

# Gulf of Alaska SAFE report

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

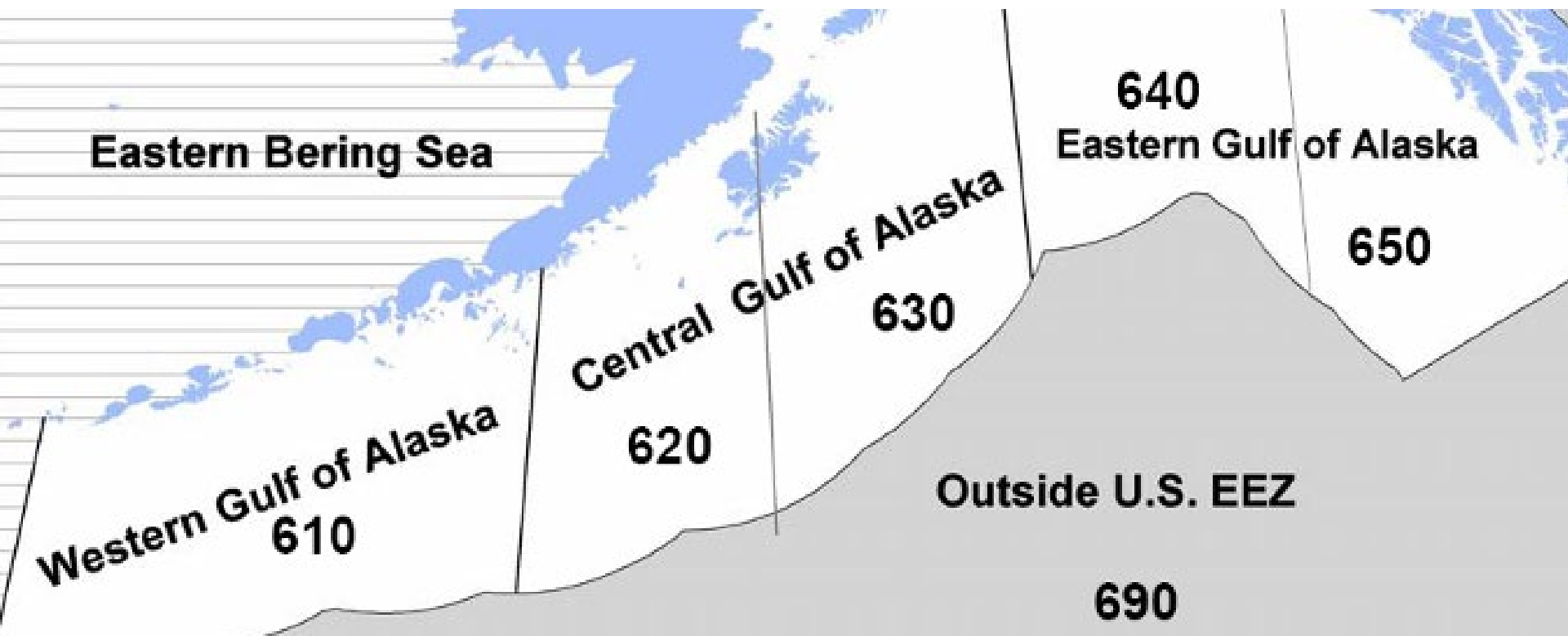
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# GOA assessment Overview

**“On”** year for GOA, NMFS bottom trawl survey occurred!

15 “full” assessments reviewed

4 “partial” assessments



# Ecosystem Considerations summary

## *Western Gulf of Alaska 2021 Report Card*

- The PDO continued its negative trend in 2021, reflecting cooling sea surface temperatures in the GOA.
- Summer (June-August) 2021 sea surface temperatures in the western GOA were generally lower than 2020, although spring surface temperatures were elevated.
- Mesozooplankton biomass (sampled April-Sept) decreased in 2020, indicating average foraging conditions for planktivorous predators.
- Copepod community size slightly increased in 2020 (sampled April-Sept) indicating there were slightly more large species available (often considered of higher nutritional quality).
- Motile epifauna biomass, observed during 2021 AFSC bottom trawl survey (May-Aug), decreased from 2019 to 2021.
- Trends in capelin, as sampled by rhinoceros auklets at Middleton Island (April-Aug.), continue to be minimal in seabird chick diets in recent years.
- Fish apex predator biomass, observed during 2021 AFSC bottom trawl survey (May-Aug), increased from 2019 to 2021 to within just above 1SD below the long-term mean.
- Black-legged kittiwakes reproductive success in 2021 (June-July) increased from 2020.
- Modelled estimates of western Gulf of Alaska Steller sea lion non-pup counts continued a slightly increasing trend from previous years; however realized counts for non-pups show the lowest values in this area since 2011.

# Ecosystem Considerations summary

## *Eastern Gulf of Alaska 2021 Report Card*

- La Nina conditions prevailed in winter 2020/2021 and are predicted for winter 2021/2022.
- Summer (June-Aug.) 2021 sea surface temperatures in the eastern GOA remain within 1SD of the long-term mean.
- Total zooplankton density in SEAK inside waters (May-Aug) increased from 2020, suggesting improved foraging conditions for planktivorous fish, seabirds, and mammals.
- The overall copepod community size (ratio of large calanoid copepods to total calanoid copepods) decreased due to decreased densities of large copepods and increased densities of small copepods.
- Motile epifauna biomass, observed during 2021 AFSC bottom trawl survey (May-Aug), decreased from 2019 to 2021. Hermit crabs, brittle stars, and other echinoderms are all below their long-term means. Eelpouts have also decreased from 2019 to 2021.
- Estimated total mature herring biomass (age 3+) of Sitka herring in spring 2020 continued to increase to the largest value in the time series (since 1980). The two populations with ocean influence (Sitka Sound and Craig) were elevated while populations in SEAK inner waters and Prince William Sound increased but remained low.
- Fish apex predator biomass, observed during 2021 AFSC bottom trawl survey, trended downward from a high in 2015 to their second lowest value over the time series in 2021. The decrease over this time period has largely been driven by Arrowtooth flounder which are at their lowest value over the time series. Pacific halibut, sablefish, and Pacific cod, have all increased from 2019.
- Growth rates of piscivorous rhinoceros auklet chicks remain below the long-term mean in 2021 (June-July), a pattern since 2015, suggesting that the adults were unable to find sufficient prey to support optimal chick growth.
- Modelled estimates of eastern Gulf of Alaska Steller sea lion non-pup counts continue an increasing trend. However, counts suggest that non-pup have been lower than predicted in 2019 and 2017.

# Ecosystem Considerations summary

**SAFE introduction also included summaries on**

- Regional Action Plan (RAP)
- Climate Integrated Modeling (GOACLIM) project

# Stock Assessment schedule for the Gulf of Alaska

Stock	Assessment	Tier	Frequency (yrs)	Full assessment Year due
Pollock	Full	3	1	2022
Pacific cod	Full	3	1	2022
Sablefish	Full	3	1	2022
N & S rock sole	Full	3	4	2025
Shallow water flatfish	Full	5	4	2025
<i>Deepwater flatfish (Dover)</i>	<i>Partial</i>	<i>3/6</i>	<i>4</i>	<i>2023</i>
Rex sole	Full	3	4	2025
Arrowtooth flounder	Full	3	2	2023
<i>Flathead sole</i>	<i>Partial</i>	<i>3</i>	<i>4</i>	<i>2022*</i>
Pacific ocean perch	Full	3	2	2023
<i>Northern rockfish</i>	<i>Partial</i>	<i>3</i>	<i>2</i>	<i>2022</i>
Shortraker rockfish	Full	5	2	2023
Other rockfish	Full	4/5/6	2	2023
<i>Rougheye &amp; blackspotted rockfish</i>	<i>Full</i>	<i>3</i>	<i>2</i>	<i>2023</i>
Dusky rockfish	Partial	3	2	2022
<i>Demersal shelf rockfish</i>	<i>Full</i>	<i>4/6</i>	<i>2</i>	<i>2022*</i>
Thornyhead rockfish	None	5	2	2022
Atka mackerel	Full	6	2	2023
Octopus	Full	6	2	2023
Sharks	None	4/5/6	2	2022
Skates	Full	5	2	2023
Forage species (including Squid)	None	eco	2	2022
Grenadiers (BSAI/GOA)	Report	Eco	1	2024

# Overview

- 15 full assessments, 4 partials

<b>Stock</b>	<b>Assessment</b>	<b>Tier</b>
<b>Pollock</b>	Full	3
<b>Pacific cod</b>	Full	3
<b>Sablefish</b>	Full	3
<b>N &amp; S rock sole</b>	Full	3
<b>Shallow water flatfish</b>	Full	5
<b>Rex sole</b>	Full	3
<b>Arrowtooth flounder</b>	Full	3
<b>Pacific ocean perch</b>	Full	3
<b>Shortraker rockfish</b>	Full	5
<b>Other rockfish</b>	Full	4/5/6
<b>Rougheye &amp; blackspotted rockfish</b>	Full	3
<b>Demersal shelf rockfish</b>	Full	4/6
<b>Atka mackerel</b>	Full	6
<b>Octopus</b>	Full	6
<b>Skates</b>	Full	5
<i>Deepwater flatfish (Dover)</i>	<i>Partial</i>	<i>3/6</i>
<i>Flathead sole</i>	<i>Partial</i>	<i>3</i>
<i>Northern rockfish</i>	<i>Partial</i>	<i>3</i>
<i>Dusky rockfish</i>	<i>Partial</i>	<i>3</i>
<i>Thornyhead rockfish</i>	<i>None</i>	<i>5</i>
<i>Sharks</i>	<i>None</i>	<i>4/5/6</i>
<i>Forage species (including Squid)</i>	<i>None</i>	<i>eco</i>

# Stock Assessment and Fishery Evaluate (SAFE) for the NPFMC SSC/Council review

Note, links will become live as documents are completed, please "refresh" browsers, also some assessments are in an "off" year.

## Ecosystem status reports:

- [EBS ESR](#)
- [Aleutian Islands ESR](#)
- [GOA ESR](#)

<b>Bering Sea and Aleutian Islands (BSAI)</b>	<b>Gulf of Alaska ( GOA)</b>
<a href="#">BSAI Introduction (with links to each chapter)</a>	<a href="#">GOA Introduction (with links to each chapter)</a>
<a href="#">BSAI Entire SAFE (zip file, 120mb)</a>	<a href="#">GOA Entire SAFE (zip file, 131mb)</a>
<a href="#">Eastern Bering Sea Pollock Muti-species model supplement</a> <a href="#">Aleutian Is. Pollock</a> <a href="#">Bogoslof Pollock</a>	<a href="#">GOA Pollock</a>
<a href="#">Eastern Bering Sea Pacific cod</a> <a href="#">Aleutian Is Pacific cod.</a>	<a href="#">GOA Pacific cod</a>
<a href="#">AK Sablefish</a>	<a href="#">AK Sablefish</a>
<a href="#">BSAI Yellowfin Sole</a>	<a href="#">GOA Shallow-water Flatfish</a>

# Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska

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	610	620	630	640	S
<b>Year</b>	<b>Western</b>	<b>Central</b>	<b>Central</b>	<b>WYAK</b>	
2022	23,720	69,259	30,053	6,722	11,
2023	23,511	68,651	29,789	6,663	11,

### 2. Pacific cod

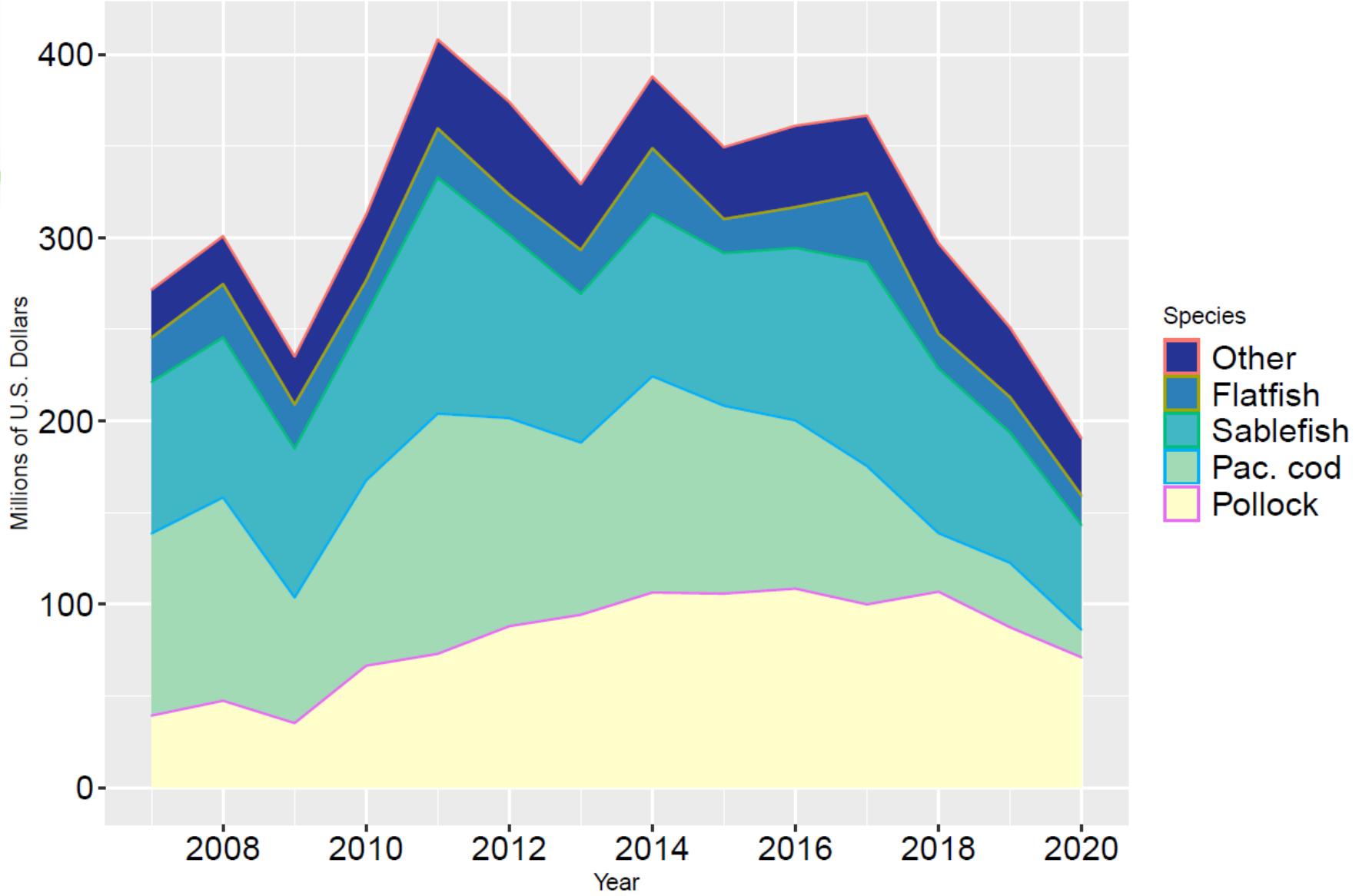
Status and catch specifications (t) of Pacific cod in recent years. Bio the projection given in the SAFE report issued in the preceding year. 2023 are those recommended by the Plan Team. Catch data are current.

Year	Age 0+ biomass	OFL	ABC
2020	203,373	17,794	14,621
2021	265,661	28,977	23,627
2022	159,837	29,131	24,043
2023		27,715	22,882

### Changes from the previous assessment

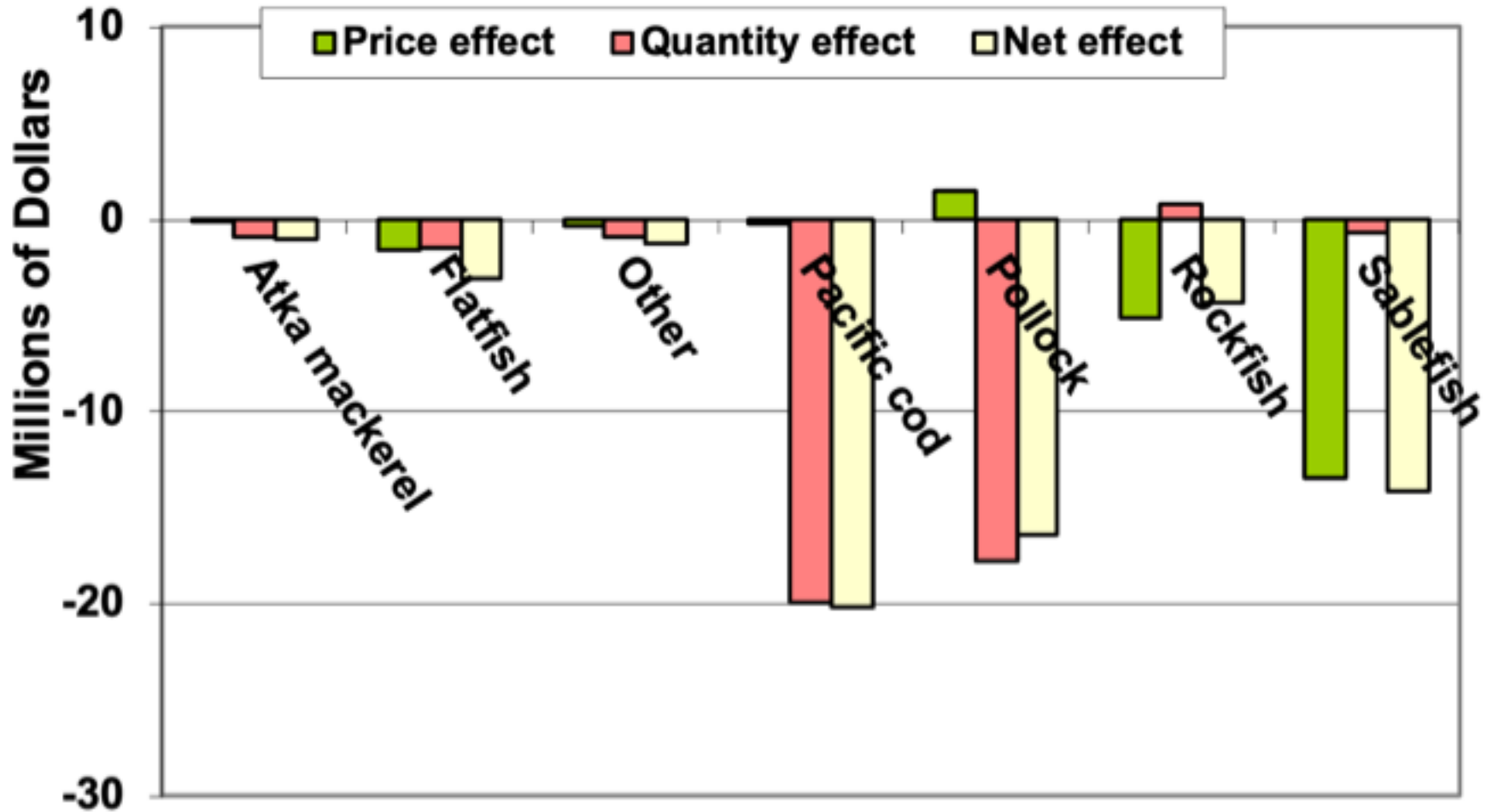
Data updated from the 2021 assessment included federal and state fishery catch for 2020 and 2021 (preliminary catch projected through the end of 2021), federal and state fishery size composition for 2020 and preliminary size compositions for 2021, 2021 AFSC longline survey abundance index (Relative





GOA Economic synopsis

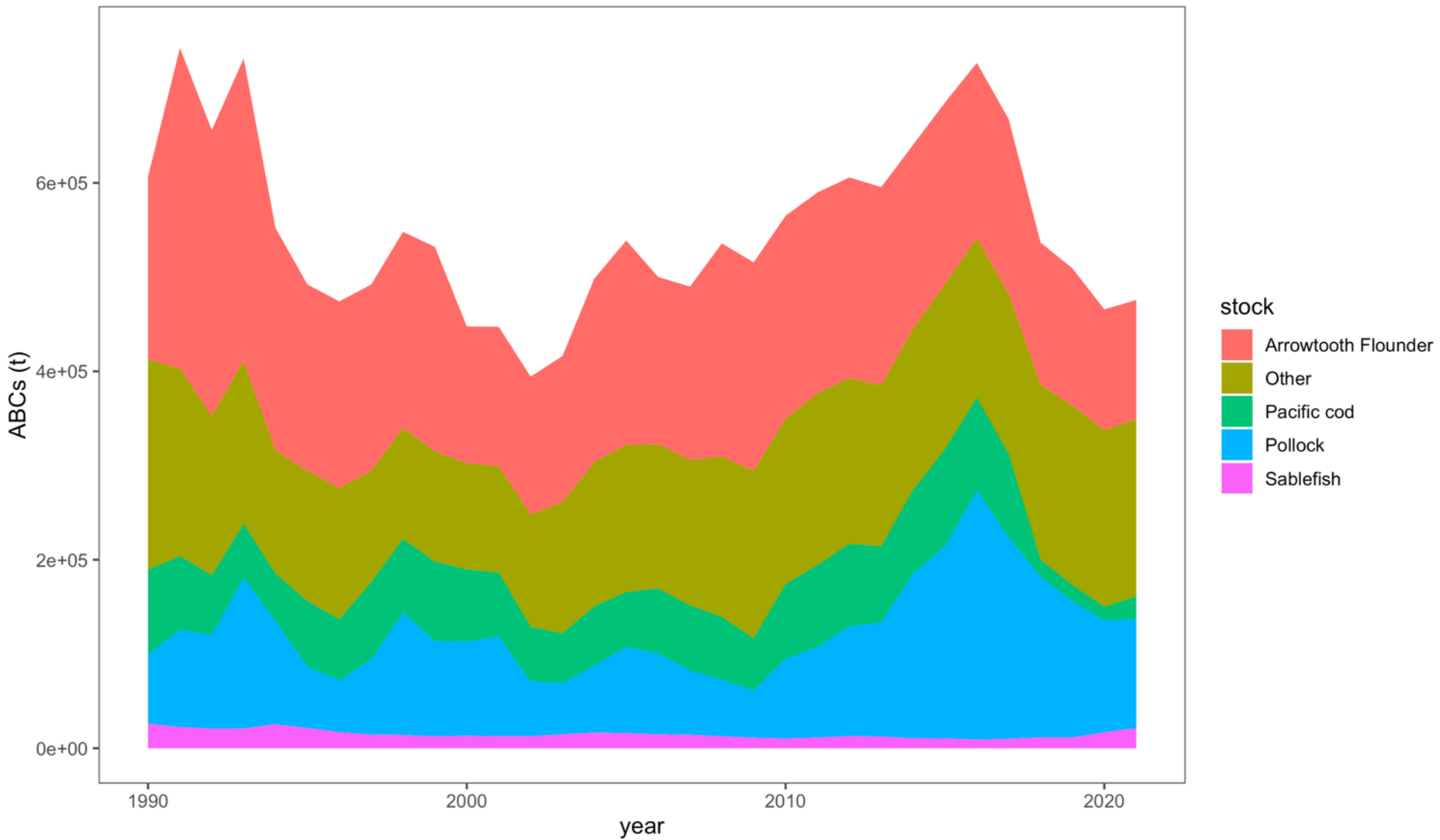
# GOA First-Wholesale Revenue Change in 2019-20 Decomposed by Species Group



revenue changes (and source)



Gulf of Alaska ABCs by main stocks

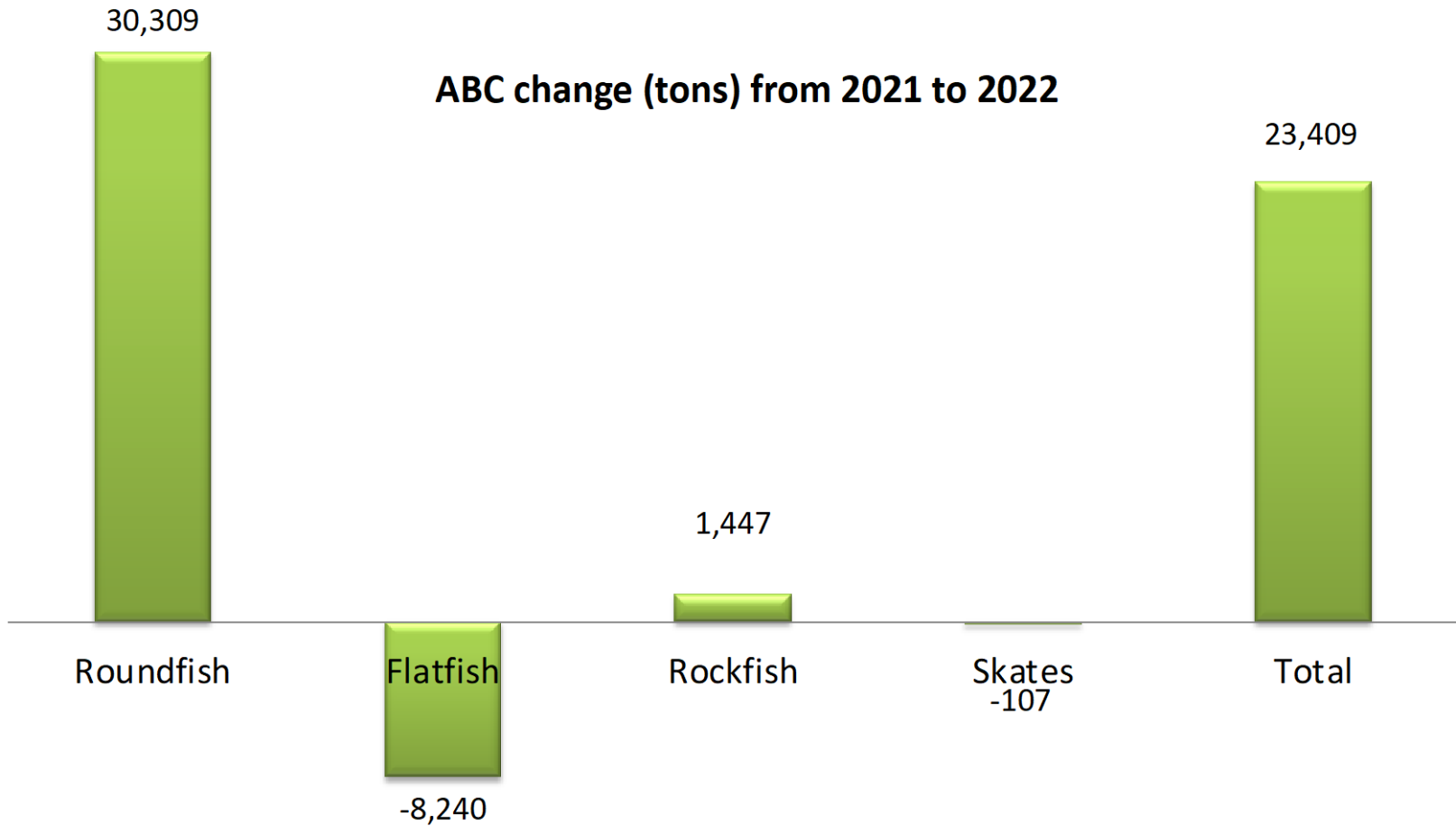




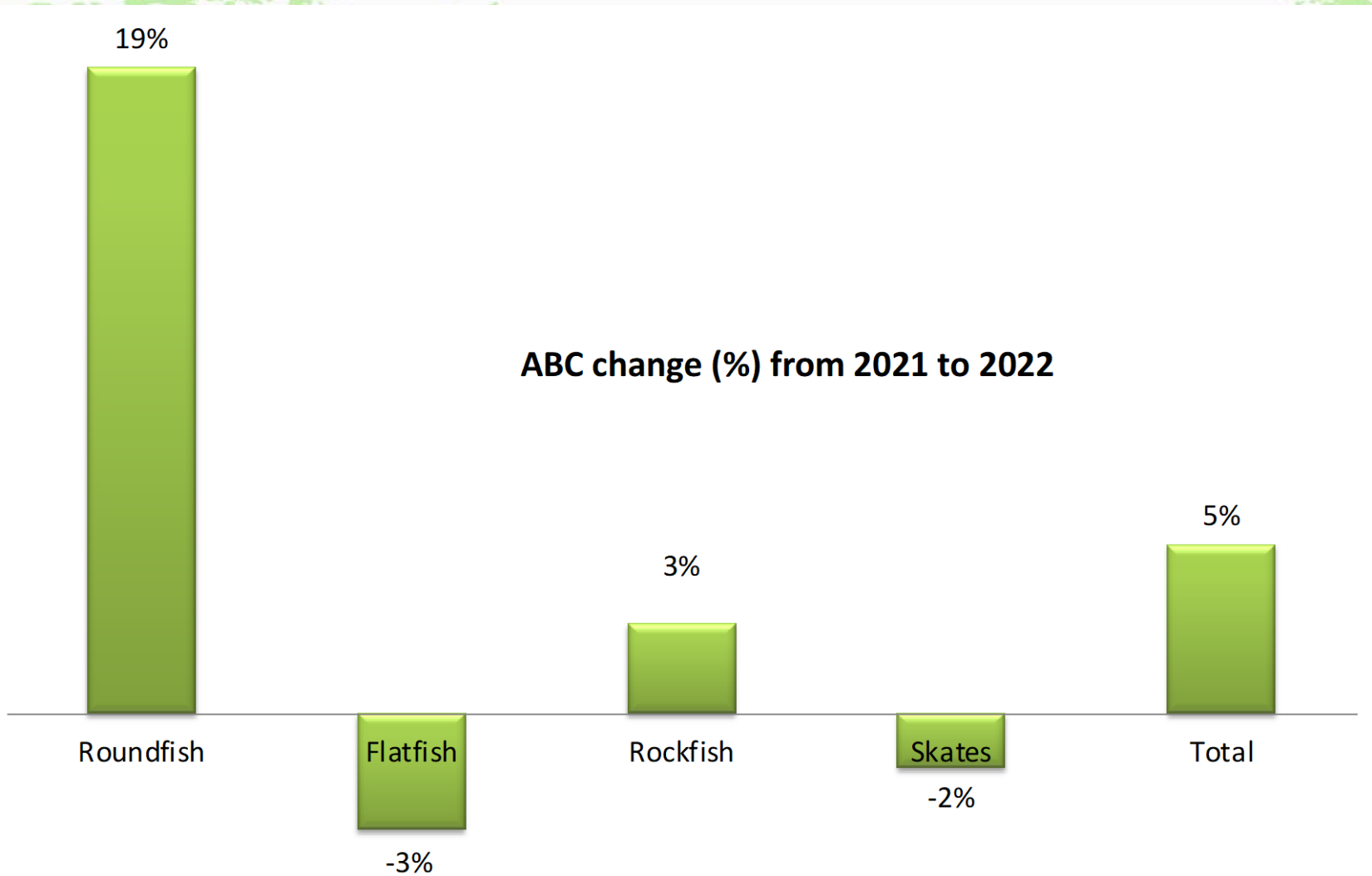
# CIE reviews (Center for Independent Experts)

- 2021: two completed rock soles and Pacific ocean perch
- 2022: Likely Tier 4/5 evaluations.

# 2021-2022 ABC change

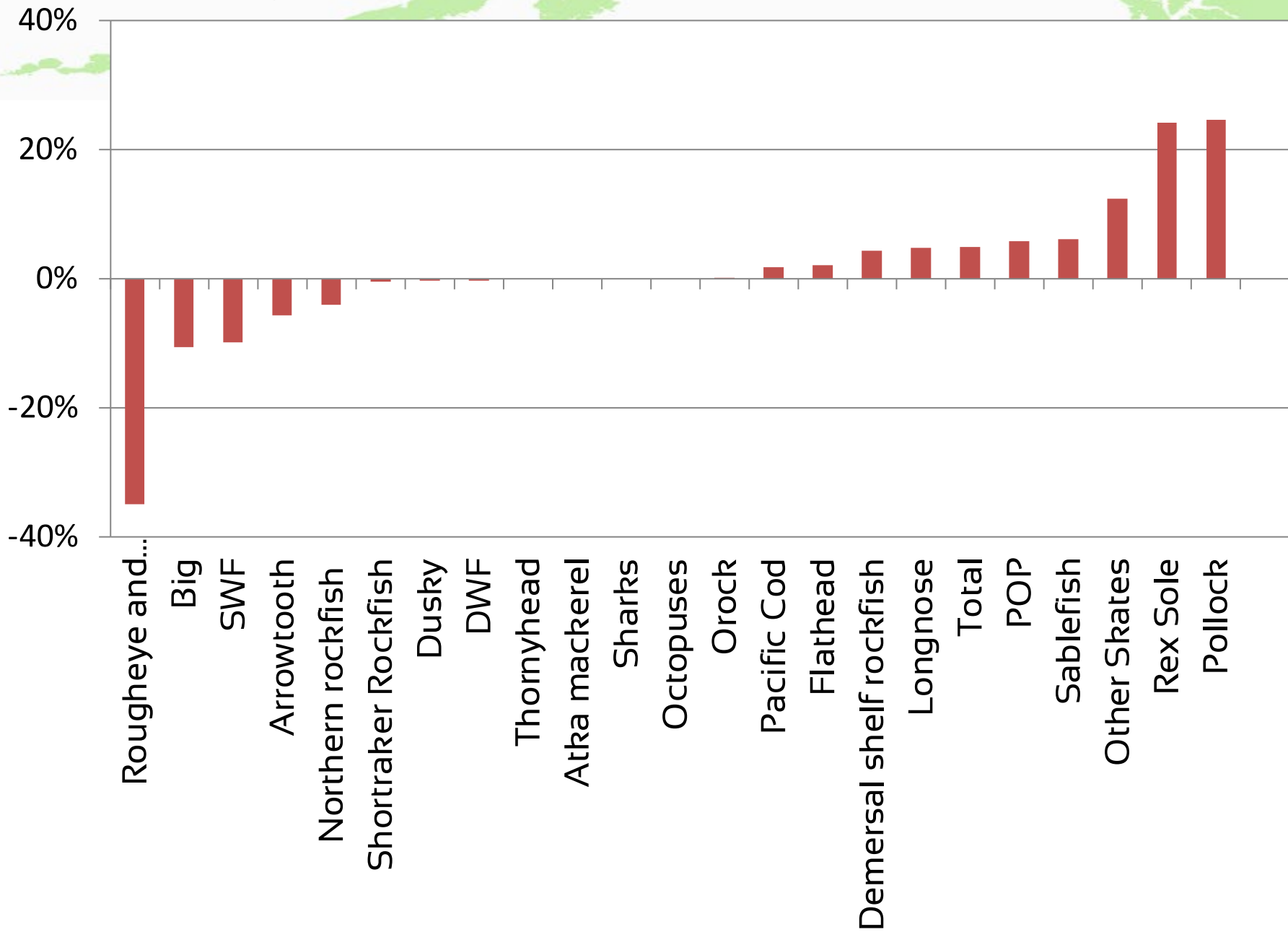


# 2021-2022 ABC change

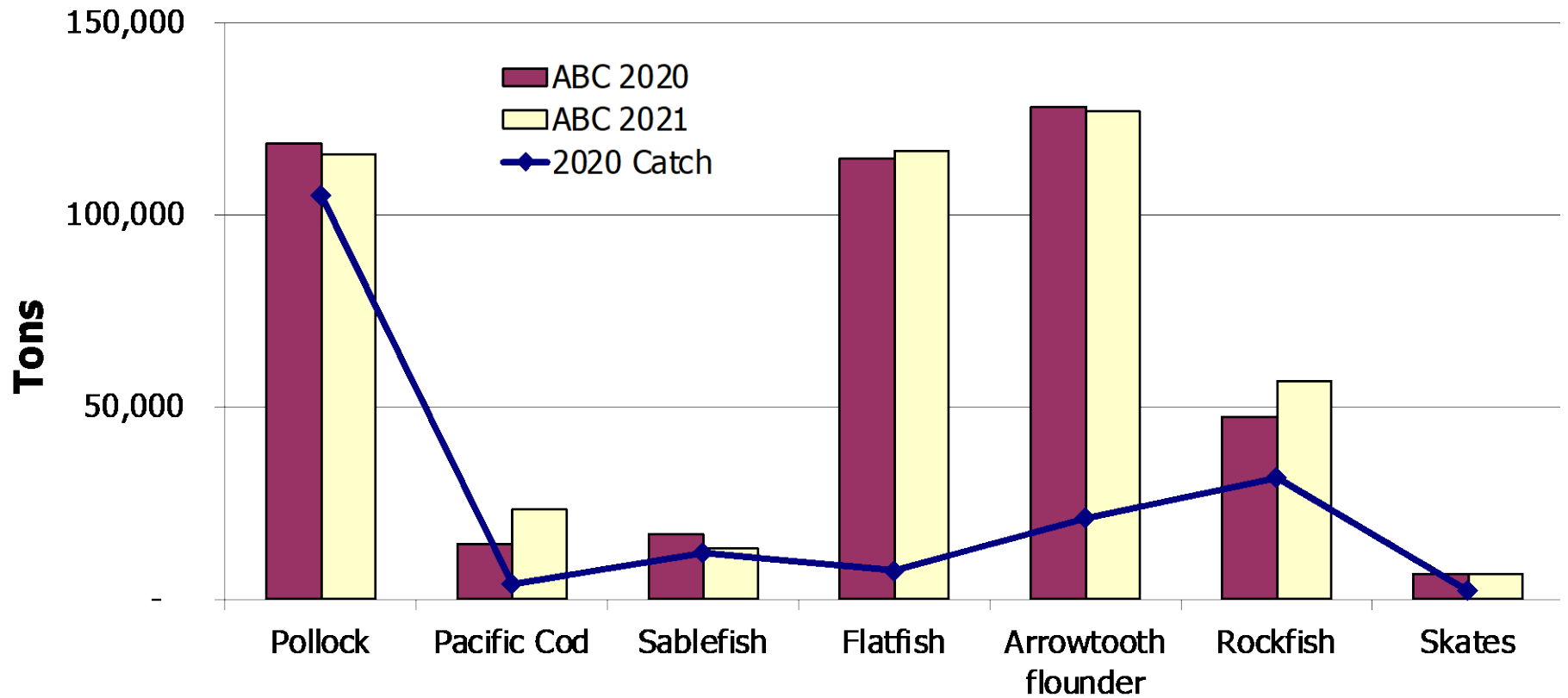


Overall a 5% increase

# Percentage change in ABC, 2021-2022

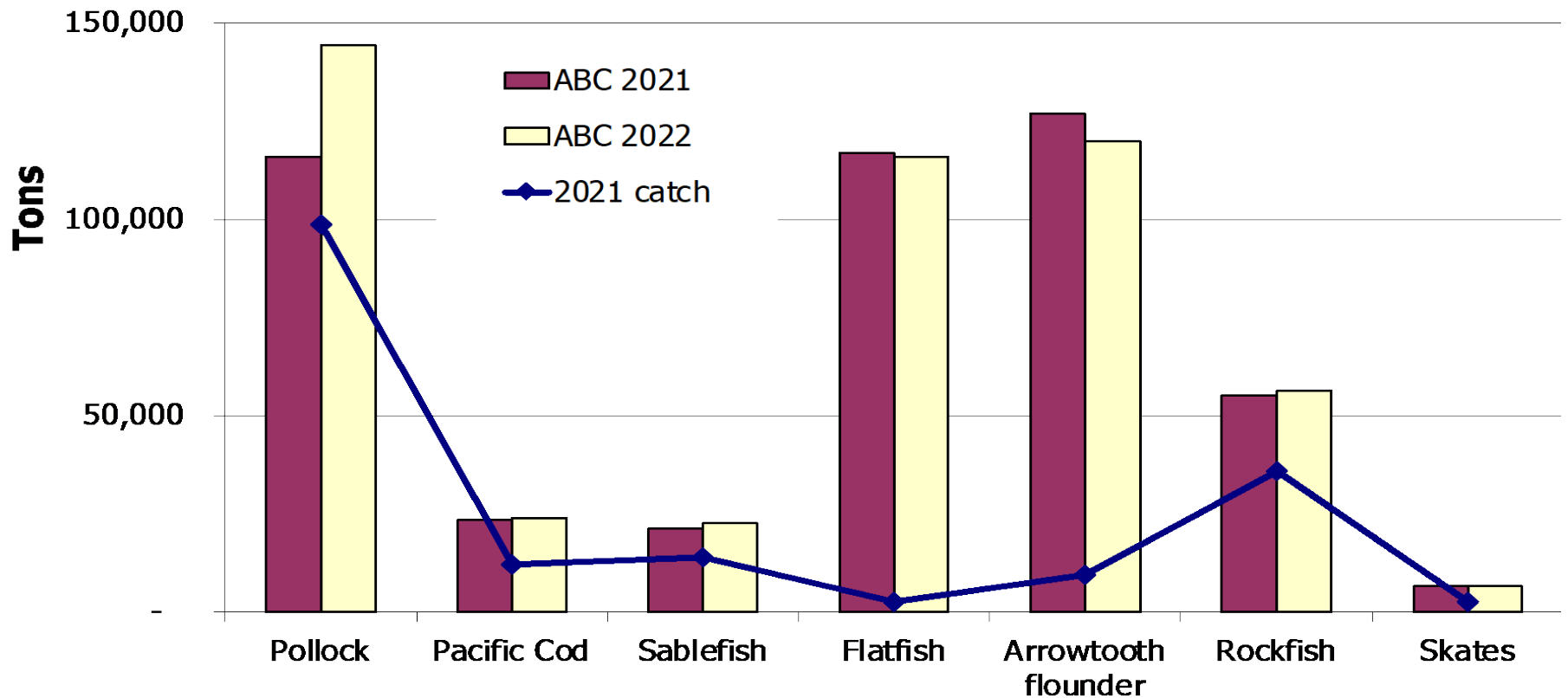


# GOA Catch and ABC levels

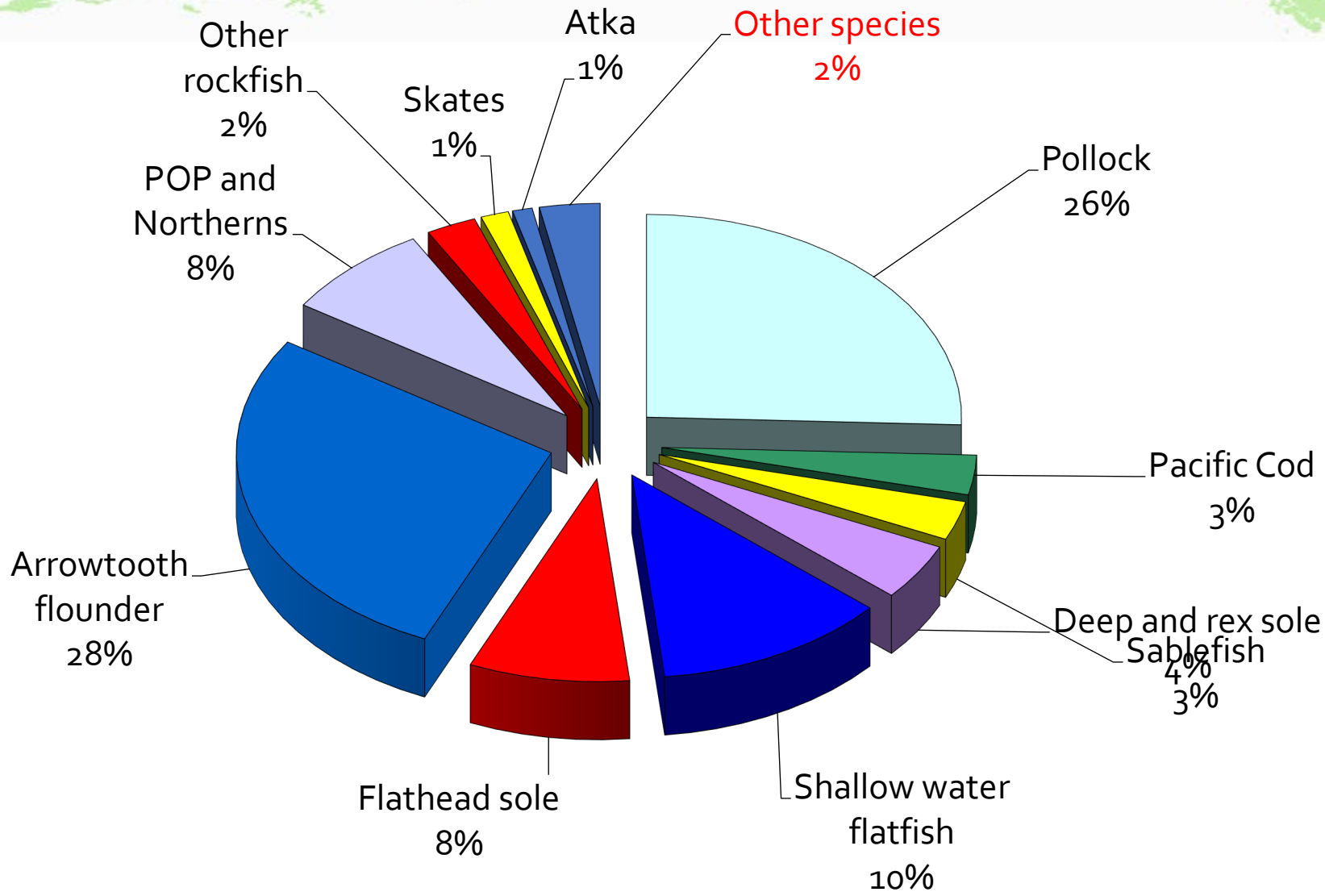




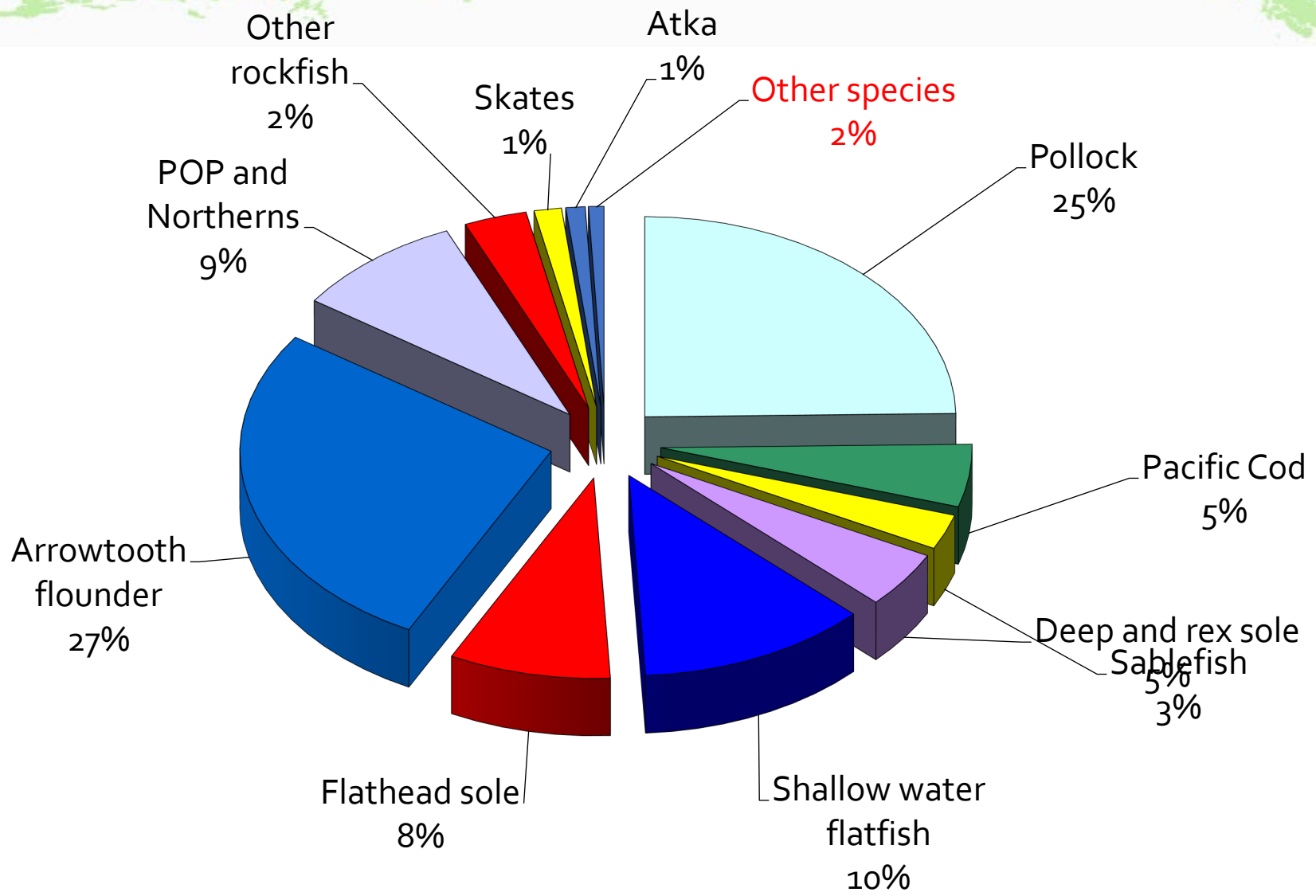
# GOA Catch and ABC levels



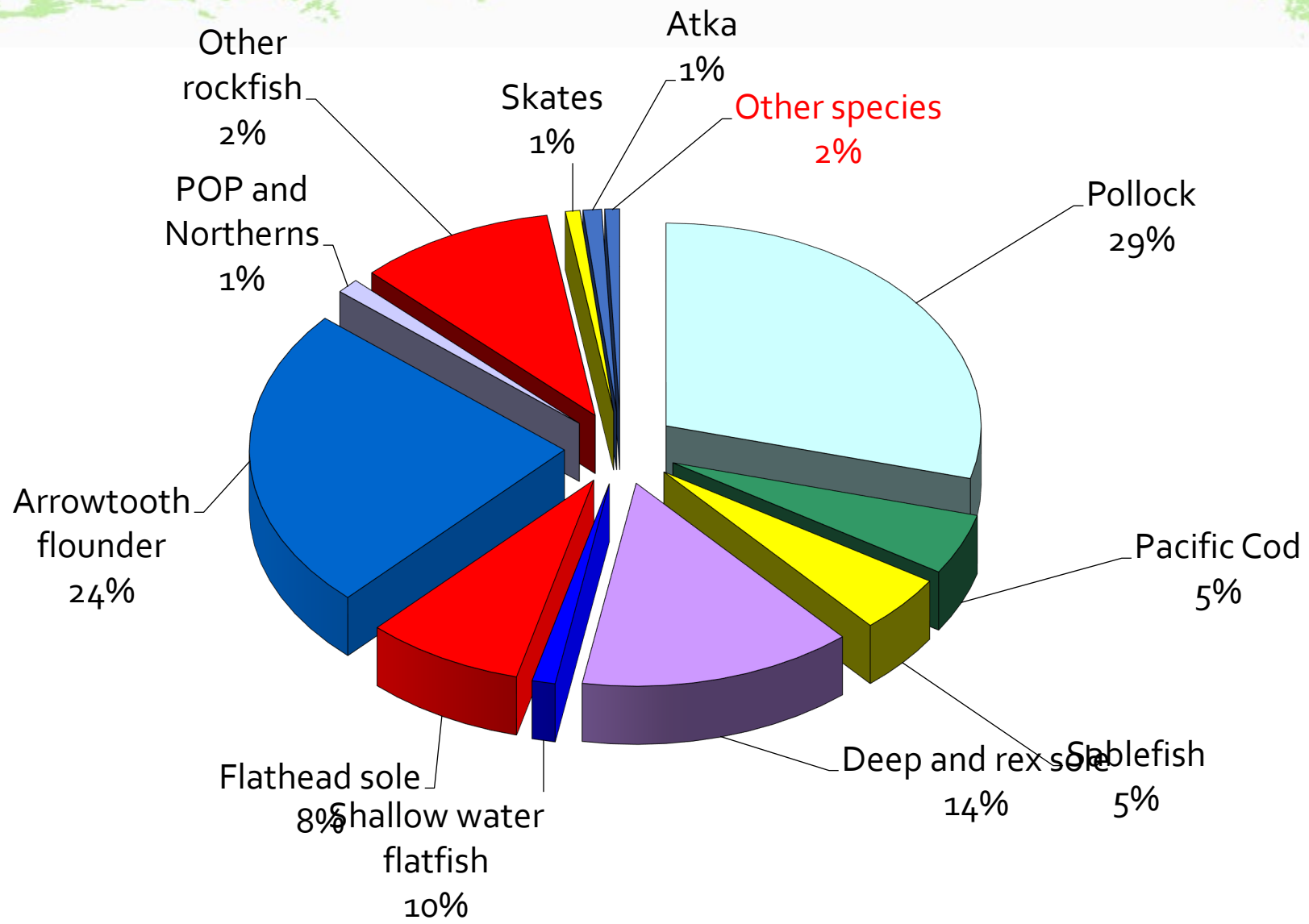
# GOA 2020 ABC's: 463,466 t



# GOA 2021 ABC's: 469,543 t



# GOA 2022 ABC's: 499,446 t



# ABC / TAC

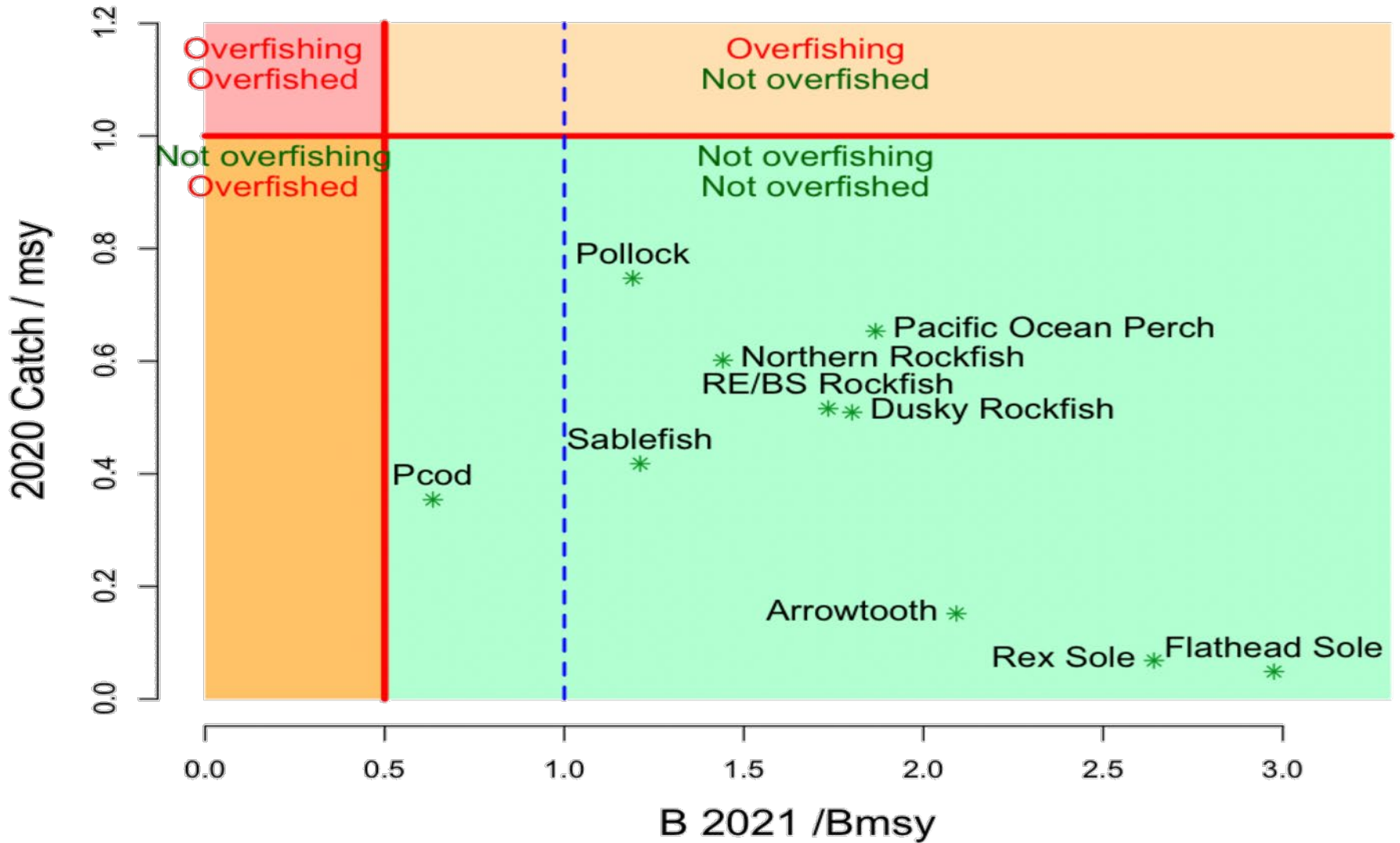
Team recommendations where  $ABC < \text{maximum permissible}$ :

Table 3. Maximum permissible fishing mortality rates and ABCs as defined in Amendment 56 to the GOA and BSAI Groundfish FMPs, and the Plan Team's 2022 and 2023 recommended fishing mortality rates and ABCs, for those species whose recommendations were below the maximum permissible.

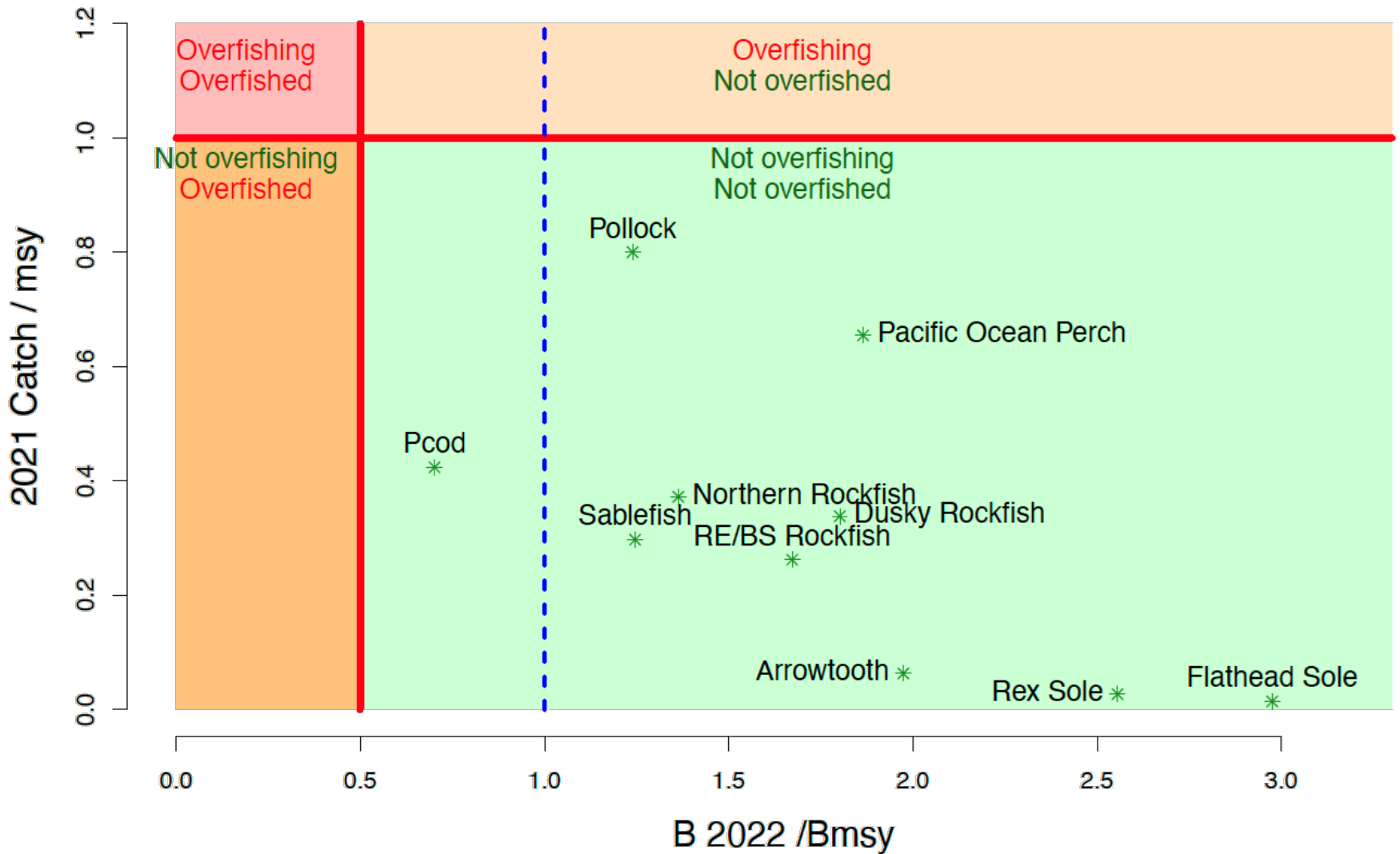
Species	Tier	2022			
		$Max F_{ABC}$	$Max ABC$	$F_{ABC}$	ABC
Sablefish	3a	0.080	34,863	0.080	34,521
Dusky rockfish	3	0.093	7,069	0.093	5,372
Demersal shelf rockfish	4, 6	0.026	342	0.02	268

Stair-step for dusky rockfish  
(applied to catch not F so  
FABC unavailable)

# Stock status summary **last** year



# Stock status summary **this** year



# Species overviews

1. 2021 ABC/Catch and recommended changes
2. Highlights
  - New data
  - Analytic approach (changes)
3. Stock status and trend
4. ABC/OFL
  - Tier history and recommendations
  - 2021, 2022 maxABC; recommended ABC

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## 2. [Pacific cod](#)

Status and catch specifications (t) of Pacific cod in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2022 and 2023 are those recommended by the Plan Team. Catch data are current through November 6<sup>th</sup>, 2021.

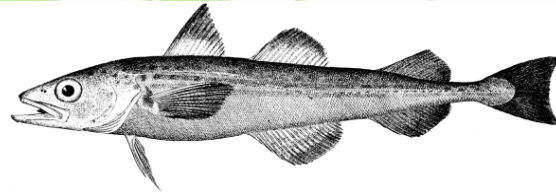
Year	Age 0+ biomass	OFL	ABC	TAC	Catch
2020	203,373	17,794	14,621	6,431	3,944
2021	265,661	28,977	23,627	17,321	12,272
2022	159,837	29,131	24,043		
2023		27,715	22,882		

### *Changes from the previous assessment*

Data updated from the 2021 assessment included federal and state fishery catch for 2020 and 2021 (preliminary catch projected through the end of 2021), federal and state fishery size composition for 2020 and preliminary size compositions for 2021, 2021 AFSC longline survey abundance index (Relative



ABC

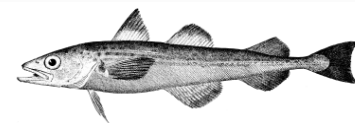


Species	2021 catch	ABC 2021	ABC 2022	Change
Pollock	98,769	115,870	144,444	up 28,574 (25%)
Pacific Cod	12,272	23,627	24,043	up 416 (2%)
Sablefish	14,115	21,475	22,794	up 1,319 (6%)
Flatfish	2,717	116,883	115,834	down 1,049 (1%)
Arrowtooth flounder	9,517	126,970	119,779	down 7,191 (6%)
Rockfish	35,882	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%)

# 1. GOA pollock overview

- Authors' presentation

## Team discussions—GOA pollock



Relative to weight-at-age changes in data

**The Team recommends that the methodologies for projecting weight at age from the survey data be investigated, possibly by implementing a random-effects model or a sample weighted mean approach rather than a simple average**

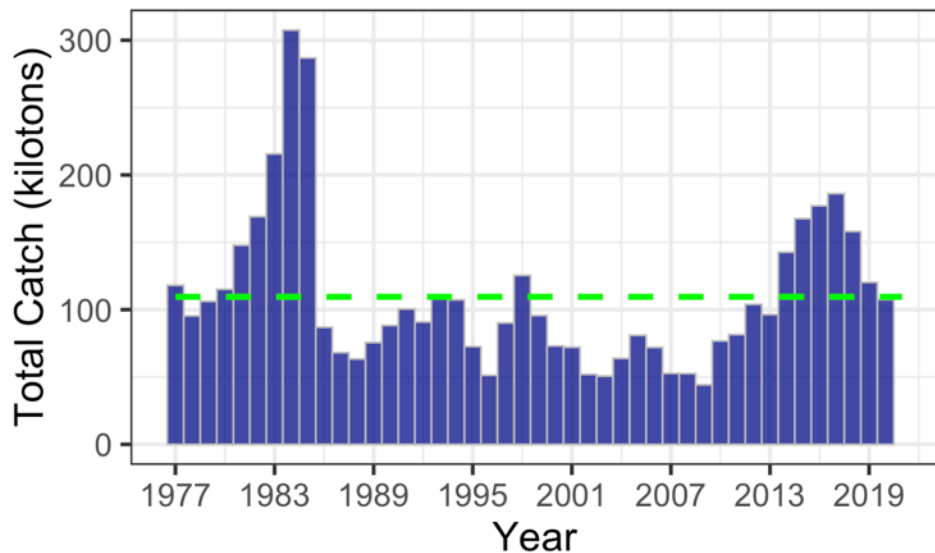
Regarding NMFS Bottom trawl survey catchability:

**The Team recommends the author further research this issue, including conducting a prior sensitivity analysis and potentially looking at applying priors (if available) for other surveys in the assessment.**

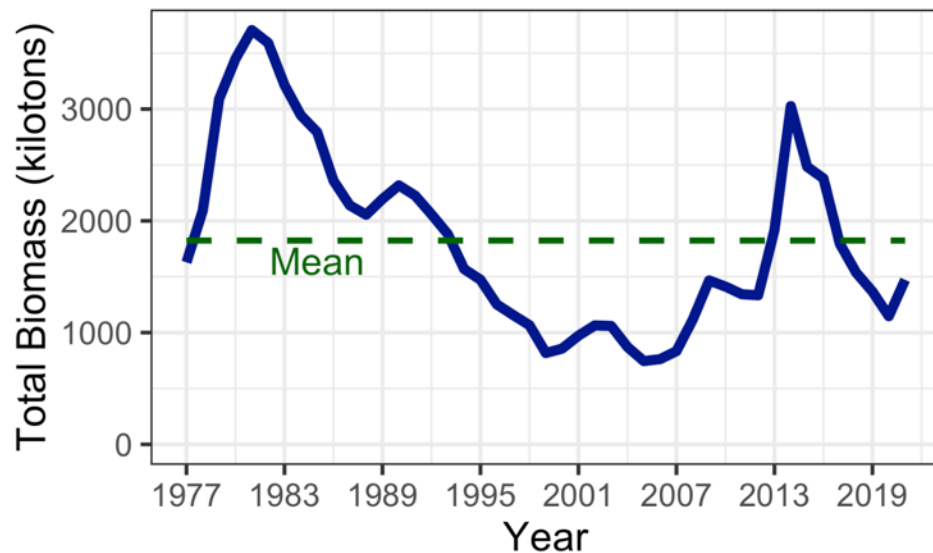
**The Team supported the authors' planned research into these topics and agreed their relative priority.**

# 1. GOA pollock

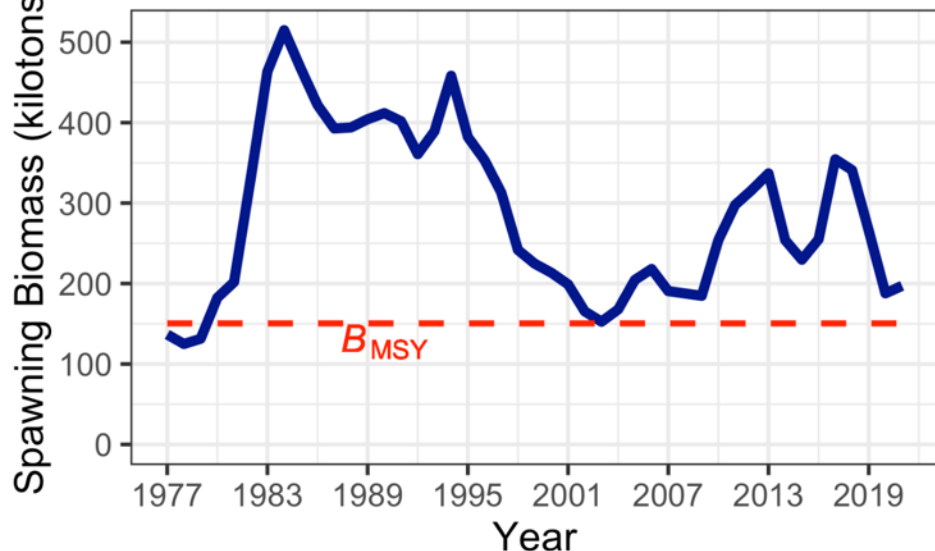
## Total Catch



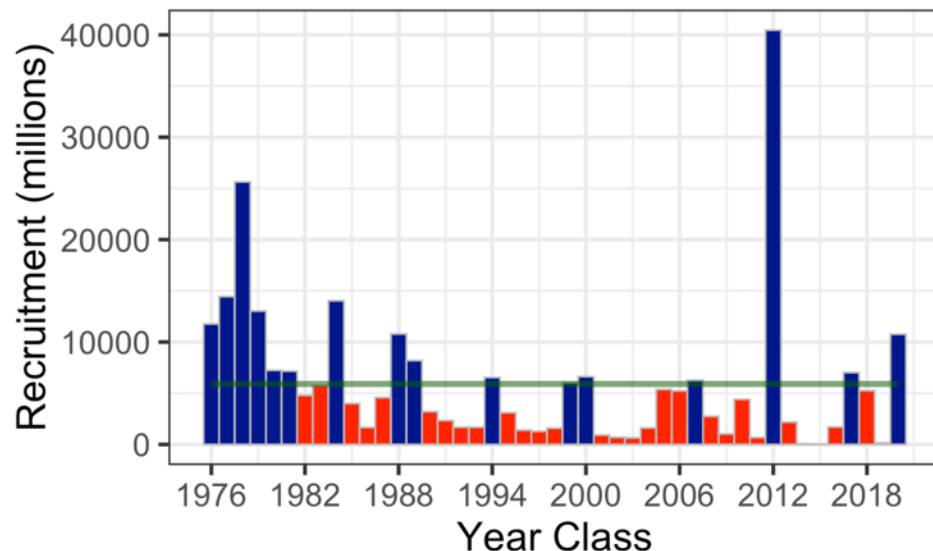
## Total Biomass



## Spawning Biomass



## Age 1 Recruitment



## 2. GOA Pacific cod



Species	2021 catch	ABC 2021	ABC 2022	Change
Pollock	98,769	115,870	144,444	up 28,574 (25%)
<b>Pacific Cod</b>	<b>12,272</b>	<b>23,627</b>	<b>24,043</b>	<b>up 416 (2%)</b>
Sablefish	14,115	21,475	22,794	up 1,319 (6%)
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Total	178,511	476,037	499,446	up 23,409 (5%)

# GOA Pacific cod



- Presentation from author



GOA Pacific cod

Team agreed with the recommended model with environmental links on

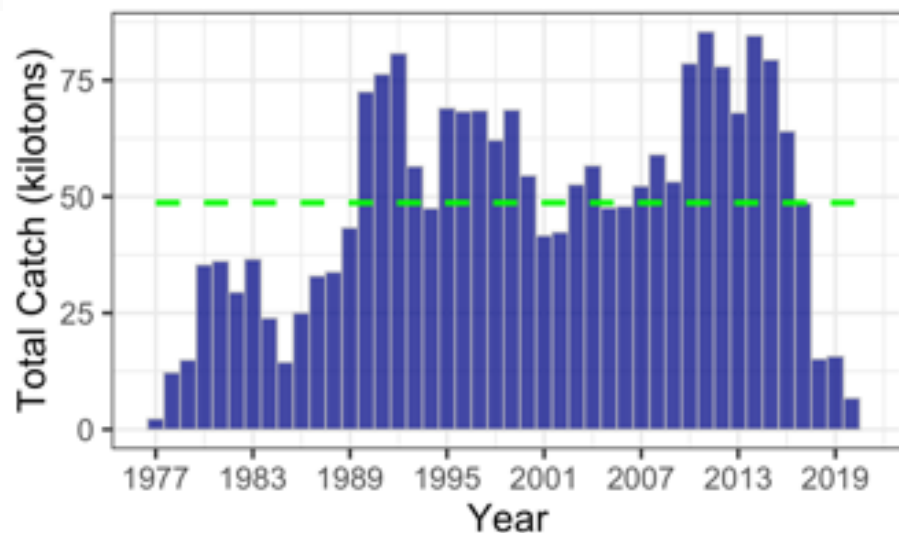
Growth

Natural mortality

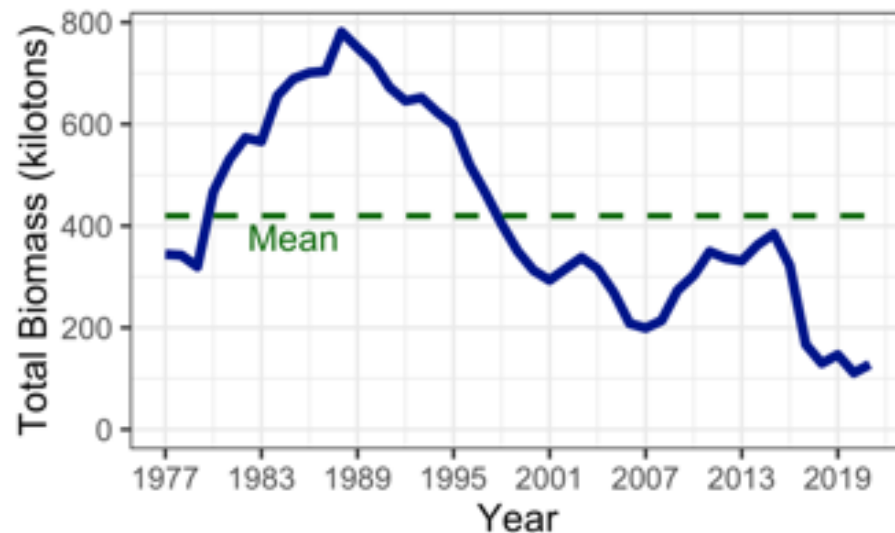


# GOA Pacific cod

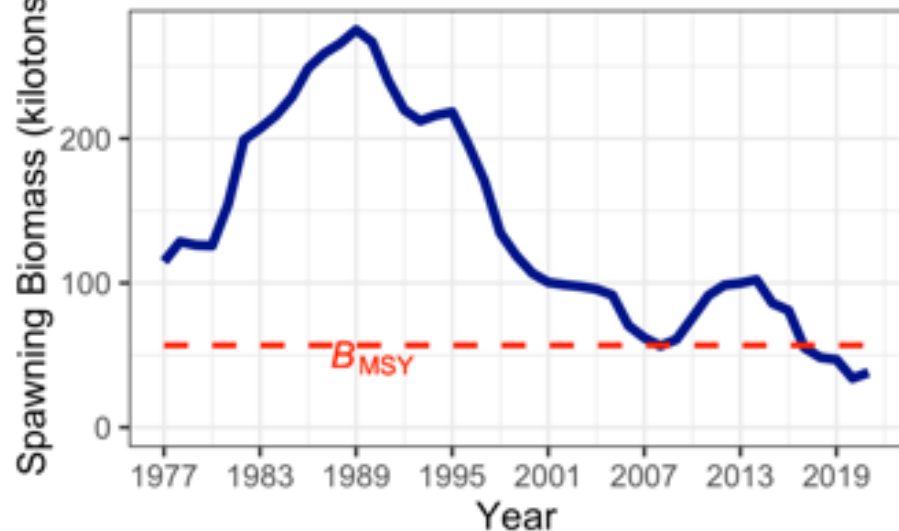
## Total Catch



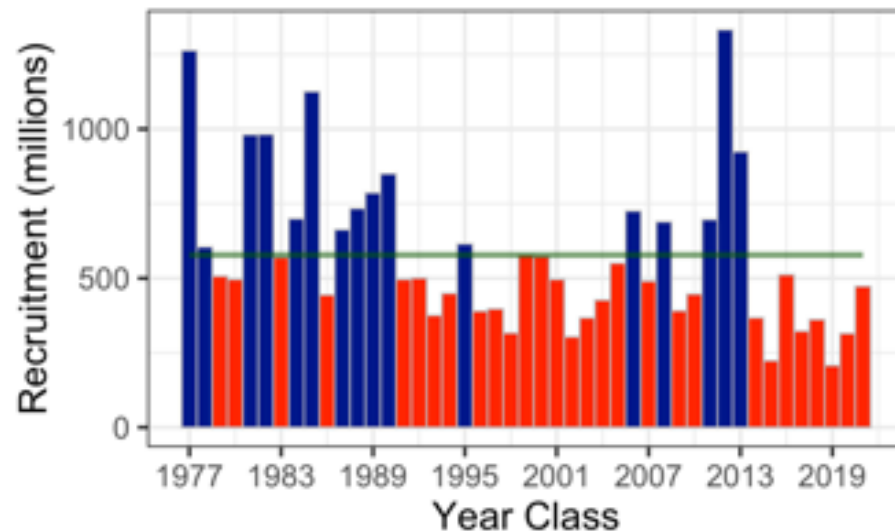
## Total Biomass



## Spawning Biomass



## Age 0 Recruitment





# 3. Sablefish

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%)
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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%)

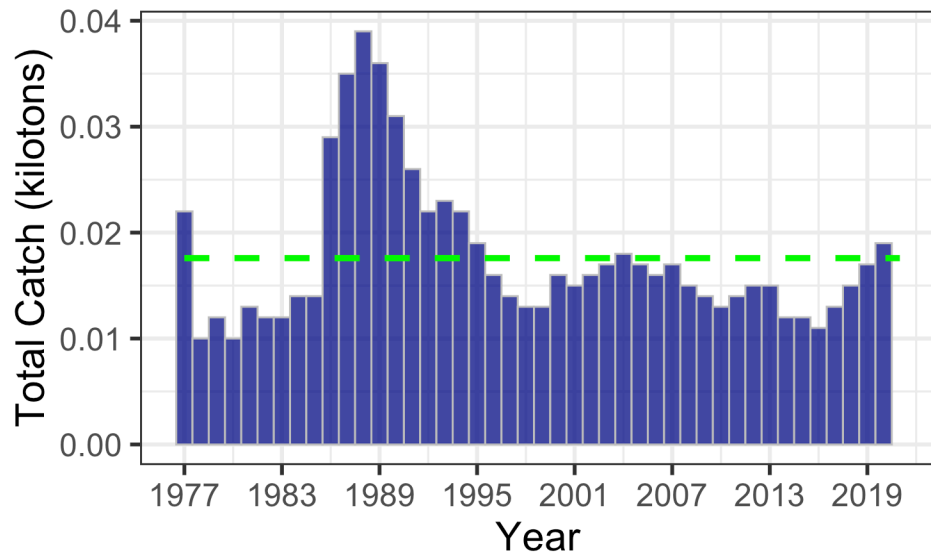
# 3. Sablefish

*Covered in Joint Team*

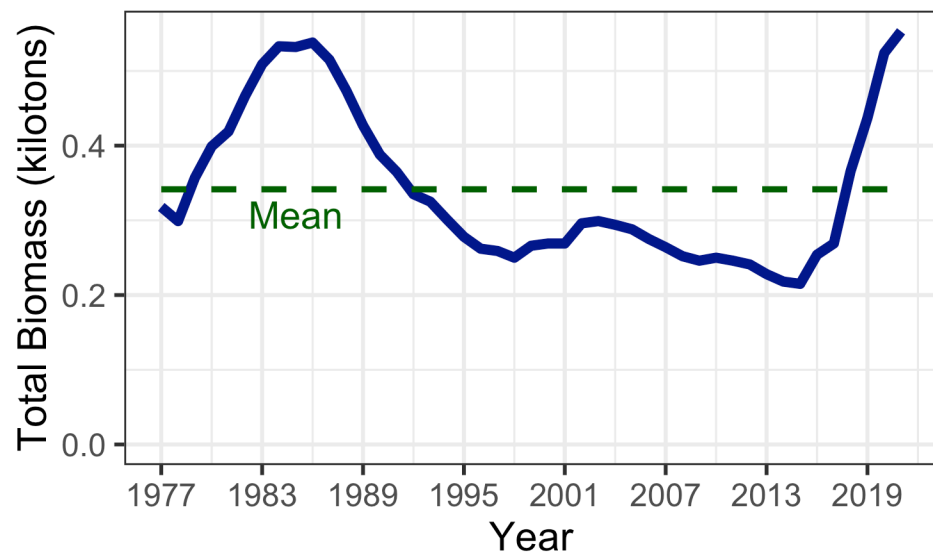
Region	OFL**	2022		2023	
		ABC	TAC	OFL	ABC
W	--	3,727		--	3,951
C	--	9,965		--	9,495
*WYAK	--	3,437		--	3,159
*SEO	--	5,665		--	5,398
<b>GOA</b>	--	<b>22,794</b>		--	<b>22,003</b>
<b>Alaska-wide</b>	<b>40,432</b>	<b>34,521</b>		<b>42,520</b>	<b>36,318</b>

# 2021 sablefish

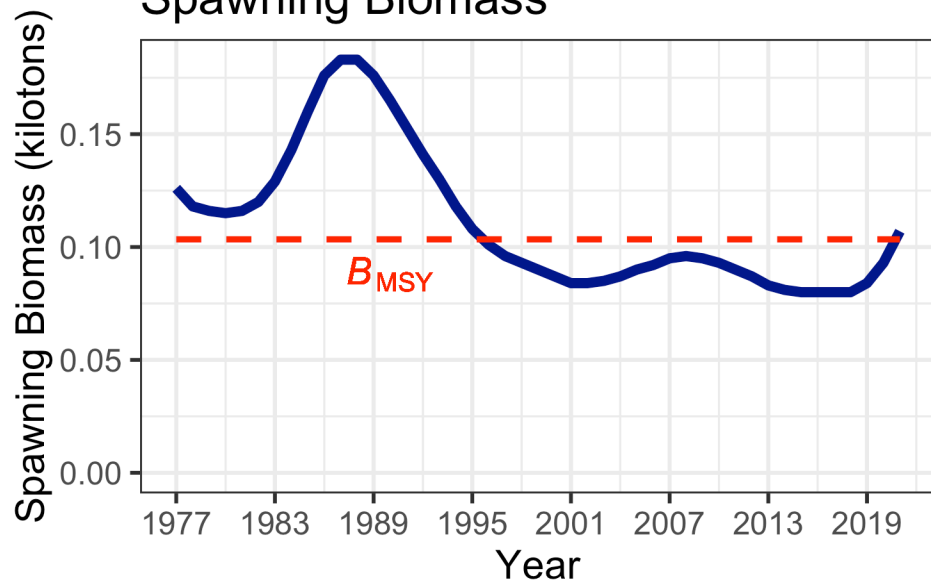
## Total Catch



## Total Biomass



## Spawning Biomass



## Age 2 Recruitment

