GOA Demersal Shelf Rockfish

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Kristen Omori, Phil Joy, Christine Hinds, Bridget Ferriss

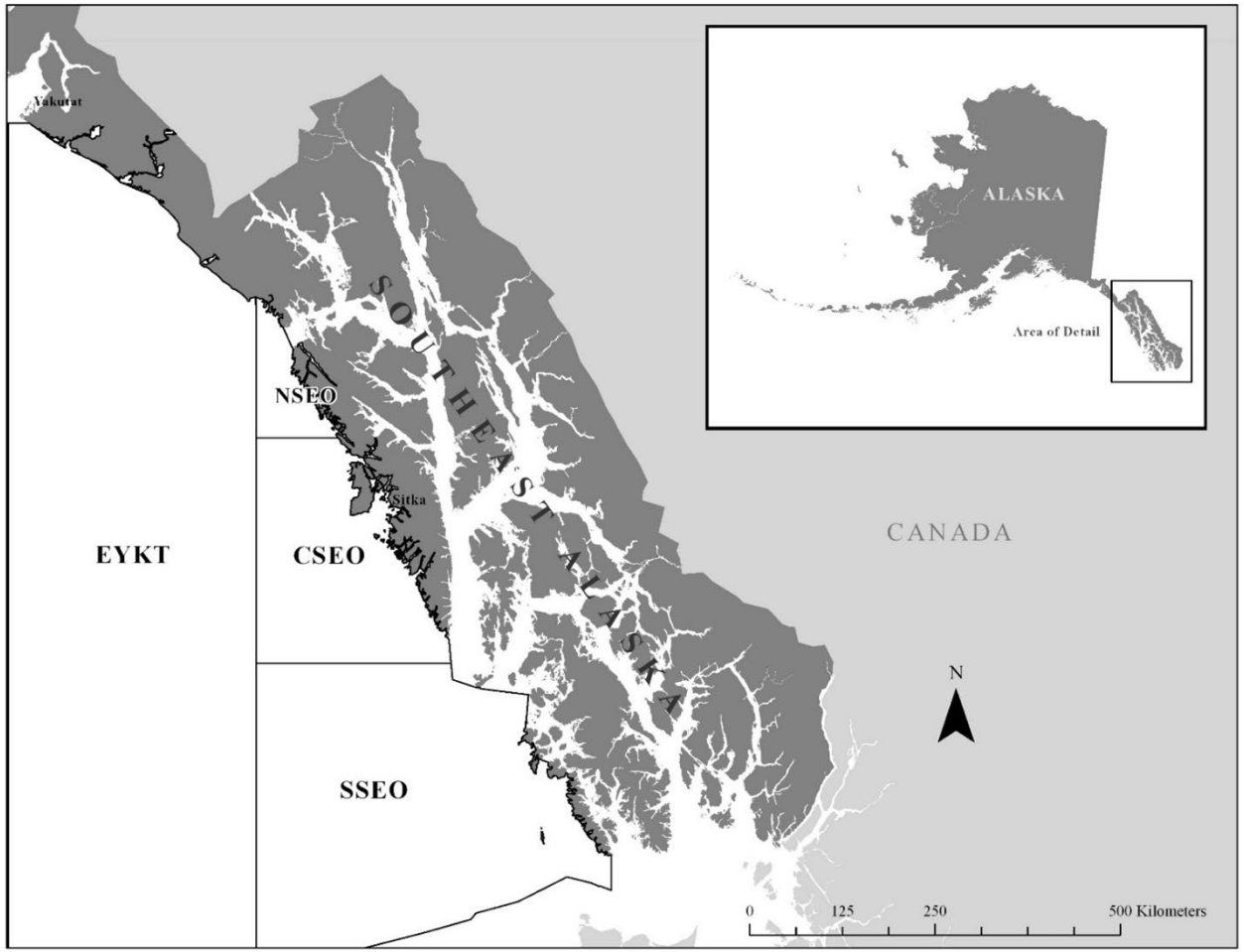
GOA Demersal Shelf Rockfish

- DSR in Central GOA/Western GOA/West Yakutat: Tier 6
- DSR except yelloweye rockfish in Southeast Outside: Tier 6
- Yelloweye in SEO: Tier 5, two-index multi-area random effects model (REMA)

"The Council recommends moving the seven demersal shelf rockfish (DSR) species which currently occur in the 'other rockfish' complex (i.e., those occurring to the west of EY/SEO) into a separate DSR complex for WG/CG/WY during the 2024 Plan Team cycle for implementation in the 2025 fisheries. This change would result in ABCs and OFLs being spatially apportioned in the following ways: Other Rockfish: One Gulf-wide OFL with three separate ABCs for WG/CG, WY, EY/SEO. DSR: Two stock complexes with separate OFLs and ABCs for WG/CG/WY and EY/SEO" (NPFMC, Oct. 2023)

Changes in the input data

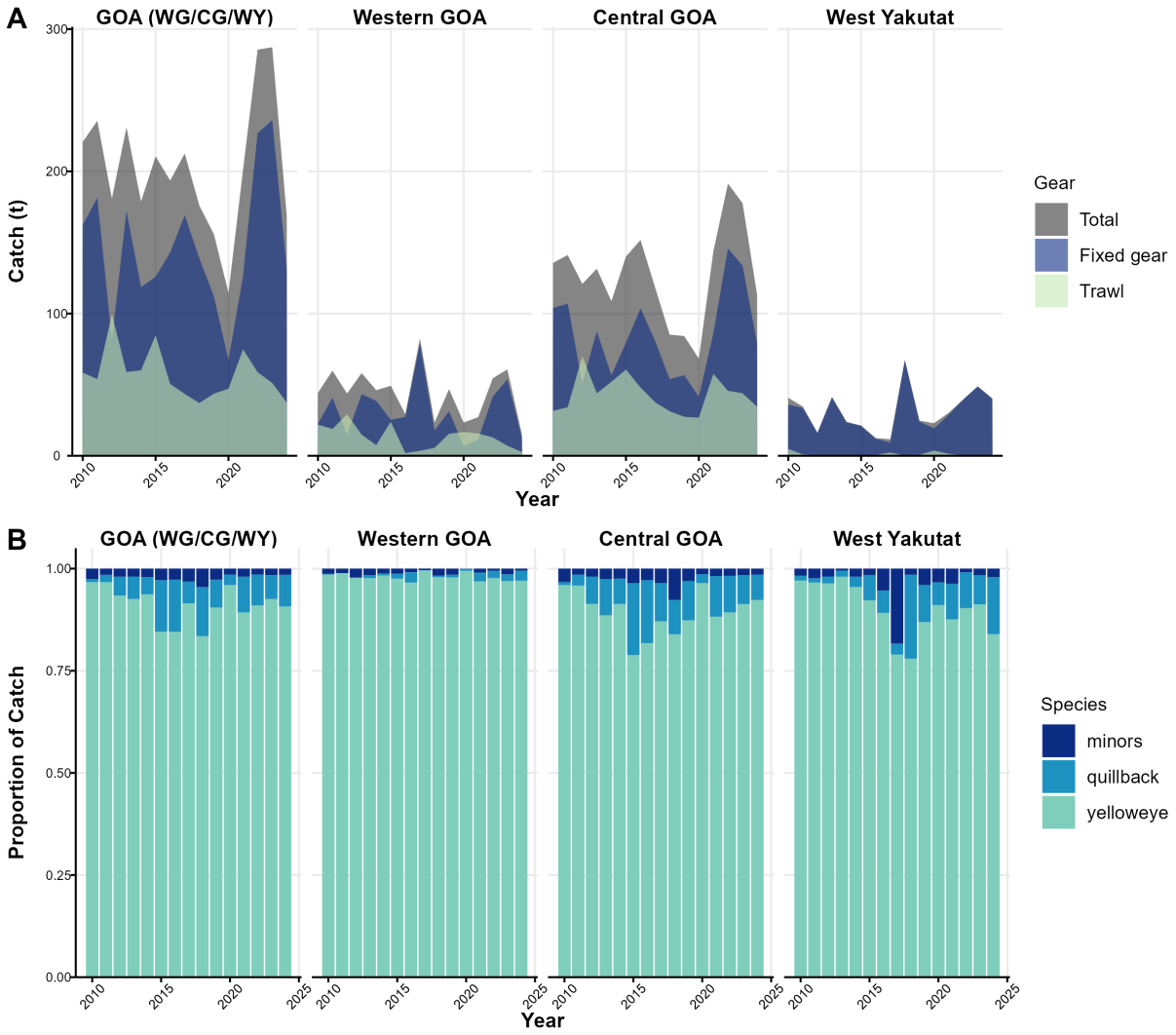
- IPHC longline survey data from 2022, 2023. 2024 not yet available.
- ADF&G ROV survey data from Northern Southeast Outside in 2022 and East Yakutat in 2023. No ROV surveys in 2024.
- SEO commercial fishery average weights
- WG/CG/WY DSR catch estimates from AKRO blend estimates and CAS data



Changes in assessment methodology

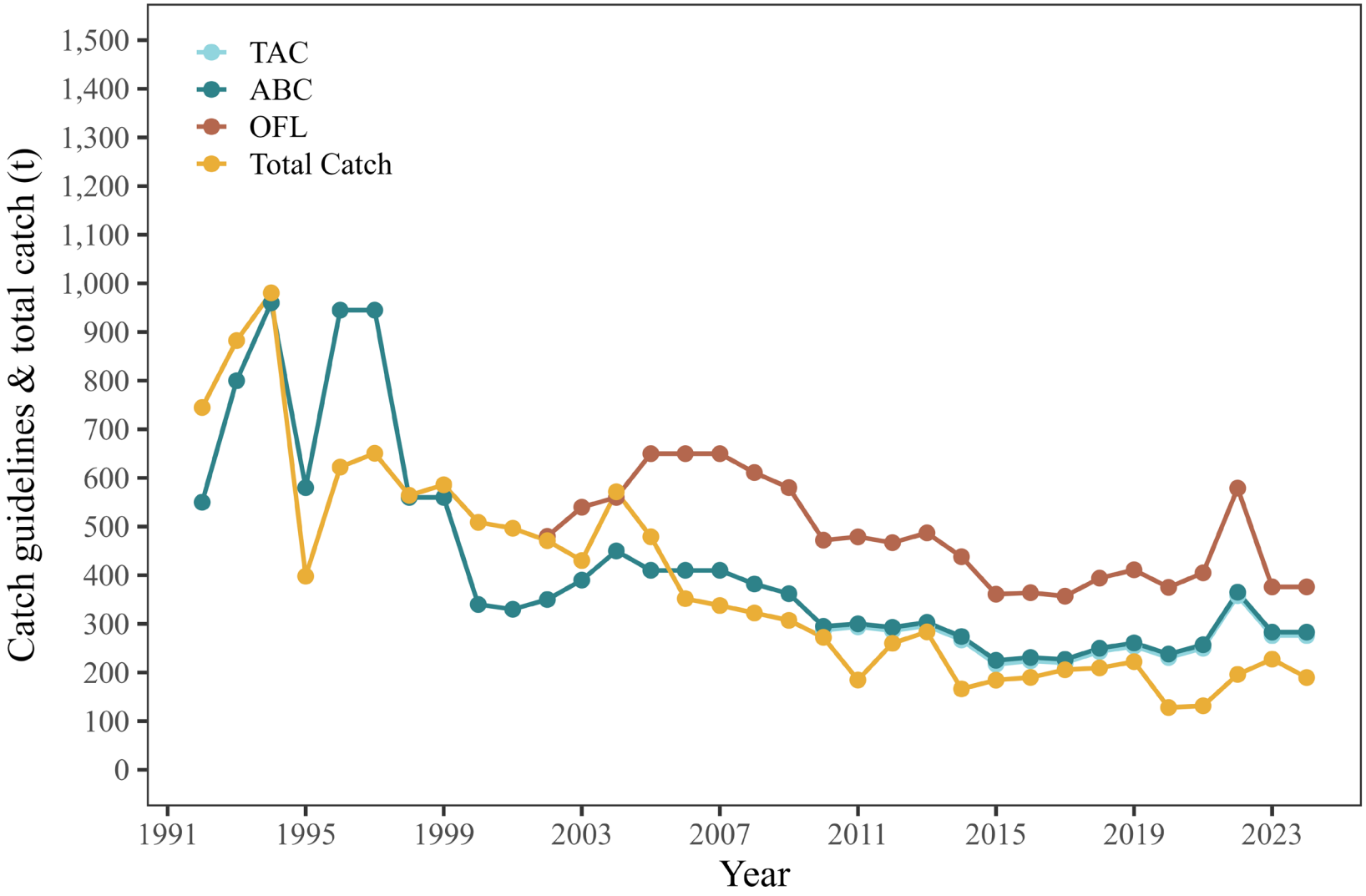
- Assessment now includes DSR species in WG/CG/WY (previously in GOA Other Rockfish); all species managed as Tier 6
- Yelloweye rockfish natural mortality value changed from 0.02 to 0.044, as recommended in the CIE review
  - Leads to larger OFL and ABC
- IPHC longline survey CPUE index used in the SEO yelloweye model is now:
  - Calculated in kg/hook (recommended in CIE review)
  - Standardized using a GAM with the Tweedie distribution to accommodate zero inflation, as recommended in the CIE review

Current status for CG/WG/WY DSR: catch



Year	WG	CG	WY	GOA (W/C/WY)	ABC	OFL	TAC
2020	23	68	23	115			
2021	27	144	30	201			
2022	55	191	40	286			
2023	61	178	49	287			
2024	15	113	40	169			
2025					271	360	

Current status for SEO DSR: catch



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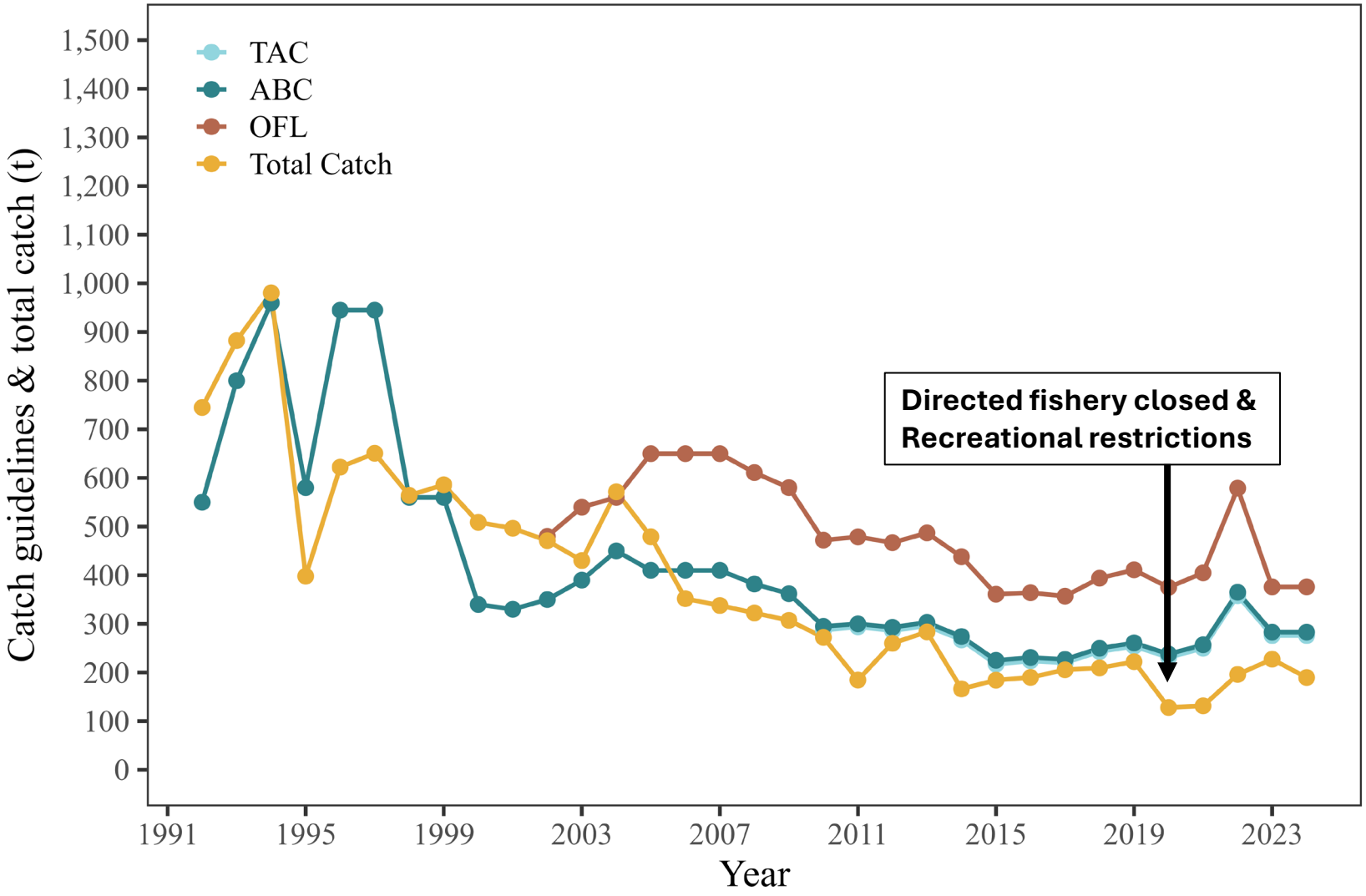

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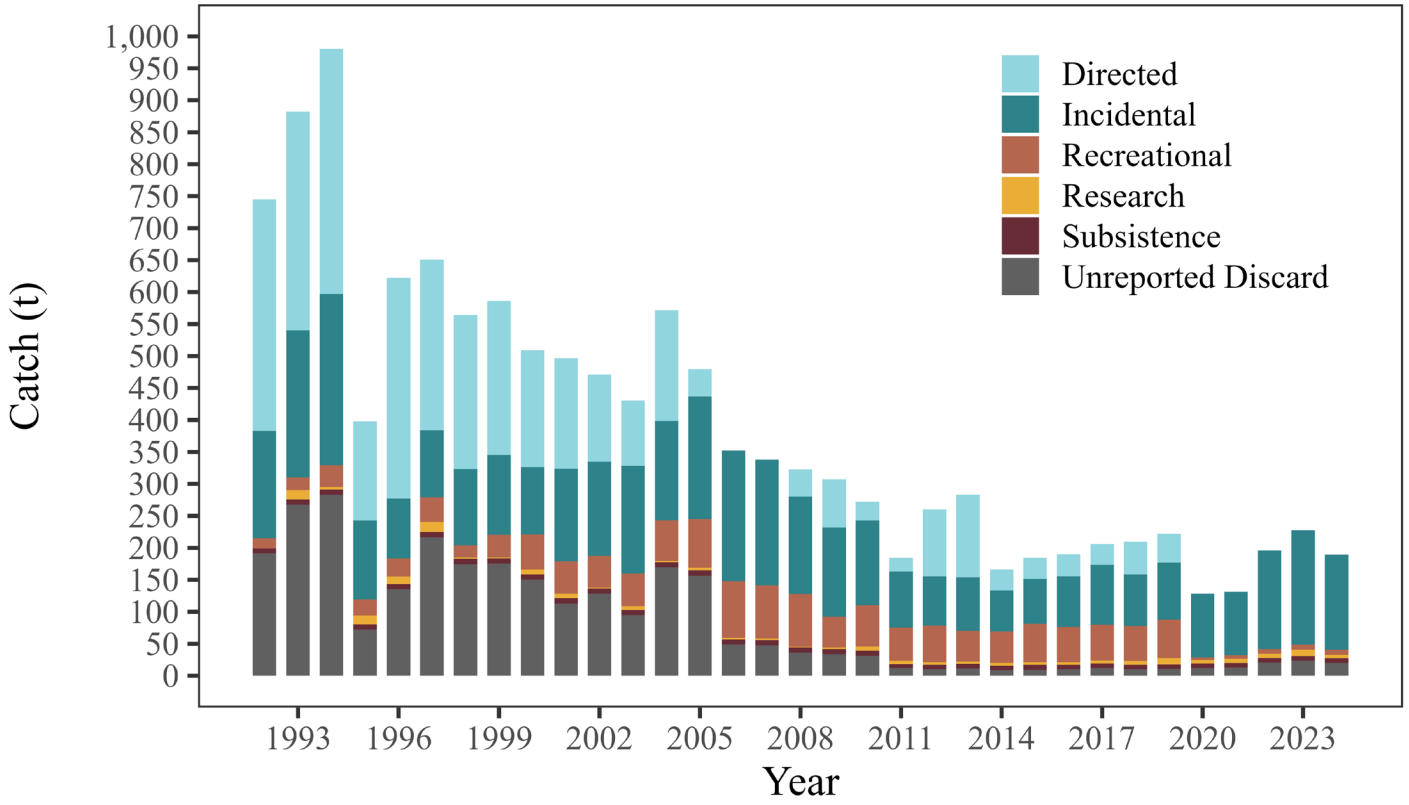
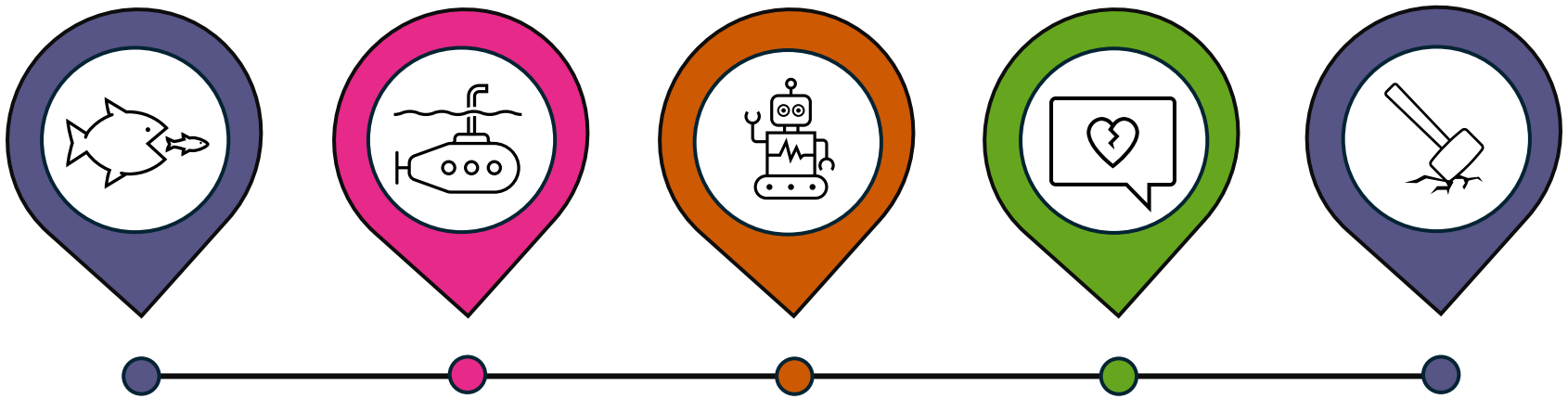


Year	Research	Directed	Incidental	Unreported discards	Recreational	Subsistence	Total	ABC	OFL	TAC
2020	6	0	99	12	4	7	128	238	375	231
2021	6	0	99	13	6	7	131	257	405	250
2022	7	0	155	21	7	7	197	365	579	358
2023	10	0	179	24	8	7	228	283	376	276
2024	5	0	149	20	8	7	189	283	376	276

SEO DSR Assessment & Survey History



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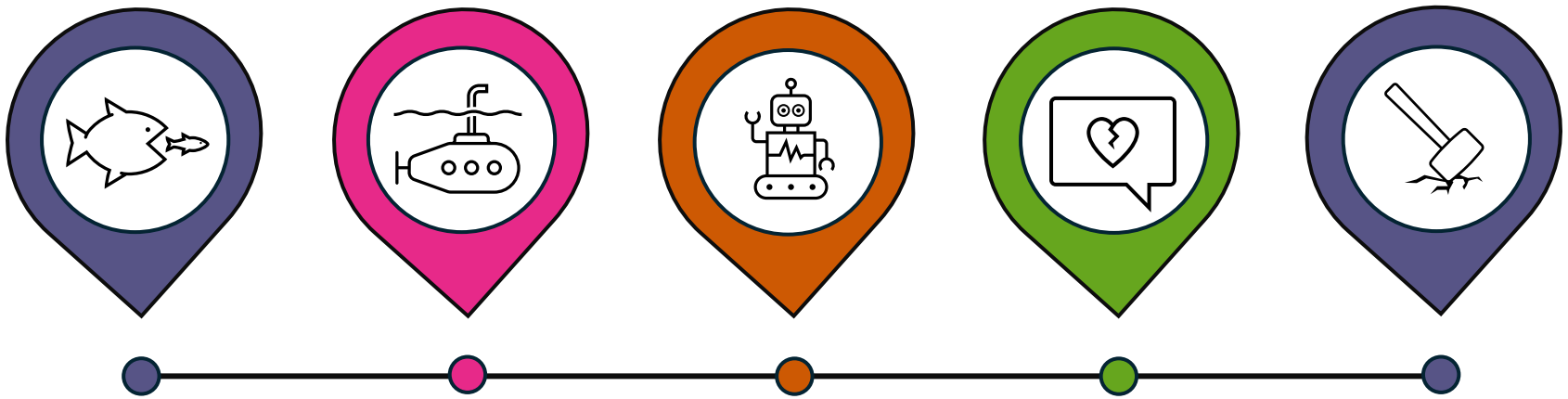

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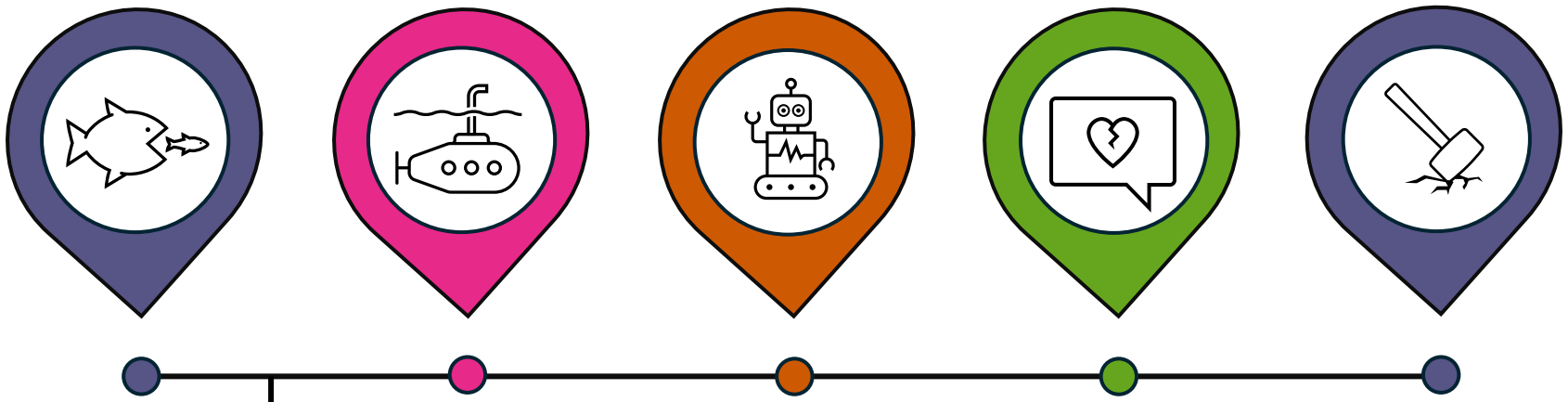

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Transect data used to set SEO targets for the first time

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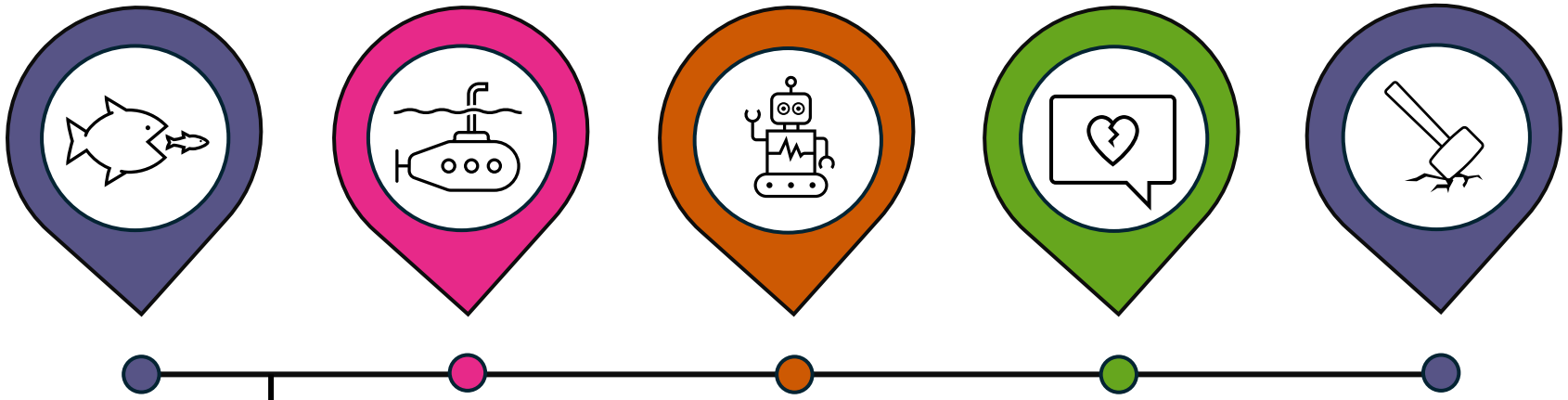

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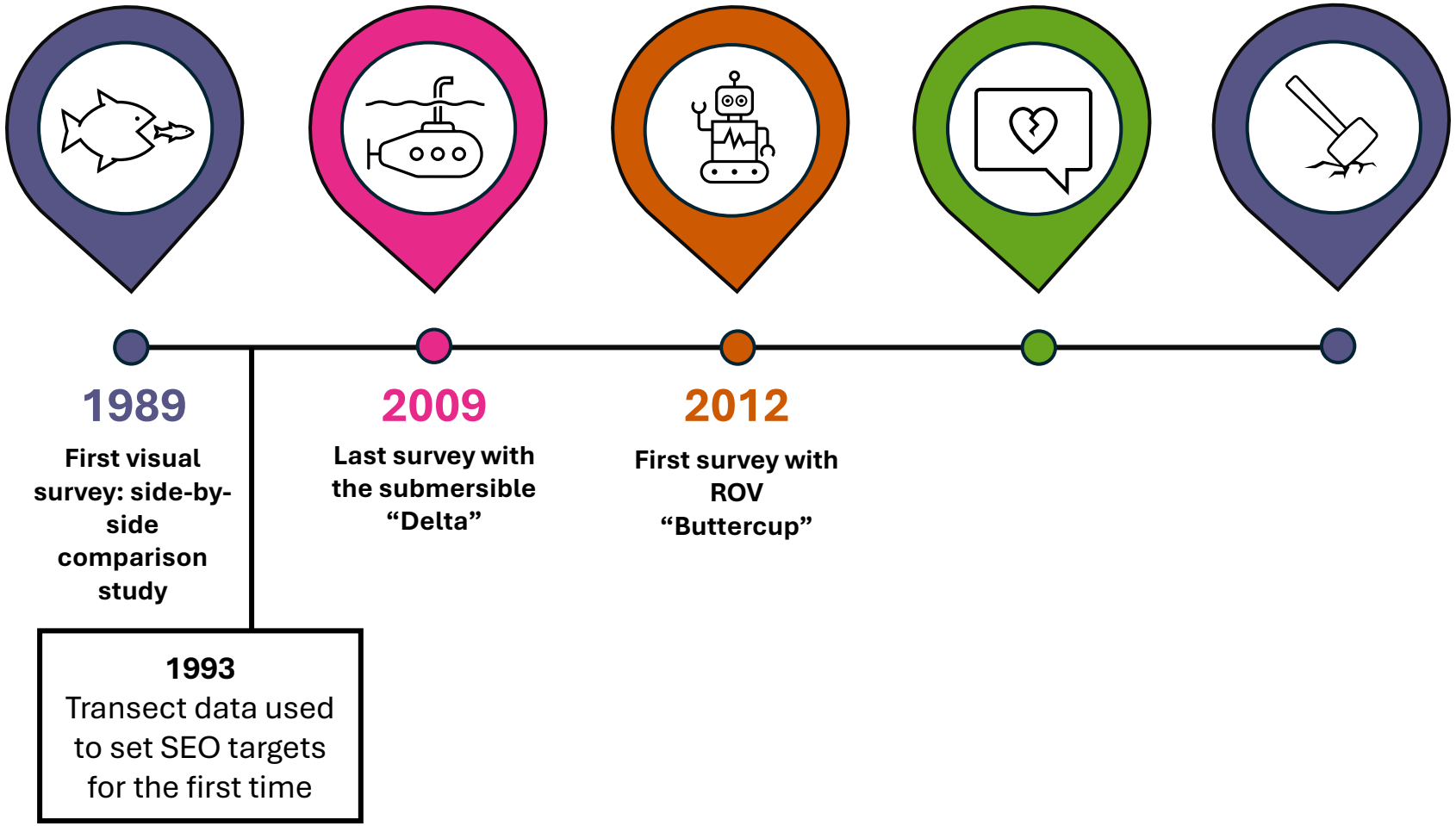

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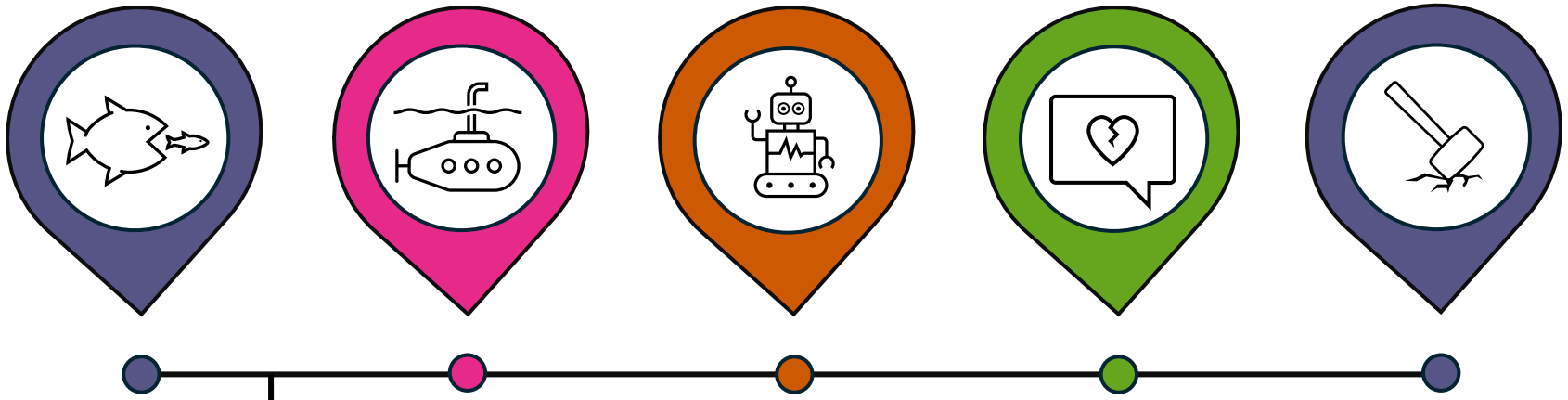

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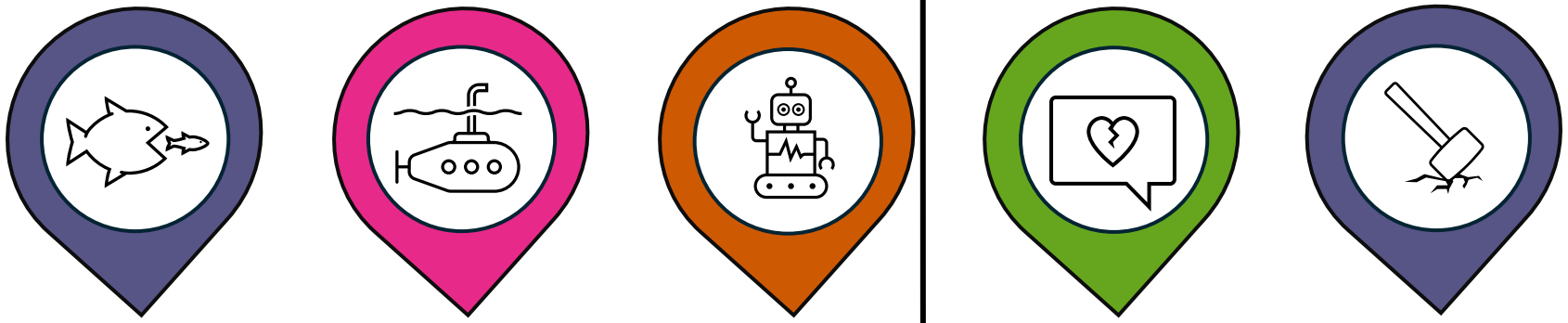
Status-quo method: Lower 90% confidence interval of biomass estimate to set targets

SEO DSR Assessment & Survey History

2013 & 2015
Random effects model presented



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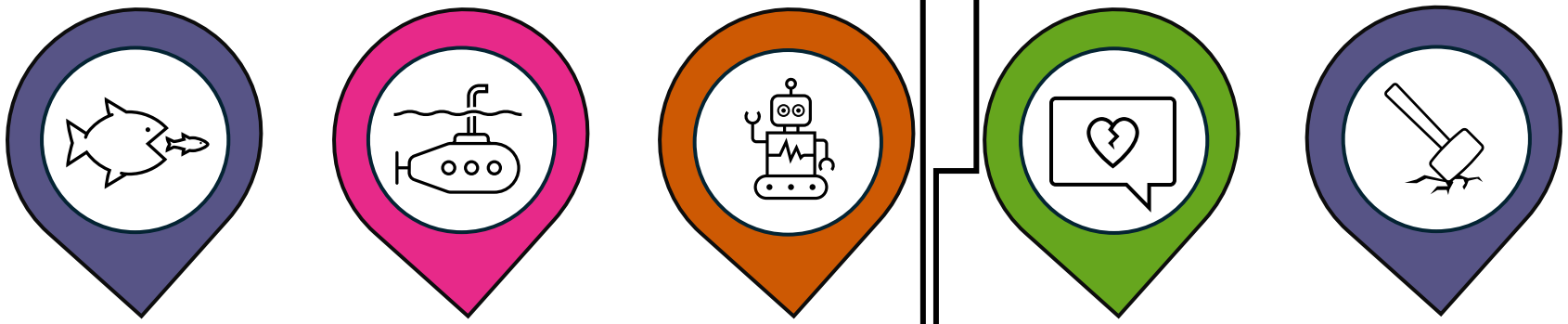

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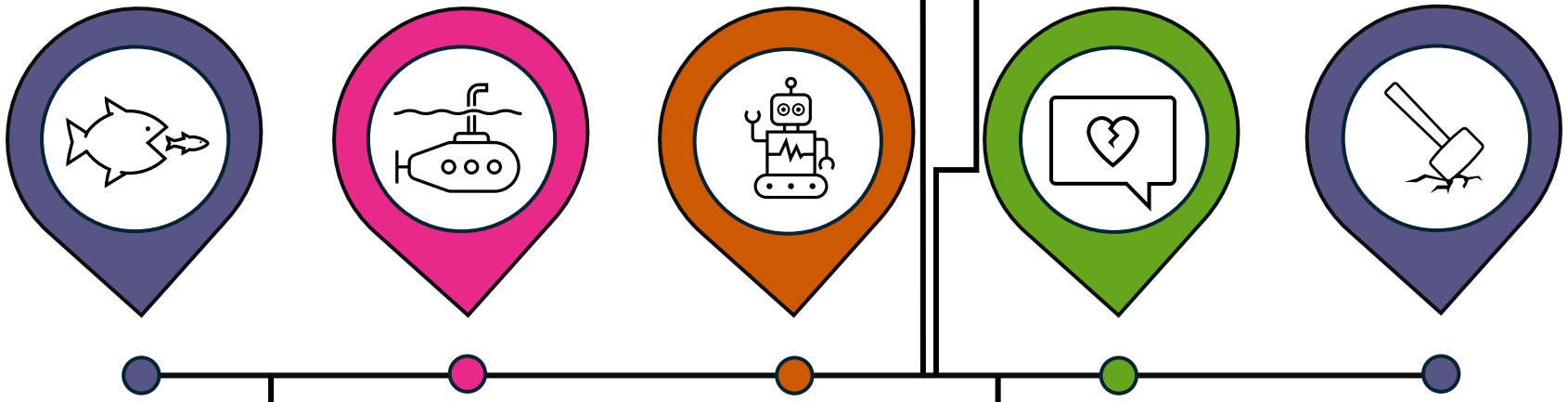

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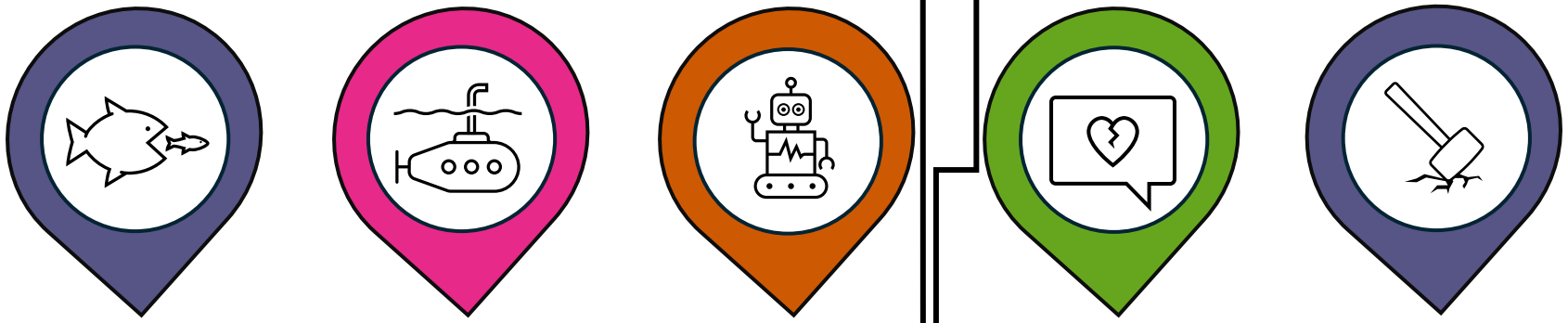

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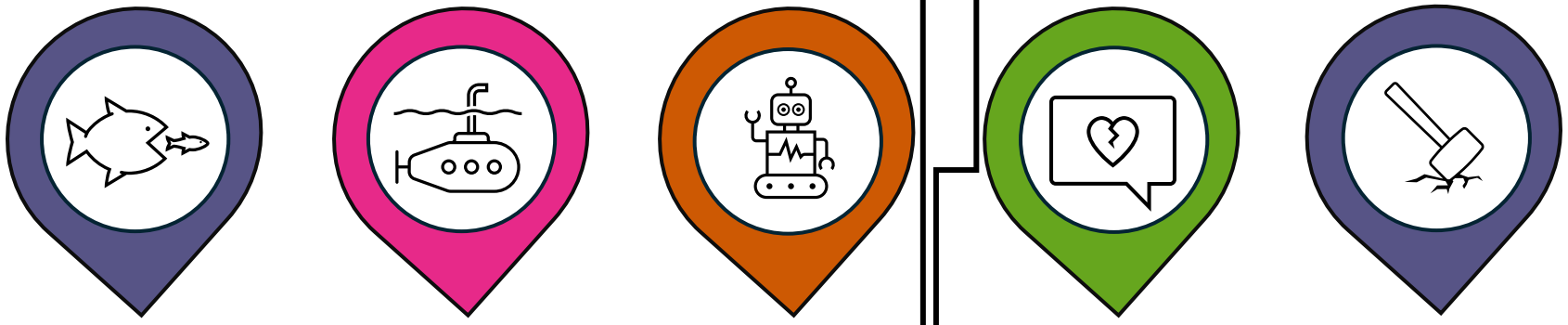

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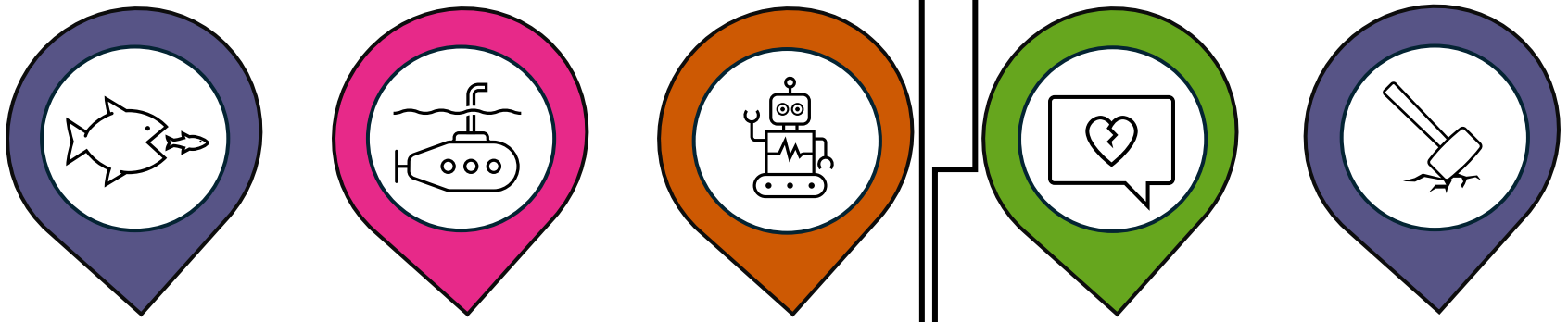

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Age-structured model presented

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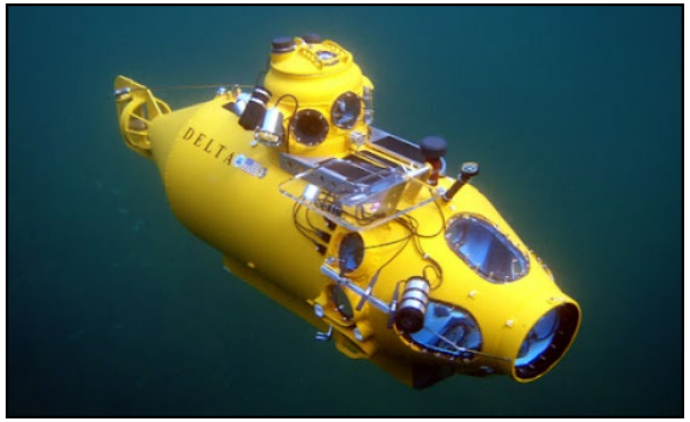
2023
Last survey with ROV "Buttercup"

2024
Failed sea trials with ROV "Swiftie"

2023
Surplus production approved at the CIE review for further development

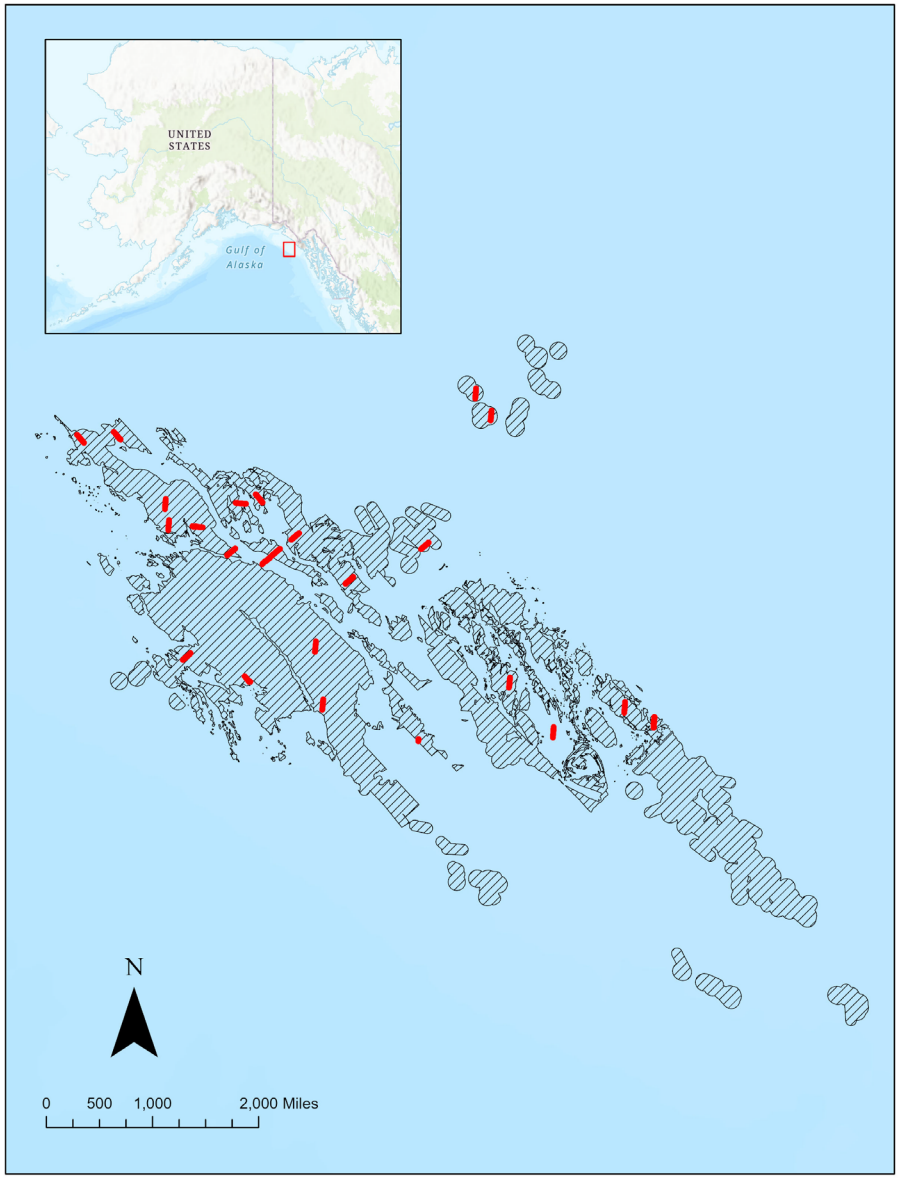
Status-quo method: Lower 90% confidence interval of biomass estimate to set targets



Survey Current Status

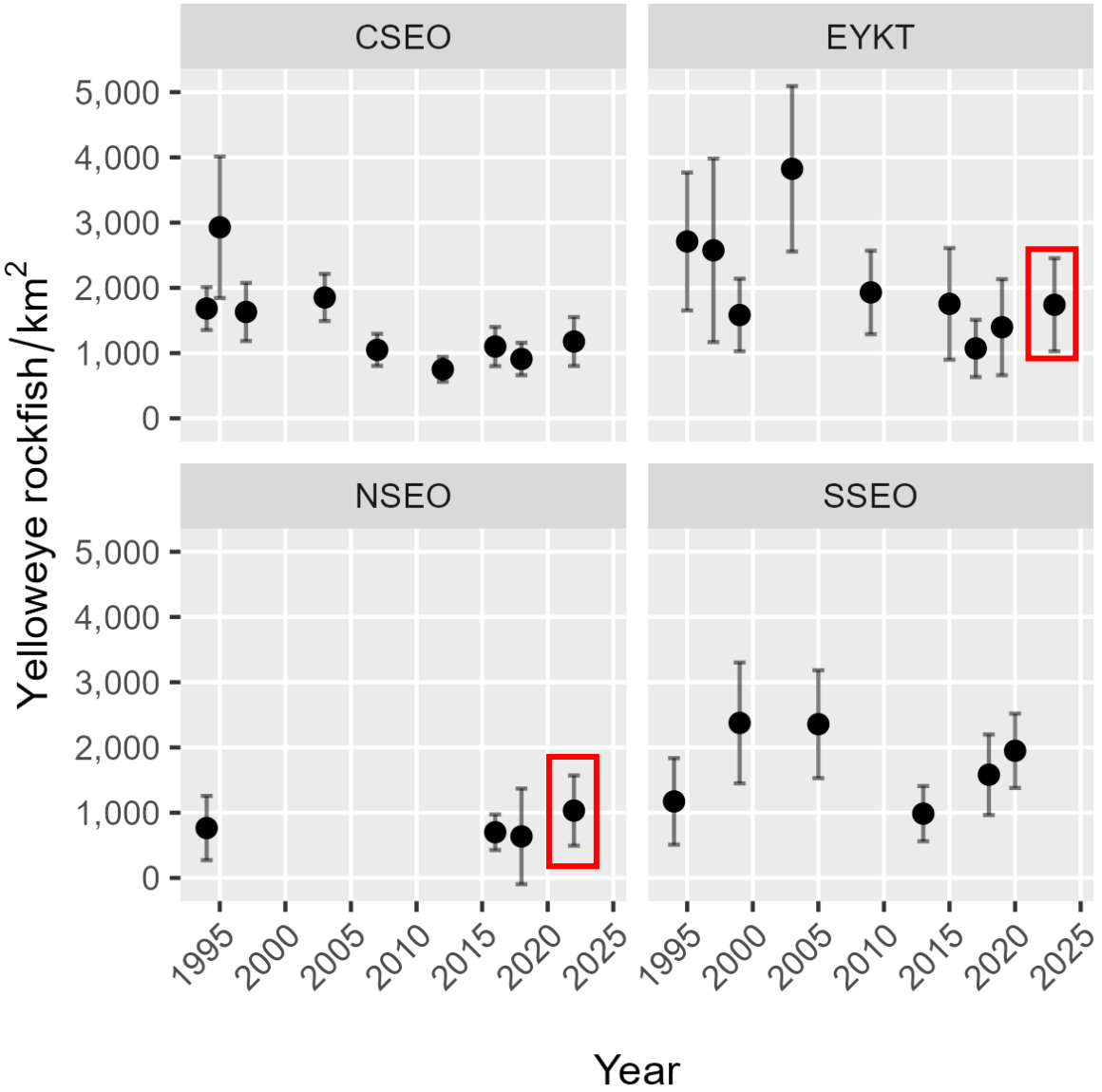
- Explored alternatives
  - Contracting a ROV pilot
  - Purchasing a new ROV
- No future plans for a ROV survey
  - No ROV
  - Lack of funding

Survey data: ADF&G ROV survey methods



- 1 km transect locations are randomly selected with designated yelloweye rockfish habitat
- Dives recorded with stereo cameras
- Video review
- R package *Distance* - estimate the density of adult and subadult yelloweye rockfish

Survey data: ADF&G ROV survey density



Biomass Calculation

Updated weight of yelloweye by management area

Commercial fisheries port sampling data

Area of rocky habitat by management area

Bathymetry and historic catch locations

Most recent yelloweye rockfish density estimates

ROV stock assessment survey

$$YE\ Biomass_{a,y_1} = Avg\ Wt_{y_1} * Habitat(km^2)_a * Density\ YE(n/km^2)_{a,y_2}$$

$$where\ a = area(EYKT, NSEO, CSEO, SSEO), y_1 = current\ year, and\ y_2 = year\ of\ last\ ROV\ survey$$

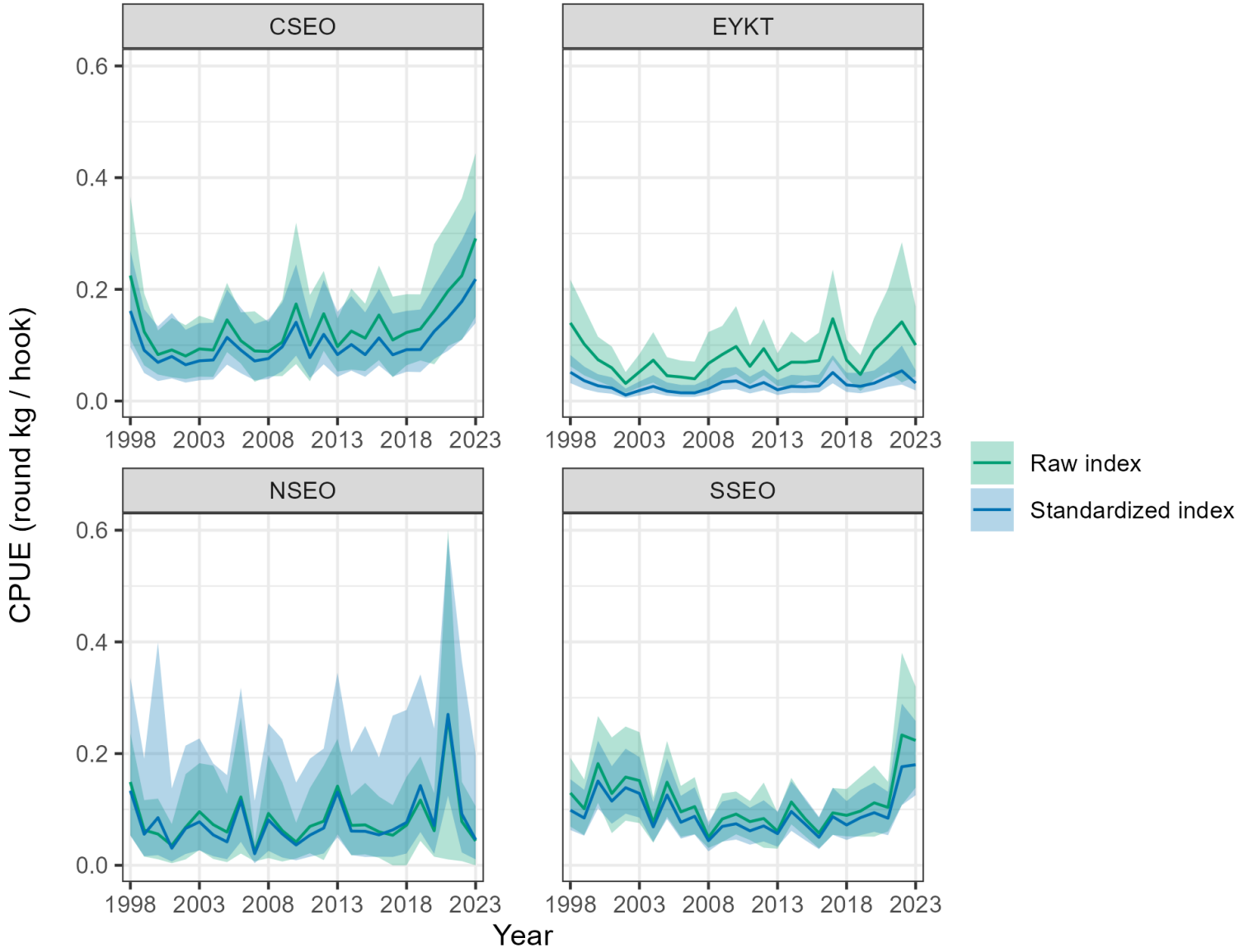
$$Total\ YE\ Biomass = \sum_{a_i}^{4} YE\ Biomass_i$$

Survey data: IPHC survey CPUE

- Calculated yelloweye CPUE in kg/hook for all stations < 457 m in SEO management area
- Standardized CPUE using a GAM with Tweedie distribution
- Previous assessment used only stations with at least one yelloweye rockfish recorded in the time series, used numbers/hook, did not standardize CPUE, calculated CPUE CVs using bootstrapping

Model formula	AIC	Deviance explained	R-squared
CPUE ~ Year * Management unit + s(Depth, k=4) + s(Soak time, k=4) + te(Longitude, Latitude)	706.6	0.367	0.330
CPUE ~ Year * Management unit + s(Depth, k=4) + te(Longitude, Latitude)	709.9	0.366	0.327
CPUE ~ Year * Management unit + s(Depth, k=4) + s(Soak time, k=4)	1434.6	0.177	0.178
CPUE ~ Year * Management unit + s(Soak time, k=4) + te(Longitude, Latitude)	1440.2	0.182	0.163
CPUE ~ Year * Management unit + te(Longitude, Latitude)	1440.9	0.181	0.161
CPUE ~ Year * Management unit + s(Depth, k=4)	1443.2	0.174	0.175
CPUE ~ Year * Management unit + s(Soak time, k=4)	2010.4	0.001	0.053
CPUE ~ Year * Management unit	2011.2	0.000	0.053

Survey data: standardized IPHC CPUE



Tier 6 calculations

CG/WG/WY

Species	WG	CG	WY	OFL	ABC
Canary	<1	1	<1	2	2
China	<1	1	<1	2	2
Copper	<1	<1	<1	0	0
Quillback	1	25	14	39	29
Rosethorn	<1	2	2	5	4
Tiger	1	6	1	7	5
Yelloweye	82	171	53	306	229
Total				361	271

SEO

Species	Max catch (t) 2010-2014	OFL (t)	ABC (t)
Canary rockfish	5.6	5.6	4.2
China rockfish	1.4	1.4	1.1
Copper rockfish	4.4	4.4	3.3
Quillback rockfish	13.9	13.9	10.4
Rosethorn rockfish	0.0	0.0	0.0
Tiger rockfish	0.8	0.8	0.6
Sum Tier 6 (t)		26.1	19.6

- Tier 6 species managed using maximum catch from reliable catch history
- 2013-2022 for CG/WG/WY, 2010-2014 for SEO
- OFL = sum of maximum catch; ABC = 0.75 * OFL

Model for SEO yelloweye: Overview

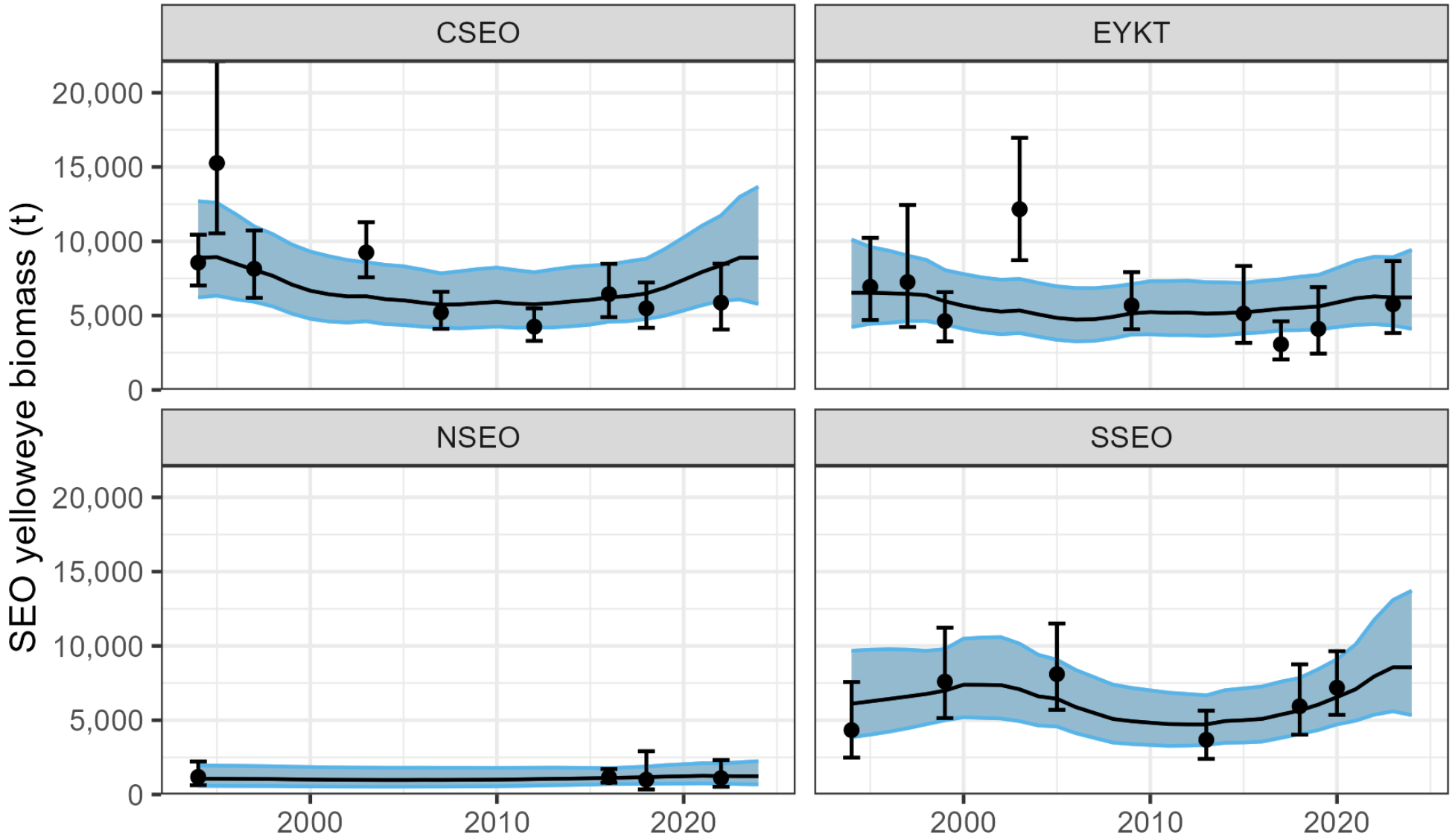
GPT Recommendation:

"The Team supports the author's recommended model (Model 22.2; two survey with an observation error term) and the recommended transition from Tier 4 to Tier 5 for the yelloweye rockfish component of the complex. The recommended random effects model smooths across years with missing data which is useful given the infrequent (3–4 year) survey schedule for this assessment." (GOA GPT, Nov. 2022)

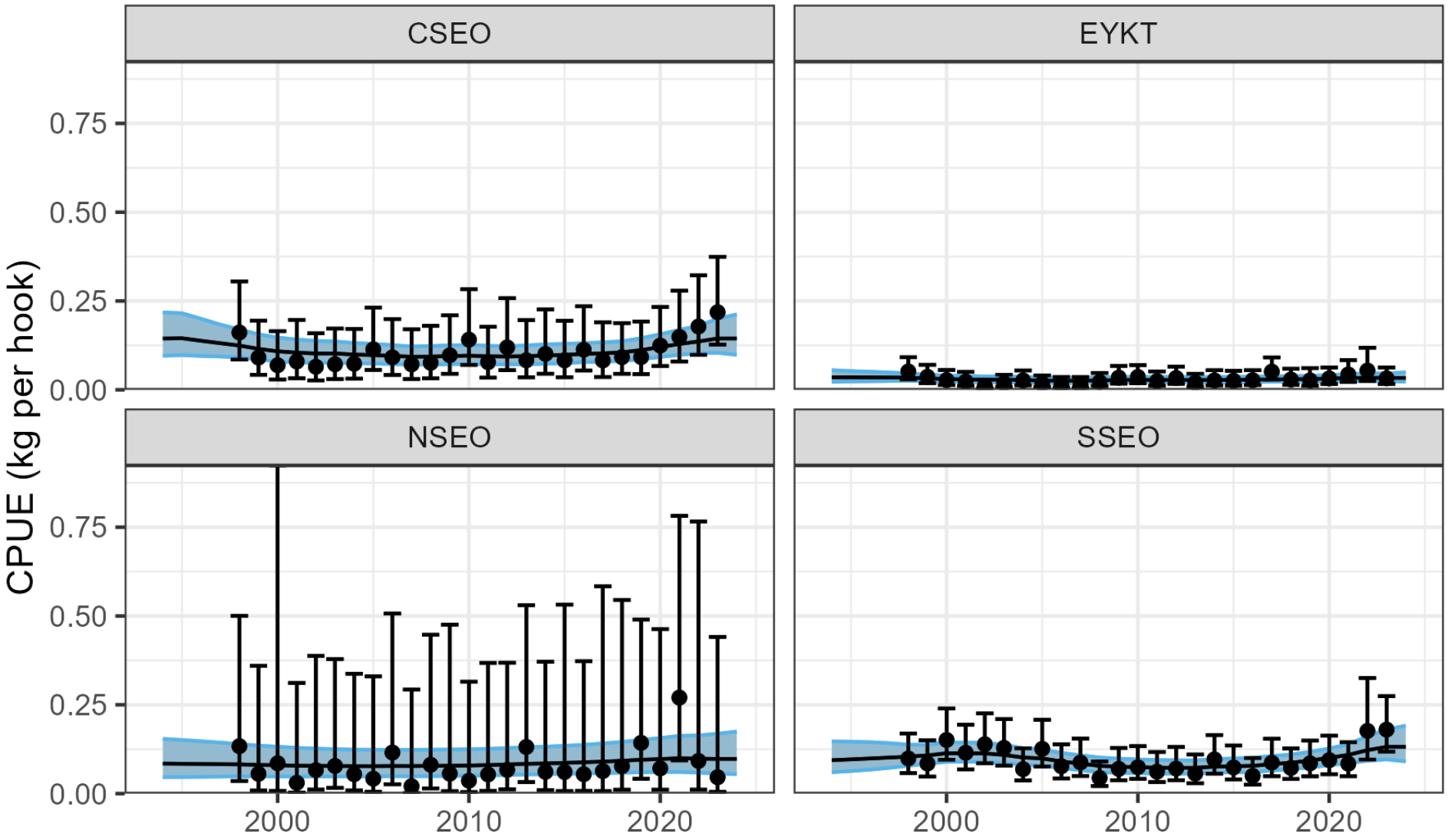
Model 22.2

- Estimates one process error, four area-specific scaling coefficients, and an additional observation error for the ADF&G ROV survey biomass estimates
- IPHC CPUE index is included as a secondary index of abundance; both surveys have equal weights
- Run using REMA package

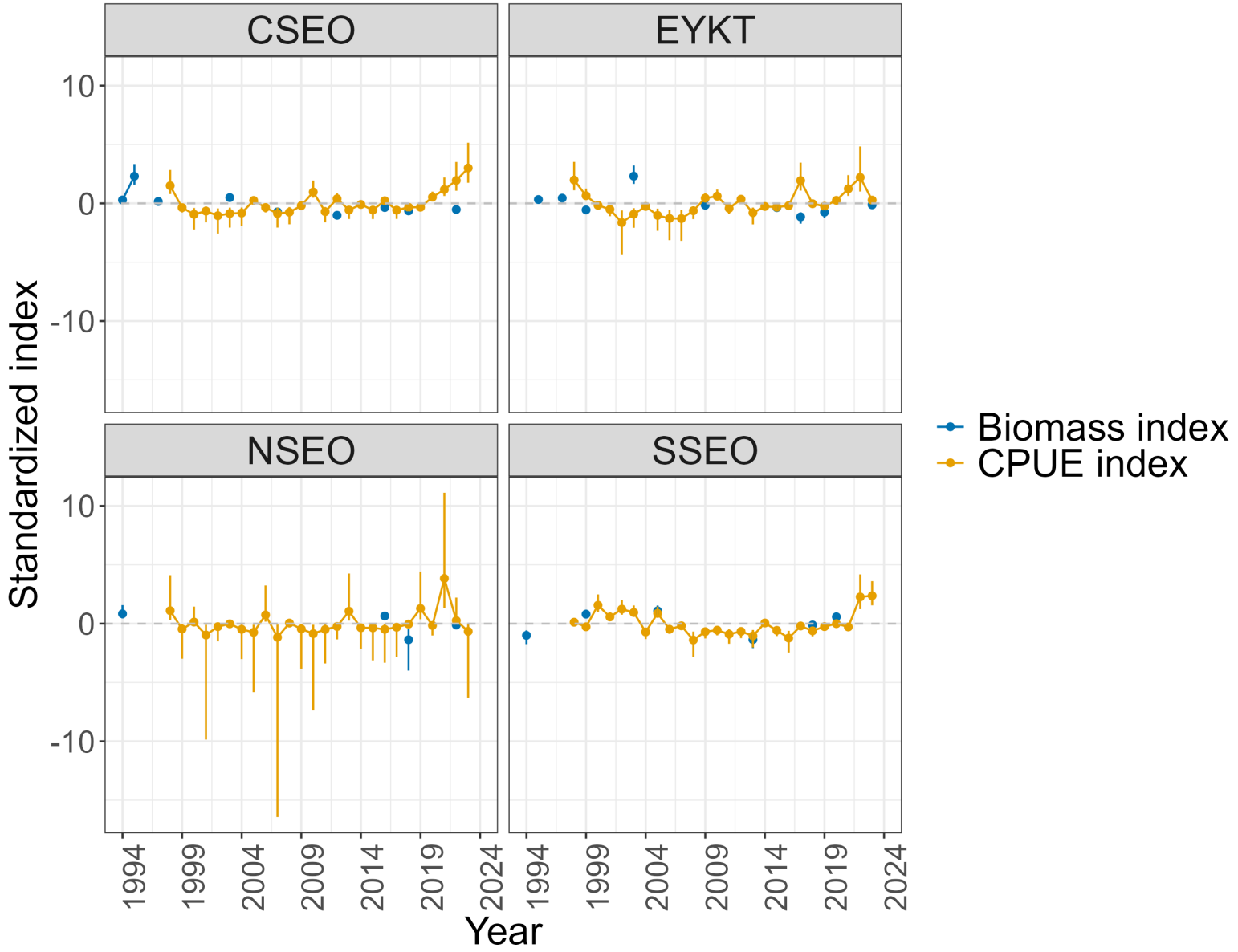
Model: Fits to ADF&G ROV survey data



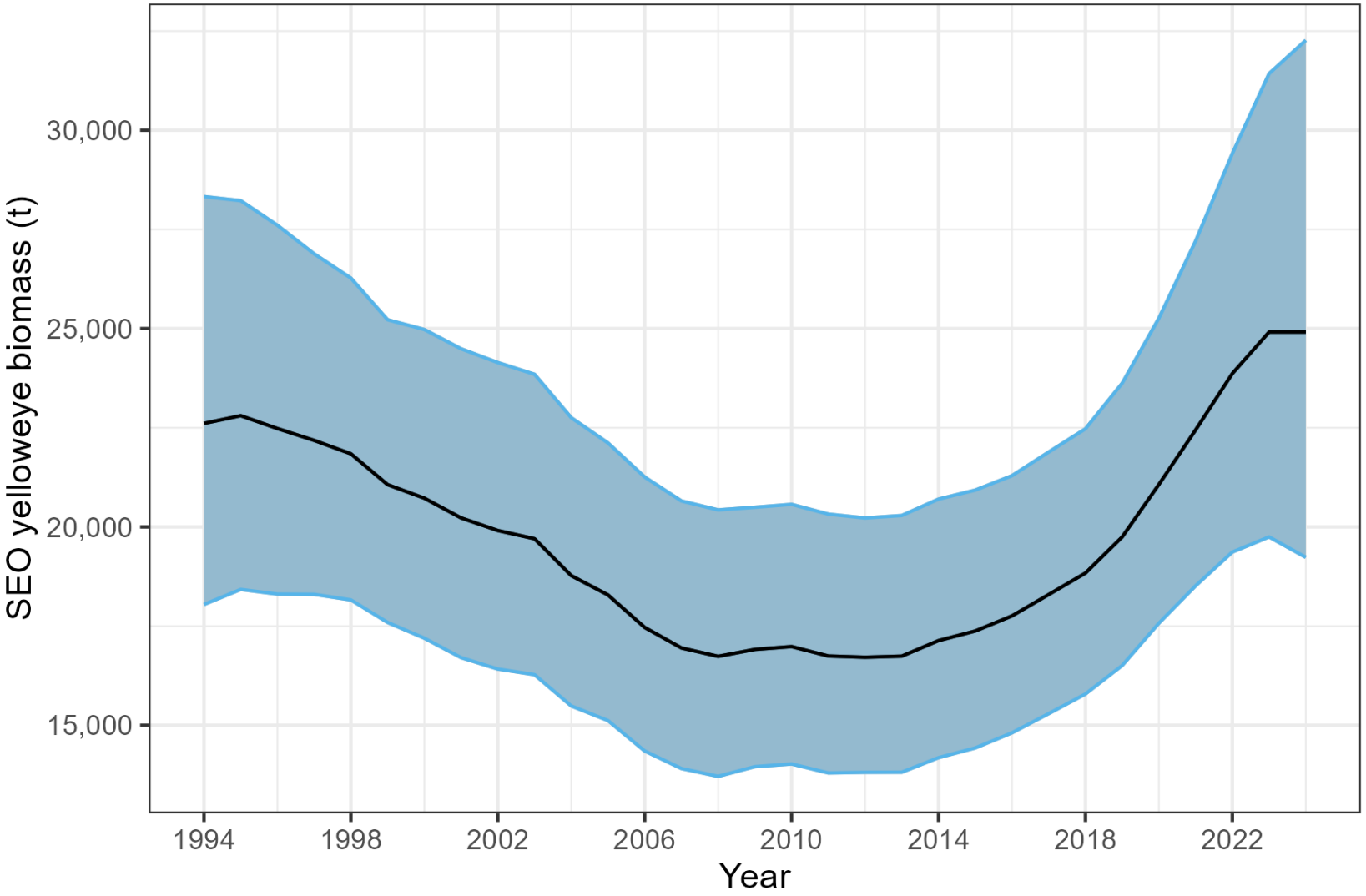
Model: Fits to IPHC survey data



Model: Comparison of indices



Model: Biomass estimates

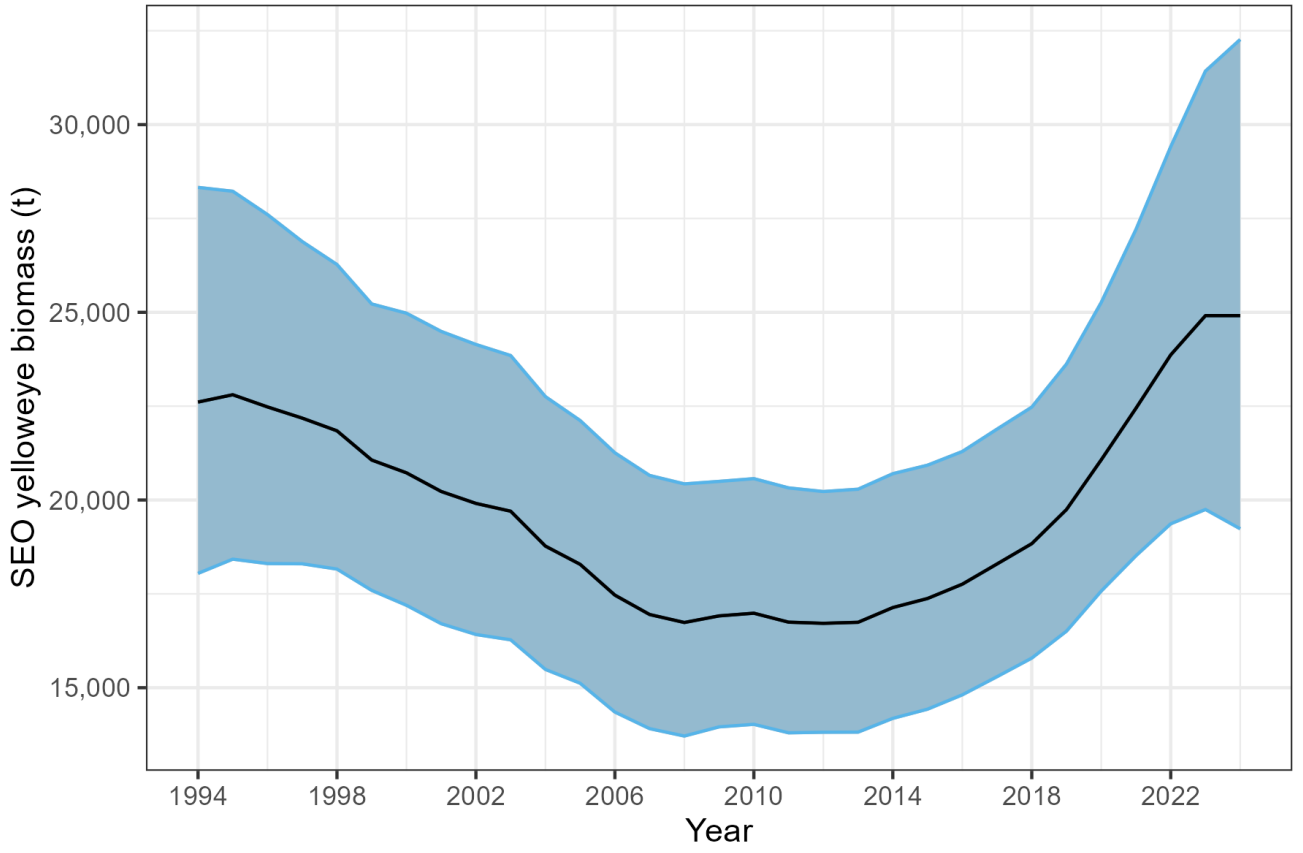


2024 biomass estimate: 24,912 t

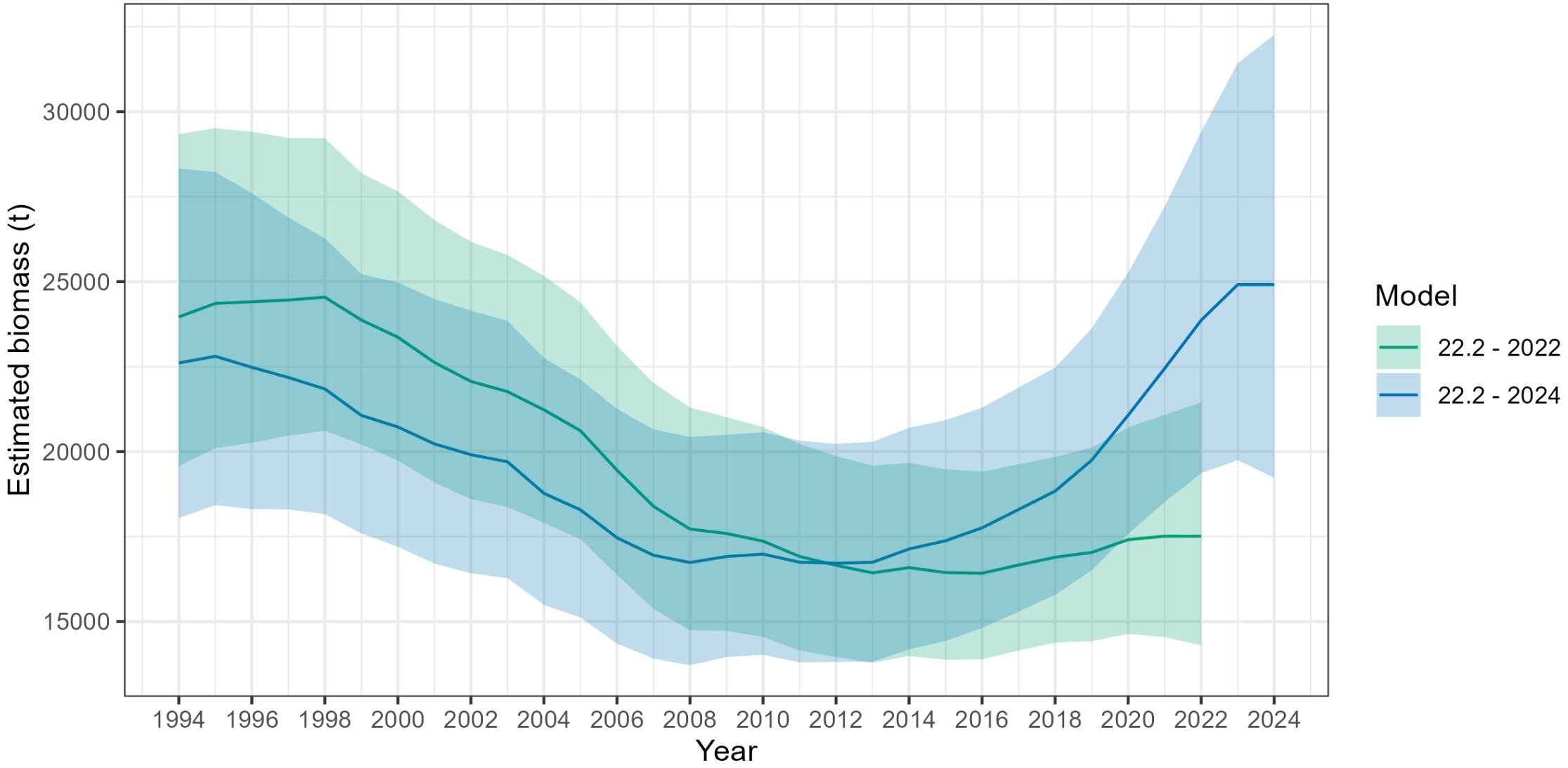
Increased 42% from 2022 assessment biomass estimate

Model: Biomass estimates

Year	Biomass (t)	Lower 95% CI	Upper 95% CI	Annual percent change
1994	22,609	18,045	28,327	-
1995	22,804	18,425	28,225	0.9%
1996	22,480	18,307	27,603	-1.4%
1997	22,181	18,301	26,884	-1.3%
1998	21,843	18,161	26,273	-1.5%
1999	21,065	17,593	25,222	-3.6%
2000	20,724	17,196	24,976	-1.6%
2001	20,227	16,706	24,491	-2.4%
2002	19,909	16,418	24,143	-1.6%
2003	19,702	16,276	23,848	-1%
2004	18,772	15,488	22,754	-4.7%
2005	18,286	15,119	22,117	-2.6%
2006	17,466	14,352	21,256	-4.5%
2007	16,950	13,910	20,654	-3%
2008	16,737	13,713	20,429	-1.3%
2009	16,913	13,957	20,496	1.1%
2010	16,984	14,025	20,569	0.4%
2011	16,746	13,799	20,323	-1.4%
2012	16,715	13,814	20,226	-0.2%
2013	16,743	13,817	20,288	0.2%
2014	17,135	14,184	20,701	2.3%
2015	17,377	14,428	20,928	1.4%
2016	17,757	14,810	21,291	2.2%
2017	18,296	15,294	21,888	3%
2018	18,837	15,789	22,474	3%
2019	19,747	16,507	23,622	4.8%
2020	21,071	17,574	25,262	6.7%
2021	22,445	18,517	27,207	6.5%
2022	23,866	19,366	29,411	6.3%
2023	24,912	19,748	31,426	4.4%
2024	24,912	19,234	32,267	0%



Model: Comparing to 2022 assessment



Harvest recommendations: Tier 6 DSR species

CG/WG/WY

	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2024	2025	2025	2026
Tier	n/a	n/a	6	6
OFL (t)	n/a	n/a	**361**	**361**
maxABC (t)	n/a	n/a	271	271
ABC (t)	n/a	n/a	**271**	**271**
	As determined *last* year for:		As determined *this* year for:	
Status	2022	2023	2023	2024
Overfishing		n/a		n/a

SEO

	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2024	2025	2025	2026
Tier	6	6	6	6
OFL (t)	26	26	**26**	**26**
maxABC (t)	20	20	20	20
ABC (t)	20	20	**20**	**20**
	As determined *last* year for:		As determined *this* year for:	
Status	2022	2023	2023	2024
Overfishing		n/a		n/a

Harvest recommendations: SEO yelloweye

Quantity	As estimated or *specified last* year for: 2024	2025	As estimated or *recommended this* year for: 2025	2026
M (natural mortality rate)	0.02	0.02	0.044	0.044
Tier	5	5	5	5
Yelloweye biomass (t)	17,511	17,511	24,912	24,912
F_{OFL}	$F = M = 0.02$	$F = M = 0.02$	$F = M = 0.044$	$F = M = 0.044$
$maxF_{ABC}$	$0.75M = 0.015$	$0.75M = 0.015$	$0.75M = 0.033$	$0.75M = 0.033$
F_{ABC}	0.01275	0.01275	0.0264	0.0264
OFL (t)	350	350	**1,096**	**1,096**
maxABC (t)	263	263	822	822
ABC (t)	263	263	**658**	**658**
Status	As determined *last* year for: 2022	2023	As determined *this* year for: 2023	2024
Overfishing	No	n/a	No	n/a

Impact of new natural mortality value:

- biomass estimate increased by 42% from 2022 assessment
- maxABC increased by 213% from 2022 assessment

CG/WG/WY DSR Risk Table

Assessment-related considerations	Population dynamics considerations	Environmental/ ecosystem considerations	Fishery performance considerations
Level 1: new assessment, but same methodology	Level 1: catch has been slightly higher than average, but not significantly	Level 1: normal, no apparent environmental/ ecosystem concerns	Level 1: no apparent fishery/resource-use performance and/or behavior concerns

Overall recommendation: Level 1 with no reduction of ABC

SEO DSR Risk Table

Assessment-related considerations	Population dynamics considerations	Environmental/ ecosystem considerations	Fishery performance considerations
Level 2: lack of survey data; uncertainty in survey biomass estimates	Level 3: more rapid changes in stock abundance than have ever been seen previously	Level 1: normal, no apparent environmental/ ecosystem concerns	Level 2: increased commercial fishery bycatch harvest

Overall recommendation: Level 2 and 20% reduction of yelloweye ABC

DSR in CG/WG/WY conclusions

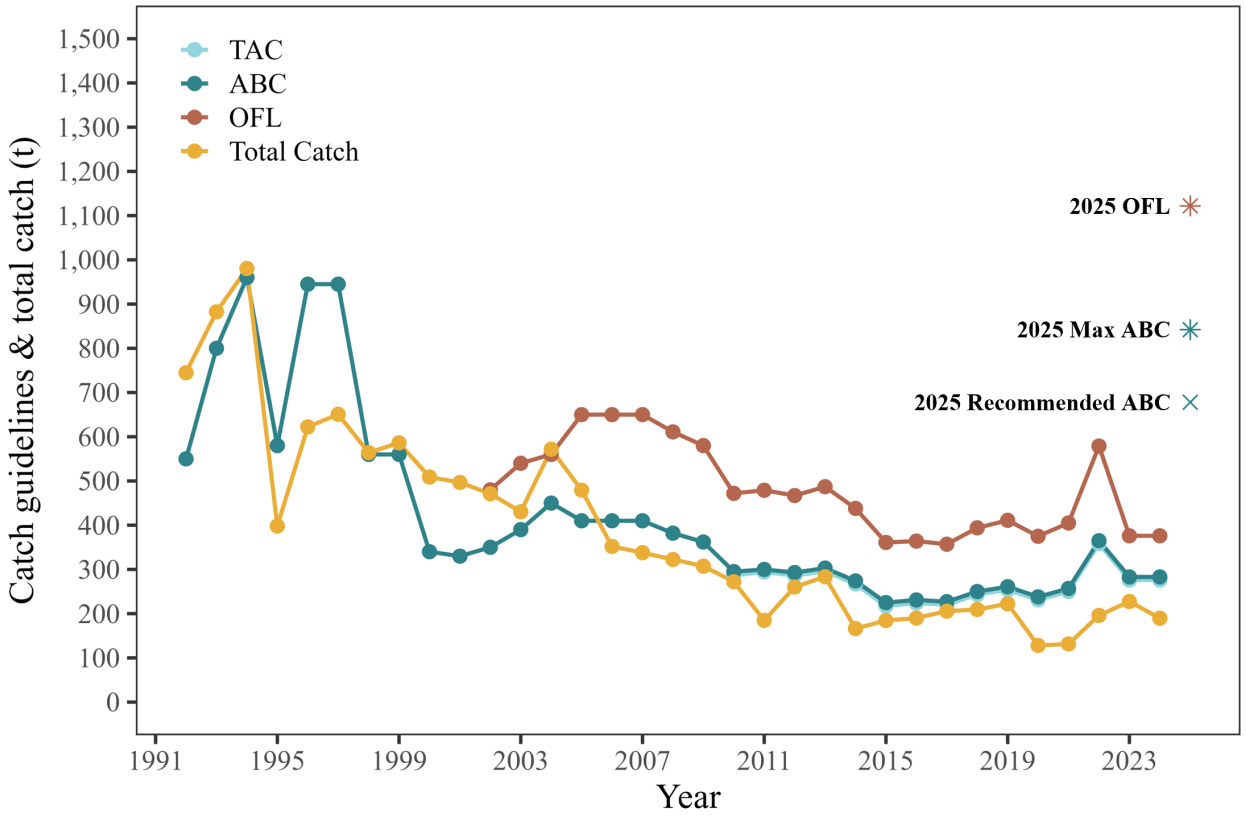
- Total catch in 2022 and 2023 would have exceeded the ABC but not the OFL
- Recommendation: maxABC
- Continued catch monitoring

	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2024	2025	2025	2026
Tier	n/a	n/a	6	6
OFL (t)	n/a	n/a	**361**	**361**
maxABC (t)	n/a	n/a	271	271
ABC (t)	n/a	n/a	**271**	**271**
	As determined *last* year for:		As determined *this* year for:	
Status	2022	2023	2023	2024
Overfishing		n/a		n/a

DSR in SEO conclusions

- *M* = 0.044, CIE recommendation
- Estimated yelloweye biomass up 42% from last assessment
- Recommend 20% buffer on yelloweye ABC due to more rapid changes in stock abundance than have ever been seen previously
- Concerns about lack of future survey data

	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2024	2025	2025	2026
M (natural mortality rate)	0.02	0.02	0.044	0.044
Tier	5/6	5/6	5/6	5/6
Yelloweye biomass (t)	17,511	17,511	24,912	24,912
OFL (t)	376	376	**1,122**	**1,122**
maxABC (t)	283	283	842	842
ABC (t)	283	283	**678**	**678**
	As determined *last* year for:		As determined *this* year for:	
Status	2022	2023	2023	2024
Overfishing	No	n/a	No	n/a



Questions?

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