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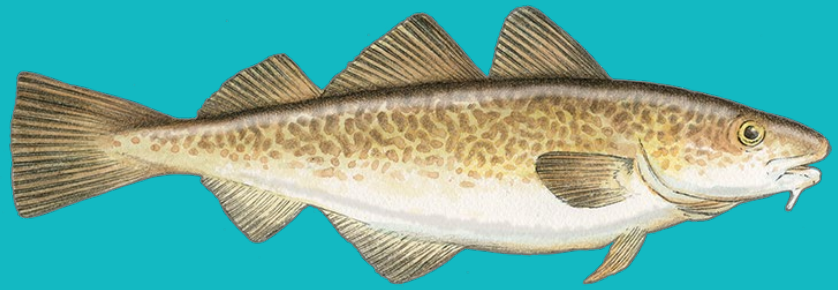
Assessment of the Pacific cod stock in the Aleutian Islands

Ingrid Spies, Steve Barbeaux, Pete Hulson, Ned Laman, Ivonne Ortiz



Aleutian Islands Pacific cod

- 2022 survey results
- Catch and fishery
- Models introduced in 2022.

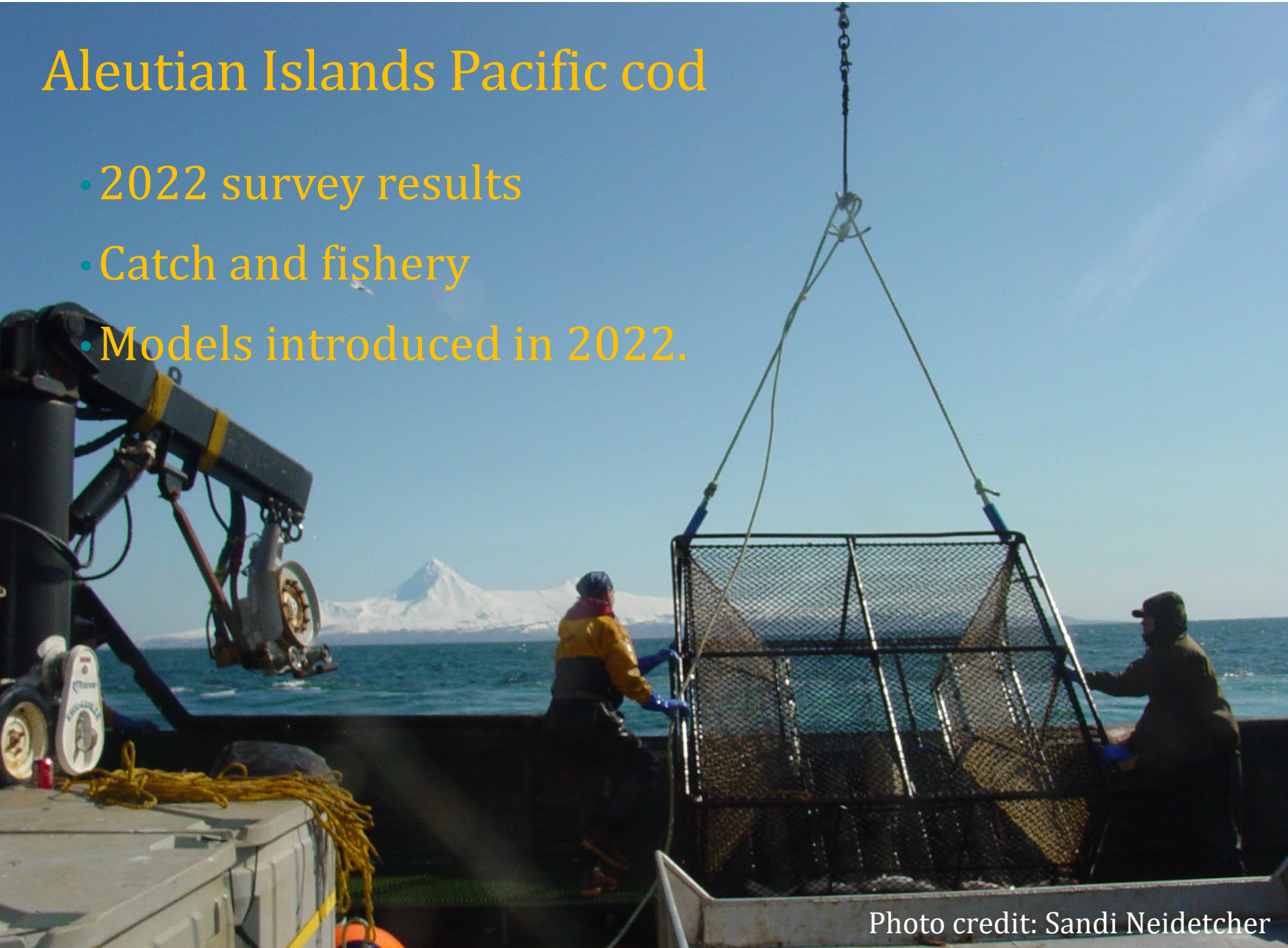
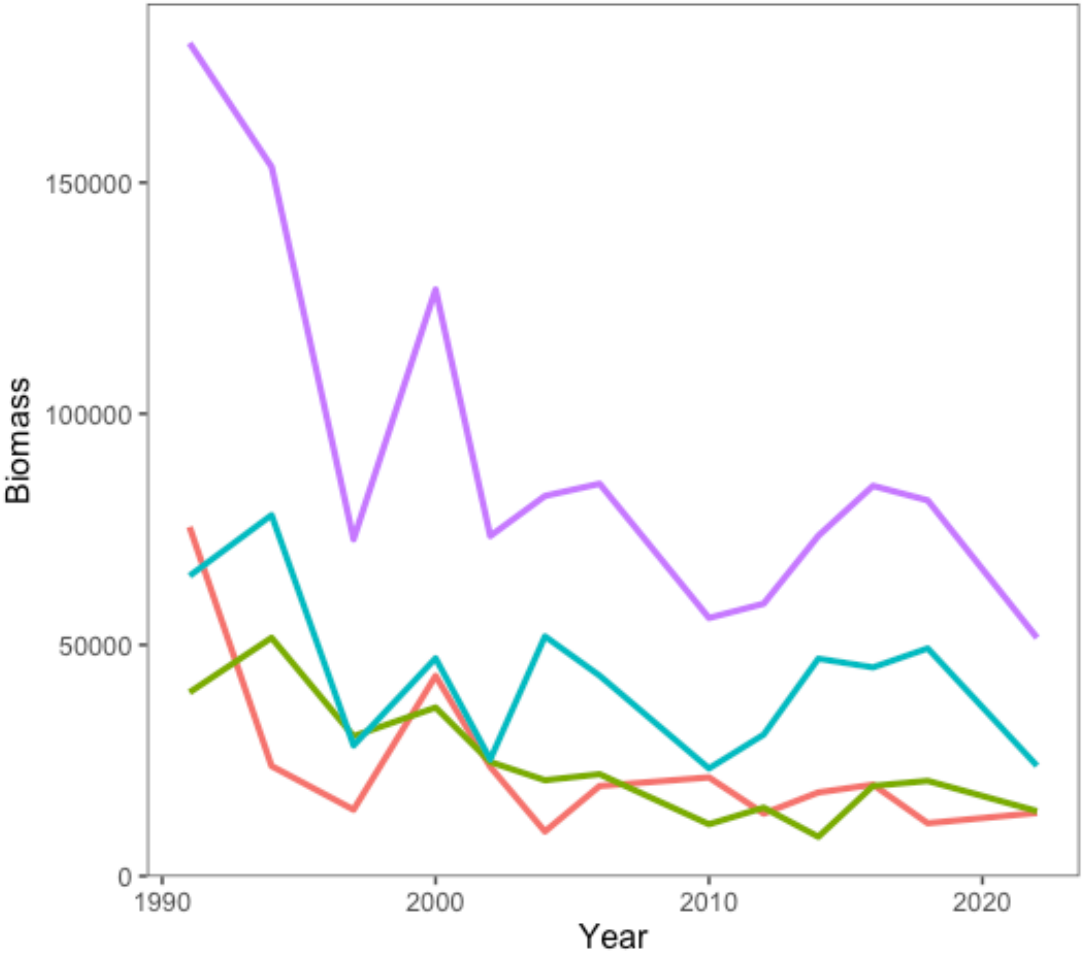
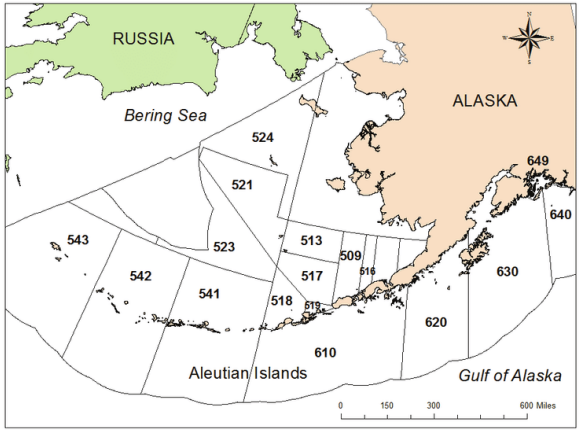


Photo credit: Sandi Neidetcher

Aleutian Islands Pacific cod trawl survey estimates by NMFS area





Region

- Western
- Central
- Eastern
- Total

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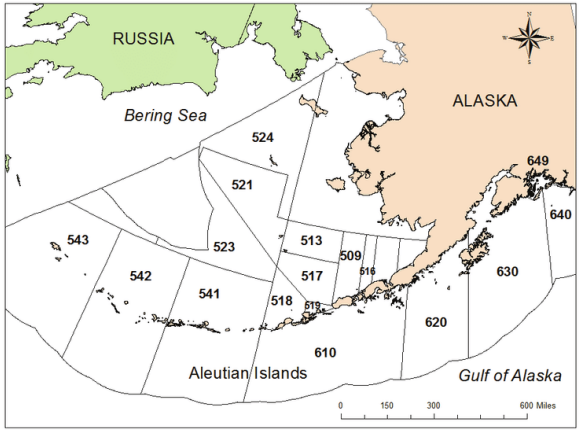
Aleutian Islands Pacific cod trawl survey estimates by NMFS area

Biomass (t)				
Year	Western	Central	Eastern	Total
1991	75,514	39,729	64,926	180,170
1994	23,797	51,538	78,081	153,416
1997	14,357	30,252	28,239	72,848
2000	43,298	36,456	47,117	126,870
2002	23,623	24,687	25,241	73,551
2004	9,637	20,731	51,851	82,219
2006	19,480	22,033	43,348	84,861
2010	21,341	11,207	23,277	55,826
2012	13,514	14,804	30,592	58,911
2014	18,088	8,488	47,032	73,608
2016	19,775	19,496	45,138	84,409
2018	11,425	20,596	49,251	81,272
2022	13,661	14,041	23,837	51,539



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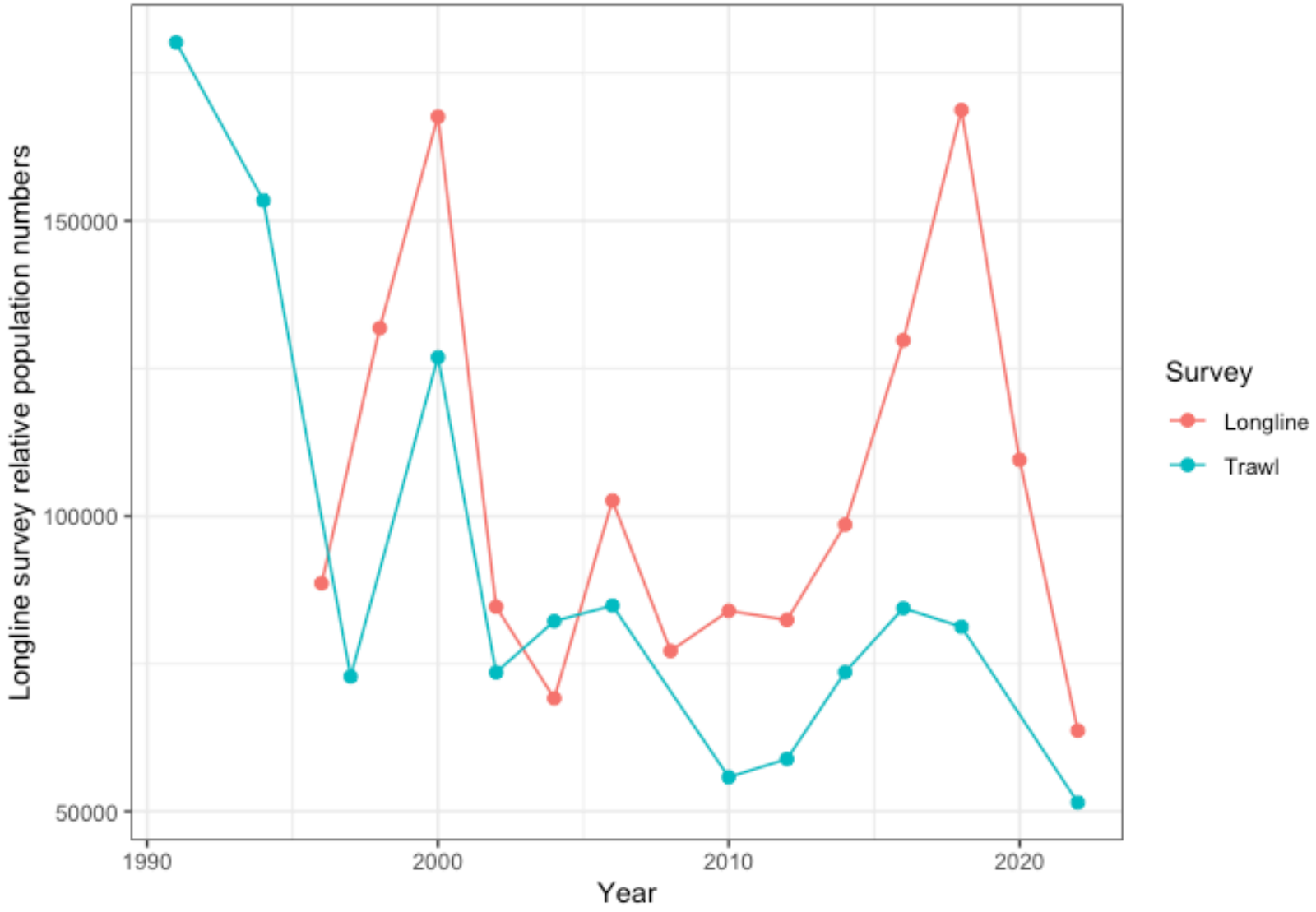
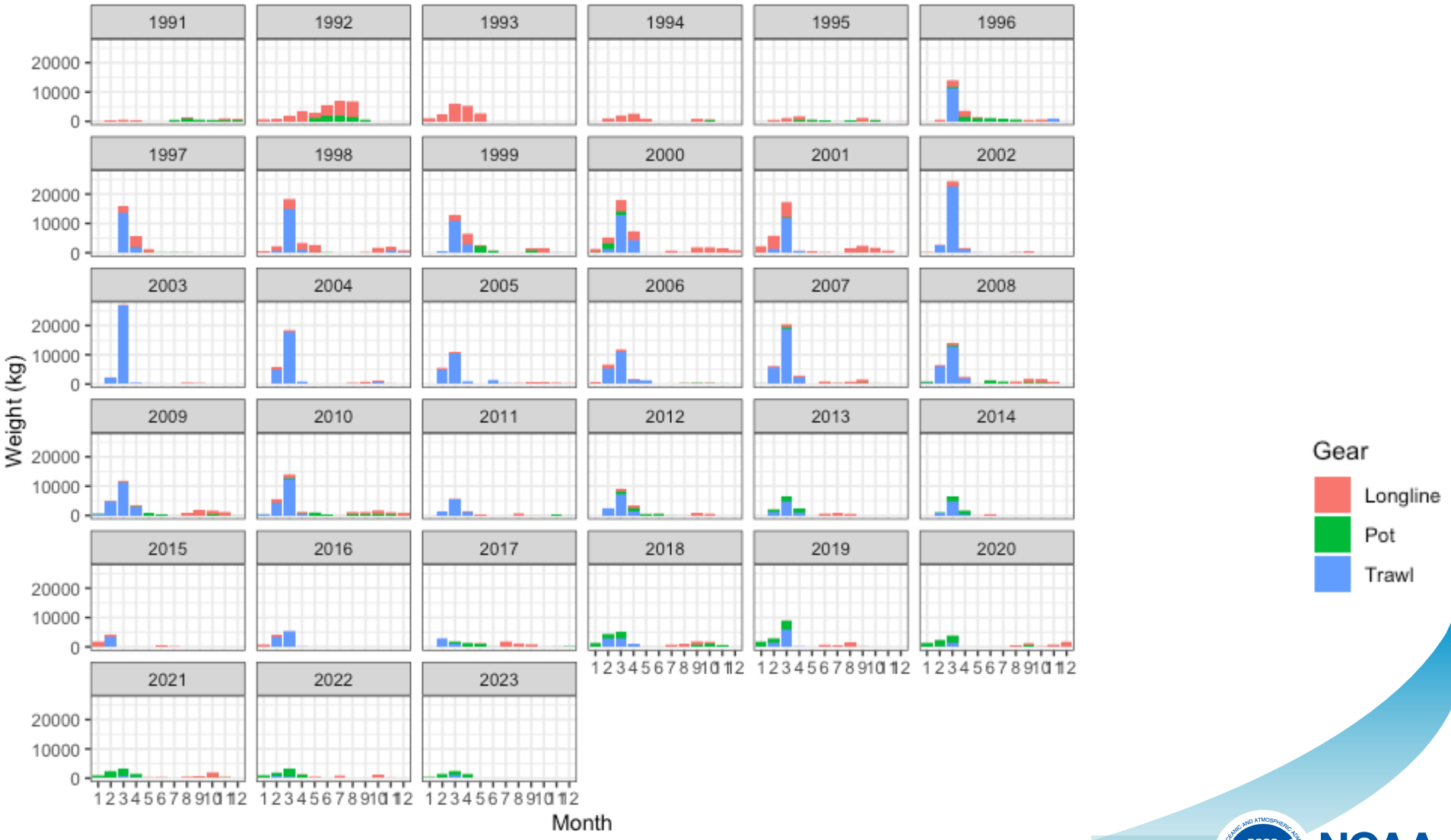
Aleutian Islands Pacific cod trawl and longline survey estimates 1991 - 2022



Longline survey uses gear similar to that used in the fishery

- The depth range of sablefish is deeper than cod, 150-2500 m, Pacific cod prefer 100-200 m.
- The hook size used on the longline survey is 13/0, and the fishery generally uses 13/0, although it can range between 12/0 and 14/0.

Aleutian Islands targeted cod fishery catch by gear, 1991-2023



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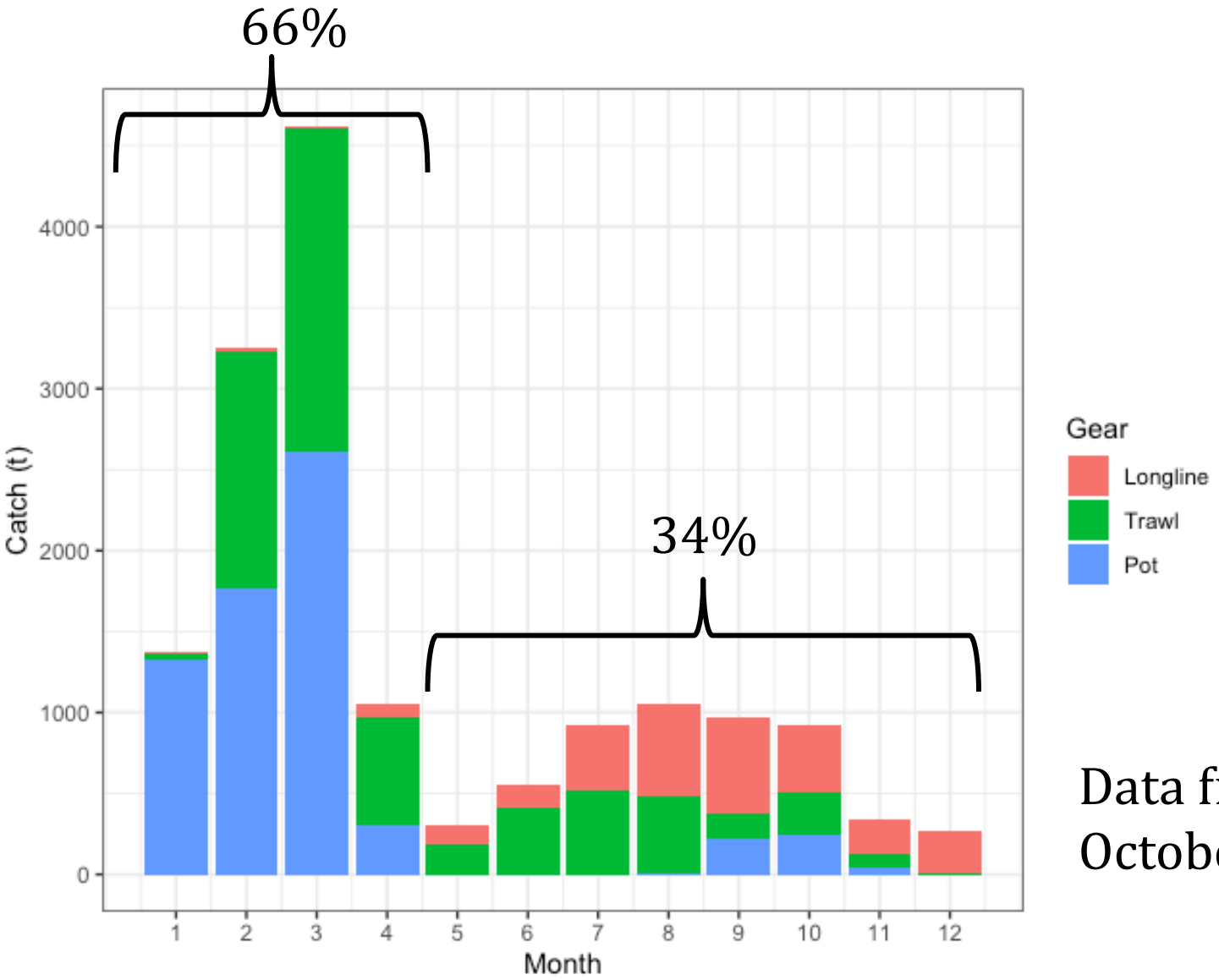
Aleutian Islands Pacific cod average catch (t) by month per year, for the past 5 years



Data from 2018 - October 31, 2022.

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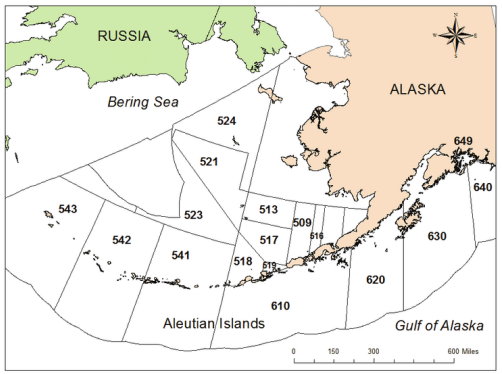
State guideline harvest levels for Aleutian Islands Pacific cod

Year	Formula
2014	0.03*(EBS ABC + AI ABC)
2015	0.03*(EBS ABC + AI ABC)
2016	0.27*AI ABC
2017	0.27*AI ABC
2018	0.27*AI ABC
2019	0.31*AI ABC
2020	0.35*AI ABC or 6,804 t, whichever is less
2021	0.39*AI ABC or 6,804 t, whichever is less
2022	0.39*AI ABC or 6,804 t, whichever is less

Aleutian Islands Pacific cod catch by area



Area
543
542
541

1993-2022
(October 31)

Assessment methodology

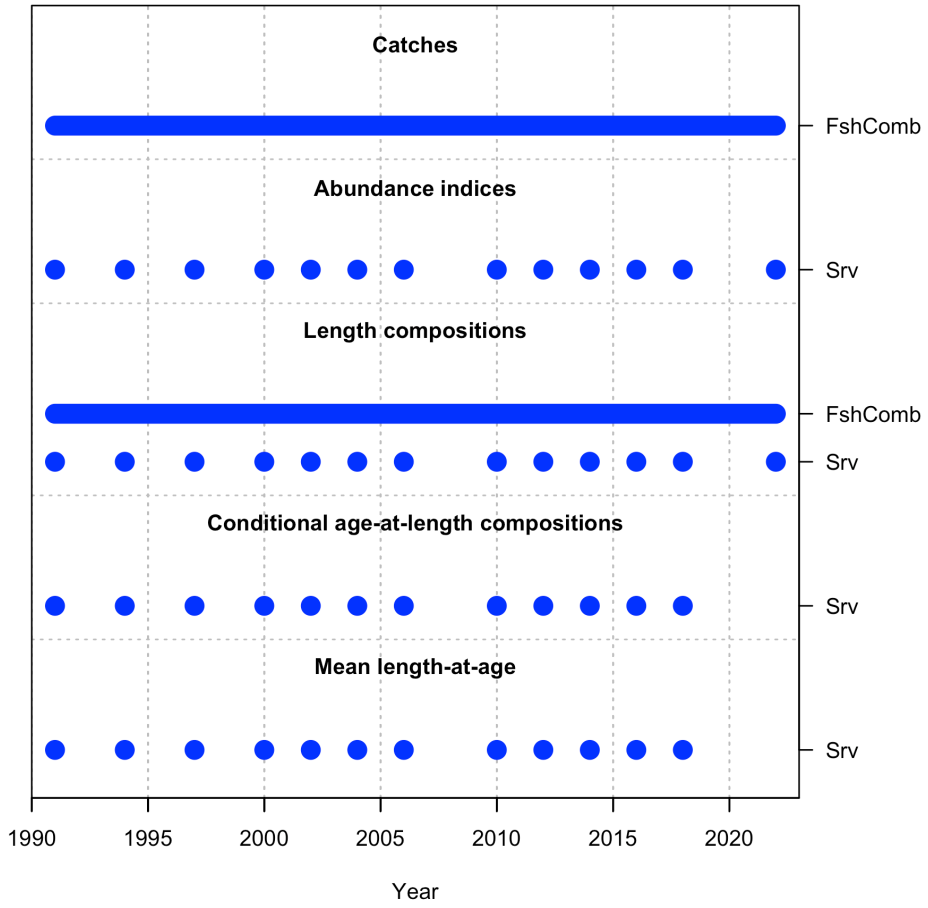
1. The Tier 5 methodology has not changed (Model 13.4). ABC=75%*M*Biomass
2. Model 22.0 “Simple”
   - 1991-2022,
   - fishery data considered a single fishery ,
   - Aleutian Islands trawl survey.
3. Model 22.1 “Complex”
   - 1991-2022,
   - fishery data for trawl, longline, and pot fisheries,
   - Aleutian Islands longline and trawl survey.

In 2022 the age structured model methodology moved from ADMB to Stock Synthesis

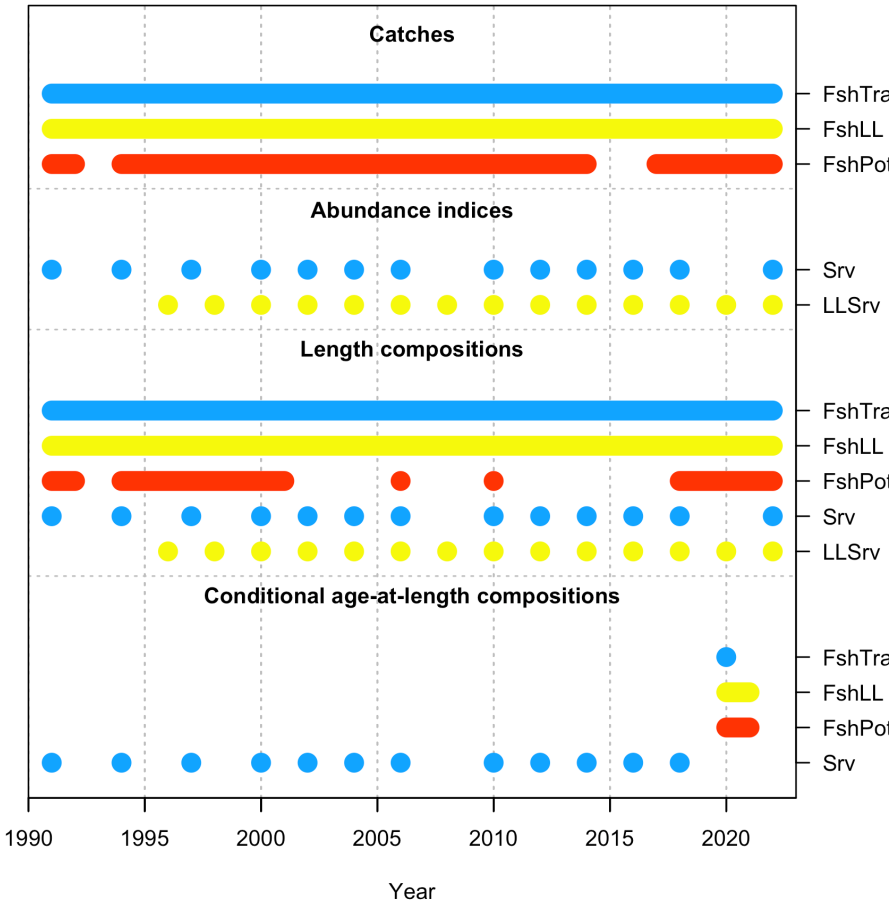
- Consistency with other cod models.
- Model formulations are well-documented.
- Multiple options allow for additional analyses that can be done in a short time.

Data sources

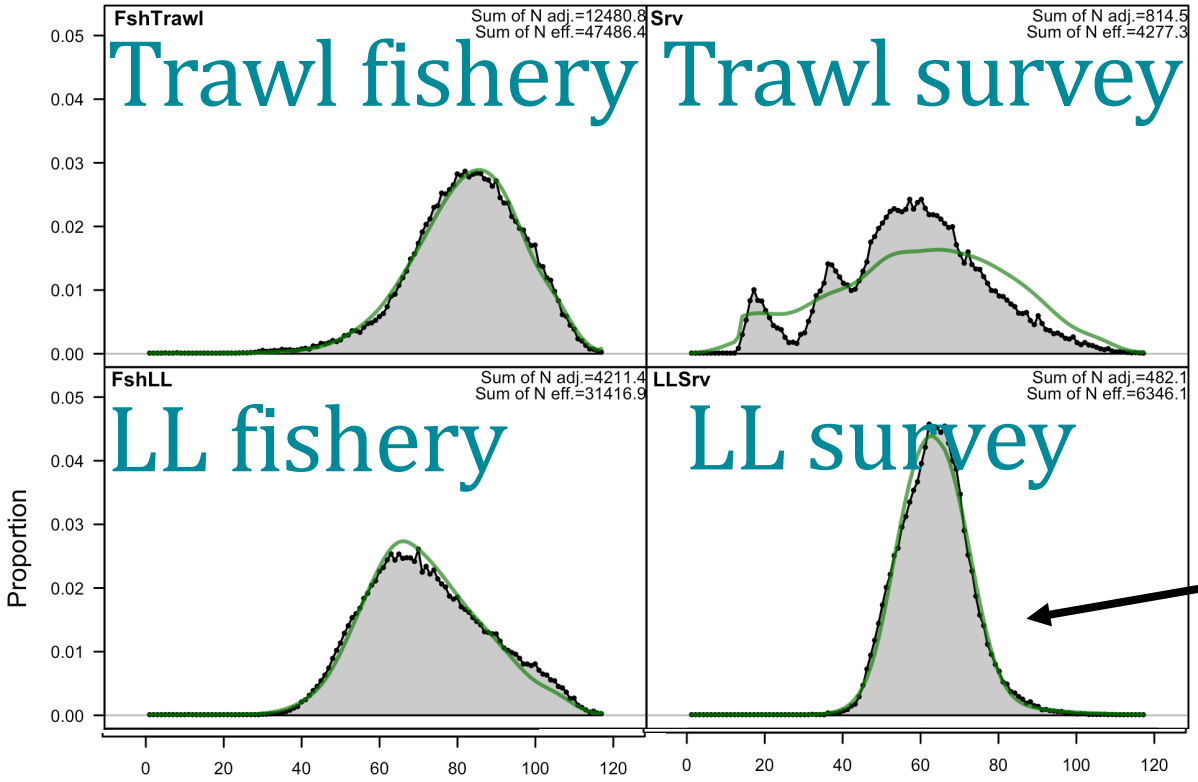
Model 22.0

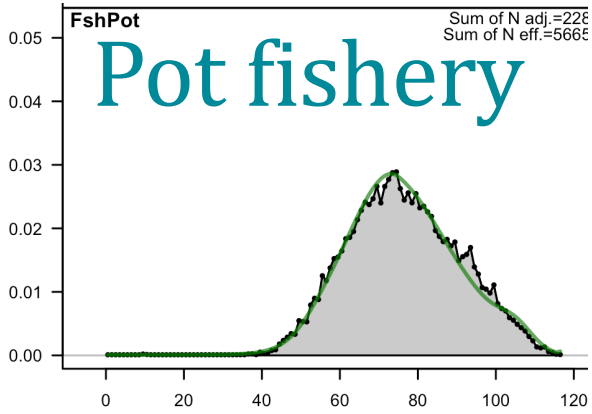


Model 22.1



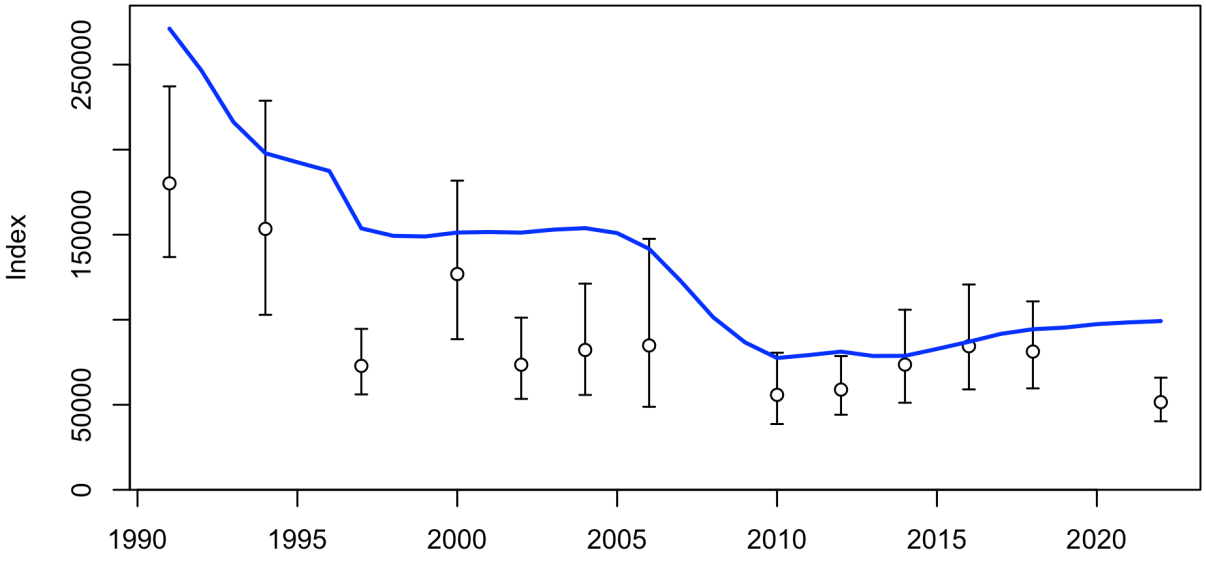
Survey length frequencies from fishery and surveys





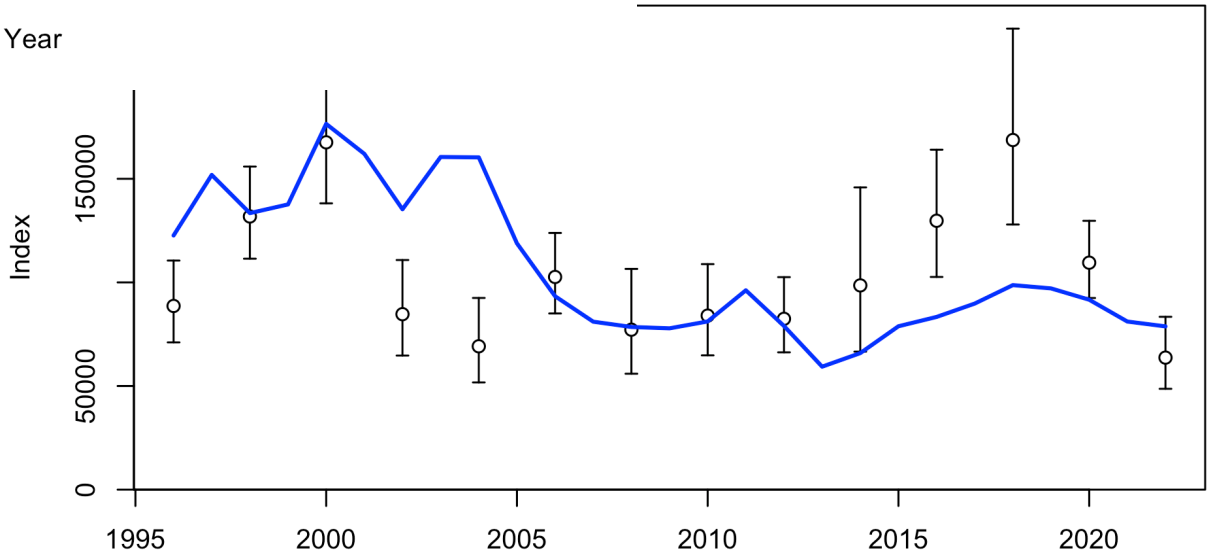
Larger fish do not seem to be caught in the longline survey.

Model 22.1 fit to trawl and longline survey

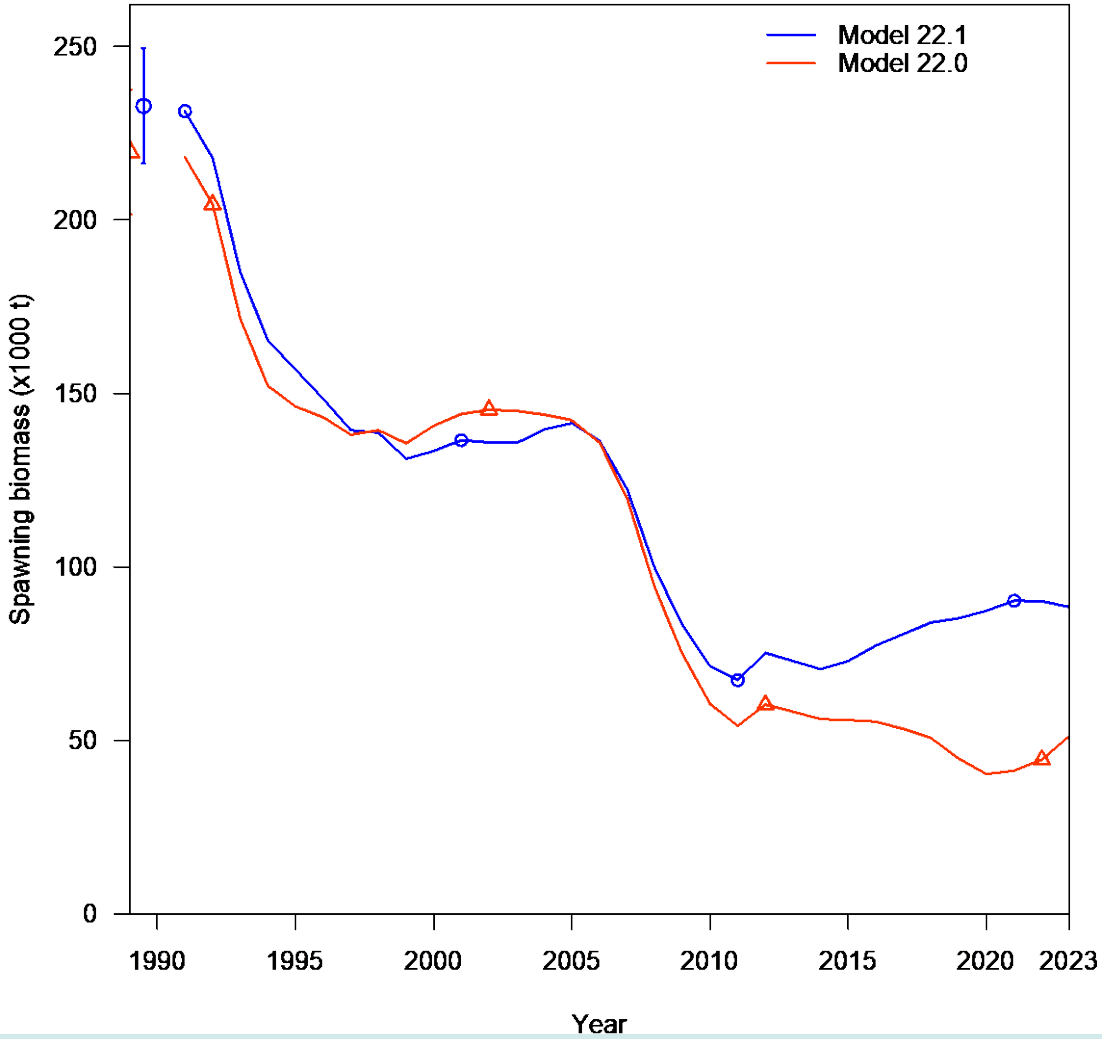


Trawl Survey

Longline Survey



Spawning biomass estimate based on Model 22.1 (blue), 22.0 (red)



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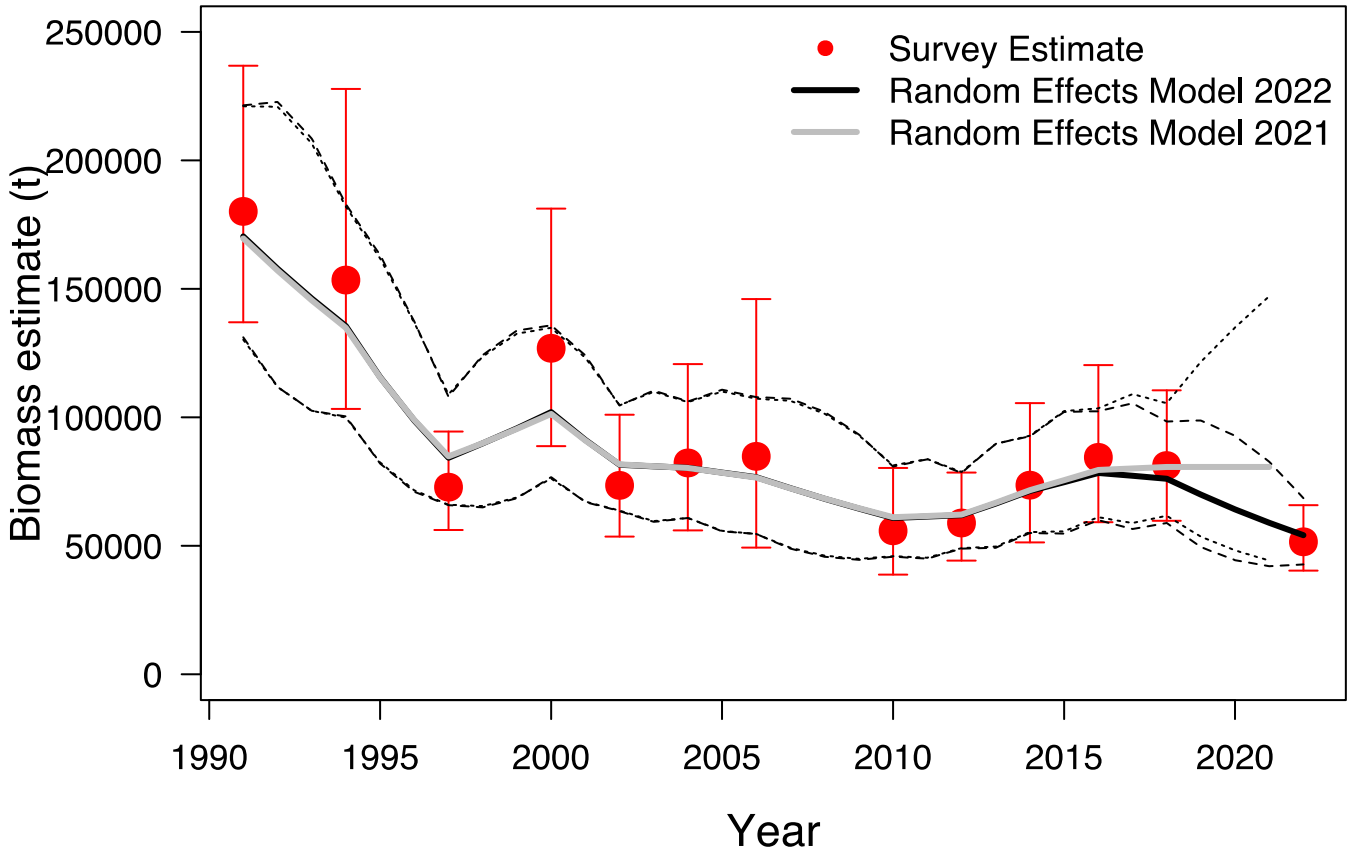
In 2022 Tier 5 model was used to set harvest recommendations.

The SSC supports the PT and author recommendation for continued use of the Tier 5 assessment approach in 2022,

- Due to strong positive retrospective pattern in both age-structured model variants 22.0, which highlight a history of overly optimistic projections for increasing abundance.
- A positive bias in their fit to the AI bottom trawl survey, for the period prior to and including 2014.

The SSC supports the PT and authors' recommendation to use the Tier 5 random effects model for 2023 harvest specification, and associated OFLs and ABCs, with no reduction from the maximum permissible ABC.

Tier 5 random effects estimate of Aleutian Islands Pacific cod biomass from the NMFS Trawl Survey, 1991 - 2022



The Tier 5 random effects estimate from 2021 is included for comparison.

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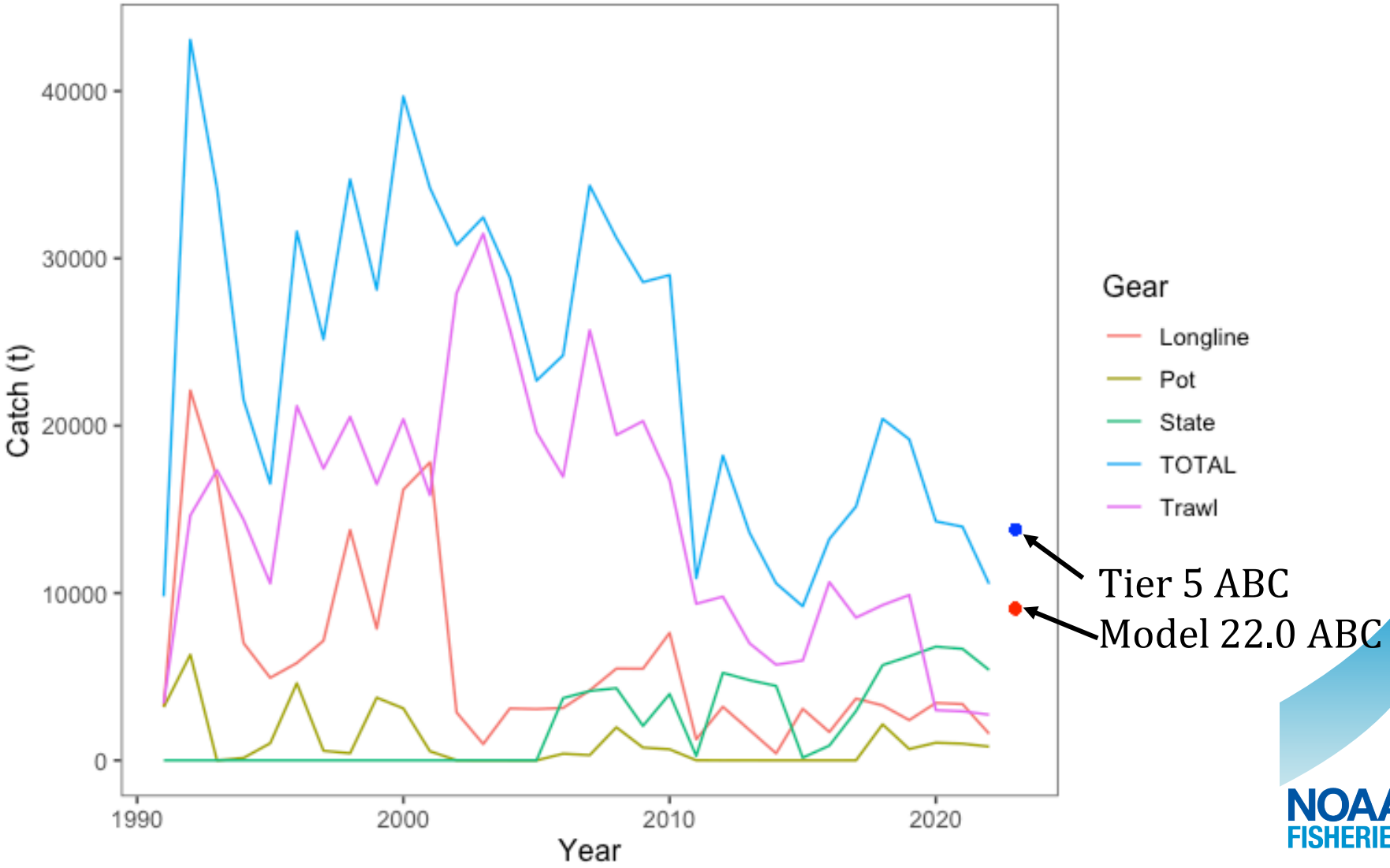
Tier 5 Reference point table

	As estimated or *specified* *last* year for:		As estimated or *recommended* *this* year for:	
Quantity	2022	2023	2023	2024
M (natural mortality rate)	0.34	0.34	0.34	0.34
Tier	5	5	5	5
Biomass (t)	80,700	80,700	54,165	54,165
F_{OFL}	0.34	0.34	0.34	0.34
$maxF_{ABC}$	0.255	0.255	0.255	0.255
F_{ABC}	0.255	0.255	0.255	0.255
OFL	27,400	27,400	18,416	18,416
$maxABC$	20,600	20,600	13,812	13,812
ABC	20,600	20,600	13,812	13,812
Status	2020	2021	2021	2022
Overfishing	No	n/a	No	n/a

Aleutian Islands Pacific cod catch history, with federal catches by gear type



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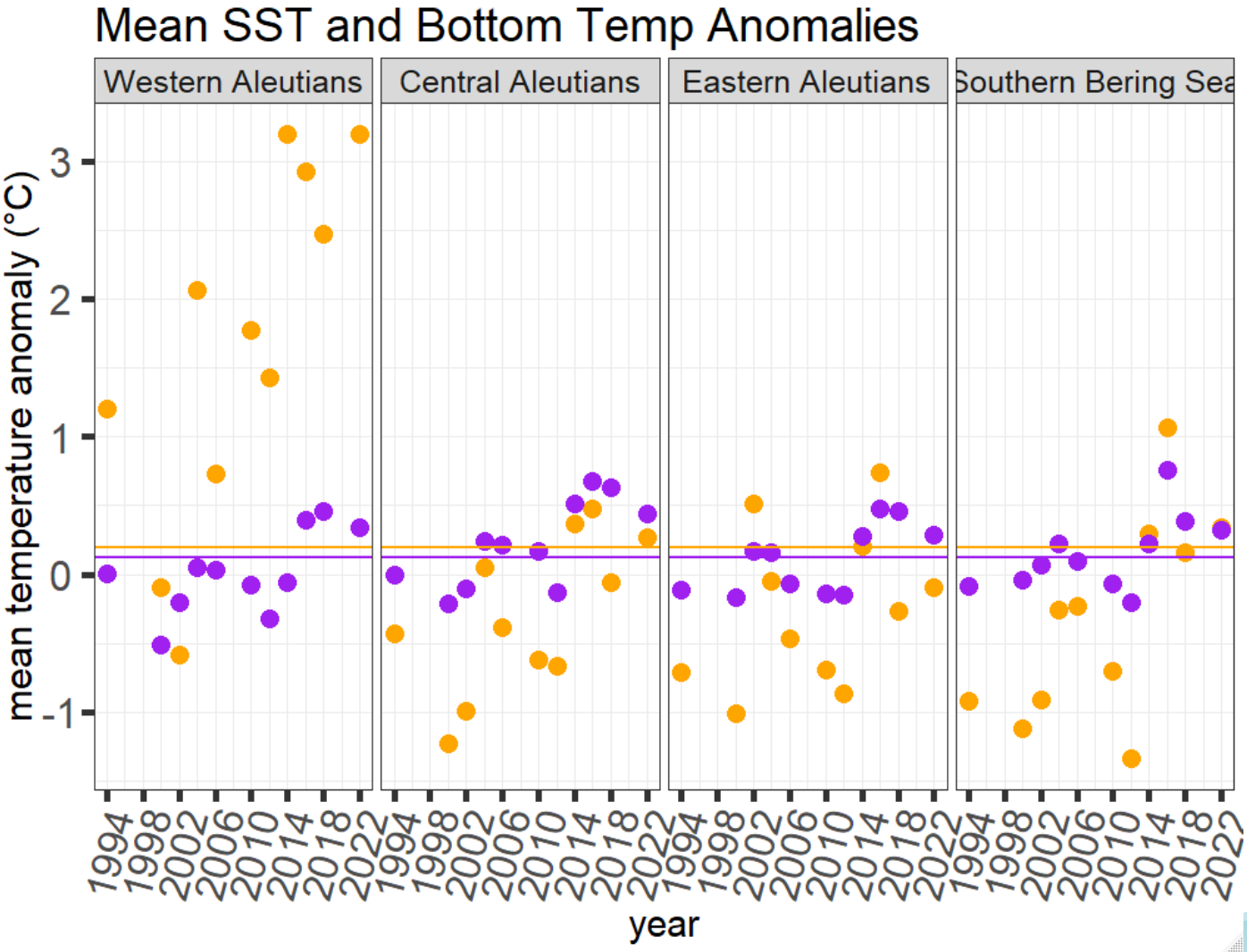
Water temperatures in the Aleutian Islands have been above the long term mean since at least 2014



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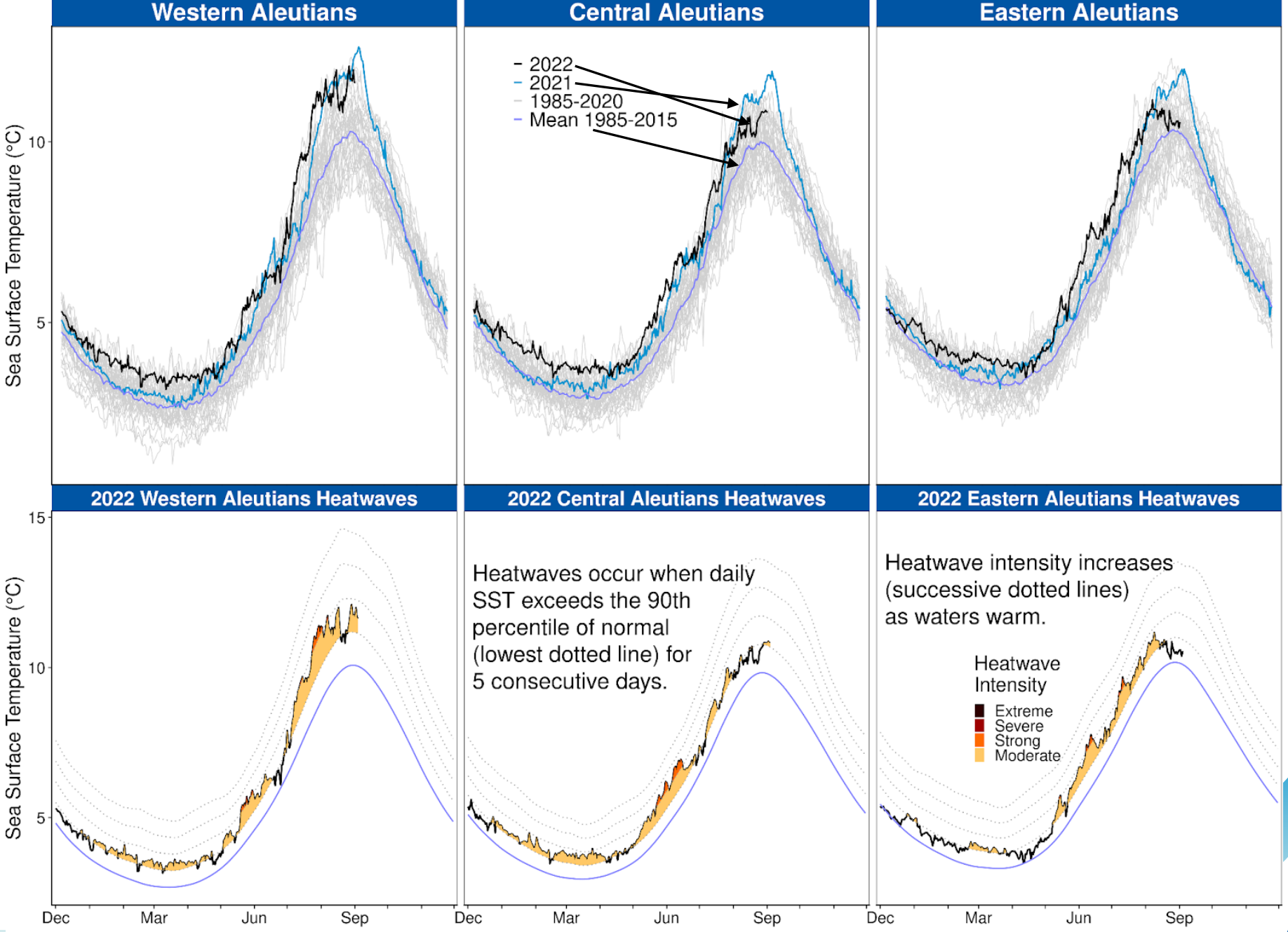

NOAA Coral Reef Watch data, courtesy National Environmental Satellite, Data, and Information Service (Updated: 09-04-2022)
Data are modeled satellite products and periodic discrepancies or gaps may exist across sensors and products.
Contact: matt.callahan@noaa.gov

Questions?

Photo credit: Sandi Neidetcher