelihood (experimental)

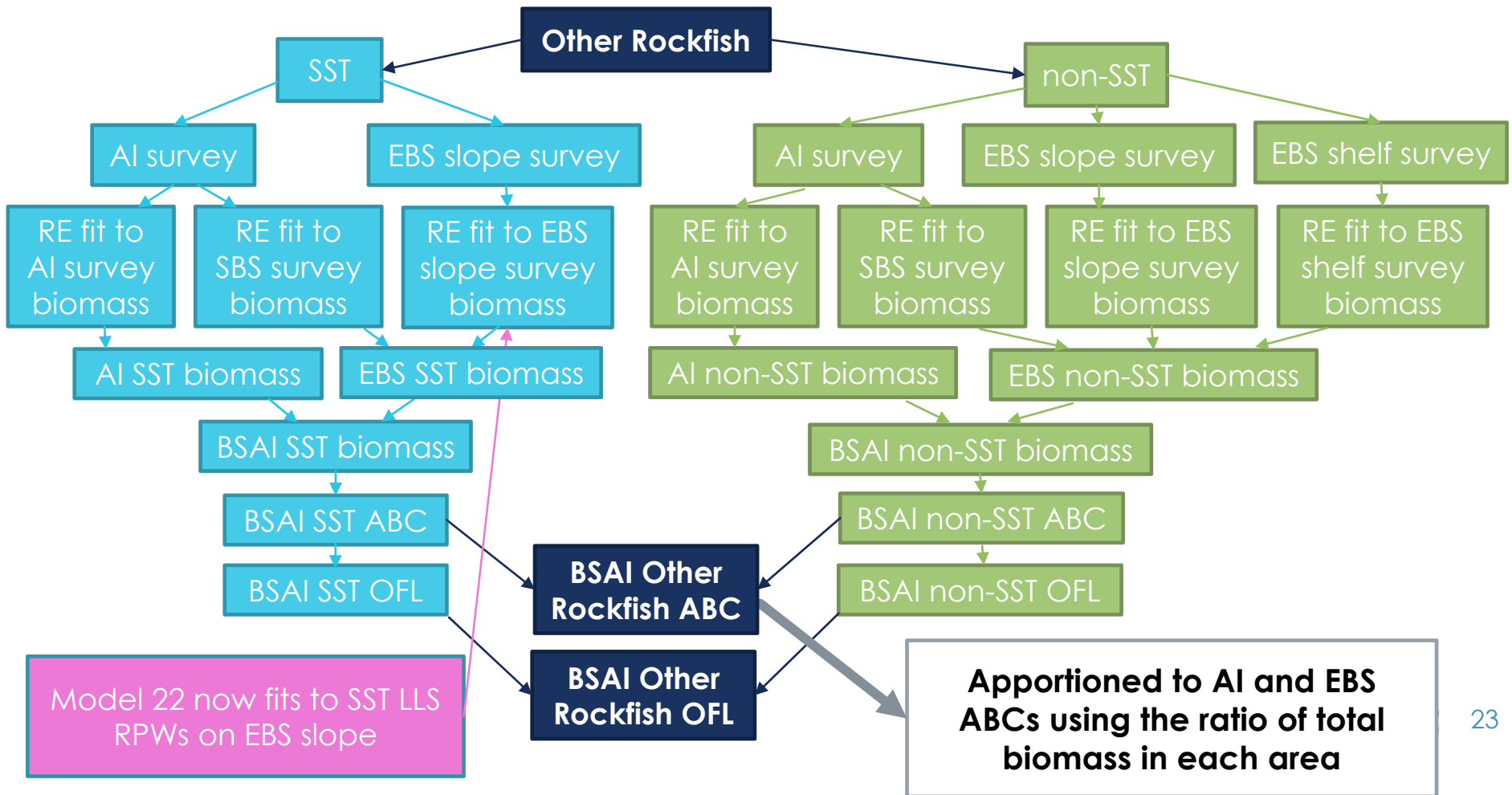


Recommend status quo approach to zeros (treat them as NA values or failed surveys):

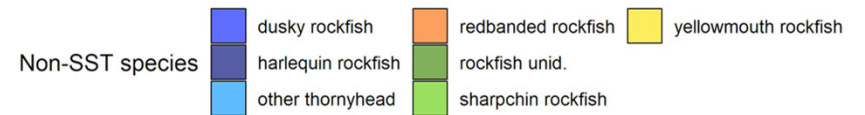
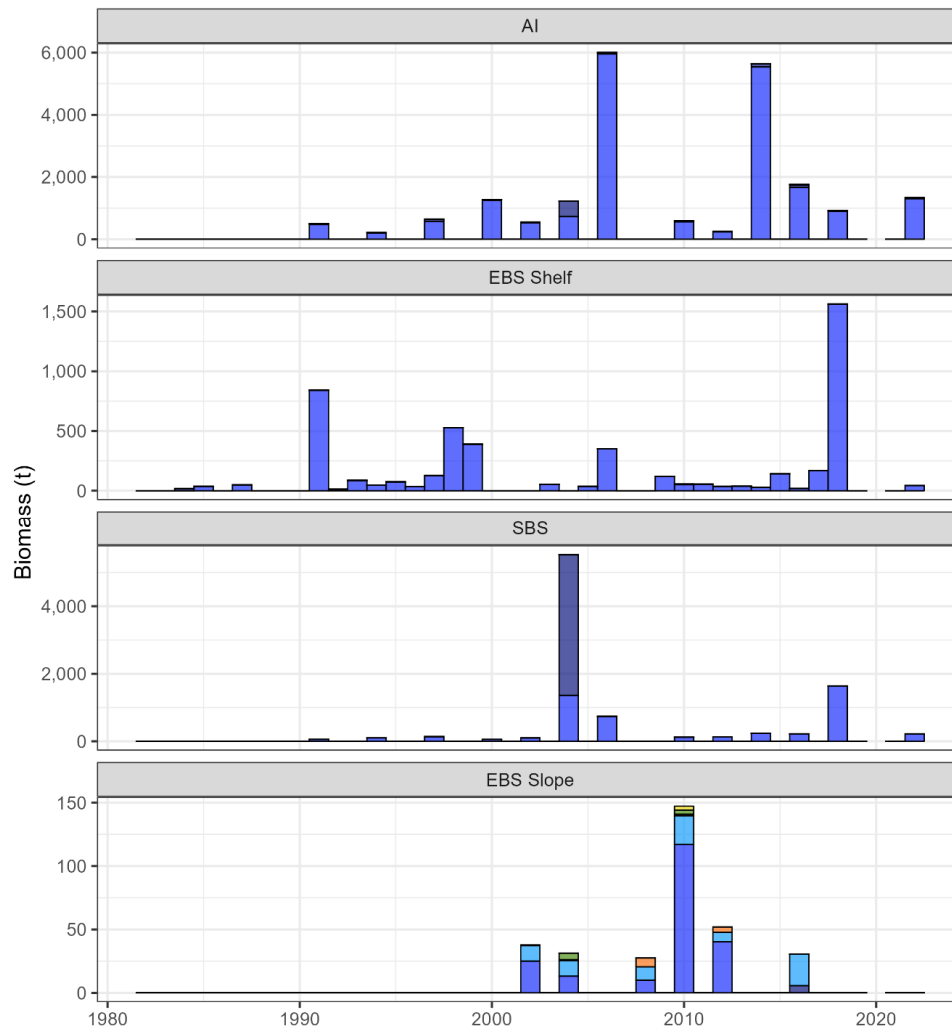
- 1) Consistency with other Tier 5 assessments
- 2) Effectively dampens periodic high biomass estimates
- 3) Most closely mimics Tweedie (positive, continuous, can include zeros)



FLOW CHART OF ASSESSMENT AND APPORTIONMENT: SPLIT-SPLIT-SPLIT-LUMP-LUMP-LUMP-SPLIT

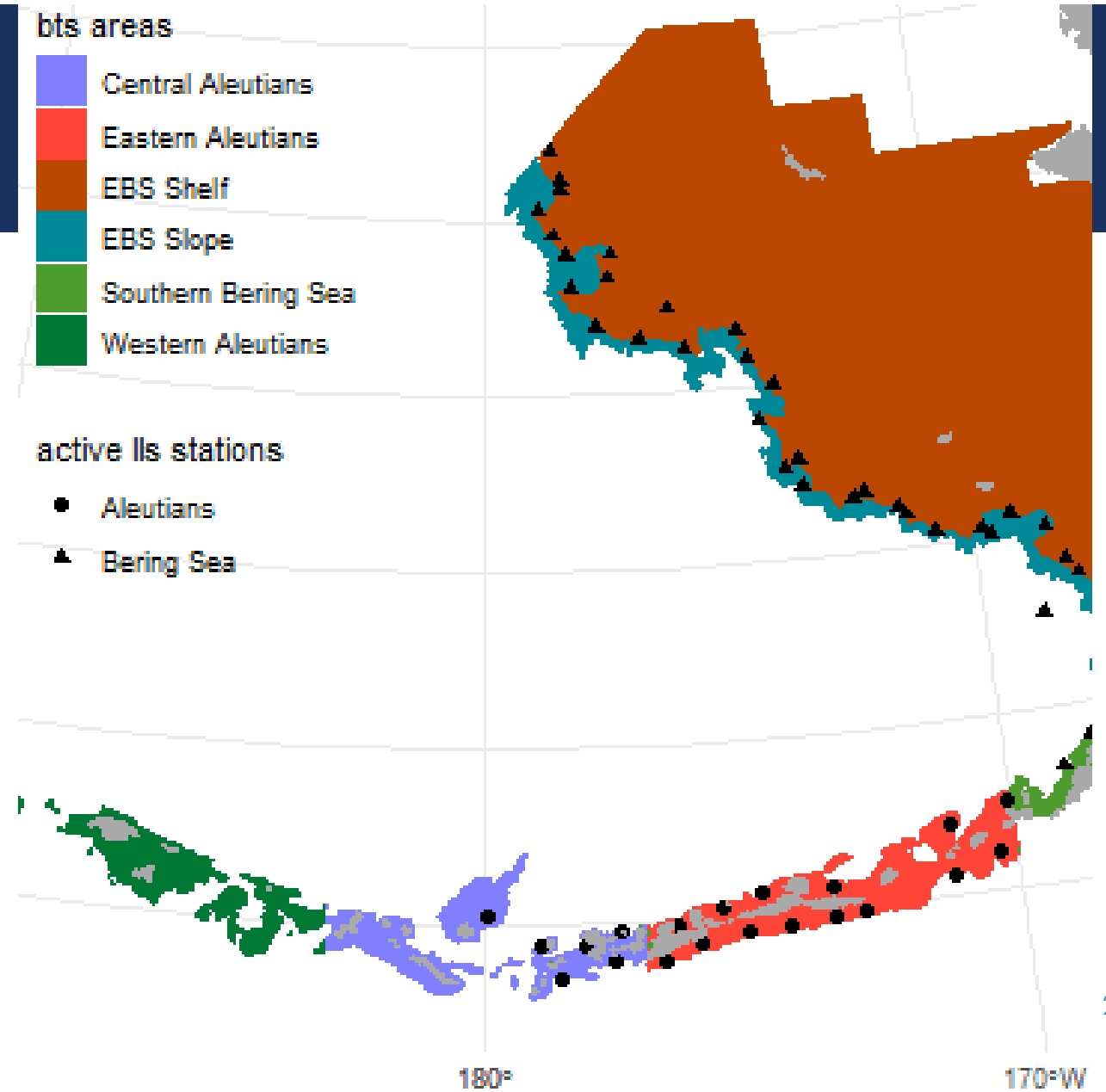


DETAILED NON-SST SURVEY BIOMASS



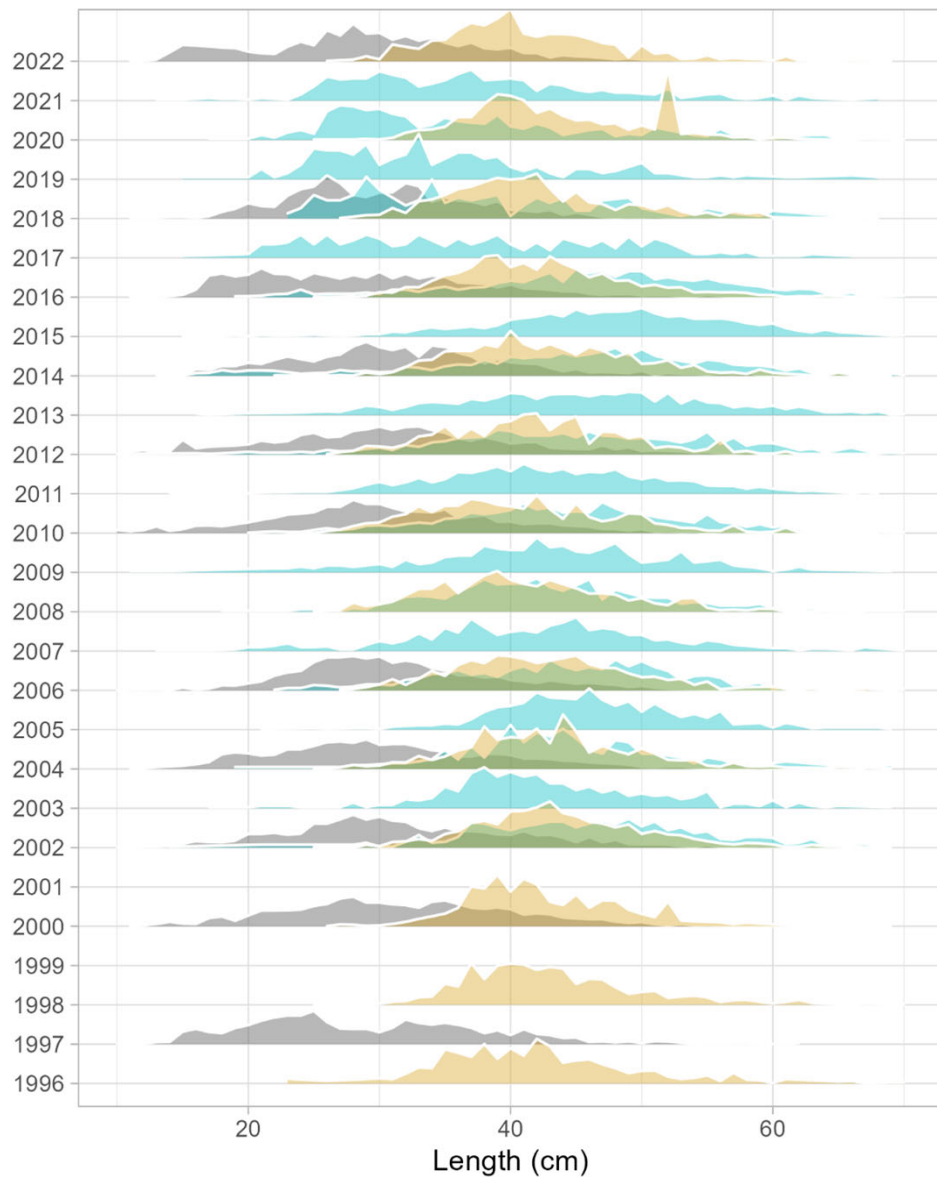
Why didn't we use LLS RPWs in the AI?

Spatial mismatch in the survey indices



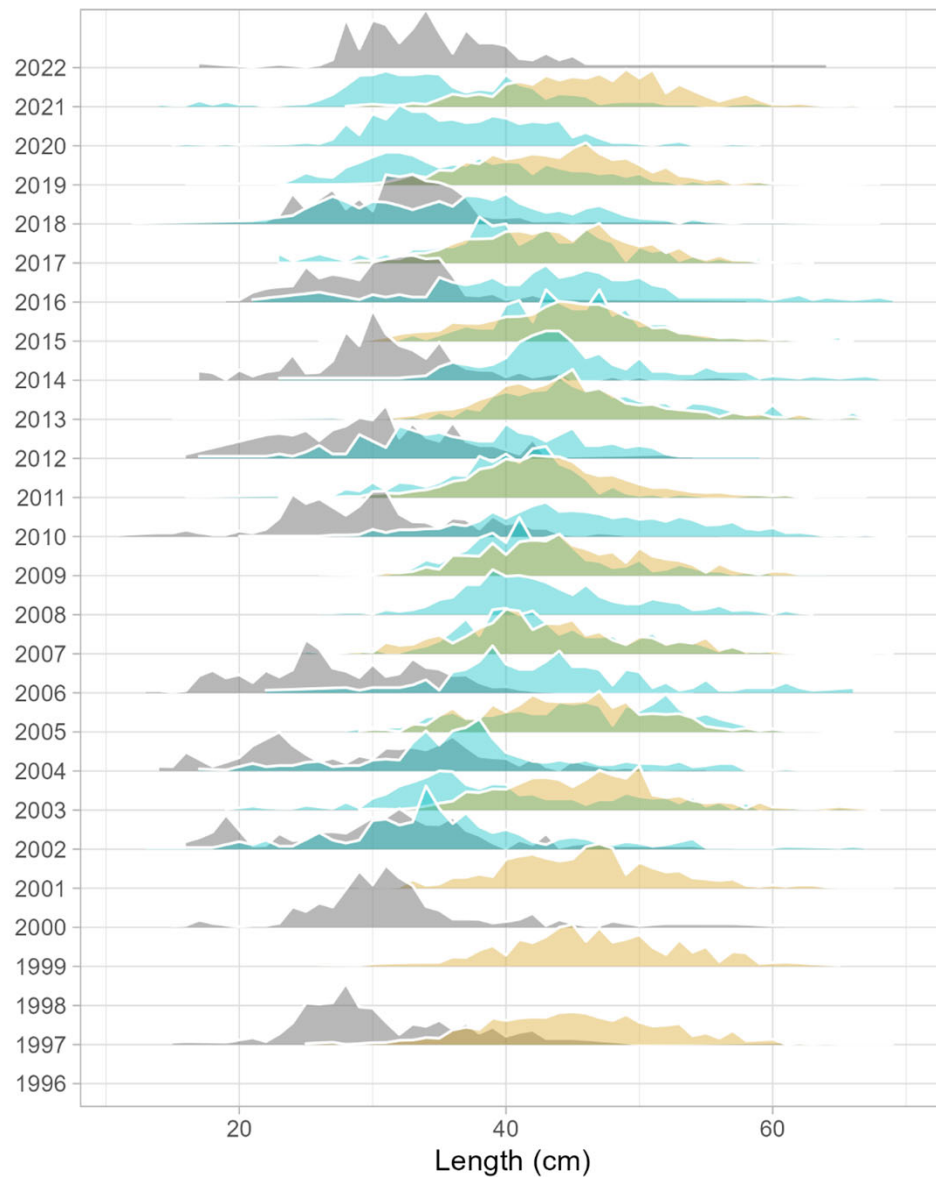
AI shortspine thornyhead

AI BTS AI fishery AI LLS



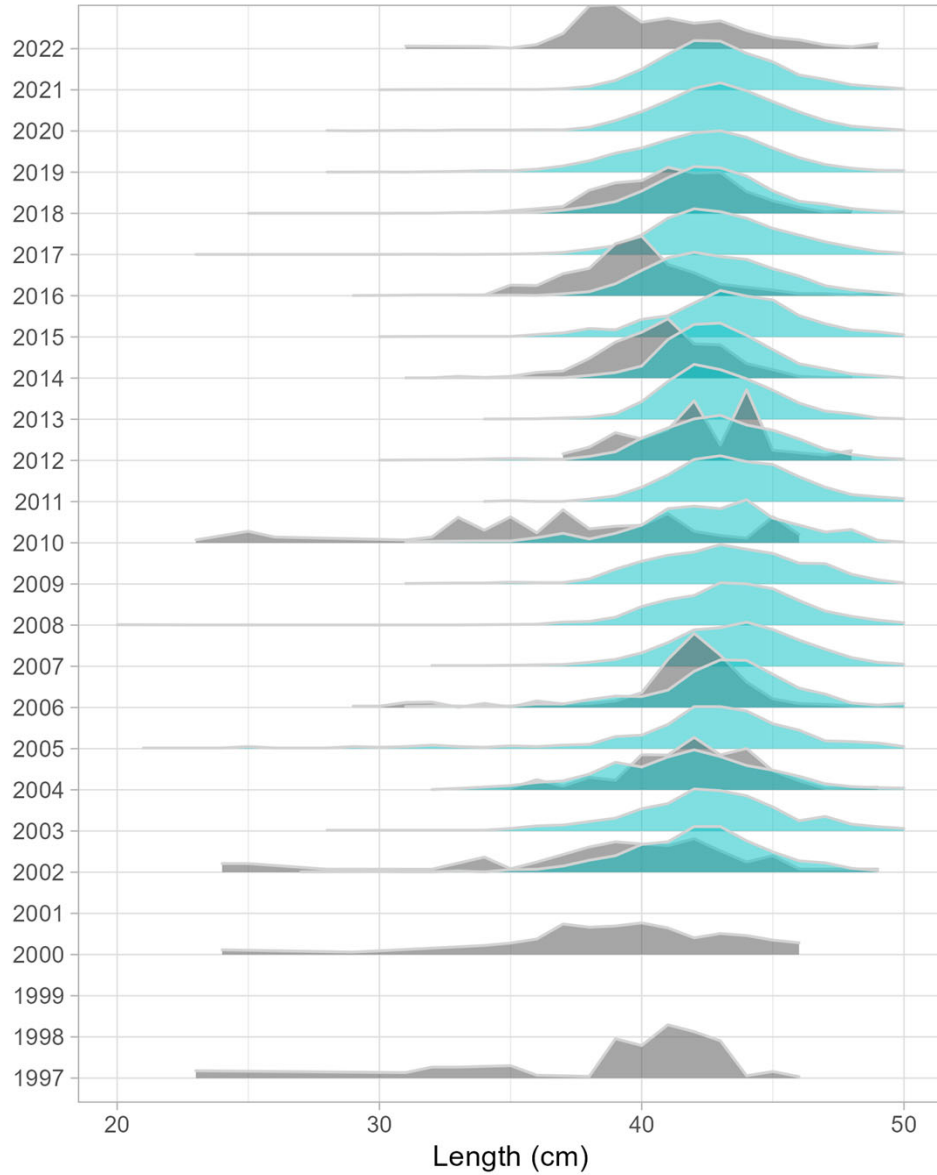
EBS shortspine thornyhead

AI BTS in SBS EBS fishery EBS LLS



AI dusky rockfish

AI BTS AI fishery



EBS dusky rockfish

AI BTS in SBS EBS fishery

