

# C2 Bering Sea Chum Salmon Bycatch

## Preliminary Draft Environmental Impact Statement and Social Impact Assessment



Scientific and Statistical Committee, April 2024

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# Presentation Outline

1. Action timeline
  1. Purpose and need
2. Description of alternatives (Chapter 4)
3. Methods used for impact analysis (Chapter 5)
4. Impact analysis (Chapter 6)

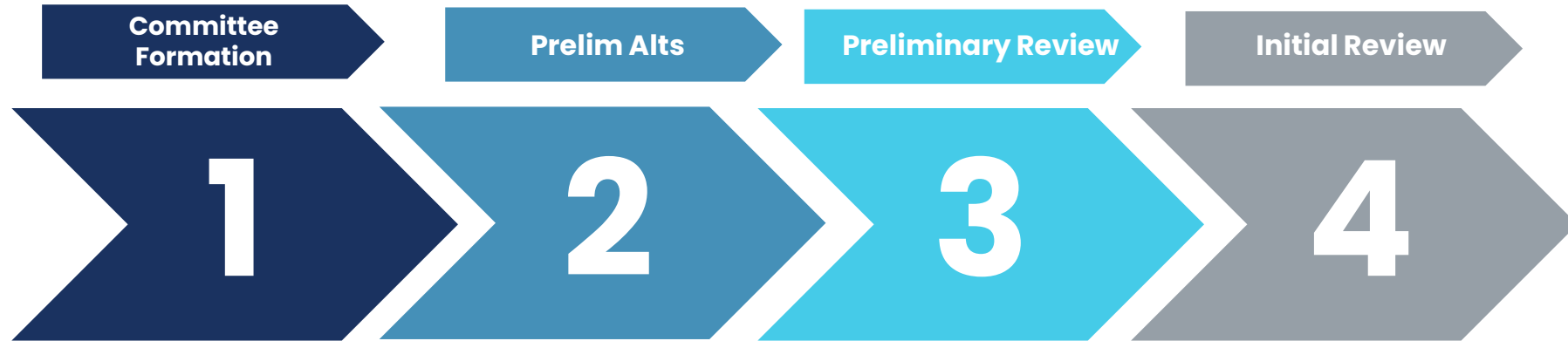


# Organization of Presentation of Impact Analysis

- **Chum salmon**
  - Status of chum stocks
  - Environmental causes of decline
  - Subsistence harvests
  - Commercial chum salmon fishing in WAK
  - Impacts to chum
  - Impacts to communities and regions engaged in subsistence and commercial chum salmon fishing
- **Pollock**
  - Distribution
  - AFA sectors
  - CDQ program
  - Community participation and engagement in the Bering Sea pollock fishery
- **Chinook and herring**
  - PSC tradeoffs and related considerations
- **Alternative 4**



# Council Timeline for the Bering Sea Chum Salmon Bycatch Action



## June 2022

- ❖ Initiated in June 2022
- ❖ Convened for three meetings
- ❖ Recommendations on concepts for alternatives finalized in March 2023

## April 2023

- ❖ Received annual update on scientific and industry reports
- ❖ Council adopted Purpose and Need statement as well as preliminary set of alternatives

## October 2023

- ❖ Council reviewed preliminary analysis on the feasibility of alternatives
- ❖ Finalized alternatives for analysis of potential impacts

## April 2024

- ❖ Council receives Initial Review analysis
- ❖ Council may modify or refine alternatives
- ❖ Council may request additional review
- ❖ Council may recommend publication by NMFS as a DEIS

We are here





# NEPA Procedural Changes Influencing this Environmental Impact Statement

- NMFS Alaska Region determined this action will require an Environmental Impact Statement (EIS) be prepared (June 2023)
  - The Notice of Intent to prepare an EIS for the Bering Sea chum salmon bycatch action was published on July 11, 2023
- The Fiscal Responsibility Act was signed on June 3, 2023
  - Effective immediately it constrains the overall timeline for preparing and completing an EIS to **two years** and **limits the EIS to 150 pages in length**
- Time clock starts with the publication of the Notice of Intent and **ends with the publication of the Final EIS**
  - Would allow for additional review in 2024



# Purpose and Need Statement

## Objectives in the purpose and need statement

- Minimize chum salmon bycatch in the Eastern Bering Sea pollock fishery
- Minimize Western Alaska (WAK) chum salmon bycatch
  - Do so while maintaining the priority objective of the Chinook salmon bycatch avoidance program
- Balance the National Standards
- Considering this action in light of the recent and ongoing declines in Western Alaska chum salmon abundance

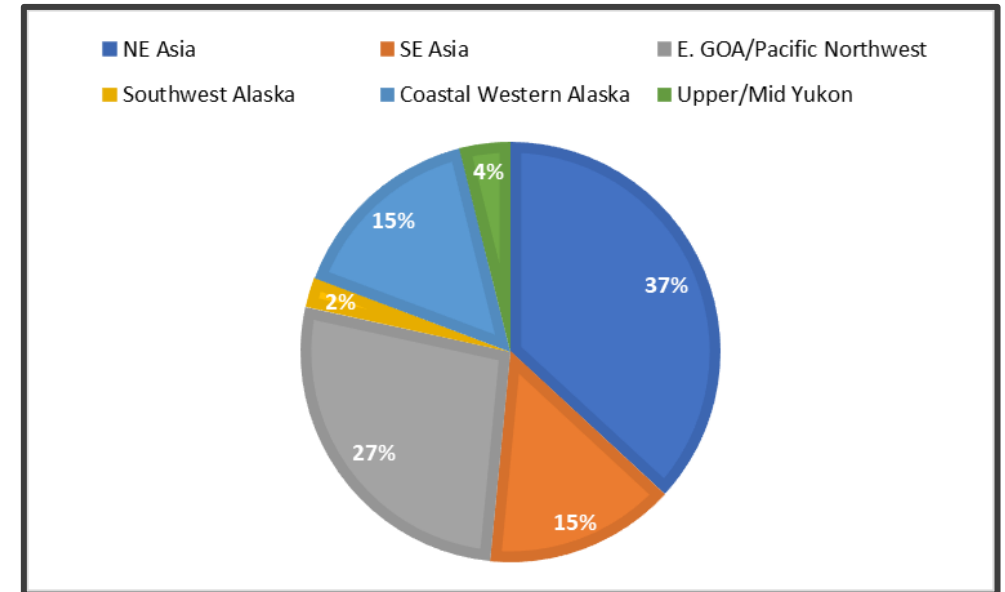


Figure 1-1 Average proportion of genetic stock composition estimates for chum salmon bycatch, 2011-2022





Dutch Harbor, ASMI Industry and Partner Use

# DESCRIPTION OF ALTERNATIVES (CHAPTER 4)

# The Bering Sea Pollock Fishery is the Directly Regulated Entity

**Table 1-1 Comparison of the number of chum salmon caught as bycatch in the Bering Sea pollock fishery to the number of chum salmon caught as bycatch in all Bering Sea groundfish fisheries (including the Bering Sea pollock fishery), and Bering Sea pollock chum salmon bycatch as a percent of total, 2013 through 2022**

<i>Year</i>	<i>Bering Sea Pollock Fishery</i>	<i>All Bering Sea Groundfish Fisheries</i>	<i>Bering Sea Pollock Fishery as % of Total</i>
2013	125,316	126,463	99.09%
2014	219,442	223,867	98.02%
2015	237,752	241,491	98.45%
2016	343,001	346,000	99.13%
2017	467,678	469,769	99.55%
2018	295,062	307,367	96.01%
2019	347,882	354,681	98.12%
2020	343,625	344,849	99.65%
2021	546,042	548,752	99.51%
2022	242,375	243,695	99.46%
<b>Average</b>	<b>316,835</b>	<b>320,693</b>	<b>98.70%</b>





# Alternative 1

# Alternative 1 – Chum Salmon Savings Area

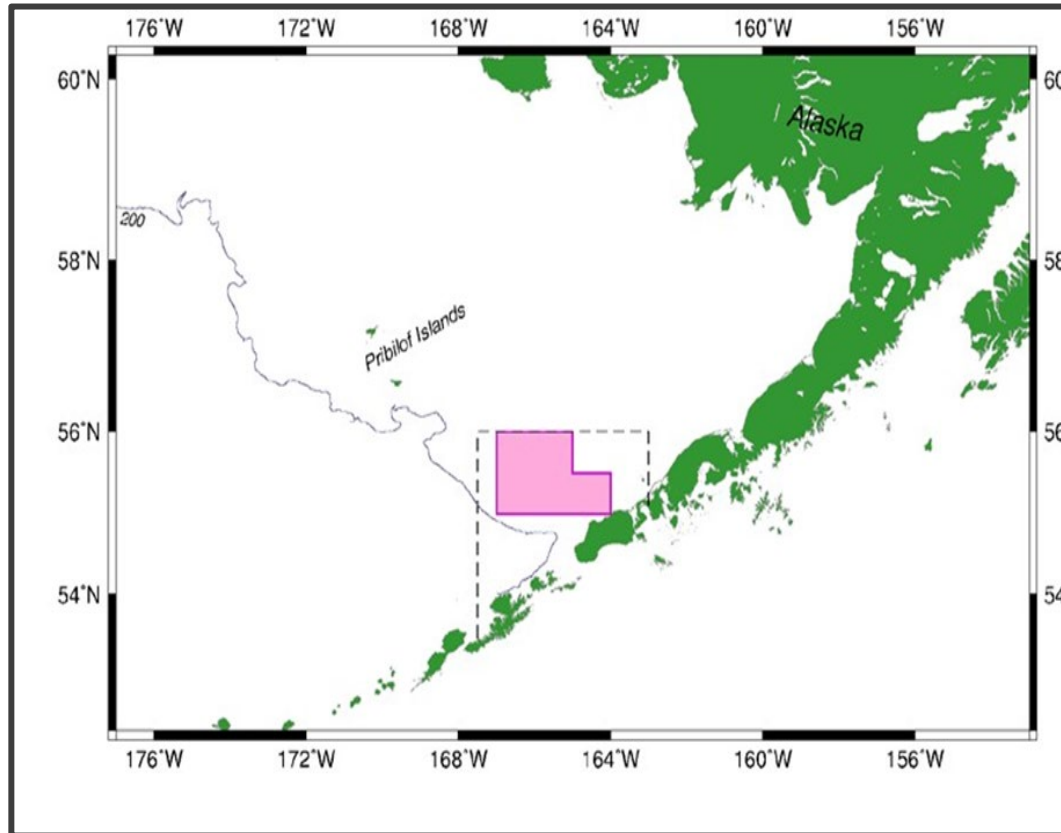


Figure 4-1 Chum Salmon Savings Area

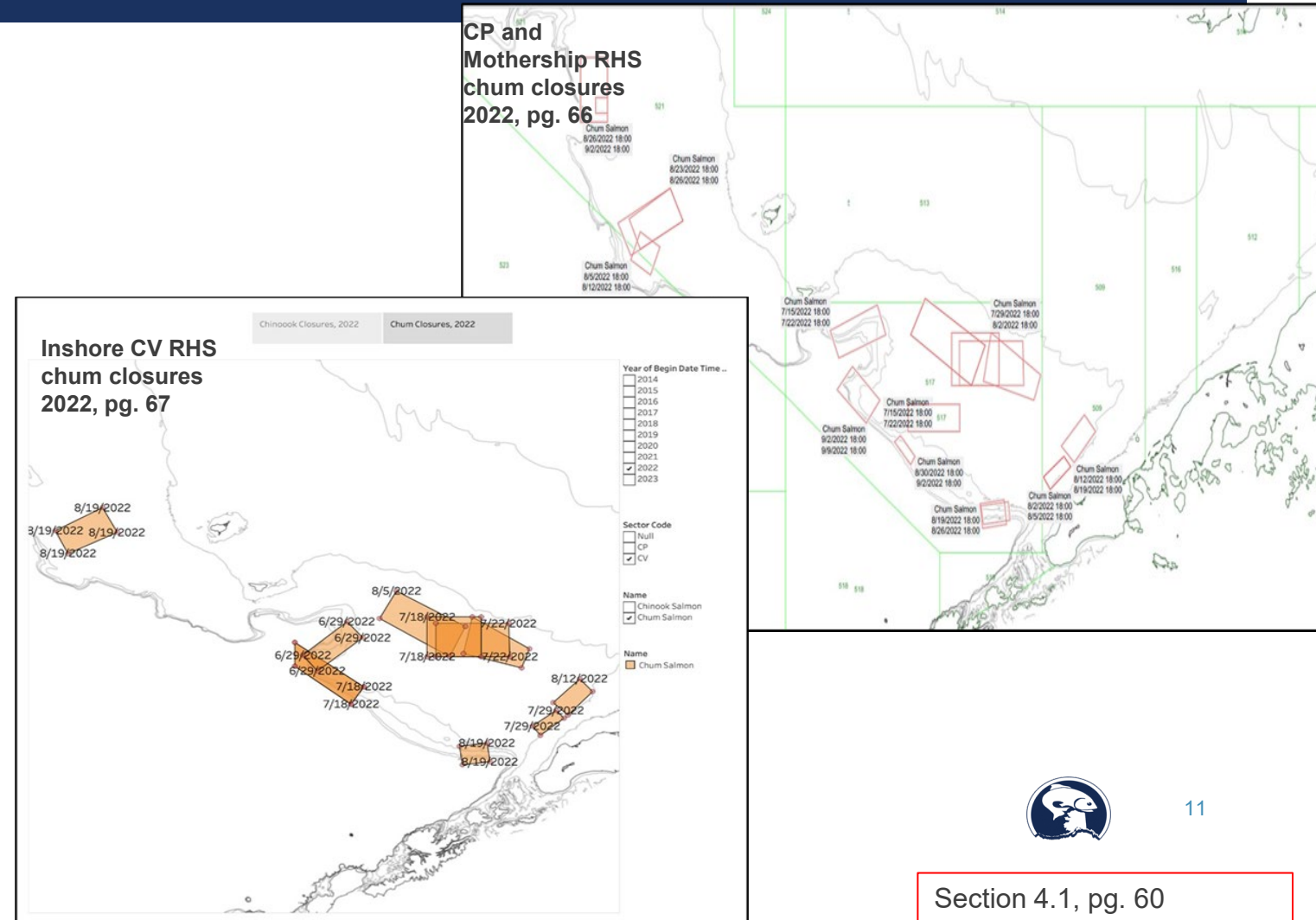
Notes: Chum Salmon Savings Area shaded in pink, CVOA in dashed line

- Time/area closure in the southeastern Bering Sea
- Closed to all trawling Aug 1 – 31, and if 42,000 non-Chinook salmon are caught Aug 15 – October 14, the area remains closed
- Regulations exempt pollock vessels from Chum Salmon Savings Area if they are governed by an IPA



# Alternative 1 – Rolling Hotspot (RHS) System for Chum Salmon Avoidance

- Identify areas on the pollock fishing grounds with high chum salmon bycatch rates and move the fleet away from the areas
- Dynamic area closures
- Near real-time pollock catch and salmon bycatch data
- Local Knowledge of pollock fishermen and IPA/cooperative managers

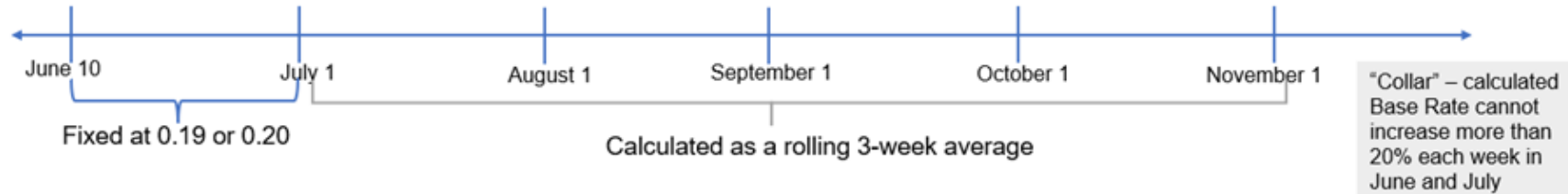


# Components of the RHS System for Chum Salmon Avoidance

## Calculated

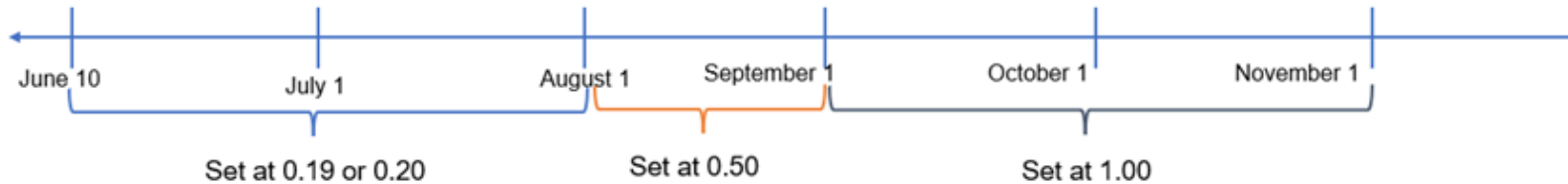
### Base Rate

Base Rate is bycatch rate (chum salmon per mt of pollock). Calculated as a rolling 3-week average, updated weekly, announced on Thursday



## Base Rate "floor"

Minimum Base Rate value that is stair-stepped across the B season



## Area bycatch rate



Bycatch rates inside ADF&G groundfish statistical areas are calculated to provide bycatch rates at a smaller spatial scale





# Other Components to the RHS System for Chum Salmon Avoidance

## Duration of RHS Closure Areas

- Inshore and Mothership CVs issue avoidance areas weekly (Friday - Friday)
- Since 2022 B season, CP sector has issued avoidance areas bi-weekly (Tuesday-Friday)

## Vessel-level Bycatch Performance

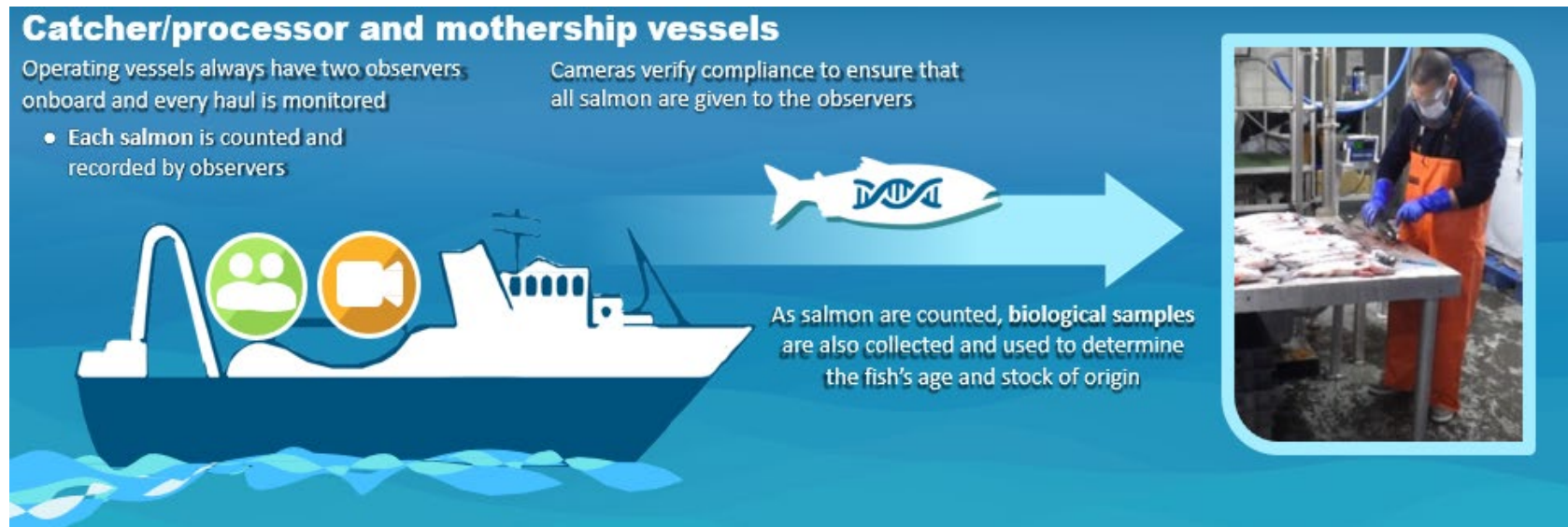
- Vessel's bycatch rates are calculated for the prior two weeks which is compared to a measure of average performance (standard varies by IPA)
  - Determines vessels required to stay out of a closure area

## Application of Genetic Information

- Combined size of area closures largest East of 168 degrees West longitude in June and July
- Base Rate floor is stair-stepped across the B season and lowest in June and July



# Observer Coverage and Monitoring Requirements



- ❖ Complete enumeration of all bycaught salmon
  - ❖ how many Chinook and chum salmon caught
  - ❖ where those fish came from
  - ❖ whether or not a potential violation of laws occurred
- ❖ Biological data
- ❖ Reliable genetic sampling
- ❖ Alternatives would not result in changes

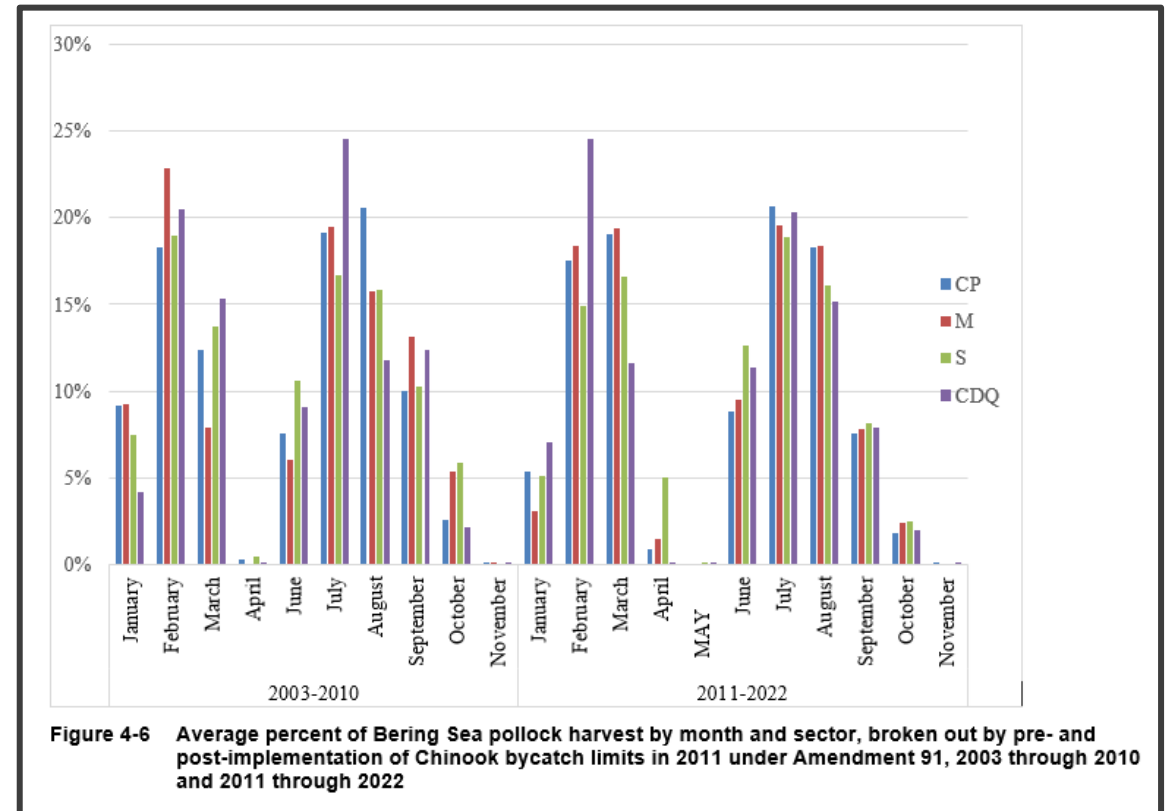




# Alternative 2

# Chum Salmon Bycatch Data from 2011 - 2022

- Amendment 91 regulations (Chinook salmon hard cap) came into effect in 2011
- NMFS implemented a comprehensive monitoring program to collect data on salmon bycatch in 2011
- Systematic genetic sampling of salmon bycatch since 2011



# Alternative 2 Option 1: Overall Chum Salmon PSC Limit

## Option 1: Setting the overall PSC limit

**Table 4-3 Summary of chum salmon PSC limits under option 1 of Alternative 2 and the Council's rationale for each value**

<b>Chum Salmon PSC Limit</b>	<b>Council Rationale</b>
200,000	Balances public testimony requesting a "very low" or a PSC limit of zero with practicability considerations
300,000	Rounded down from the 10-year average (2013-2022) level of bycatch of 315,449 chum salmon
350,000	Rounded down from the 5-year average (2018-2022) level of bycatch of 354,654 chum salmon
400,000	Rounded up from the 3-year average (2020-2022) level of bycatch of 377,102 chum salmon
450,000	Middle value between 400,00 and 550,000 chum salmon
550,000	Rounded value of the highest level of chum salmon bycatch in the analyzed period (2021 at 545,901 chum salmon)



# Review of Alternatives: Alternative 2 option 2: Indices

Management Area		Available Data	Rationale for Data Use	Applicable suboption(s)
Yukon	Summer	Run reconstruction	Reliable run abundance information is available for both Yukon River summer and fall chum salmon as both runs have full run reconstruction information available, meaning there is total accounting of catch and escapement within the drainage	Suboption 1, Suboption 2a, suboption 2b
	Fall	Run reconstruction		Suboption 1 and Suboption 2b
Kuskokwim		Bethel test fishery cumulative CPUE	Data are readily available and a reliable estimate of run abundance  Less impacted by weather conditions (flooding) compared to weir assessment  Used by salmon fisheries managers	Suboption 1
Norton Sound		Standardized index of escapements to the Snake, Nome, Eldorado, Kwiniuk, and North Rivers + total Norton	Representative of chum salmon returns across several management subdistricts across Norton Sound	Suboption 1

# Index thresholds and rationale

Management area		Index threshold	Council Rationale
Yukon	Summer	950,000	Rounded value of the midpoint of Yukon River Drainage escapement goal (500,000-1,200,000) + ANS (83,500-142,192)
	Fall	575,000	Rounded value of the midpoint of Yukon River Drainage escapement goal (300,000-600,000) + ANS (89,500-167,900)
Kuskokwim		2,800	When CPUE is less than 2,300, the run size typically fails to meet ANS (41,200-116,400) and escapement goals; the selected value was also derived by rounding the 25 <sup>th</sup> percentile
Norton Sound		57,000	Rounded from the 25 <sup>th</sup> percentile for the standardized index (57,029)



# Index thresholds and suboptions

Management area		Index threshold	Suboption 1 3 Area index	Suboption 2a Yukon Summer	Suboption 2b Yukon Summer and Fall
Yukon	Summer	950,000	If 3/3 above thresholds = no PSC limit	If Summer run above threshold no PSC limit  If Summer run above threshold PSC limit = X	If 2/2 above thresholds = no PSC limit
	Fall	575,000	If 2/3 areas above threshold, PSC limit in following year = X		If 1 or no areas above threshold, PSC limit in following year = X
Kuskokwim		2,800	If 1 or no areas above thresholds PSC limit in following year = X		
Norton Sound		57,000			

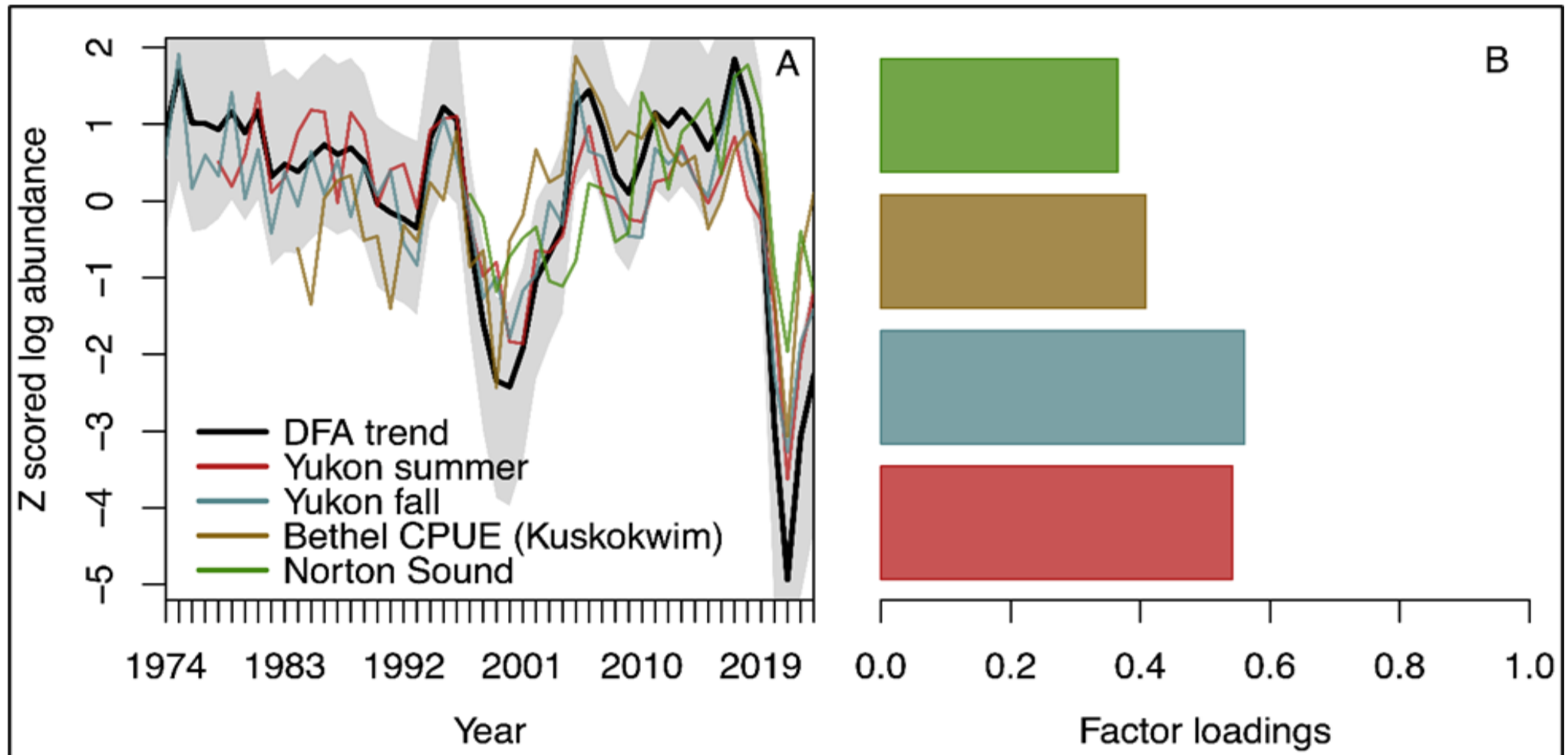


# Implementation of Alt2, Option 2

- ADF&G would evaluate whether index thresholds for “low WAK chum salmon abundance” are met based on area assessments.
- Information ADF&G would use for area assessments would ultimately depend on the suboption selected.
  - The data sources available for determining whether an area is at a “low” level of historical abundance (i.e., below index thresholds) varies by area
- ADF&G would provide NMFS (and Council) an assessment of area performance against index thresholds each year during harvest specifications.
  - Depending on index selected some information would be preliminary and/or unavailable for preliminary specifications in October
- Timing = consistent with Council’s annual October meeting where preliminary groundfish harvest specifications (including PSC limits) are set. Note that the herring estimate is only available for December
- Follow procedures for proposed and final rulemaking following October and December Council meetings



# Dynamic factor analysis (DFA) derived shared latent trend and factor loadings



## Review of Alternatives: Alternative 2 option 2

### SSC Guidance:

- Feedback on DFA analysis as it relates to comparing efficacy of indices under consideration as it relates to selecting between them
- Recommendation on use of index moving forward (trade-offs in simplifying from three area index):
  - Three Area
  - Yukon Summer chum
  - Yukon summer and Yukon fall chum



# Alternative 2 Option 3: Apportionments

- Suboption 1: apportionment based on 3-year average level of historical bycatch
- Suboption 2: apportionment based on 5-year average level of historical bycatch
- Suboption 3: apportionment based on pro-rata approach, 25% weighted to AFA pollock allocation and 75% to 3-year average
- Suboption 4: apportionment based on AFA pollock allocation



# Alternative 2 Option 3 Adjusted Blend Bycatch Rate

**Table 4-6 3- and 5-year average levels of B season chum salmon bycatch by sector including the adjusted historical blend for the CP and CDQ sectors, 2011 through 2022**

<i>Year</i>	<i>CDQ</i>	<i>CP</i>	<i>Inshore</i>	<i>Mothership</i>	<i>Total</i>
2011	10,033	38,024	118,857	24,399	191,313
2012	475	1,653	19,067	977	22,172
2013	2,403	8,380	110,496	3,835	125,114
2014	14,735	50,742	145,322	8,087	218,886
2015	9,953	34,743	174,343	14,046	233,085
2016	33,654	117,599	144,882	43,101	339,236
2017	64,374	230,039	154,610	16,825	465,848
2018	28,103	97,930	147,369	21,303	294,705
2019	28,309	100,704	172,798	44,860	346,671
2020	17,420	68,299	237,632	19,743	343,095
2021	34,394	119,186	341,779	50,542	545,901
2022	17,618	60,533	131,896	32,262	242,309
3-yr avg.	23,144	82,673	237,102	34,182	377,102
<b>3-yr avg. as % of total</b>	<b>6.1%</b>	<b>21.9%</b>	<b>62.9%</b>	<b>9.1%</b>	<b>100.0%</b>
5-yr avg.	25,169	89,330	206,295	33,742	354,436
<b>5-yr avg. as % of total</b>	<b>7.1%</b>	<b>25.2%</b>	<b>58.2%</b>	<b>9.5%</b>	<b>100.0%</b>

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.



# Summary of Apportionment Percentages

**Table 4-7 Summary table for sectors' apportionment percentages under each suboption**

<i>Apportionments</i>	<i>CDQ</i>	<i>CP</i>	<i>Inshore</i>	<i>Mothership</i>
Suboption 1: 3-yr avg.	6.1%	21.9%	62.9%	9.1%
Suboption 2: 5-yr avg.	7.1%	25.2%	58.2%	9.5%
Suboption 3: pro-rata	7.1%	25.4%	58.4%	9.1%
Suboption 4: AFA	10%	36%	45%	9%



# Other Components to Alternative 2

- Inshore sector's apportionment further divided among inshore open access fishery and the inshore cooperatives based on the cooperative's pollock allocation
- CDQ apportionment further divided among the CDQ groups based on the group's pollock allocations
- PSC limit would be transferable: inter-cooperative transfers, transfers among CDQ groups, intra-cooperative transfers, post delivery transfers



<b><i>Inshore cooperative 2022 pollock allocations</i></b>	
Akutan Catcher Vessel Assoc.	(33.788%)
Arctic Enterprise Assoc.	(0.000%)
Northern Victor Fleet Cooperative	(10.773%)
Peter Pan Fleet Cooperative	(2.512%)
Unalaska Fleet Cooperative	(11.454%)
UniSea Fleet Cooperative	(22.094%)
Westward Fleet Cooperative	(19.380%)
Inshore Open Access	(0.000%)

<b><i>CDQ group pollock allocations (fixed since 2005)</i></b>	
APICDA	14%
BBEDC	21%
CBSFA	5%
CVRF	24%
NSEDC	22%
YDFDA	14%





# Alternative 3



# Alternative 3 – Annual WAK Chum Salmon Threshold

- Establish an annual WAK chum threshold of 40,000 to 53,000 WAK chum salmon
- Alternative 3 must be implemented in conjunction with Alternative 2
- The number of chum salmon caught as bycatch during the B season pollock fishery that are estimated to be WAK chum through genetic sampling analyses would accrue to this threshold amount
- Several policy considerations remain for the Council



**Table 4-11 3-, 5-, and 10-year average (2011-2022) estimated proportion of WAK chum salmon stocks in the overall B season chum salmon bycatch over the most recent 3-, 5-, and 10- year periods as well as the 95% credible interval (CI) over those averages**

<i>Time Period</i>		<i>Coastal Western Alaska</i>	<i>Upper Middle Yukon</i>	<i>Western Alaska</i>
3-year avg.	Proportion	12.7%	1.2%	<b>13.8%</b>
	95% CI	11.4 - 14.0%	0.7-1.7%	<b>12.1 - 15.7%</b>
	Number	42,401	3,748	<b>46,150</b>
	95% CI	37,747 - 47,163	2,213 - 5,630	<b>39,960 - 52,794</b>
5-year avg.	Proportion	13.9%	1.5%	<b>15.3%</b>
	95% CI	12.3 - 15.5%	0.9 - 2.1%	<b>13.8 - 17.6%</b>
	Number	45,483	4,455	<b>49,938</b>
	95% CI	40,132 - 51,085	2,739 - 6,507	<b>42,871 - 57,592</b>
10-year avg.	Proportion	15.4%	3.1%	<b>18.5%</b>
	95% CI	13.6 - 17.3%	2.2 - 4.1%	<b>15.8-21.4%</b>
	Number	45,668	8961	<b>54,629</b>
	95% CI	40,055 - 51,431	6,398 - 11,938	<b>46,453 - 63,369</b>



# Alternative 3 – Apportionments

- Annual WAK chum salmon bycatch limit apportioned among the sectors, inshore cooperatives, and the CDQ groups
  - Apportioned based on suboptions under option 3 of Alternative 2

**Table 4-12 Amount of the WAK chum threshold (number of fish) each Bering Sea pollock sector would be apportioned under the apportionment suboptions considered under option 3 of Alternative 2**

	<i>Apportionment suboptions</i>	<i>CDQ</i>			<i>CP</i>			<i>Inshore</i>			<i>Mothership</i>		
<b>40,000 - 53,000 WAK chum</b>	Suboption 1: 3-yr avg.	6.1%	2,440	3,233	21.9%	8,760	11,607	62.9%	25,160	33,337	9.1%	3,640	4,823
	Suboption 2: 5-yr avg.	7.1%	2,840	3,763	25.2%	10,080	13,356	58.2%	23,280	30,846	9.5%	3,800	5,035
	Suboption 3: Pro-rata	7.1%	2,840	3,763	25.4%	10,160	13,462	58.4%	23,360	30,952	9.1%	3,640	4,823
	Suboption 4: AFA	10%	4,000	5,300	36%	14,400	19,080	45%	18,000	23,850	9%	3,600	4,770



# Performance Standard

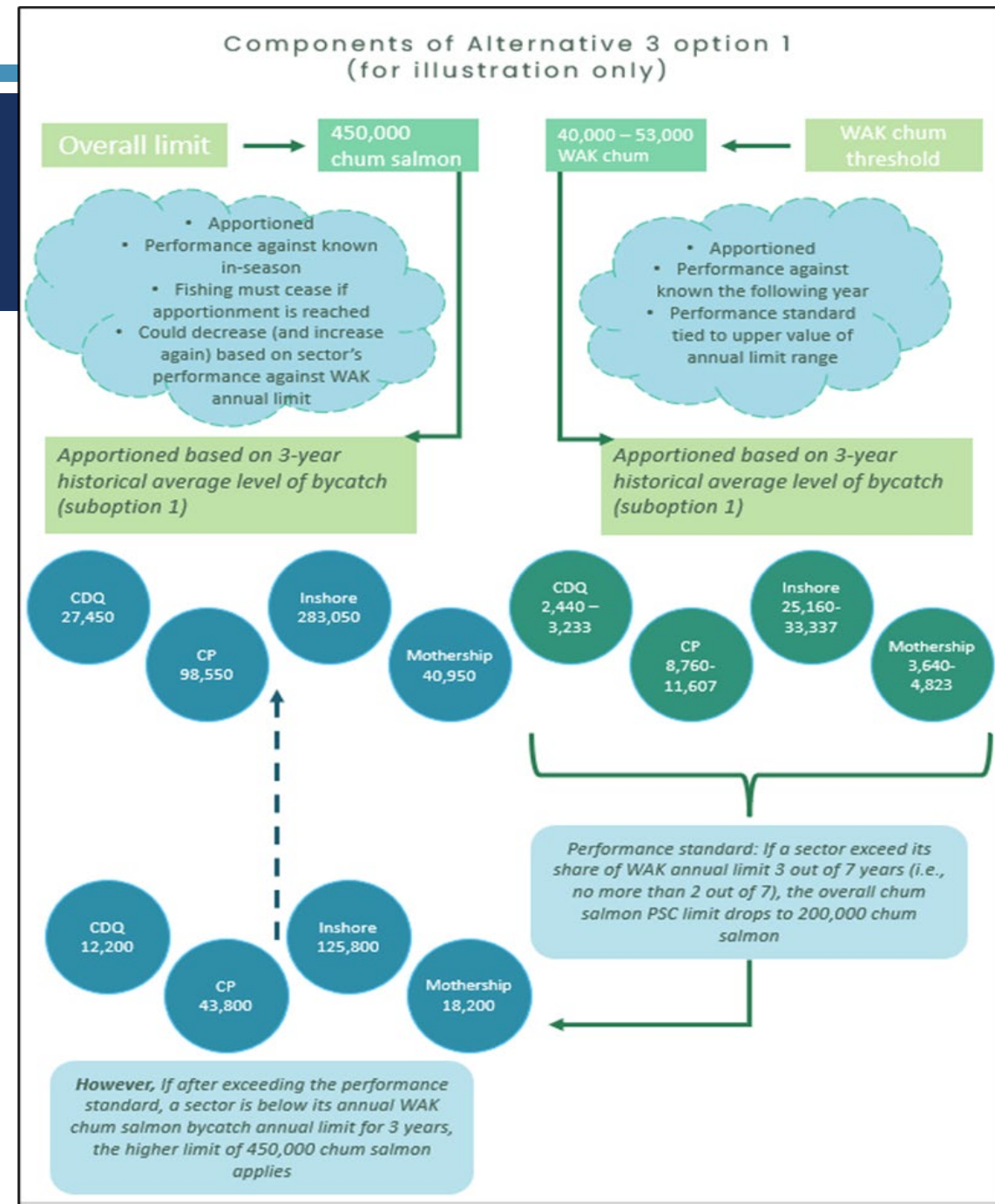
## Option 1 of Alternative 3

- Overall chum salmon PSC limits in effect would be either 450,000 chum salmon or 200,000 chum salmon

## Option 2 of Alternative 3

- Overall chum salmon PSC limits in effect would be either 550,000 chum salmon or 300,000 chum salmon

***PSC limit in effect for a sector would depend on their performance against the performance standard***



# Alternative 3 – Implementation Timing



The B season pollock fishery occurs with a regulatory opening on June 10 and has a regulatory closure of November 1



The annual groundfish harvest specifications process occurs  
The overall chum salmon PSC in effect for the 2026 B season would be set  
The WAK chum salmon threshold would also be set but its value does not vary with sector's performance



Information on the genetic stock composition estimates of the overall bycatch are available but cannot inform the overall chum salmon PSC limit in effect for the 2026 B season - the limit was set in the prior year



The B season pollock fishery would occur with the overall PSC limit set in fall 2025 in effect



Fishing sectors would receive their formal evaluation how they performed against the 2025 WAK chum threshold  
Overall PSC limit in effect in the 2027 B season would be determined  
2027 B season limit based on 2025 genetics





# Alternative 4

# Alternative 4 – Modify Regulations Implementing Salmon Bycatch IPAs

- Modify current regulations implementing salmon bycatch IPAs
- Option 1 of Alt 4 – chum salmon reduction plan agreement
- Option 2 of Alt 4 – use of refined genetics information
- In order to move forward with Alternative 4, the Council would need to specify the provisions that would be added to (or modify) the current regulations
  - A policy choice is whether and how to modify regulations



# Alternative 4 – Council’s Request for Proposals

- List of potential measures that could be developed for incorporation into the IPAs and/or through regulation:
  - Option 1 and 2 trigger values
  - Adjusted base rates to implement a closure
  - Adjusted closure area size
  - Adjusted closure duration
  - Application of the closures to all vessels not just those above the base rate
  - Genetic data
  - Genetic cluster thresholds







# METHODS FOR IMPACT ANALYSIS (CHAPTER 5)



# Different Approaches to Evaluating Salmon Bycatch Data

3-year average	6.1%	21.9%	62.9%	9.1%	100%
	12,200	43,800	125,800	18,200	200,000
Year	CDQ	CP	Inshore	Mothership	Total
2011	3,758	44,299	118,857	24,399	191,313
2012	200	1,928	19,067	977	22,172
2013	554	10,229	110,496	3,835	125,114
2014	2,407	63,066	145,322	8,091	218,886
2015	4,650	40,046	174,343	14,046	233,085
2016	16,342	134,750	144,882	43,629	339,236
2017	87,058	207,355	154,610	16,825	465,848
2018	26,586	99,447	147,339	21,303	294,675
2019	15,726	113,428	172,798	44,860	346,671
2020	8,582	77,138	237,632	19,743	343,094
2021	55,663	97,917	341,779	50,542	545,901
2022	6,365	71,786	131,896	32,262	242,309

5-year average	7.1%	25.2%	58.2%	9.5%	100%
	14,200	50,400	116,400	19,000	200,000
Year	CDQ	CP	Inshore	Mothership	Total
2011	3,758	44,299	118,857	24,399	191,313
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Pro-rata	7.1%	25.4%	58.4%	9.1%	100%
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2022	6,365	71,786	131,896	32,262	242,309

AFA	10%	36%	45%	9%	100%
	20,000	72,000	90,000	18,000	200,000
Year	CDQ	CP	Inshore	Mothership	Total
2011	3,758	44,299	118,857	24,399	191,313
2012	200	1,928	19,067	977	22,172
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Figure 6-35 Historical chum salmon bycatch performance by sector and fishery total compared to the four suboptions for apportioning an overall chum salmon PSC limit of 200,000

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN.



# Retrospective Analysis

- Estimate the potential amount of chum salmon avoided and pollock harvest forgone because of a fishery closure in the B season (similar to Am. 91 and 110)
  - Overlays apportionments of analyzed PSC limits on pollock sector's historically observed chum salmon bycatch (2011-2022)
- Estimate the timing of when a sector would have closed in the B season
  - Used to provide estimates of total bycatch and pollock harvest taken by that date compared to the amount of pollock harvest and total bycatch for the entire B season
- Numerical estimates provide a frame of reference, ***but the analysis expects fishing behavior would change***



# Estimating WAK Chum Salmon Bycatch by Sector

**Table 4-17** Estimated number of WAK chum salmon caught as bycatch by each Bering Sea pollock sector, 2011 through 2022

	<i>CDQ</i>	<i>CP</i>	<i>Mothership</i>	<i>Inshore</i>	<i>Total</i>
<b>2011</b>	NA	8,917	4,430	32,444	45,791
<b>2012</b>	NA	NA	NA	3,932	3,932
<b>2013</b>	NA	2,468	801	28,219	31,488
<b>2014</b>	NA	8,715	NA	31,650	40,365
<b>2015</b>	NA	5,133	1,928	36,262	43,323
<b>2016</b>	3,031	21,946	13,758	38,236	76,971
<b>2017</b>	22,674	33,435	4,673	35,288	96,070
<b>2018</b>	6,272	17,644	4,503	30,391	58,810
<b>2019</b>	2,898	5,090	7,637	40,237	55,862
<b>2020</b>	NA	1,926	1,148	25,620	28,694
<b>2021</b>	6,092	7,736	3,447	33,522	50,797
<b>2022</b>	902	8,037	7,891	37,278	54,108
<b>Average</b>	6,978	11,004	5,022	31,090	48,851



# Analytical Approach: Using the Upper Bound of the Range

**Table 6-38 Historical performance against the WAK chum threshold apportioned under Alternative 2, option 3, suboption 1 (3-year historical average level of bycatch), 2011 through 2022**

Suboption 1 (3-year average)	6.10% 2,440 - 3,233	21.90% 8,760 - 11,607	9.10% 3,640 - 4,823	62.90% 25,160 - 33,337
Year	CDQ	CP	Mothership	Inshore
2011	NA	8,917	4,430	32,444
2012	NA	NA	NA	3,932
2013	NA	2,468	801	28,219
2014	NA	8,715	NA	31,650
2015	NA	5,133	1,928	36,262
2016	3,031	21,946	13,758	38,236
2017	22,674	33,435	4,673	35,288
2018	6,272	17,644	4,503	30,391
2019	2,888	5,090	7,637	40,237
2020	NA	1,926	1,148	25,620
2021	6,092	7,736	3,447	33,522
2022	902	8,037	7,891	37,278

Source: NMFS Alaska Region Catch Accounting System; QuotaGrp\_AnnualEst

Notes: NA denotes insufficient samples were available to estimate genetic stock proportions. Orange cells indicate the years when genetic analyses indicate a sector would have exceeded the upper bound of the apportionment of the WAK chum threshold (which could have an associated management action); yellow cells indicate when the sector would have exceeded the lower bound of the apportionment; gray cells indicate years where the WAK proportion was not able to be estimated for a sector.



# Cost and Revenue Categories

**Gross ex-vessel revenue** = the market price paid to the fishermen for their catch \* round weight groundfish harvested

- Better metric for trends and potential impacts on shoreside CVs and those CVs unaffiliated with mothership
- No ex-vessel value for CPs and CVs associated with a mothership, so estimated using shoreside ex-vessel prices and applying to groundfish round weight harvested while pollock fishing

**Gross first wholesale revenue** = the market value of the primary processed fishery product when sold to an unaffiliated entity

- Better metric for trends and potential impacts on CPs and CV with affiliation with mothership

Both types of values are included for all sectors to evaluate relative impacts of chum PSC limits/apportionments

\* All values adjusted to real 2022 U.S. dollars.



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# Environmental scan for impact analysis



# Environmental categories

PSC species

Other Marine resources

Ecosystem

Crab

Halibut

Chinook salmon

Herring

Seabirds

Habitat

Marine Mammals

Climate change on resource categories including chum and pollock

# Other Marine Resources

Habitat

Seabirds

Marine  
Mammals



Sections included but  
No anticipated impacts under  
alternatives from status quo

Habitat

Seabirds

Marine  
Mammals

# All PSC categories

Crab

Halibut

Chinook  
salmon

Herring

# All PSC categories

Crab

Halibut

Chinook  
salmon

Herring

Potentially  
constraining  
PSC limits

PSC limits  
for time area  
closures

Non-constraining PSC limits  
-unlikely to affect fleet behavioral  
changes from status quo



# Environment

## Climate change

Chum salmon

Habitat

Impacts of  
environment on  
pollock stock

Impacts of  
alternatives on  
pollock and food  
web interactions



Dutch Harbor, ASMI Industry and Partner Use

# IMPACT ANALYSIS (CHAPTER 6)



# Chum salmon

# Outline of chum salmon sections

- Impacts under Status Quo (Alternative 1)
  - Status of chum stocks
  - Environmental causes of decline
  - Subsistence harvests
  - Commercial chum salmon fishing in WAK
  - Impacts to chum
  - Impacts to communities and regions engaged in subsistence and commercial chum salmon fishing



# Chum salmon biology, status and distribution

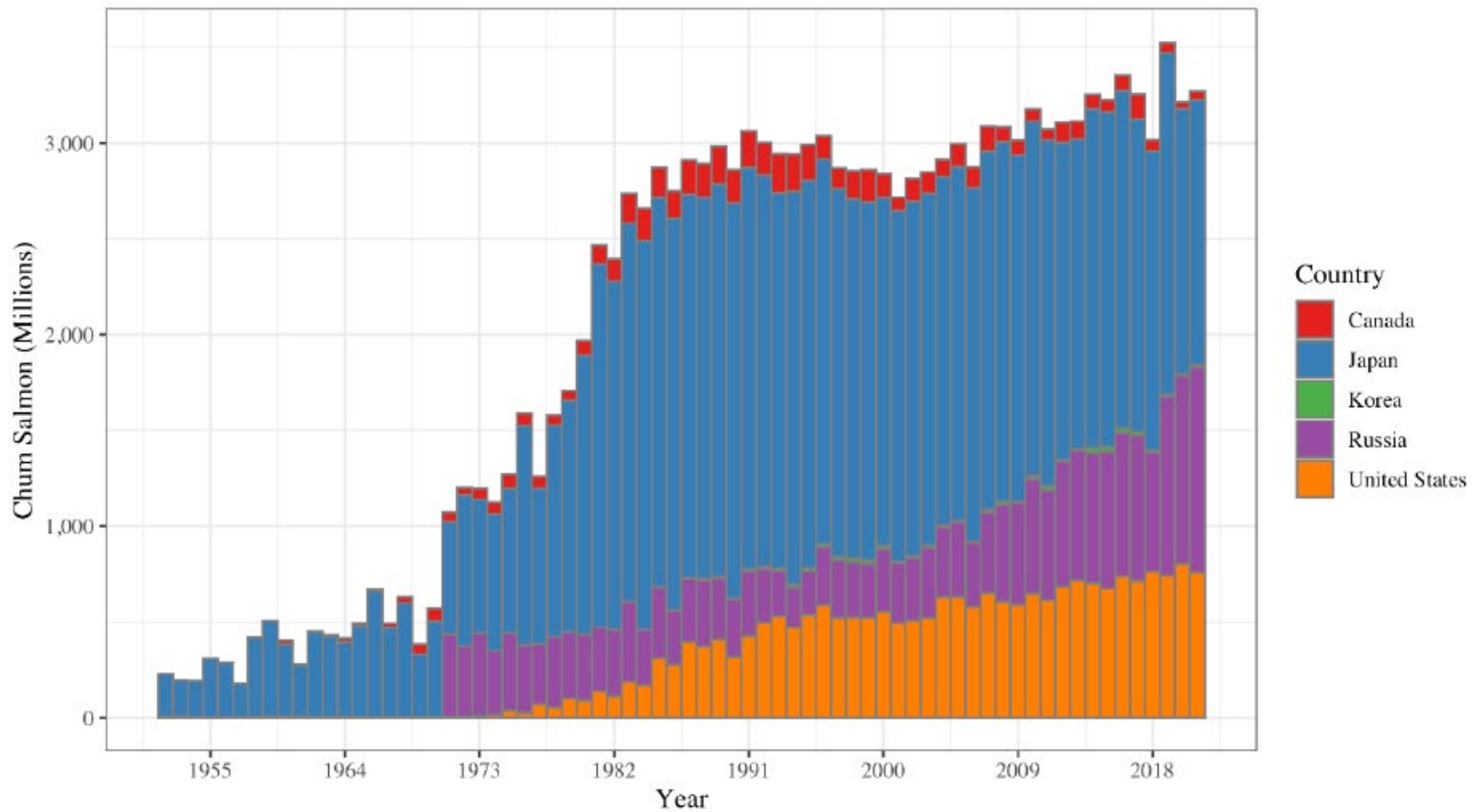
	Past 11 years (2010–2020)	Last 3 years (2018–2020)	Preliminary 2021
<b>NW Pacific</b>			
<b>Russia</b>			
W Bering Sea & NW Pacific	↔	↓	↑
Sea of Okhotsk	↑	↓	↓
Primor'e & SW Sakhalin	↓	↓	↓
<b>Japan</b>			
Hokkaido Pacific side	↓	↓	↓
Hokkaido W & Okhotsk sides	→	↓	→
Honshu Pacific side	↓	↓	↓
Honshu western side	→	→	↓
<b>Korea</b>			
	↓	↓	↓

	Past 11 years (2010–2020)	Last 3 years (2018–2020)	Preliminary 2021
<b>NE Pacific</b>			
<b>USA (Alaska)</b>			
Northern EBS	↔	↓	↓
Southern EBS	↔	↓	↓
Western GOA	↔	↓	↓
Northern GOA	↔	↓	↓
Eastern GOA/SE Alaska	↔	↓	↓
<b>Canada</b>			
Northern B.C./Yukon	↔	↓	↓
Southern B.C.	↔	↓	↓
<b>USA (Washington)</b>			
Puget Sound (not ESA listed)	↓	↓	↓
Hood Canal (ESA listed)	↔	↓	↑
Coast	↑	↑	↑
Lower Columbia River	↑	↑	↑





# Figure 6-4 Total hatchery chum salmon production around the Pacific rim from 1952 – 2021 NPAFC 2022



# Western Alaskan stock status

## 2022

Stock	Abundance?	Escapement goals met? <sup>a</sup>	Subsistence Fishery?	Commercial Fishery?	Sport Fishery?
Nushagak River	Below average	0 of 1	Yes	Yes	Yes
Kuskokwim Bay	Below average	NS <sup>b</sup>	Yes	No	Yes
Kuskokwim River	Below average	0 of 1	Limited	No	No
Yukon River summer run	Below average	0 of 2	No	No	No
Yukon River fall run	Below average	0 of 5 <sup>c</sup>	No	No	No
Norton Sound	Below average	4 of 4	Yes	Limited	Yes
Kotzebue	Above average	NS <sup>b</sup>	Yes	Yes	Yes

<sup>a</sup> Includes performance for the subset of goals that were assessed. Some escapement goals were not assessed for various logistical reasons, including funding and weather.

<sup>b</sup> No survey, escapement goal was not assessed.

<sup>c</sup> Includes 2 U.S./Canada goals.

## 2023

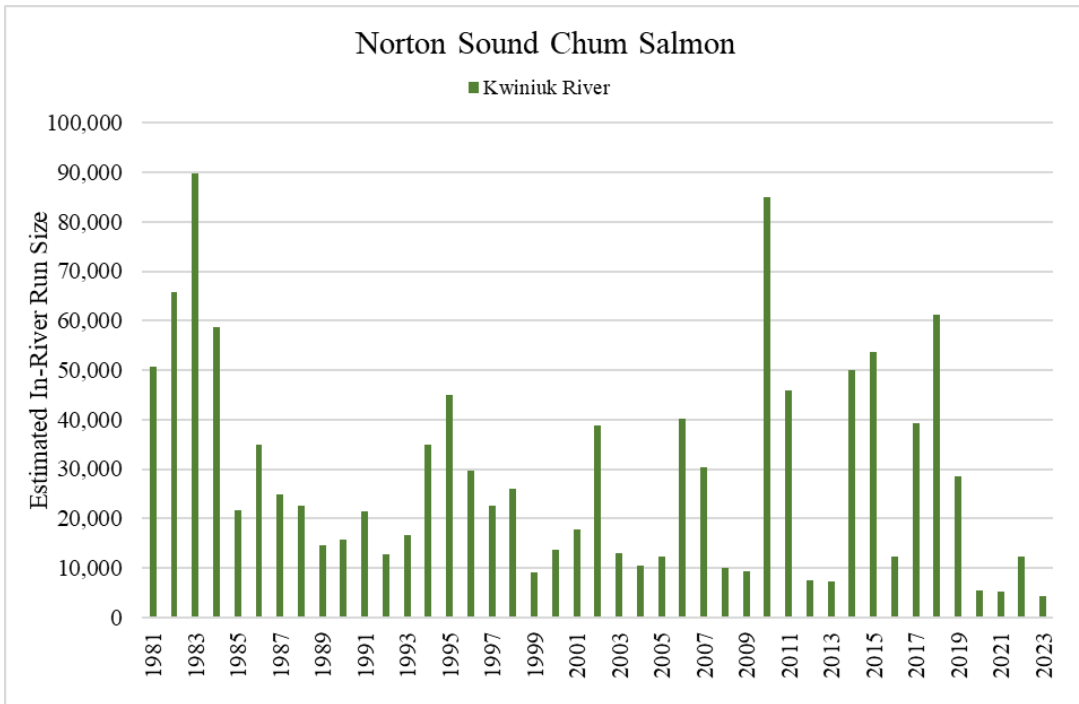
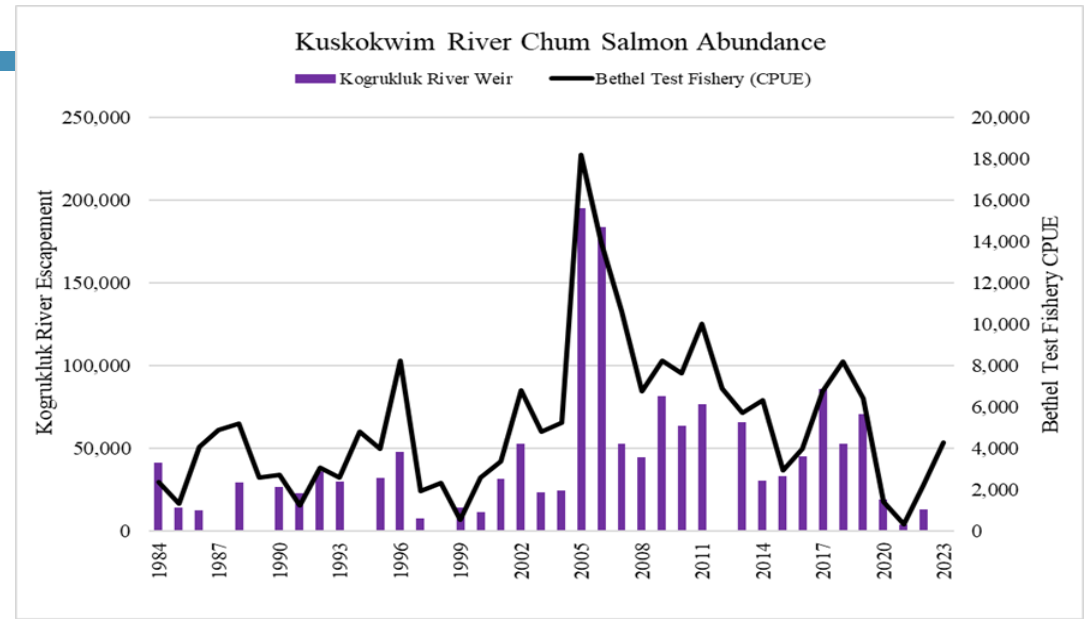
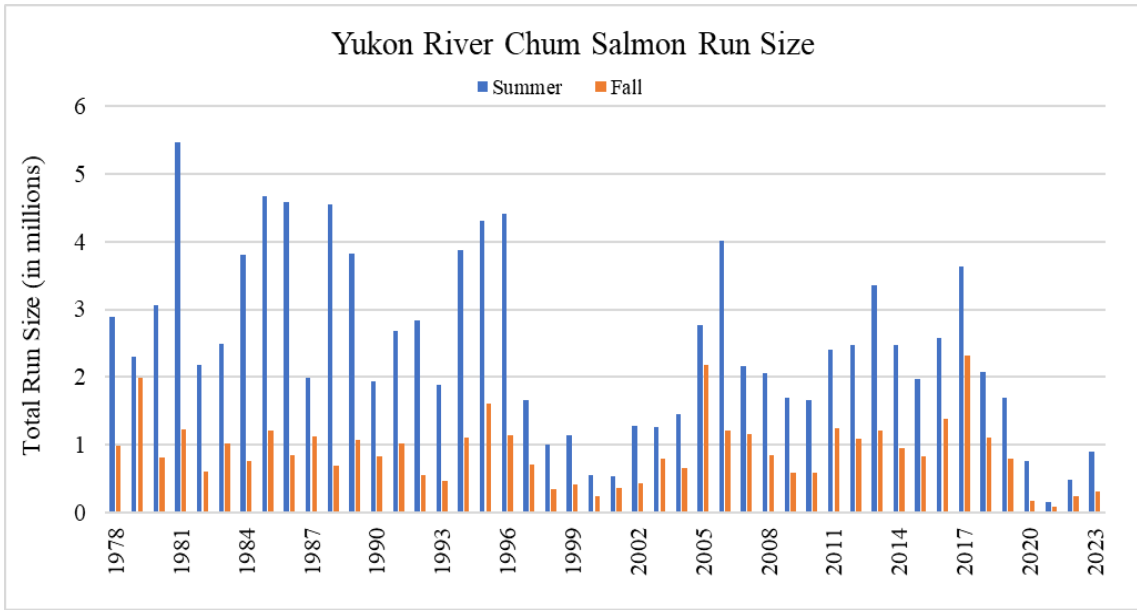
Stock	Abundance?	Escapement goals met? <sup>a</sup>	Subsistence Fishery?	Commercial Fishery?	Sport Fishery?
Nushagak River	Below average	0 of 1	Yes	Yes	Yes
Kuskokwim Bay	Below average	NS <sup>b</sup>	Yes	No	No
Kuskokwim River	Below average	NS <sup>b</sup>	Limited	No	No
Yukon River summer run	Below average	1 of 1	Limited	No	Limited
Yukon River fall run	Below average	3 of 5 <sup>c</sup>	No	No	No
Norton Sound	Below average	2 of 3	Yes	Limited	Limited
Kotzebue	Below average	NS <sup>b</sup>	Yes	Yes	Yes

<sup>a</sup> Includes performance for the subset of goals that were assessed. Some escapement goals were not assessed for various logistical reasons, including funding and weather.

<sup>b</sup> No survey, escapement goal was not assessed.

<sup>c</sup> Includes 2 U.S./Canada goals.





# Section 6.1.3: Environmental Factors related to chum declines

**Ages 3-5  
encountered as  
bycatch**

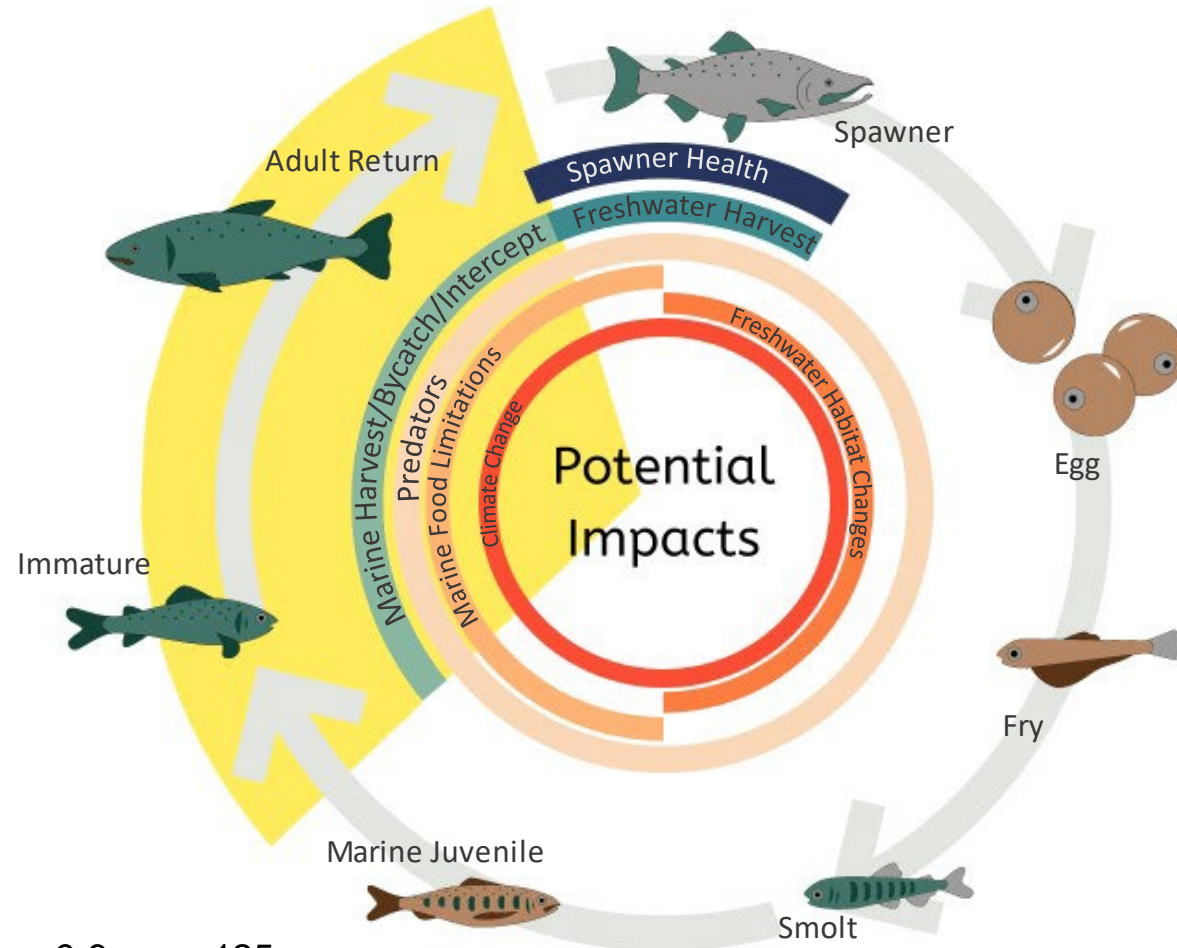
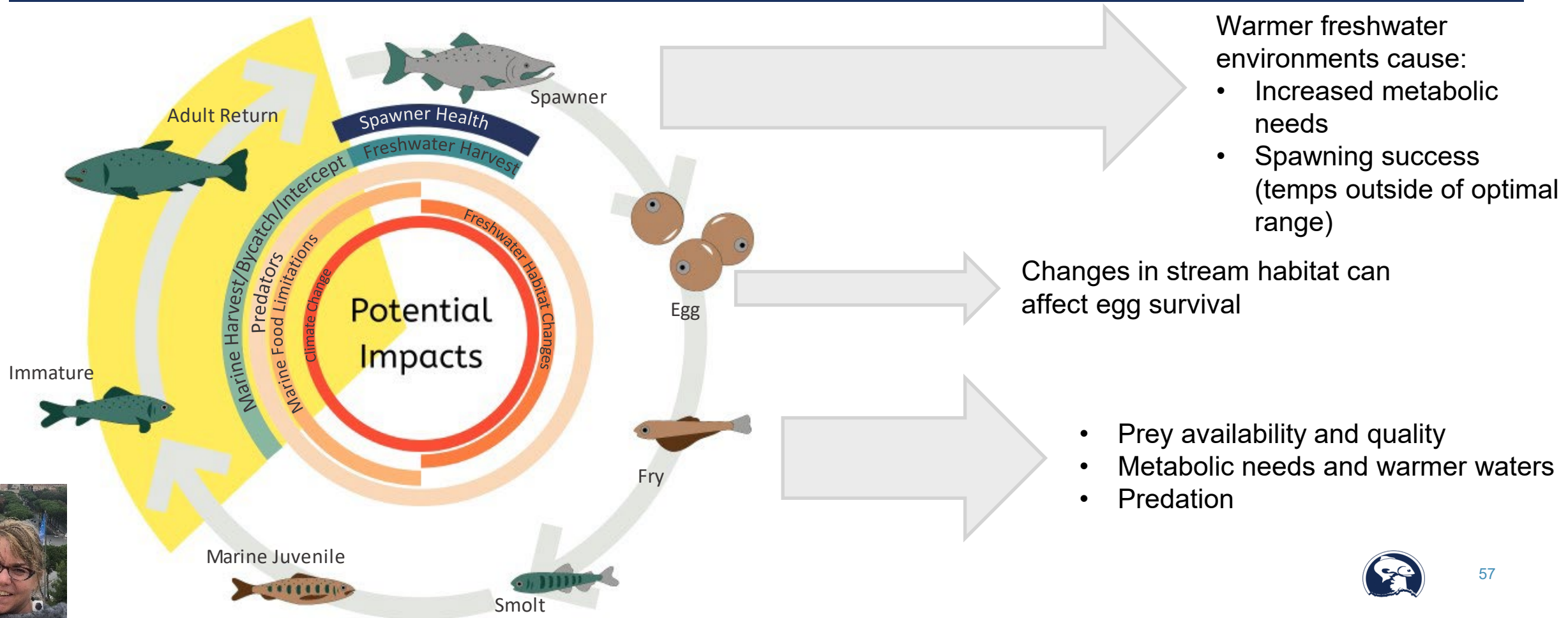


Figure 6-9 page 125



# Causes of decline by life history stage





# Causes of decline by life history stage

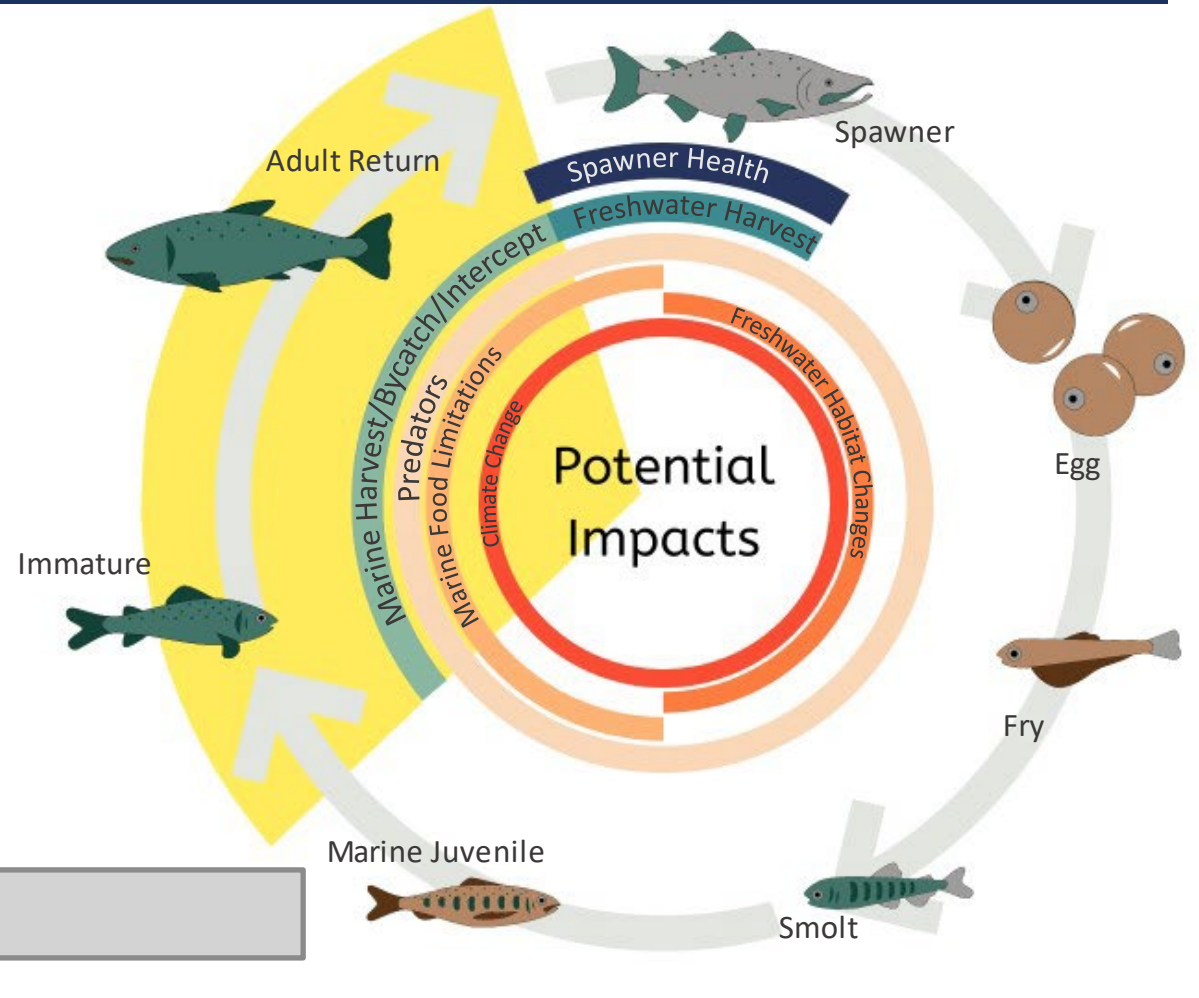
Exacerbated by Marine Heatwaves

- Decreased prey availability
- Increased metabolism
- Lower quality prey items



Other issues:

- Pathogen load
- Predator density
- Competition for prey with Asian hatchery fish

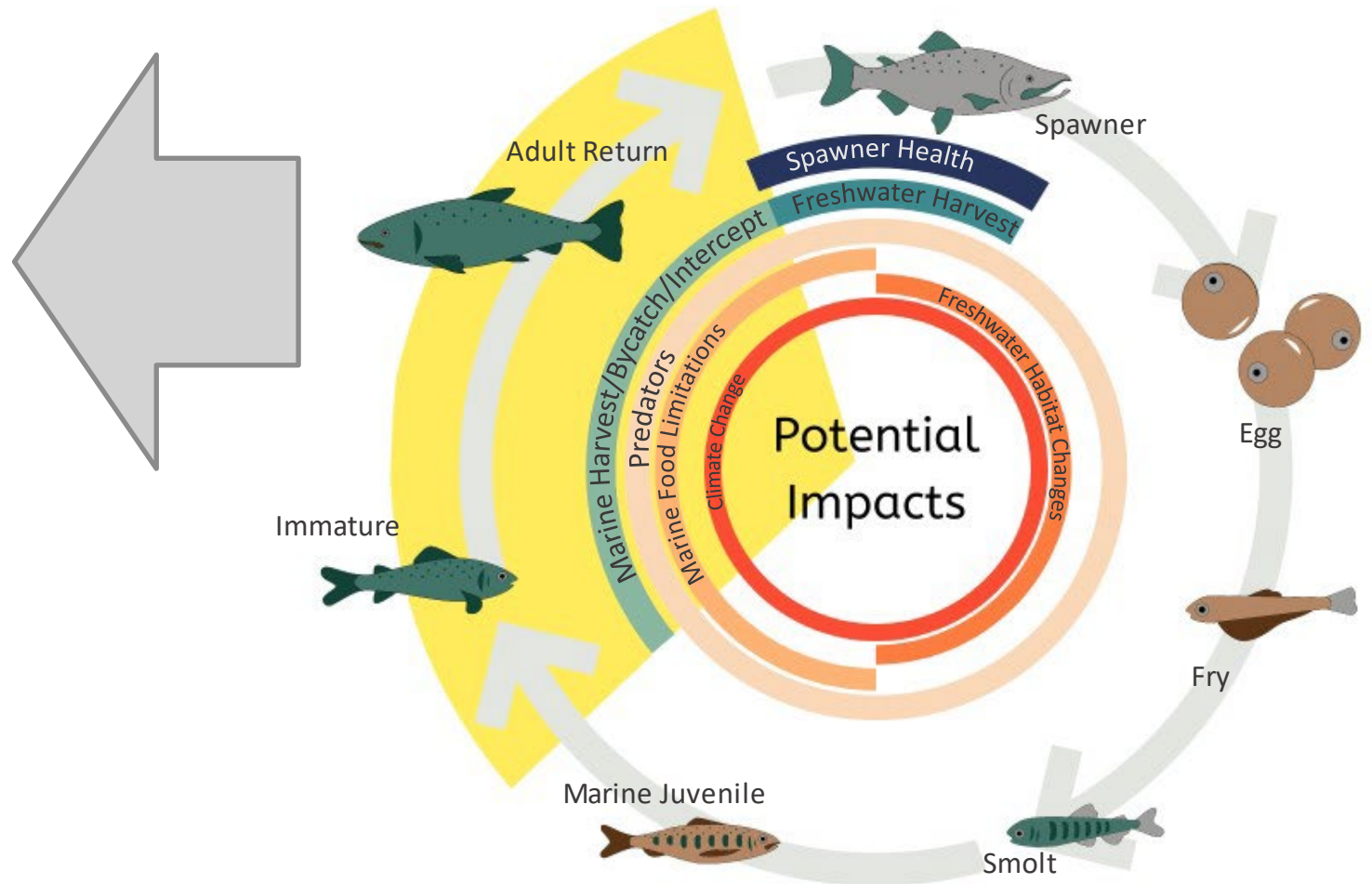


# Causes of decline by life history stage

Ages 3-5 caught as bycatch in pollock fishery

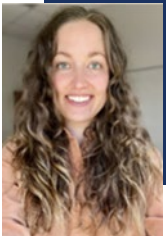
State of Alaska commercial fishery catch of AYK stocks

Competition for prey with hatchery fish



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# Overview of Subsistence Harvests





# Statutory and Regulatory Background of Alaska Subsistence Fisheries

- State and Federal components to subsistence management
- Alaska state law defines subsistence fishing as the taking of fish, shellfish, or other fisheries resources by residents for subsistence uses (AS 16.05.940 (31))
  - Noncommercial, customary and traditional uses

## State of Alaska definition for subsistence

*Direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption (AS 16.05.940(34)).*



# Amounts Reasonably Necessary for Subsistence

- Alaska BOF must identify salmon and other fish stocks that support subsistence fisheries
- Customary and traditional findings (C&T findings)
- If there is a harvestable surplus of these stocks, BOF must provide reasonable opportunities for subsistence uses
- Amounts reasonably necessary for subsistence (ANS)
- Table 3-2 provides ANS amounts for Arctic-Yukon-Kuskokwim Areas by salmon species (pg. 53 DEIS)



# Approach to Characterizing Community and Regional Engagement in Subsistence Harvests of Chum Salmon

Substantial information provided by cooperating agencies, Alaska Department of Fish & Game and Kuskokwim River Inter-Tribal Fish Commission (KRITFC)

- Subsistence harvests of salmon for the Yukon, Kuskokwim, and Norton Sound-Port Clarence Areas
  - Annual post season household harvest surveys and subsistence fishing permits (ADF&G)
  - Comprehensive Subsistence Information Baseline Studies (ADF&G)
  - Community Based Harvest Monitoring Program (KRITFC)
- All communities considered culturally dependent on subsistence harvests of chum salmon noting their degree of dependence as a food source may vary
- Social science of LK, TK, and subsistence related to salmon



# Yukon Area

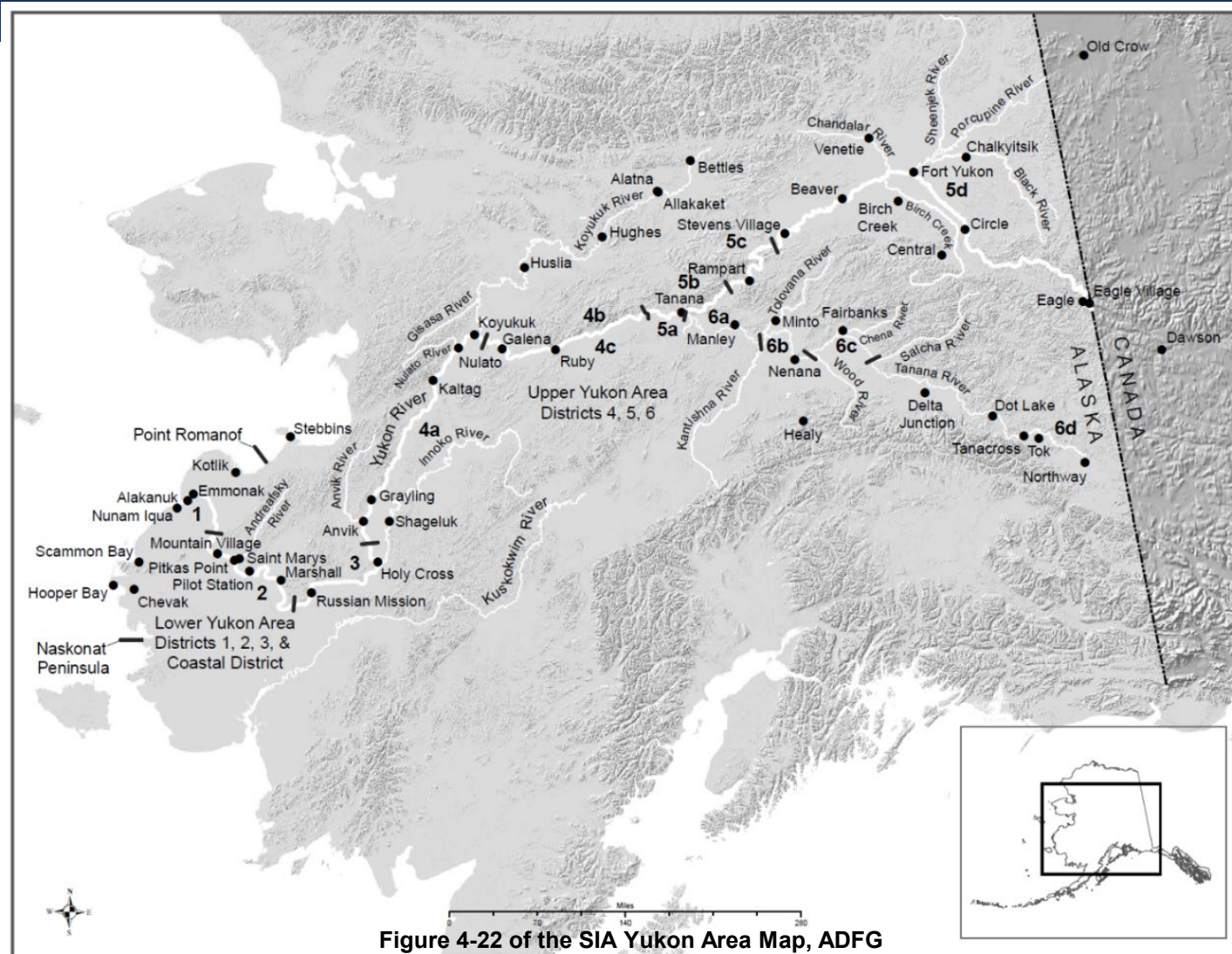
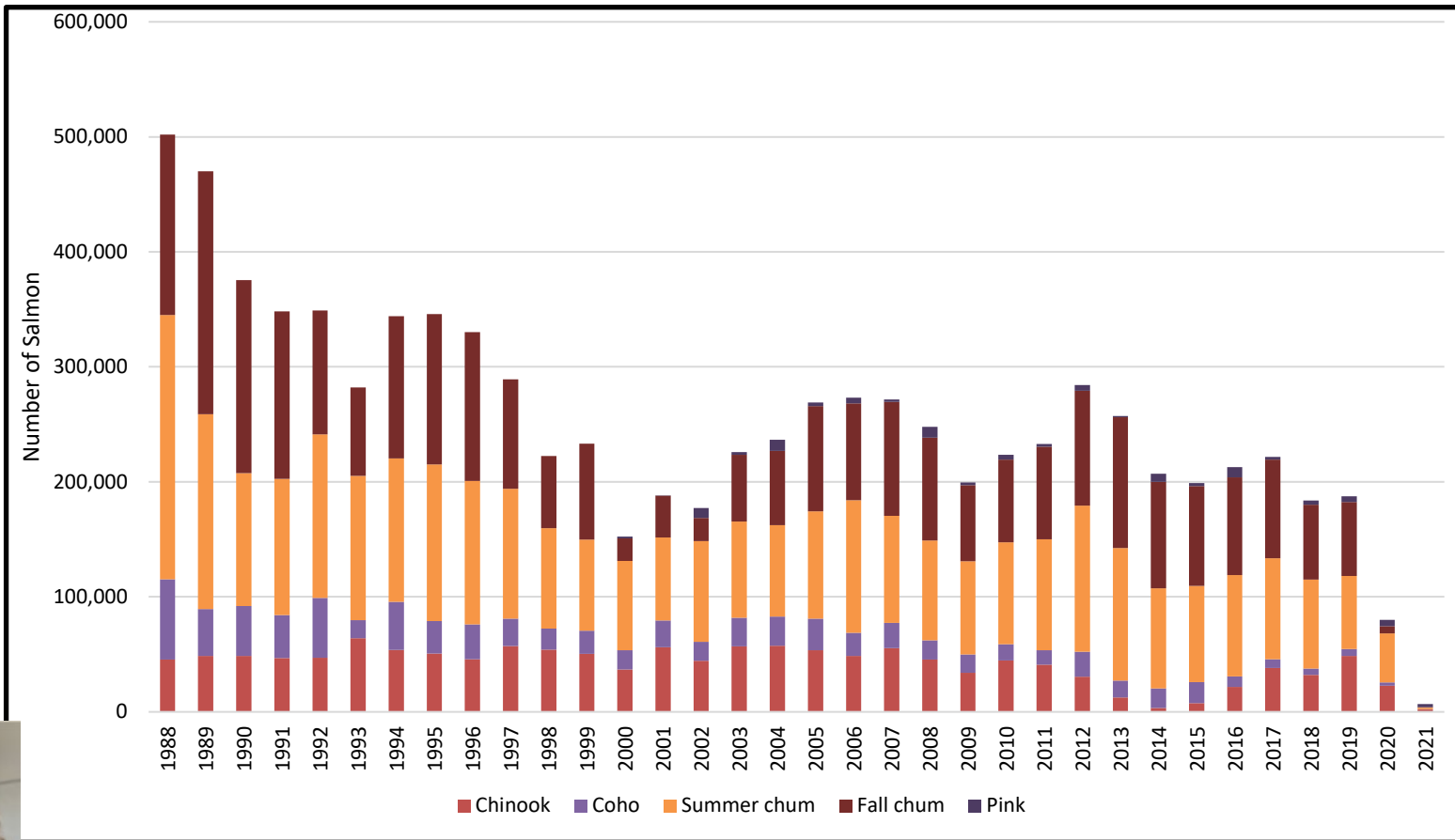


Figure 4-22 of the SIA Yukon Area Map, ADFG



# Overview of Subsistence Harvests of Salmon in the Yukon Area

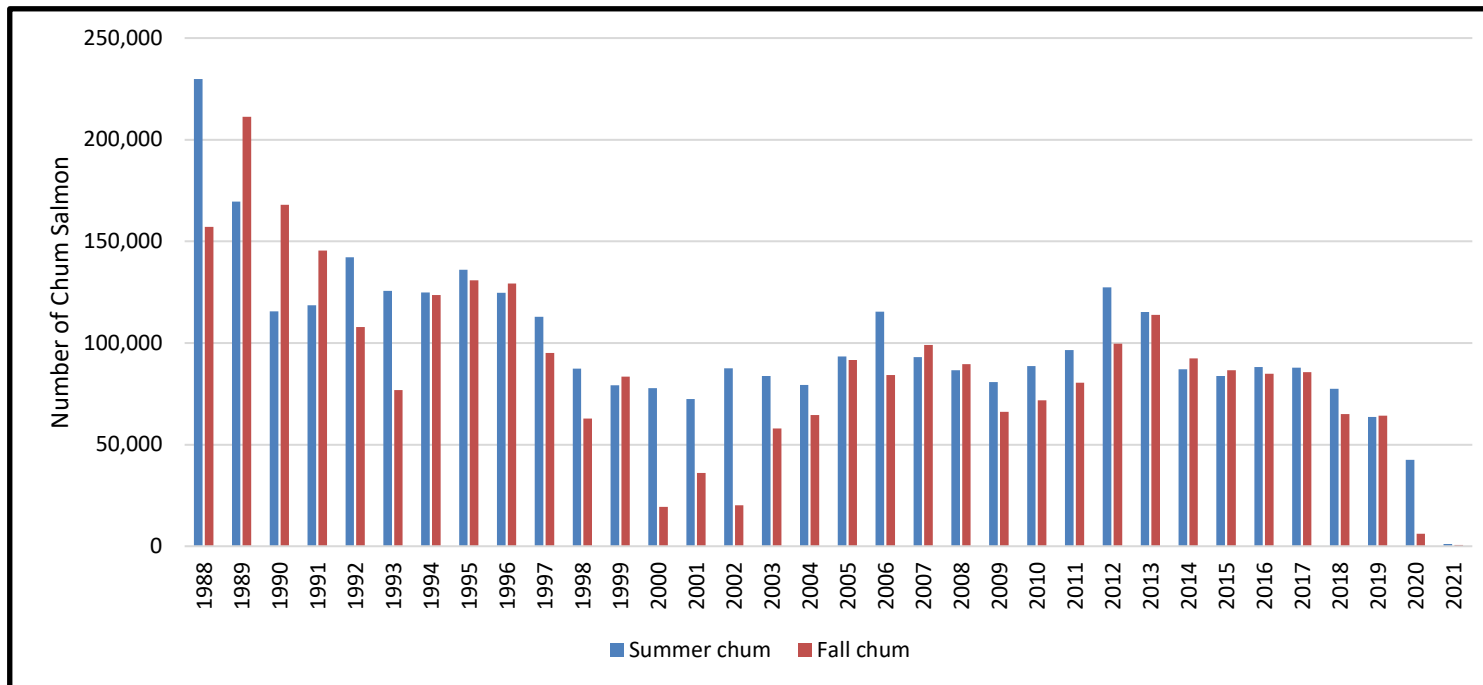


- Historical Average (1988-2021): 253,806 salmon
- 3-year average (2019-2021): 91,368 salmon
- 2021: 6,869 salmon

Figure 4-23 of the SIA Estimated subsistence harvests of salmon, Yukon Area, 1988-2021  
ADFG



# Subsistence Harvests of Chum Salmon in the Yukon Area



## Summer chum

- Ranged from 229,838 (1988) and 1,234 fish (2021)
- Subsistence harvests relatively stable from 2011-2020

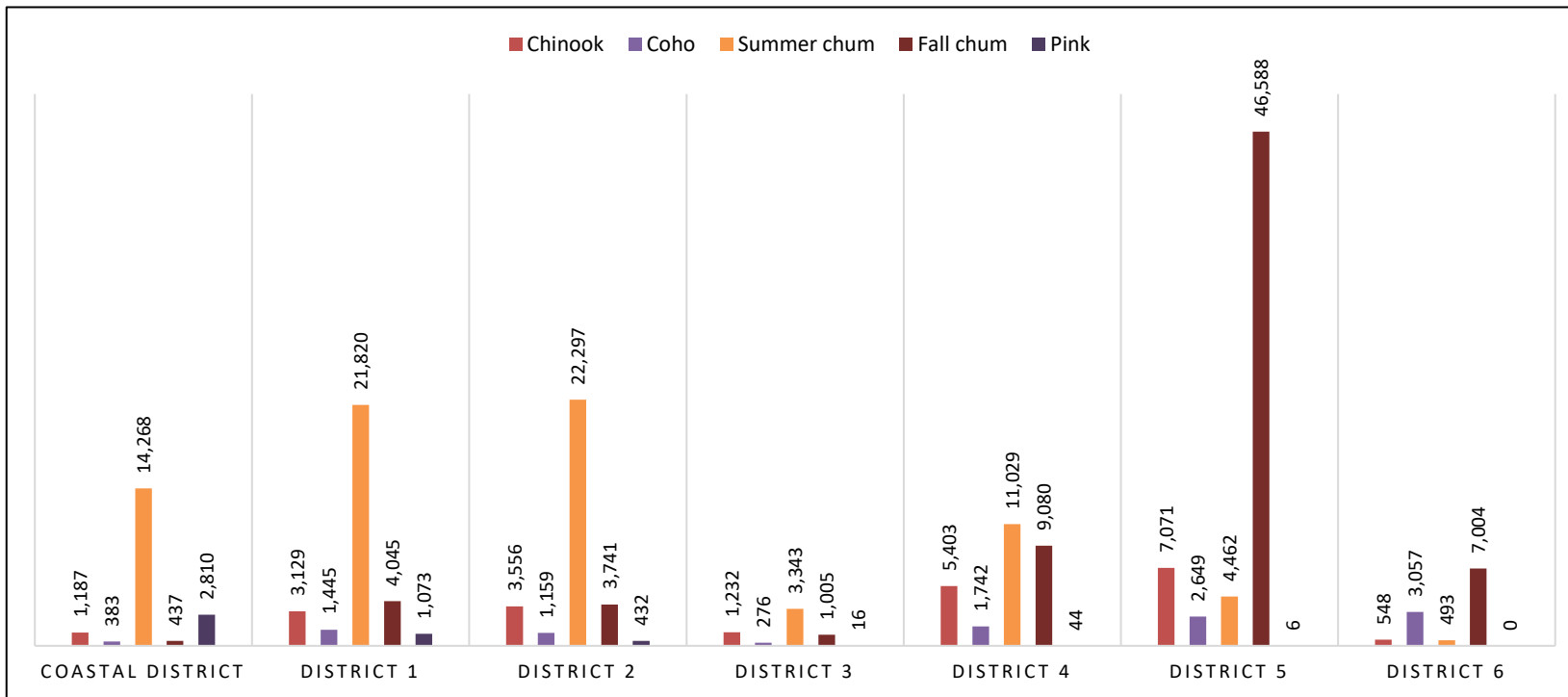
## Fall chum

- Subsistence harvests ranged from 211,303 (1989) and 705 (2021)
- Two low periods: 2000-2002 and 2020-2021

Figure 4-24 of the SIA Estimated summer and fall chum subsistence harvests, Yukon Area, 1988-2021  
ADFG



# Variation in Subsistence Harvests of Salmon Across the Yukon Area



- Composition of species harvests vary across the drainage
- Summer chum are harvested in larger proportions in the lower region
- Gradual shift in subsistence uses towards fall chum moving up the river

Figure 4-25 of the SIA Average level of historical species composition of subsistence harvest estimates by Yukon Area district, 2012-2021  
ADFG





# Kuskokwim Area

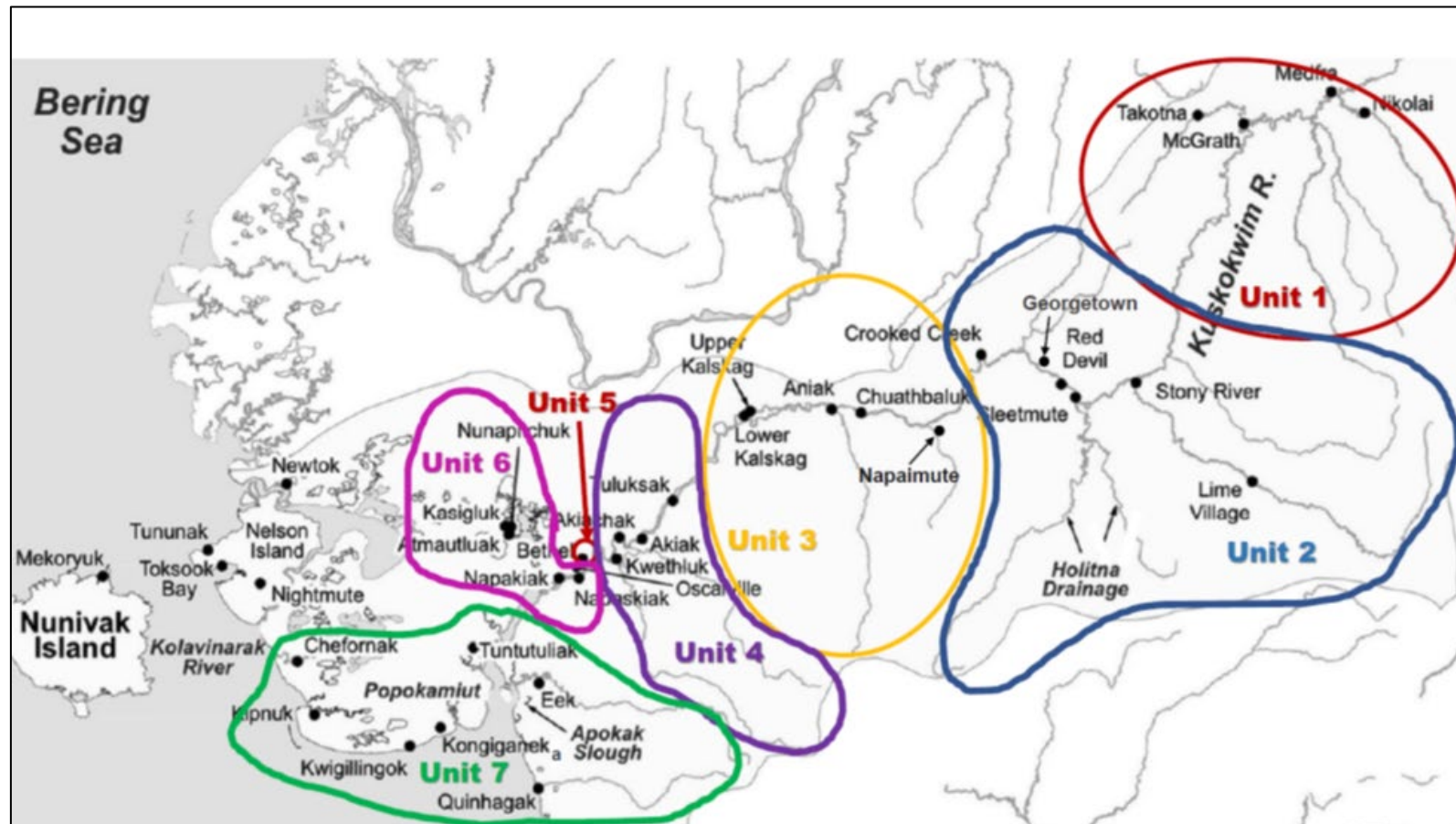
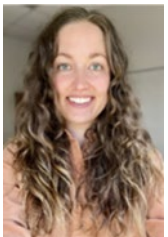
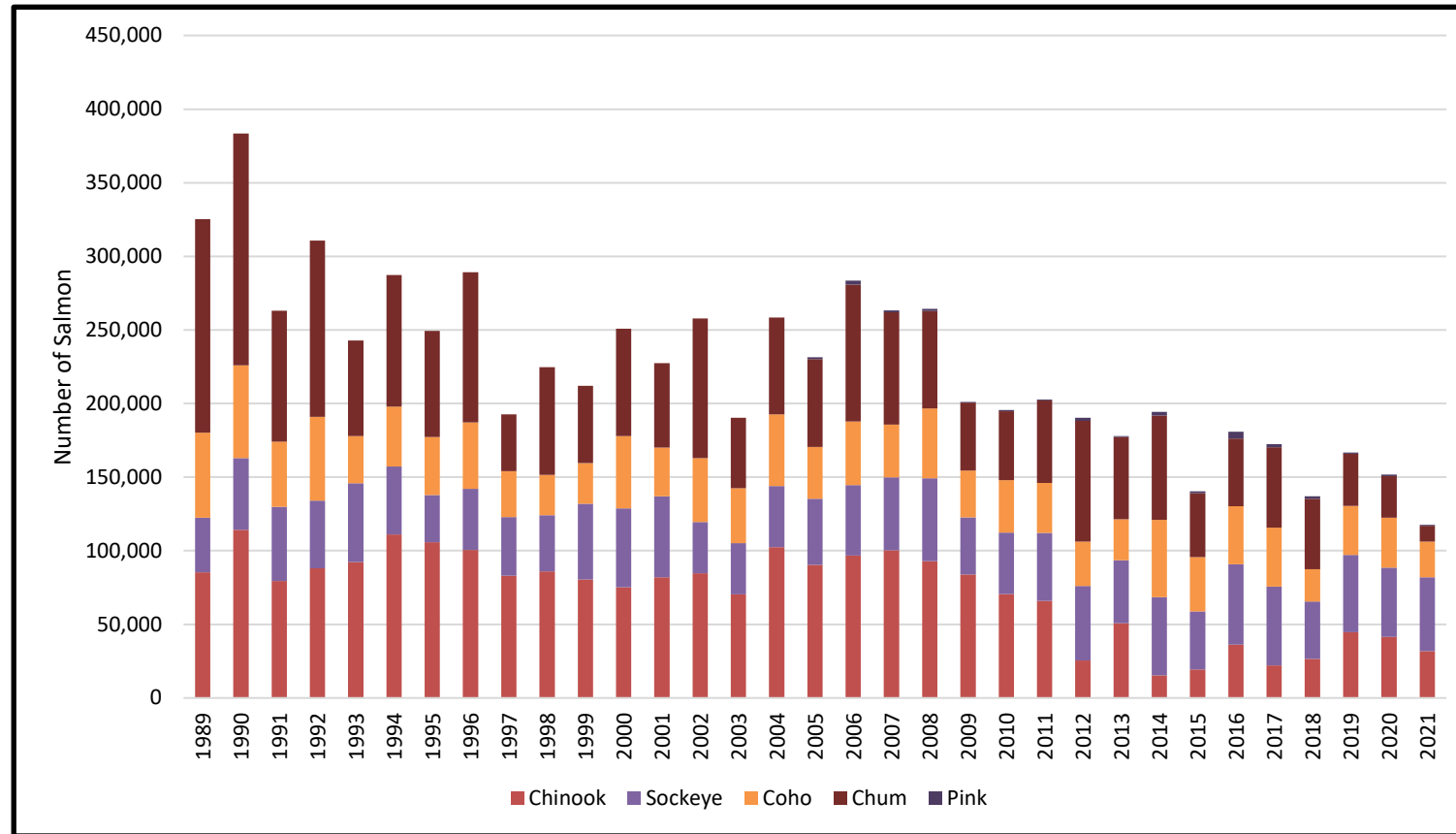


Figure 4-27 of the SIA Kuskokwim watershed and major tributaries with the 7 geographic regions delineated by KRITFC





# Overview of Subsistence Harvests of Salmon in the Kuskokwim Area



- Historical average (1988-2021): 225,385 salmon
- 3-year average (2019-2021): 145,436 salmon
- 2021: 117,693 salmon



Figure 4-31 of the SIA Estimates of historical subsistence salmon harvests, Kuskokwim Area, 1989-2021 ADFG



# Subsistence Harvests of Chum Salmon in the Kuskokwim Area

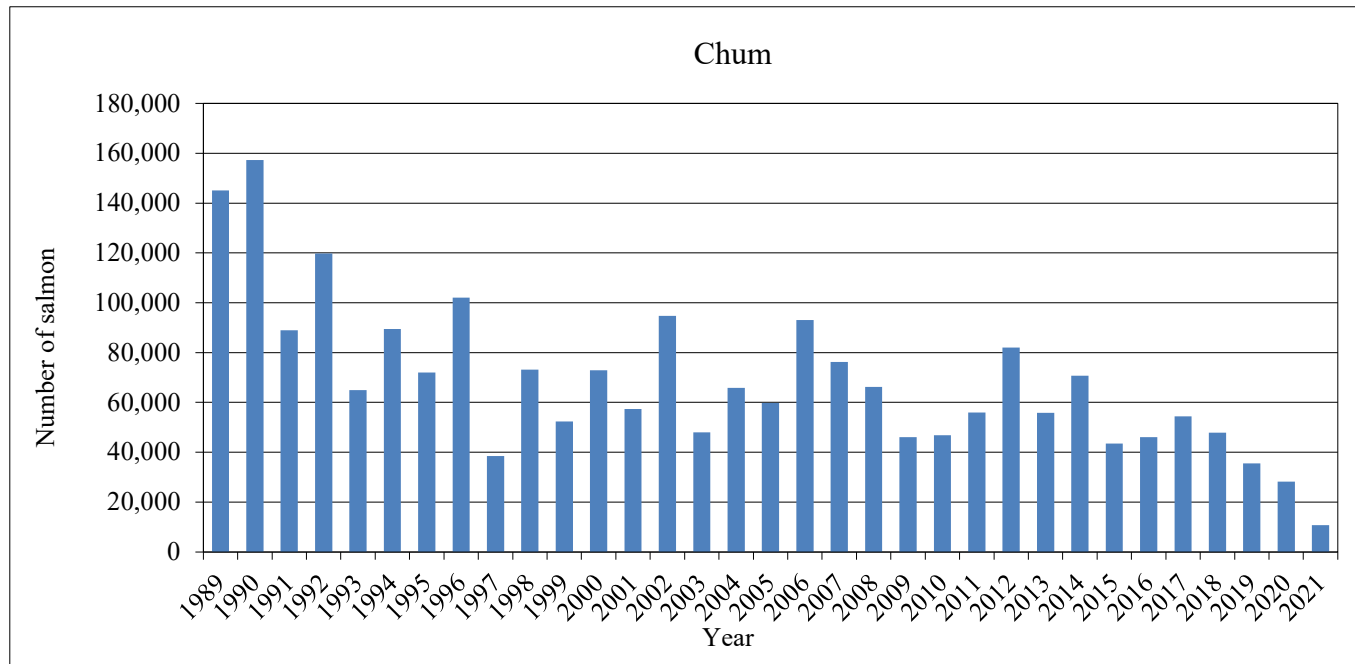


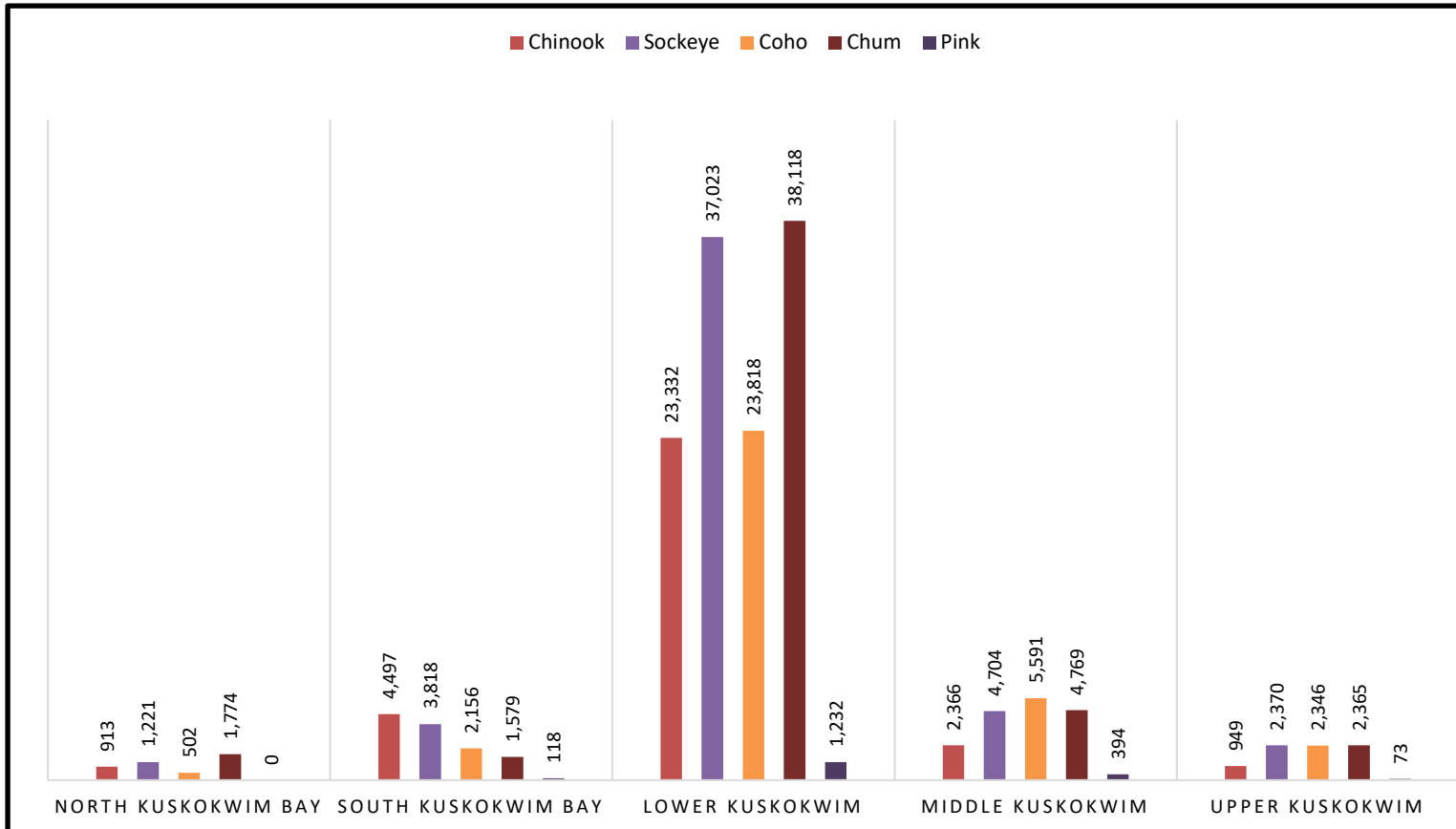
Figure 4-32 of the SIA Estimated subsistence harvests of chum salmon, Kuskokwim Area, 1989-2021  
ADFG



- Subsistence harvests of chum salmon ranged between 157,335 (1990) and 10,690 (2021)
- Historical average level of harvest was 68,533 chum salmon
- 3-year average harvest was 24,787 fish (2019-2021)
- ANS updated in 2013
  - Chum salmon below ANS 2019-2021



# Variation in Subsistence Harvests of Salmon Across the Kuskokwim Area



- Subsistence harvests distributed across the region in proportion with population
- Bering Sea Coast subregion (Mekoryuk, Newtok, Tununak, Toksook Bay, Nightmute, and Chefnak) not depicted because of data availability
- North Kuskokwim Bay (Kongiganak, Kwigillingok, and Kipnuk) 2012-2014 only

Figure 4-33 of the SIA Average level of subsistence harvest by species composition in ADF&G Kuskokwim Area subregions, 2012-2021  
ADFG



# Norton Sound-Port Clarence Management Area

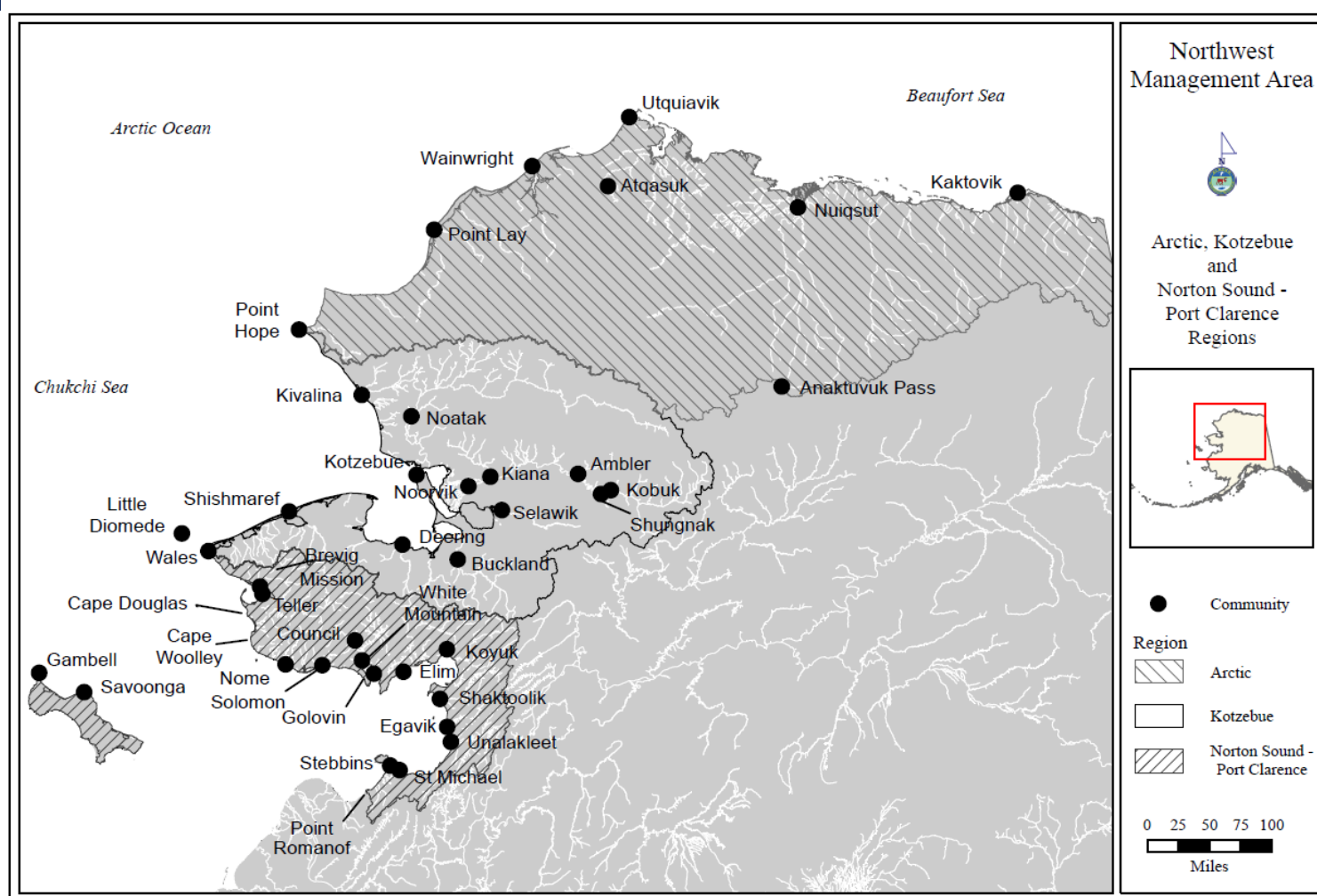
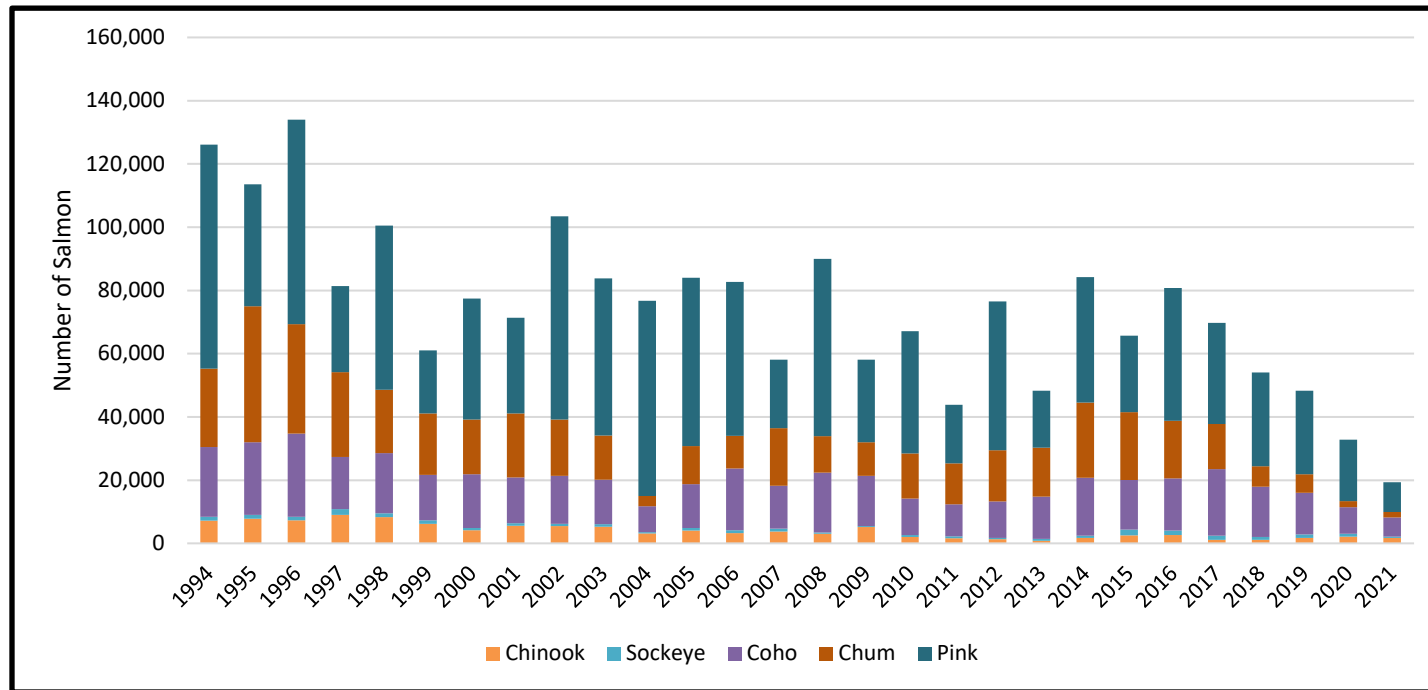


Figure 4-38 of the SIA Northwest and Northern Regions, ADF&G



# Subsistence Harvests of Salmon in Norton Sound



- General pattern of decline in total subsistence harvests of salmon
- Subsistence harvests of chum salmon have ranged between 43,014 (1995) and 1,681 (2021) fish
- Historical average level of subsistence harvests of chum salmon was 16,297 fish (1994-2021)
- 3-year average level of harvest was 3,141 fish (2019-2021)



Figure 4-39 of the SIA Estimated historical subsistence salmon harvests, Norton Sound District, 1994-2021  
ADFG



# Variation in Subsistence Harvests of Salmon Across the Norton Sound District

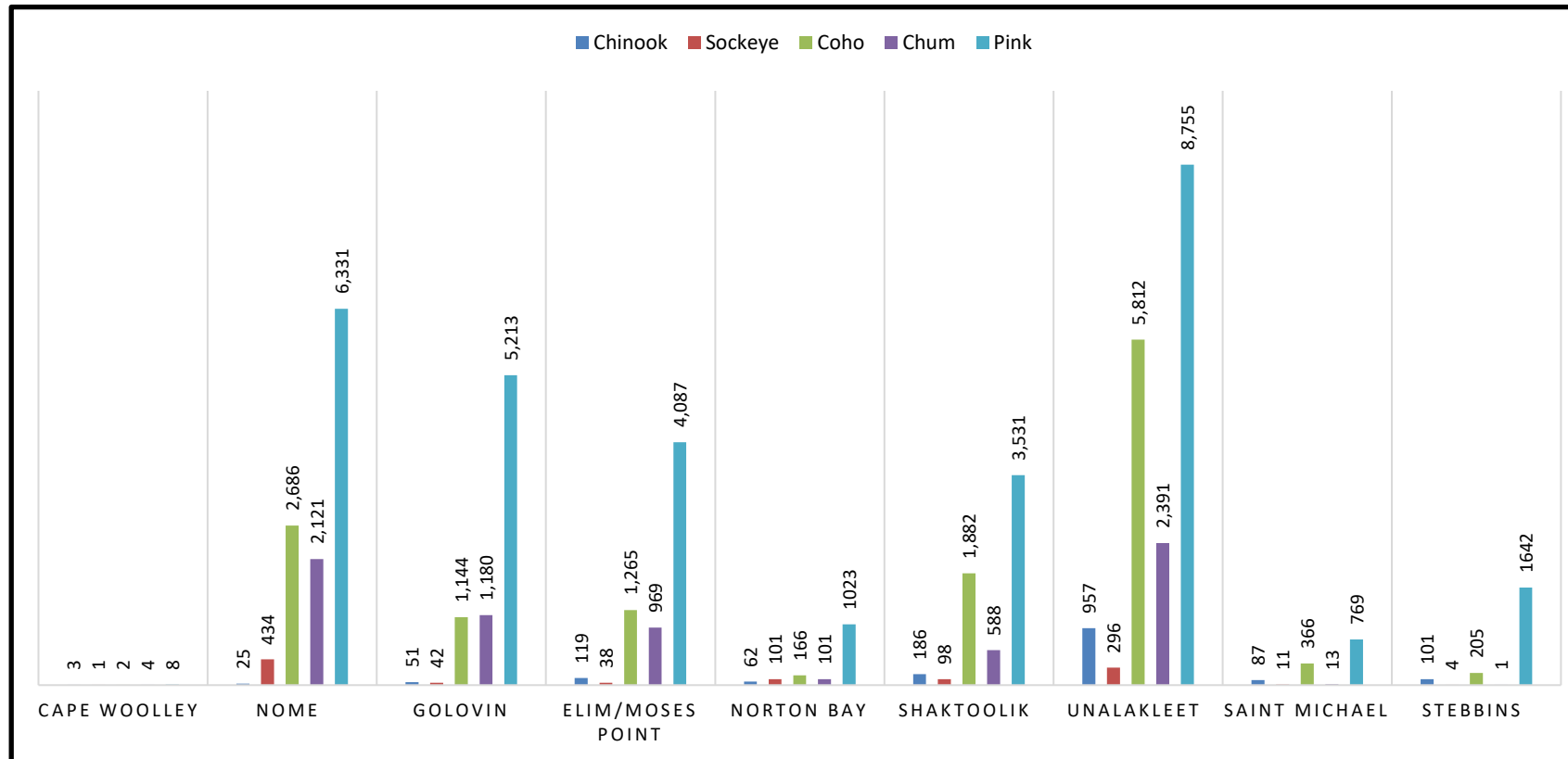
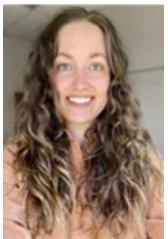
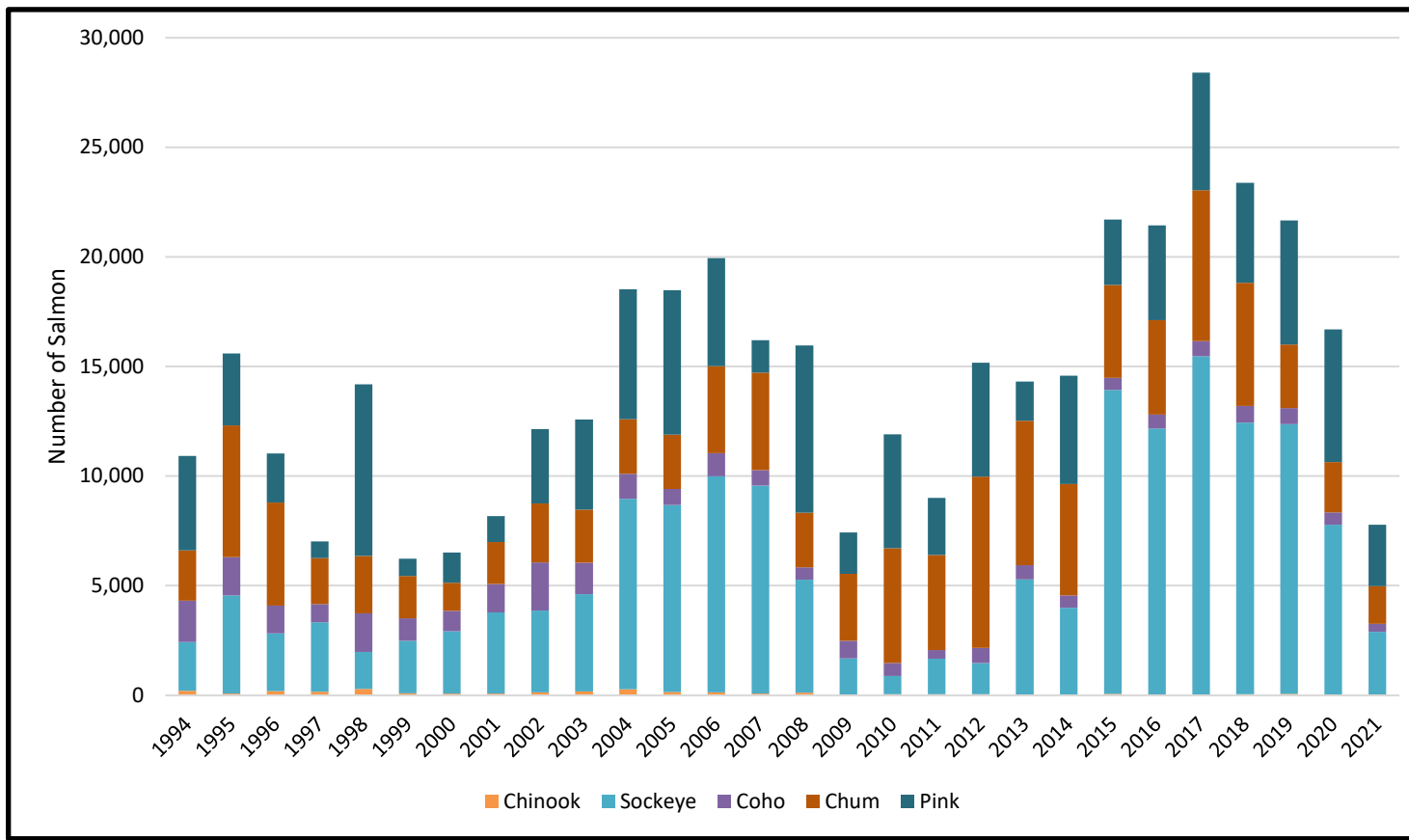


Figure 4-40 of the SIA Average species composition of subsistence salmon harvests for subdistricts, Norton Sound District, 2012-2021 ADFG

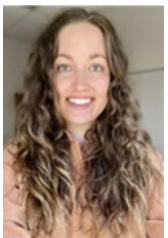


# Subsistence Harvests of Salmon in Port Clarence



- Estimated subsistence harvests of all species of salmon have ranged between 28,411 fish (2017) and 7,429 fish (2009)
- Subsistence harvests of chum salmon have ranged between 6,886 (2017) and 1,275 (2000)

Figure 4-41 of the SIA Historical subsistence salmon harvests, Port Clarence District, 1994-2021



# The role of Subsistence Harvests of Salmon in Mixed Economies and Food Security

- Contemporary subsistence uses occur within a **mixed economy**

*“For local families, commercial fishing income was used to purchase equipment and supplies used for subsistence fishing and hunting...Core village subsistence activities were not eroded or replaced but reinforced with earnings of commercial fishers.” Wolfe & Spaeder (2009)*

- Salmon play an important role in meeting **food security** needs and supporting mental and physical wellbeing

- Includes many components including sufficient quantities as well as access to culturally preferred foods

*“It’s like how you have to have maybe milk every day, or sugar. That’s how dried fish is. It’s something you have to have.” Fisher from Tuntutuliak, as quoted in Ikuta et al. (2013:14).*

- Chum salmon can play an important dietary role

*Chum salmon are also a unique source of traditional foods, such as eggamarrlluk (half-dried, half-smoked salmon), and for feeding Elders or other family members that cannot digest oil rich species like Chinook salmon (KRITFC 2021).*





# Knowledge Sharing, Family, and Relationships

- Chum salmon have been a critical food source for sled dogs throughout the Arctic-Yukon-Kuskokwim region used for transportation, hauling goods, subsistence hunting and fishing, trapping, and recreation

*“Yeah, that was one of my favoritest things to do was bale...make the bales of dog food. And then my dad used to get, oh, my word, they used to cut thousands and thousands of dog salmon for dog fish. Thousand[s], and I remember long time ago when we used to get like 3,000 dog fish a day, my mom and dad would cut them all.” Judy Vanderpool, McGrath, as quoted in Native Village of Georgetown (2021:57).*

- The act of fishing brings people together – to teach, to learn, to share knowledge and connect with family

*“[at fish camp] ...during fishing activities, everyone has a role to play from the young children to the oldest Elder. Salmon fishing [in Russian Mission] is a group effort with family groups establishing fish camps along the banks of the river in the community or nearby. Often a child’s first jobs are to haul fish and water, wash and hang the fish, gather wood for the smokehouse, and, when old enough handling a knife...” Moncrieff 2017: 20*

- Households are shifting subsistence use patterns but there is no replacement for the reciprocal relationships people hold with salmon



*“If animals are treated with respect, they return; if they are abused, they do not. According to the Yup’ik view, the world is inhabited by humans and animals in constant communication. Crashes in animal populations are never biological processes separable from these fundamentally social relations. This positive reciprocity is the defining feature of Yup’ik life, as it is for many arctic peoples, as well as hunters and gatherers worldwide.” Fienup-Riordan (2020:25)*

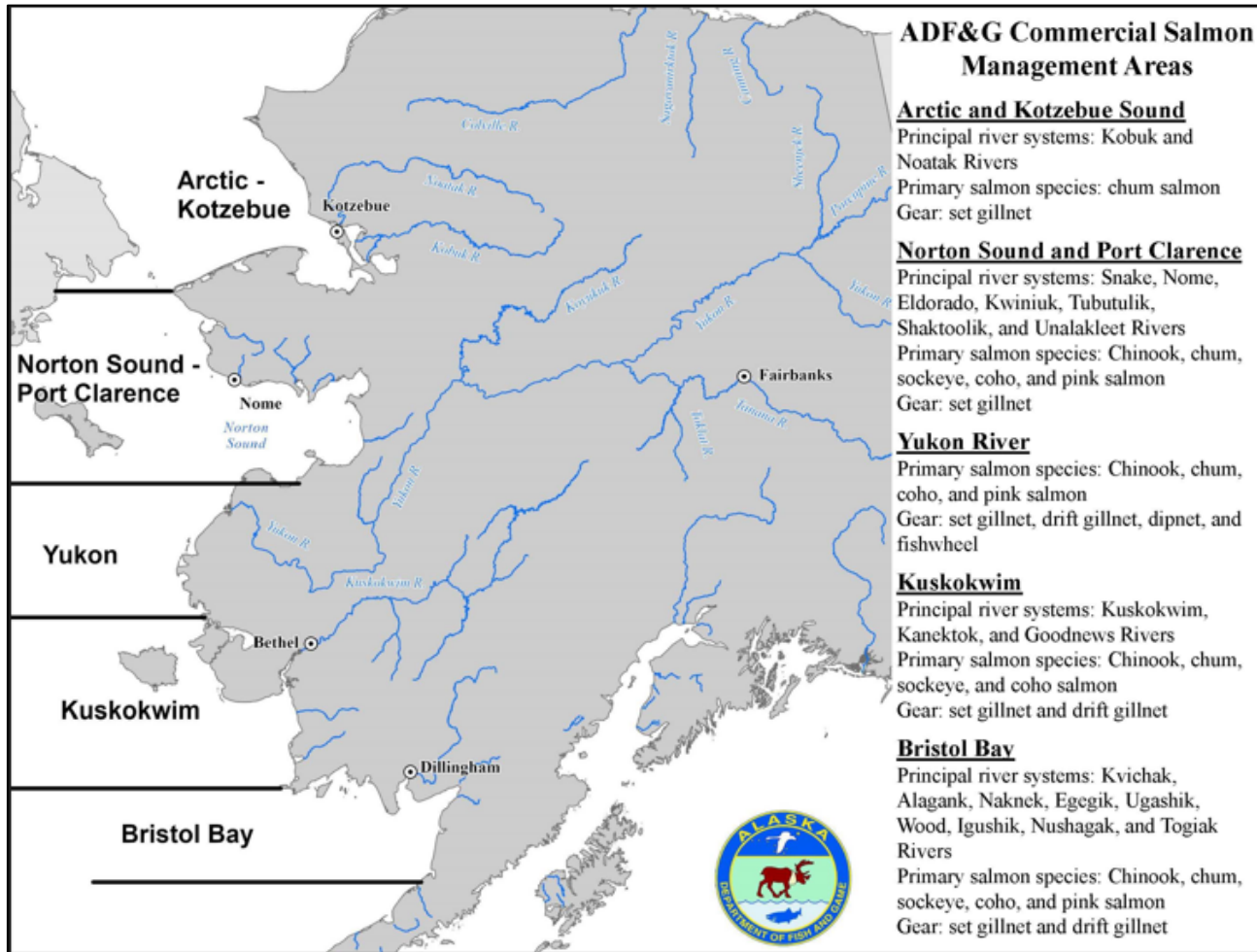


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# Overview of Commercial Chum Salmon Fishing in Western and Interior Alaska



# Commercial Salmon Fishing in Western and Interior Alaska

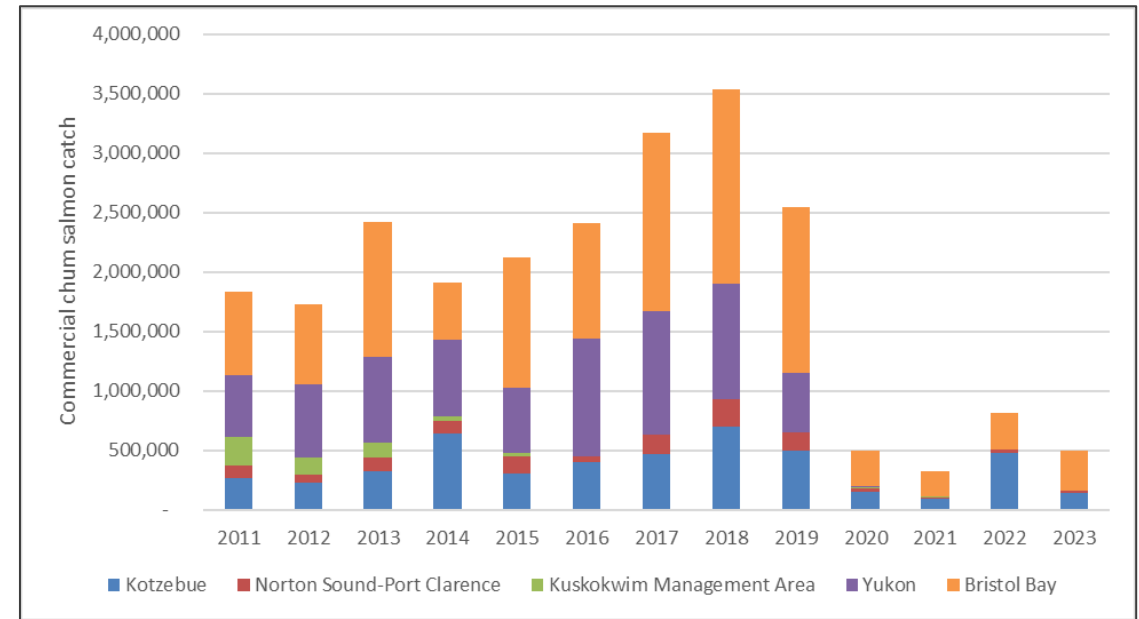


- Section 4.4. in the SIA provides status quo description of commercial salmon fisheries for WAK chum
- Given the consistency and accessibility of commercial data, covers 5 ADF&G management areas
- ADF&G considers salmon surplus above escapement needs and subsistence uses prior to opening commercial fisheries.



# Summary of Commercial Chum Salmon Trends

Fisheries Management Area	Most recent year with directed commercial chum fishery	Chum catch in most recent year opened (number of fish)	Chum ex-vessel value in most recent year opened	% of total salmon value chum represents in most recent year opened	10-year average catch from most recent year opened (number of fish)	10-year average ex-vessel value beginning in from most recent year opened	Historic high catch (number of fish)
Kotzebue	2023	141,781	\$733,061	100%	385,919	\$1,426,326	695,153 (2018)
Norton Sound-Port Clarence <sup>a</sup>	2023	15,693	\$62,606	54%	94,609	\$430,303	319,437 (1983)
Yukon River Summer Run	2020	13,968	\$51,067	99%	386,991	\$1,378,825	1,616,682 (1988)
Yukon River Fall Run	2019	268,360	\$1,073,146	76%	268,923	\$1,304,167	489,702 (2017)
Kuskokwim River	2020 <sup>b</sup>	*	*	*	51,194	\$129,564	1,318,647 (1988)
Remainder of Kuskokwim Area <sup>c</sup>	2021	5,845	\$6,453	1%	21,029	\$115,686	133,524 (2010)
Bristol Bay	2023	342,905	\$574,777	0%	822,485	\$1,478,778	2,243,569 (2006)



SIA: Figure 4-45, page 162

SIA: Table 4-55, page 161



# CFEC Commercial Salmon Permits



Percent of total ex-vessel value of salmon fisheries by species, 1976-2021

Species	Upper Yukon Fish Wheel (S08P)	Upper Yukon Gillnet (S04P)	Lower Yukon Gillnet (S04Y)	Kuskokwim Gillnet (S04W)	Norton Sound (304Z)	Kotzebue Gillnet (S04X)	Bristol Bay Drift Gillnet (S03T)	Bristol Bay Set Gillnet (S04T)
Chinook	11.8%	32.0%	62.5%	17.5%	12.9%	0.1%	1.3%	1.0%
Sockeye	0.0%	0.0%	0.0%	16.0%	0.4%	0.0%	95.7%	95.9%
Coho	3.1%	0.1%	3.6%	46.1%	43.1%	0.0%	0.6%	1.5%
Pink	0.0%	0.0%	0.0%	0.3%	8.0%	0.0%	0.5%	0.6%
Chum	85.0%	67.9%	33.8%	20.1%	35.6%	99.7%	1.8%	1.1%

Kuskokwim aerial; Photo credit: N. Pollock/KRITFC



# Commercial Salmon Community Engagement and Dependence

Three sets of tables for each management area:

- **First two sets of tables:** patterns of community and regional (i.e., local versus non-local) **engagement** through number of permit holders and value
  - 'Local' and 'non-local' distinctions adopted from recent CFEC reports
- **Third set of tables:** community and regional **dependence** by commercial revenue from chum salmon specifically, at the community level aggregated, relative to other fisheries revenue

		Annual Average 2011-2022 (number)	Annual Average 2011-2022 (percent)	Unique Persons 2011-2022 (number)
<b>Kotzebue gillnet</b>	Local Total	83	98%	208
	Non-Local Total	2	2%	10
<b>Norton Sound gillnet</b>	Local Total	129	98%	271
	Non-Local Total	2	2%	15
<b>Upper and Lower Yukon gillnet and fishwheel</b>	Local Total	359	96%	847
	Non-Local Total	15	4%	70
<b>Kuskokwim gillnet</b>	Local Total	206	99%	715
	Non-Local Total	3	1%	15
<b>Bristol Bay drift and set gillnet</b>	Local Total	607	25%	1,329
	Non-Local Total	1,803	75%	4,150





# Regional Economics of Commercial Salmon Fishing

**Declines in commercial chum salmon fishing opportunities fit into a broader economic and social framework**

**Many communities across Western and Interior Alaska have mixed economies**

- Depend on both subsistence food production component as well as a cash component from employment
- Subsistence and commercial fishing can be interconnected in many ways. Joint subsistence and commercial closures can represent a “double-blow” to food access

**Economic impacts and “support sectors” can look different than typical economic impact analytical framework may employ.**

- These commercial fisheries are highly local (less so for Bristol Bay), there are a limited number of for-profit businesses within most communities, and cultural importance of sharing – including one’s labor.
- Cash may be exchanged for assistance or use of equipment, but also bartering/sharing of salmon harvest, and expectations/responsibly to participate.
- With limited businesses available, developing the skills and knowledge for commercial fishing, boat maintenance, equipment repair, etc. another extremely important value.
- CFEC permit reports demonstrate high rates of transfers within families and rates at which permits are gifted rather than sold

**The presence of commercial processors or fish buyers are another important component for commercial opportunities.**



Boats lined up for tender after 6-hour chum salmon commercial fishery in 2014;  
Photo credit: S.Evans/KRITFC





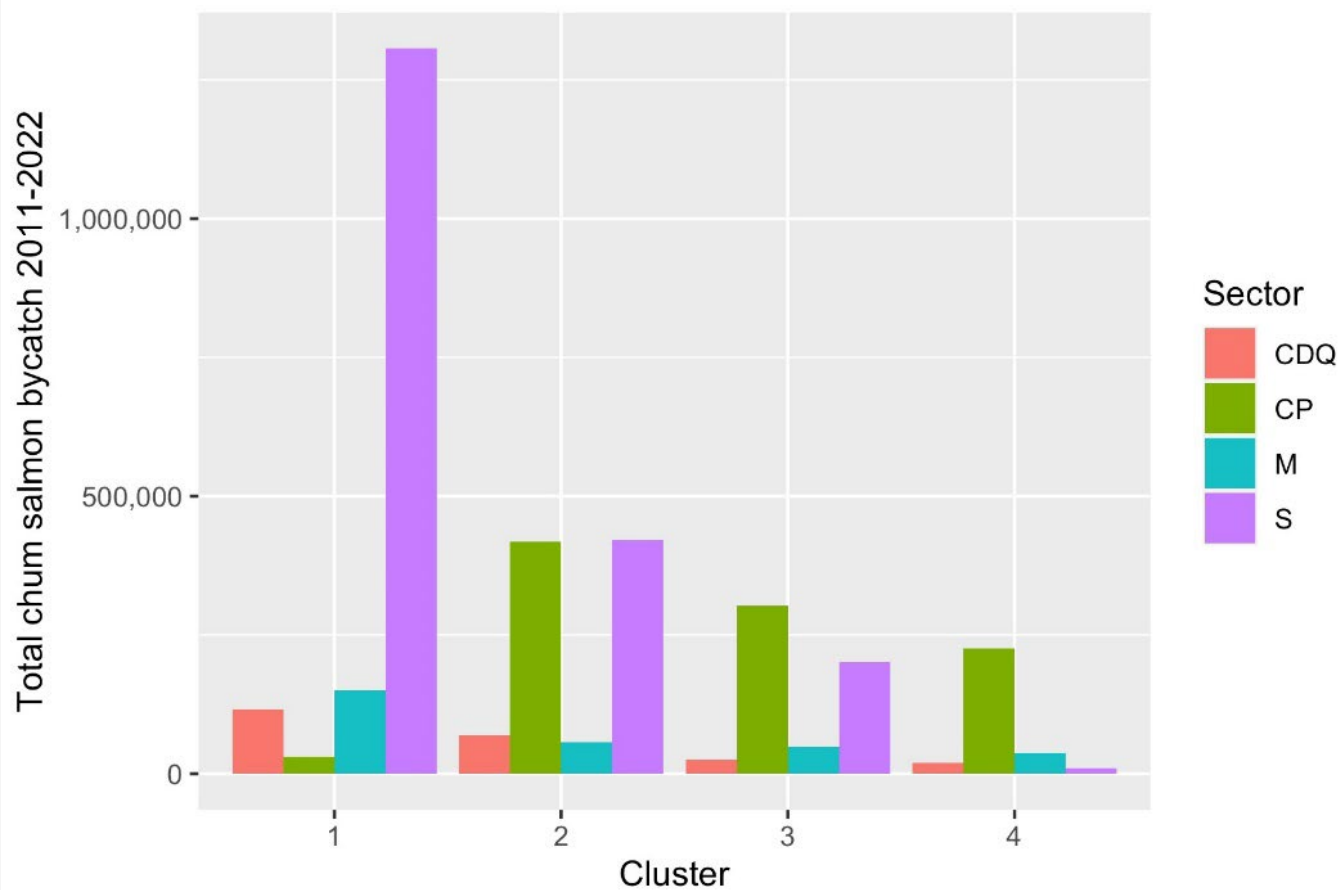
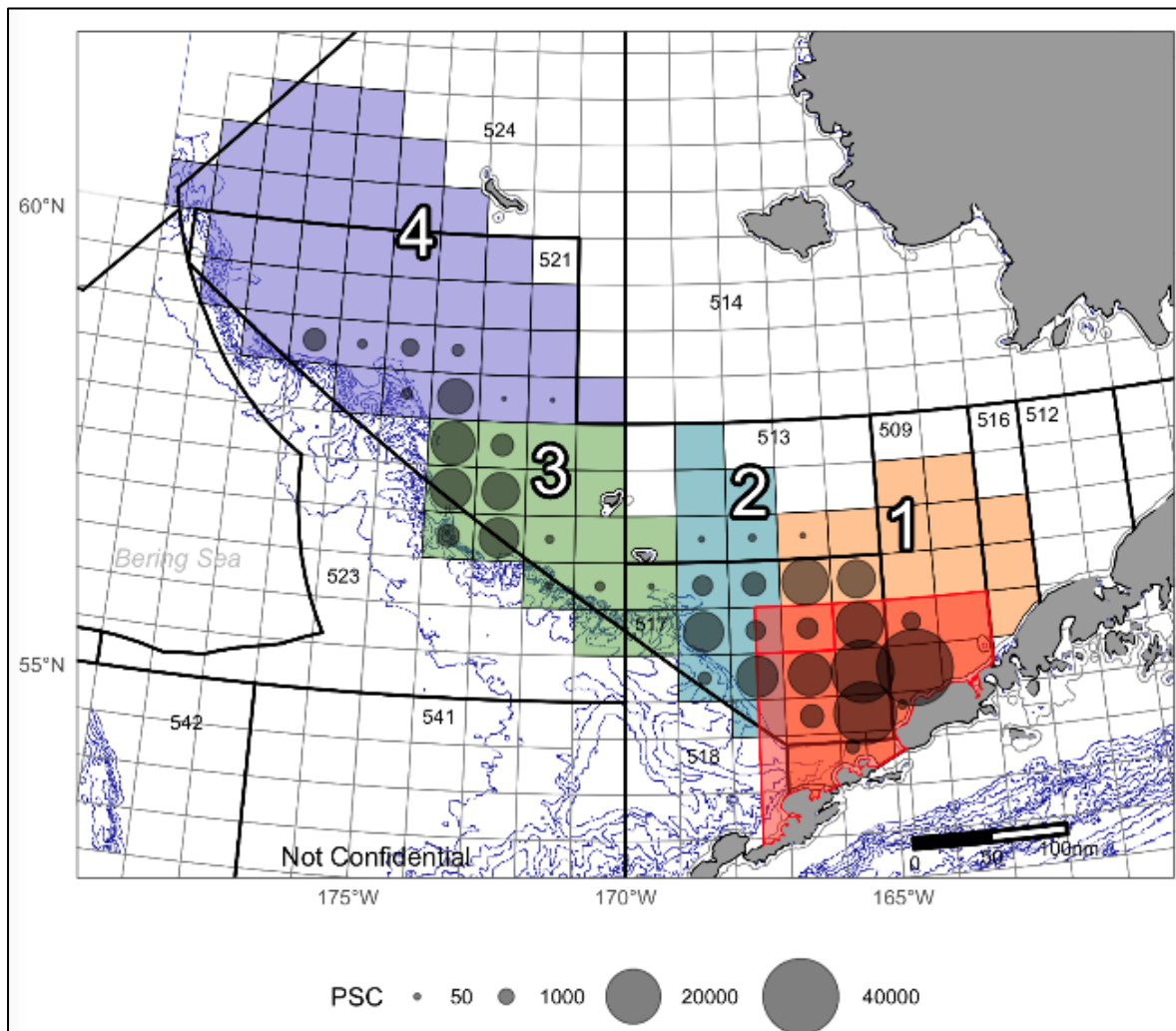
# Impacts on chum under Alternative 1: Status quo



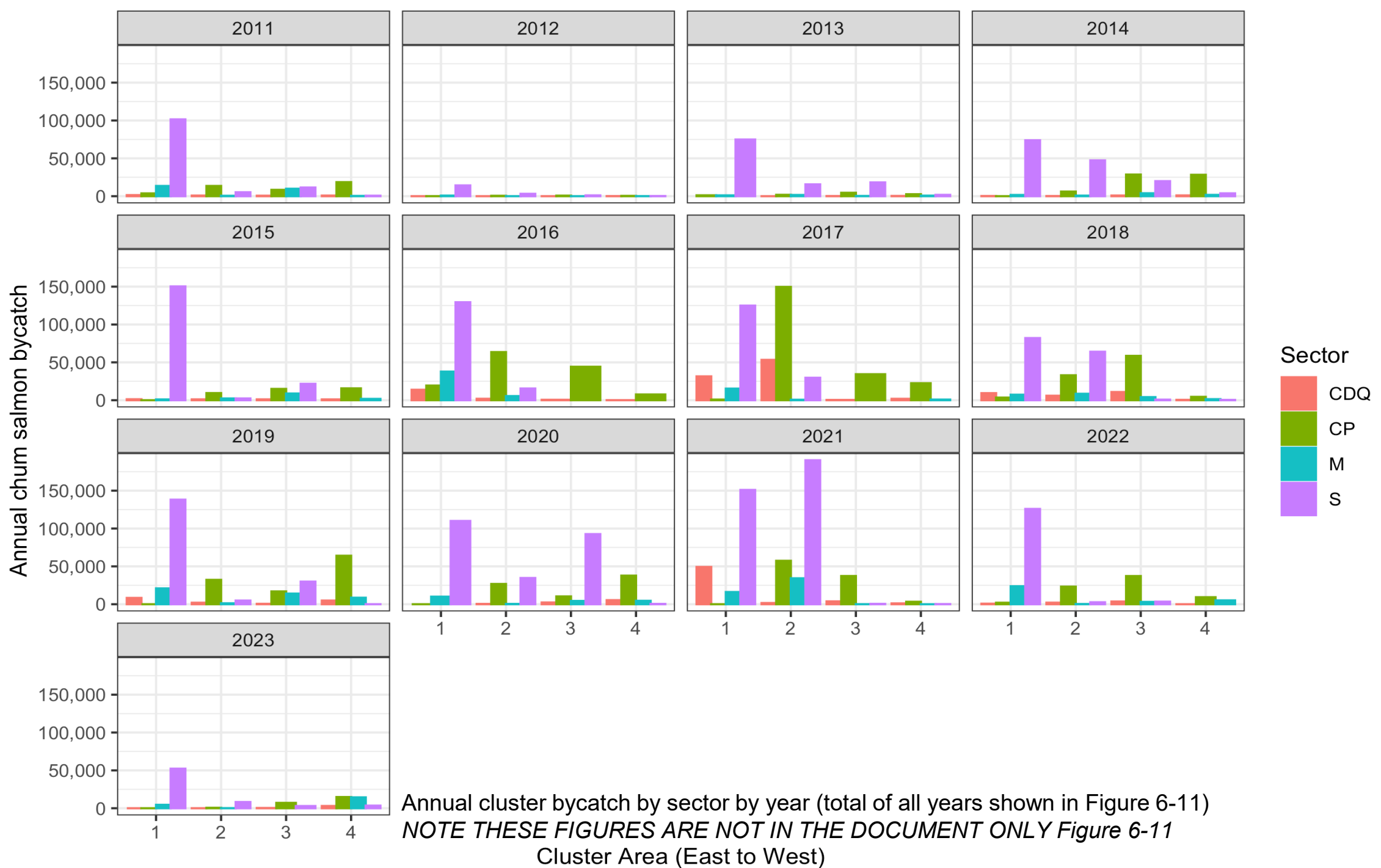
**B season chum salmon bycatch (number of fish) by Bering Sea pollock fishery sector as well as the 3-, 5-, 10-, and 12-year average levels of bycatch, 2011 through 2022**

<b>Year</b>	<b>CDQ</b>	<b>CP</b>	<b>Mothership</b>	<b>Inshore</b>	<b>Total</b>
<b>2011</b>	3,758	44,299	24,399	118,857	191,313
<b>2012</b>	200	1,928	977	19,067	22,172
<b>2013</b>	554	10,229	3,835	110,496	125,114
<b>2014</b>	2,407	63,066	8,091	145,322	218,886
<b>2015</b>	4,650	40,046	14,046	174,343	233,085
<b>2016</b>	16,342	134,750	43,629	144,882	339,236
<b>2017</b>	87,058	207,355	16,825	154,610	465,848
<b>2018</b>	26,586	99,447	21,303	147,339	294,675
<b>2019</b>	15,726	113,428	44,860	172,798	346,671
<b>2020</b>	8,582	77,138	19,743	237,632	343,094
<b>2021</b>	55,663	97,917	50,542	341,779	545,901
<b>2022</b>	6,365	71,786	32,262	131,896	242,309
<b>3-yr. avg. (2020-2022)</b>	23,537	82,280	34,182	237,102	377,102
<b>5-yr. avg. (2018-2022)</b>	22,584	91,943	33,742	206,295	354,564
<b>10-yr. avg. (2013-2022)</b>	22,393	91,516	25,477	176,113	315,499
<b>12-yr. avg. (2011-2022)</b>	18,991	80,116	23,345	158,255	280,707

# Spatial distribution of chum salmon by genetic cluster areas 1 through 4 (2022 only) and by cluster and sector (2011-2022)



Figures 6-10, 6-11, pages 131-132



## Estimated number of WAK chum salmon caught as bycatch by pollock fishing sector, 2011 through 2022

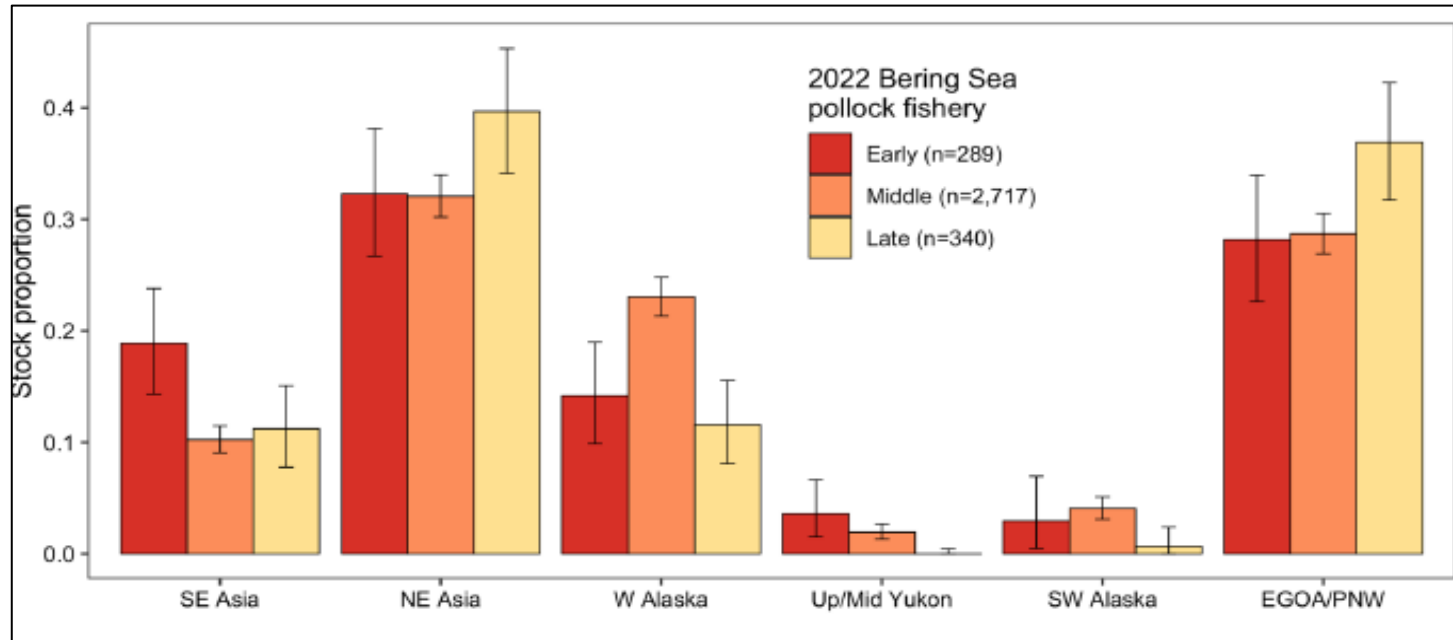
	CDQ	CP	Mothership	Inshore	Total
2011	NA	8,917	4,430	32,444	45,791
2012	NA	NA	NA	3,932	3,932
2013	NA	2,468	801	28,219	31,488
2014	NA	8,715	NA	31,650	40,365
2015	NA	5,133	1,928	36,262	43,323
2016	3,031	21,946	13,758	38,236	76,971
2017	22,674	33,435	4,673	35,288	96,070
2018	6,272	17,644	4,503	30,391	58,810
2019	2,898	5,090	7,637	40,237	55,862
2020	NA	1,926	1,148	25,620	28,694
2021	6,092	7,736	3,447	33,522	50,797
2022	902	8,037	7,891	37,278	54,108
<b>Average</b>	<b>6,978</b>	<b>11,004</b>	<b>5,022</b>	<b>31,090</b>	<b>48,851</b>

Source: NMFS Alaska Region Catch Accounting System.

Notes: NA denotes insufficient samples were available to estimate genetic stock proportions



**Stock composition estimates with 95% credible interval for the chum salmon bycatch from the Early, Middle, and Late periods of the 2022 Bering Sea B season pollock fishery**

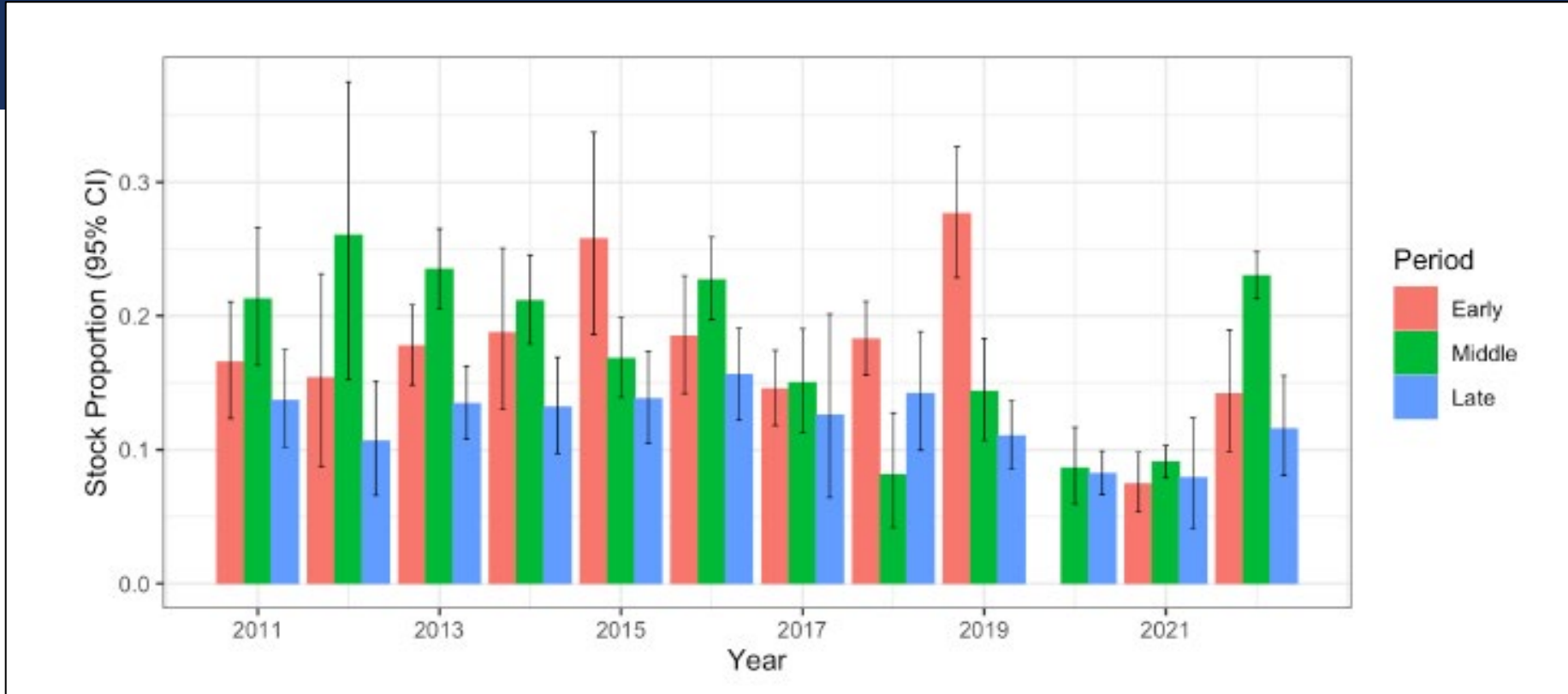


When Analyzed as Three Distinct Time Periods

Period	Statistical Weeks	Associated Week-end Calendar Dates
Early	24-29	June 10-July 29
Middle	30-34	July 29-August 26
Late	35-44	August 26 -November 4



Mean stock composition estimates for the WAK reporting group from the Early, Middle, and Late periods from the B season pollock fishery, 2011 through 2022

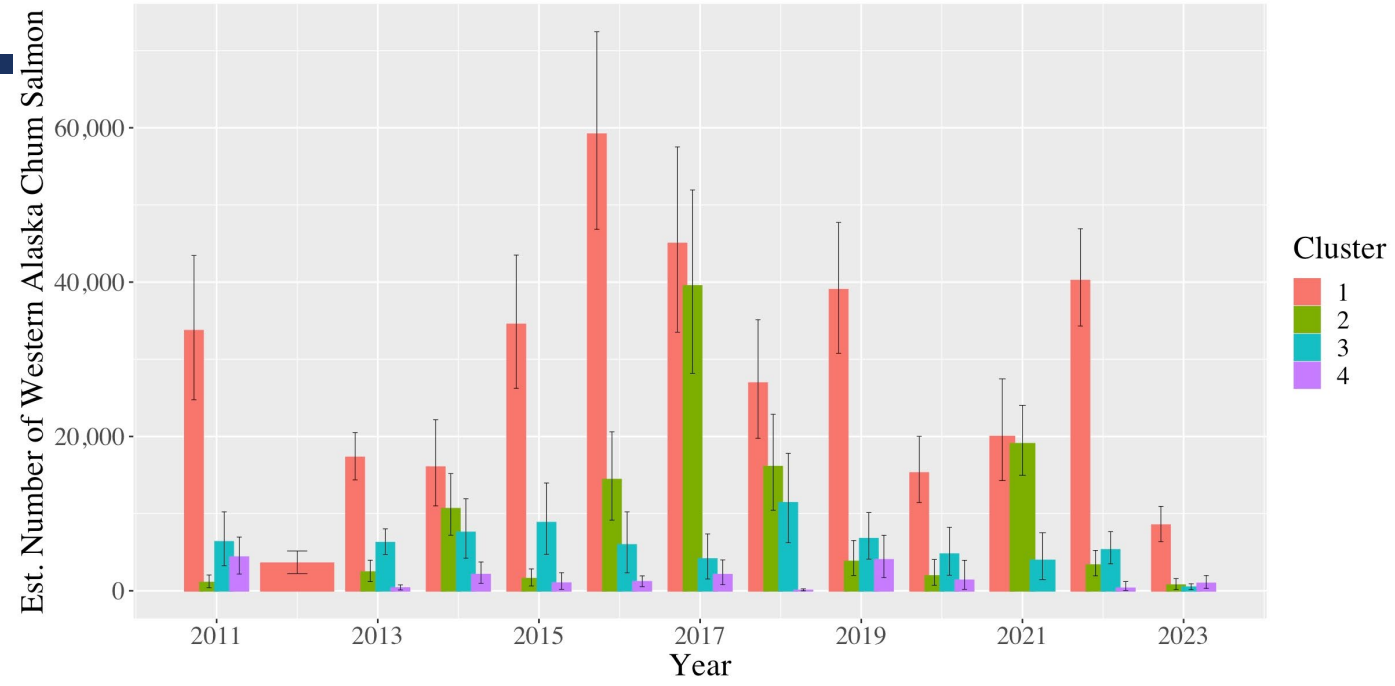


When Analyzed as Three Distinct Time Periods

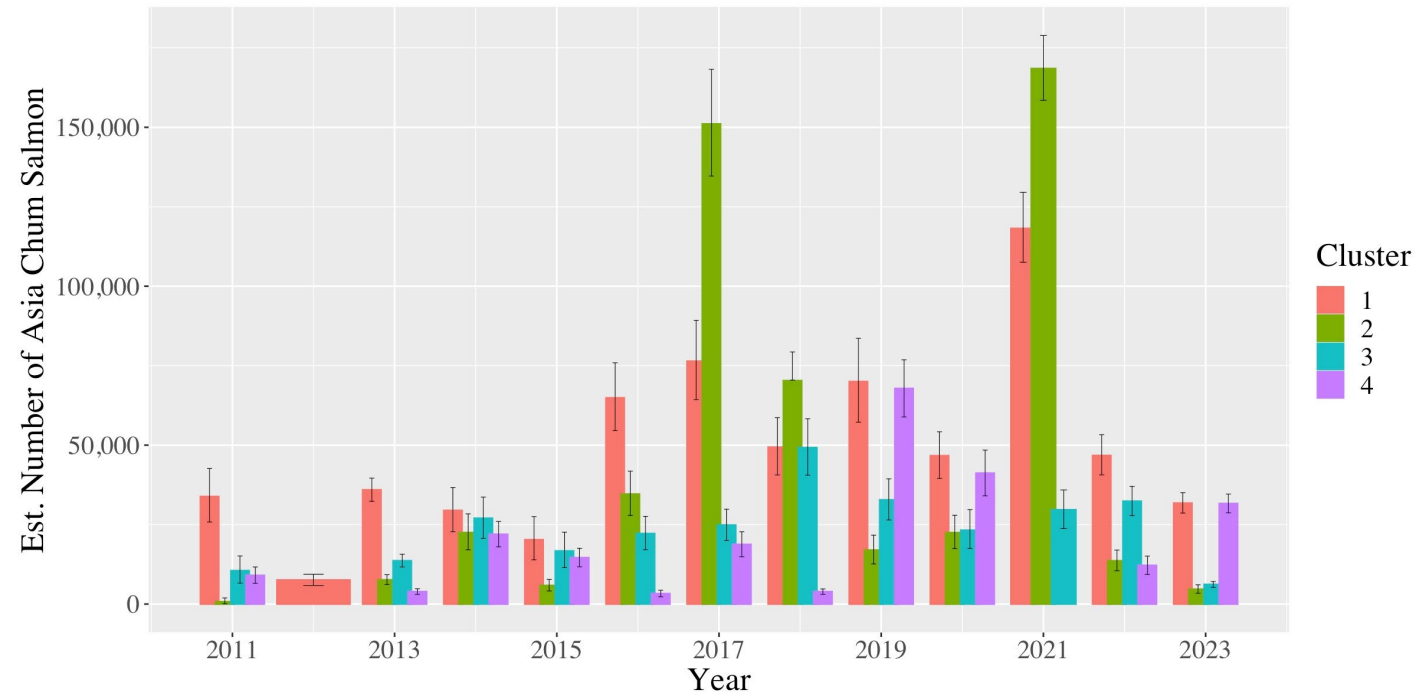
Period	Statistical Weeks	Associated Week-end Calendar Dates
Early	24-29	June 10-July 29
Middle	30-34	July 29-August 26
Late	35-44	August 26 -November 4

Figure 6-14, page 137





WAK chum by cluster and year



Asian chum by cluster and year

**NOTE THESE FIGURES ARE NOT IN THE DEIS**



# All chum salmon bycatch avoidance areas within genetic cluster areas 1 and 2 2017- 2023 Source: Sea State

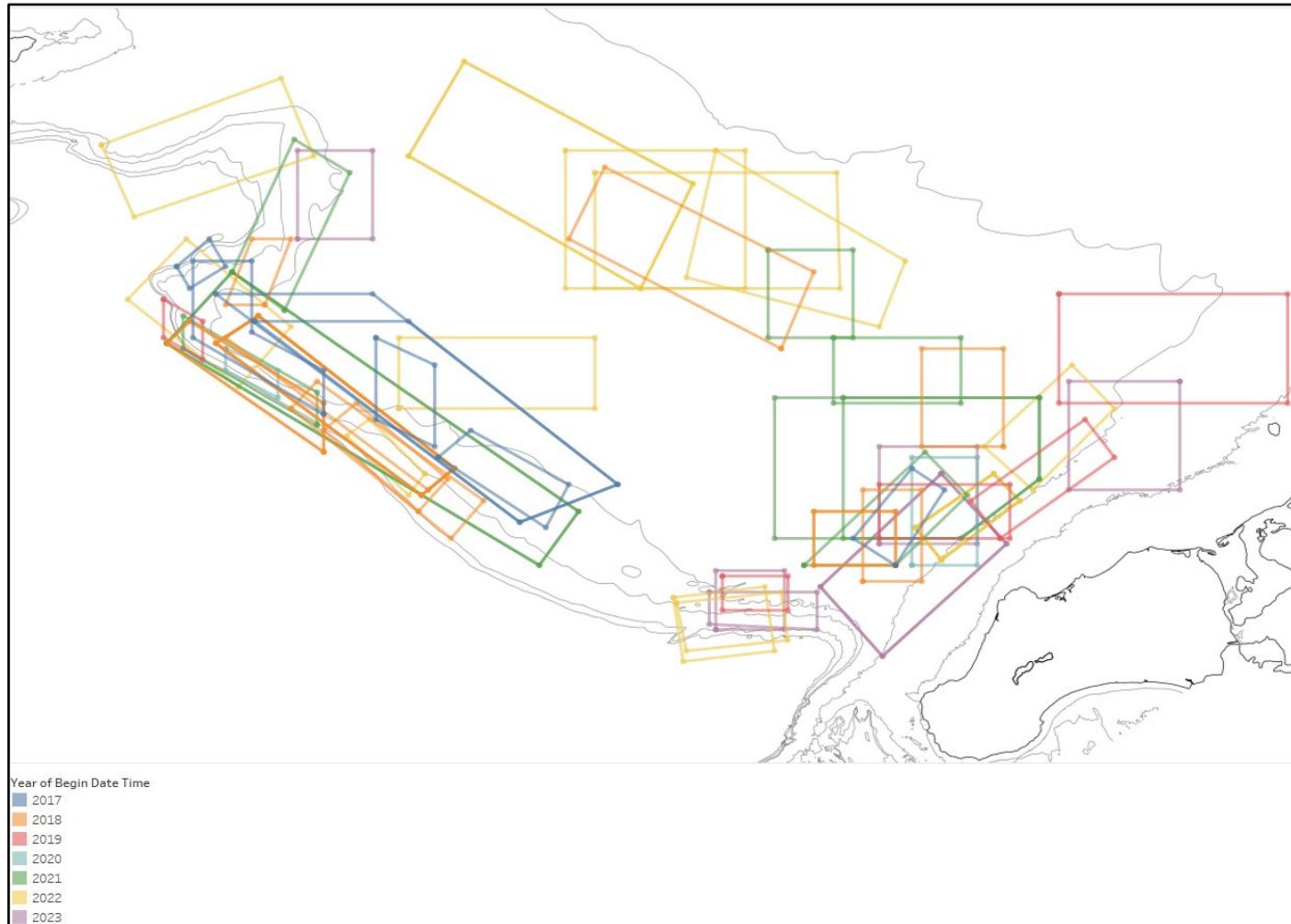


Figure 6-20, page 148





# Uncertainties associated with a chum salmon AEQ for purposes of this analysis

More certainty

Data Needed to Estimate Impacts of Bycatch

Data	Source
Number of chum caught in bycatch	NMFS Observers Census of all salmon
Age of chum in bycatch	Scale analysis of ages by Auke Bay Lab (ABL) scientists
Genetic Stock of Origin	Annual analysis by ABL scientists - temporal - spatial - stock specific ages
Maturation rates by river systems	ADF&G
Ocean mortality	Published literature e.g., Beamish et. al 2018 (limited to Asian stocks)

**What is the purpose in estimating a highly uncertain AEQ when we cannot do a run reconstruction for all WAK chum to estimate an impact rate?**

>> uncertainty



## Coastal Western Alaska (CWAK), Upper/Middle Yukon and combined Western Alaska (CWAK + Upper/Middle Yukon) resulting numbers of fish 2011-2022

Year	Chum Bycatch	Coastal Western Alaska		Upper/Middle Yukon		Western Alaska Combined	
	Total	Mean	Est. #	Mean	Est. #	Mean	Est. #
2011	191,313	16.20%	30,993	8.90%	17,027	25.10%	48,020
2012	22,172	13.80%	3,060	7.40%	1,641	21.20%	4,701
2013	125,114	18.10%	22,633	6.30%	7,782	24.40%	30,415
2014	218,886	17.70%	38,699	2.10%	4,553	19.80%	43,252
2015	233,085	16.00%	37,294	3.90%	9,090	19.90%	46,384
2016	339,236	19.30%	65,473	5.30%	17,980	24.60%	83,453
2017	465,848	14.00%	65,219	6.00%	27,951	20.00%	93,170
2018	294,675	15.40%	45,385	3.40%	10,020	18.80%	55,405
2019	346,671	15.90%	55,143	0.30%	1,040	16.20%	56,183
2020	343,094	8.00%	27,448	1.10%	3,774	9.10%	31,222
2021	545,902	8.90%	48,658	0.50%	2,854	9.40%	51,512
2022	242,309	21.10%	51,106	1.90%	4,618	23.00%	55,724

Estimated number per year comprises a maximum amount that could return:

We know that not all chum return in a given year due to:

Oceanic mortality  
Age specific maturity



## Section 6.1.4.5

### Brief overview of 2023 chum salmon bycatch and genetic results

- Non-Chinook salmon PSC in the BSAI pollock fishery in 2023 was 112,303
- CWAK chum = 8.3% (estimated 9,246 fish)
- Upper/Middle Yukon component = 2.3% (estimated 2,540 fish)
  
- Drop in the genetics proportion of CWAK from 2022 (CWAK in 2022 was 21.1%)
- Slight increase in the Upper/Middle Yukon component (1.9% in 2022)



# Summary of impacts to chum under Alternative 1

- Coastal WAK (CWAK) estimated contribution to the overall chum bycatch (2011-2022)
  - low of 3,060 in 2012
  - high of 65,473 in 2016
- Relative proportions of CWAK stocks to overall bycatch can be highly variable by year
- 2021
  - 545,902 total chum salmon were caught as bycatch, but the proportion of CWAK stocks was 8.90% resulting in a relative number of CWAK chum of 48,658 fish.
- 2022
  - almost half the total amount of chum salmon was caught (242,309) but the higher proportion of CWAK chum (21.20%) meant a similar number of CWAK chum salmon (51,106) were caught in 2021.
- Upper/Middle Yukon reporting groups are variable (ranging from 0.50% to 8.90%)
  - relative contribution to the overall bycatch tend to be much lower resulting in a range of Upper/Middle Yukon chum taken over this time frame from 1,641 in 2012 to 27,951 in 2017.
- Proportions are highly influenced by fishing locations annually by sector.



# Summary of impacts and limitations to estimate impacts to chum under Alternative 1 (p 143)

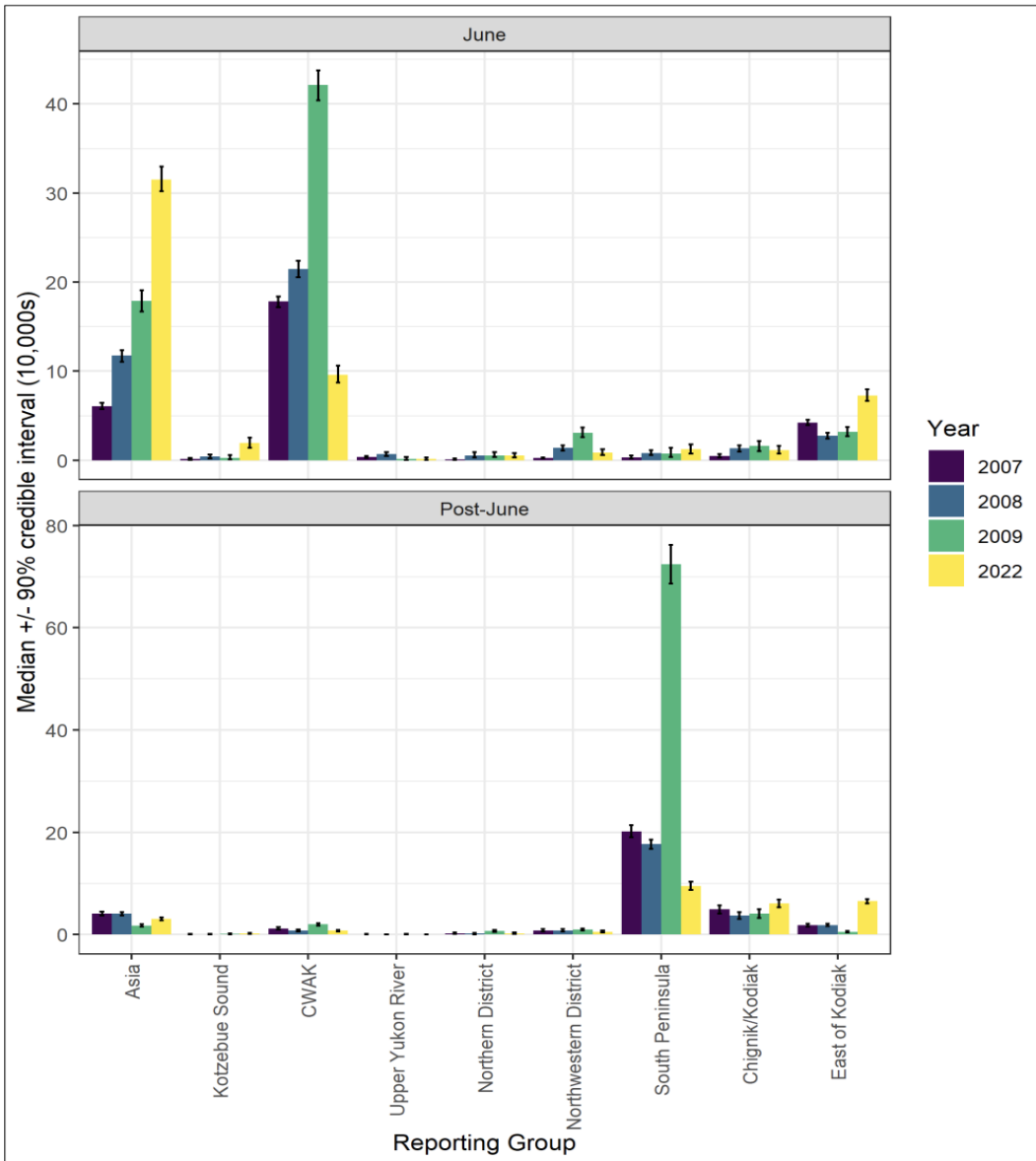
- WAK salmon populations vary in their productivity and life history characteristics.
  - may contribute to their sustainability or population viability, which may be important for the resiliency of chum salmon stocks, particularly in the face of climate change
  - limited information on specific spawning populations of chum salmon, which makes it difficult to understand how each specific population may or may not respond to bycatch and other environmental factors
- Data to estimate the impacts of bycatch on specific spawning populations of chum salmon are not available, these data would be extremely difficult to collect, and even if they were available there are many assumptions that would need to be made to estimate impacts.
- Footnote p 143 regarding potential impacts on discrete spawning populations
  - analysts are not able to estimate impacts to these levels
  - Feedback sought on feasibility of including this type of discussion in a future iteration of analysis





# Cumulative effects

# Area M chum harvests



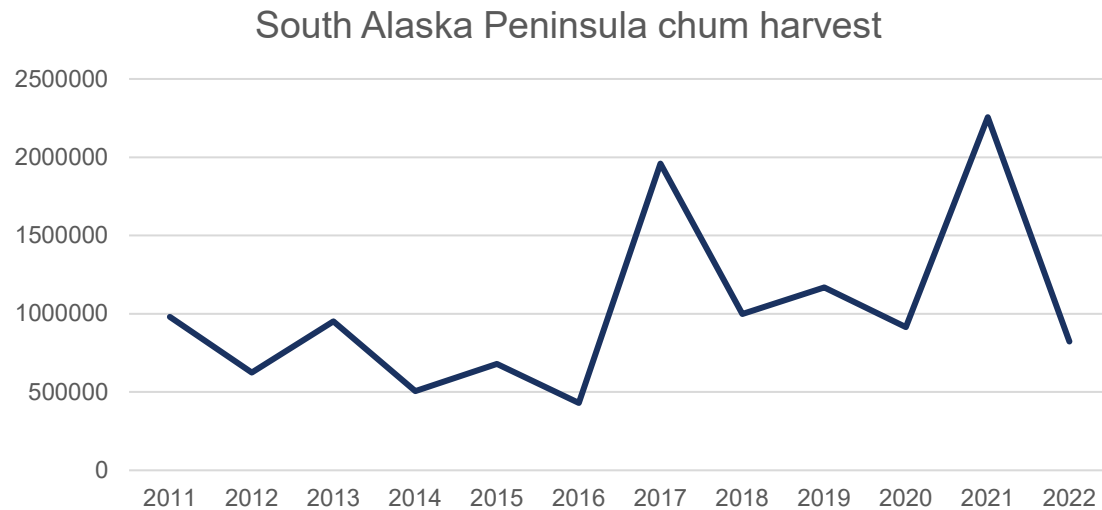
**Estimates of stock-specific compositions of harvest rate South Alaska Peninsula June and post-June chum salmon harvests, 2022 (source Dann et al. 2023)**

**On average, between 2007 to 2009, 57% of chum salmon harvest in the South Alaska Peninsula were of CWAK origin**

**2023 study = relative proportion of CWAK stocks declined from the WASSIP study findings to 18%, (varies by time )**

Figures 6-18, page 145

# Status quo bycatch and Area M harvests of AYK stocks



This table is not in DEIS



Year	Total WAK chum	Area M commercial fisheries June CWAK contribution*
2011	48,020	76,200
2012	4,701	71,111
2013	30,415	71,830
2014	43,252	70,225
2015	46,384	32,169
2016	83,453	48,711
2017	93,170	115,360
2018	55,405	96,744
2019	56,183	98,833
2020	31,222	88,223
2021	51,512	210,348
2022	55,724	97,937

**Figure 6-19 South Alaska Peninsula historical harvest of chum salmon 2011-2022**  
 from ADF&G Fishery Management Report No. 22-32, 2022

*\*Using harvest data from Figure 6-19 and 2022 Dann et al results of 18% contribution from CWAK applied over annual harvest (noting that this does not account for variations over time as shown in Figure 6-18)*



# Potential Impacts to Communities and Regions Engaged in and Dependent on Subsistence Harvests of Chum Salmon Under Alternative 1

- The impact of chum salmon bycatch occurring in the Bering Sea pollock fishery on adult chum salmon returns to Western and Interior Alaska river systems under the status quo **is uncertain**
- Although not quantified in this analysis, **Alternative 1 would be expected to continue this current level of impact** as it relates to subsistence salmon fishing
  - Alternative 1 is not anticipated to have inherent benefits to the overall health of the resource such that abundance improves where less restricted subsistence opportunities could be provided, **but** fishing behavior could still change into the future under status quo regulations
- **However,** the outcomes for subsistence users are uncertain and also affected by a variety of factors external to this impact analysis



# Potential Impacts to Communities and Regions Engaged in Commercial Chum Salmon Fishing under Alternative 1

- Commercial salmon fisheries would continue to be managed by the State of Alaska
  - Surplus above escapement needs and subsistence would be made available for other consumptive uses, such as commercial fishing opportunities.
- While chum PSC in the pollock fishery is documented and genetics indicate the estimated proportion expected to originate from WAK, the analysis cannot further estimate the impact that chum salmon bycatch has had on adult returns to Western and Interior river systems
- Although not quantified in this analysis, **Alternative 1 would be expected to continue this current level of impact** as it relates to commercial salmon fishing
- **However,** the outcomes for commercial users are uncertain and also affected by a variety of factors external to this impact analysis





# Pollock Under the Status Quo

# Pollock impacts under Alternative 1

## Bering Sea and Aleutian Islands

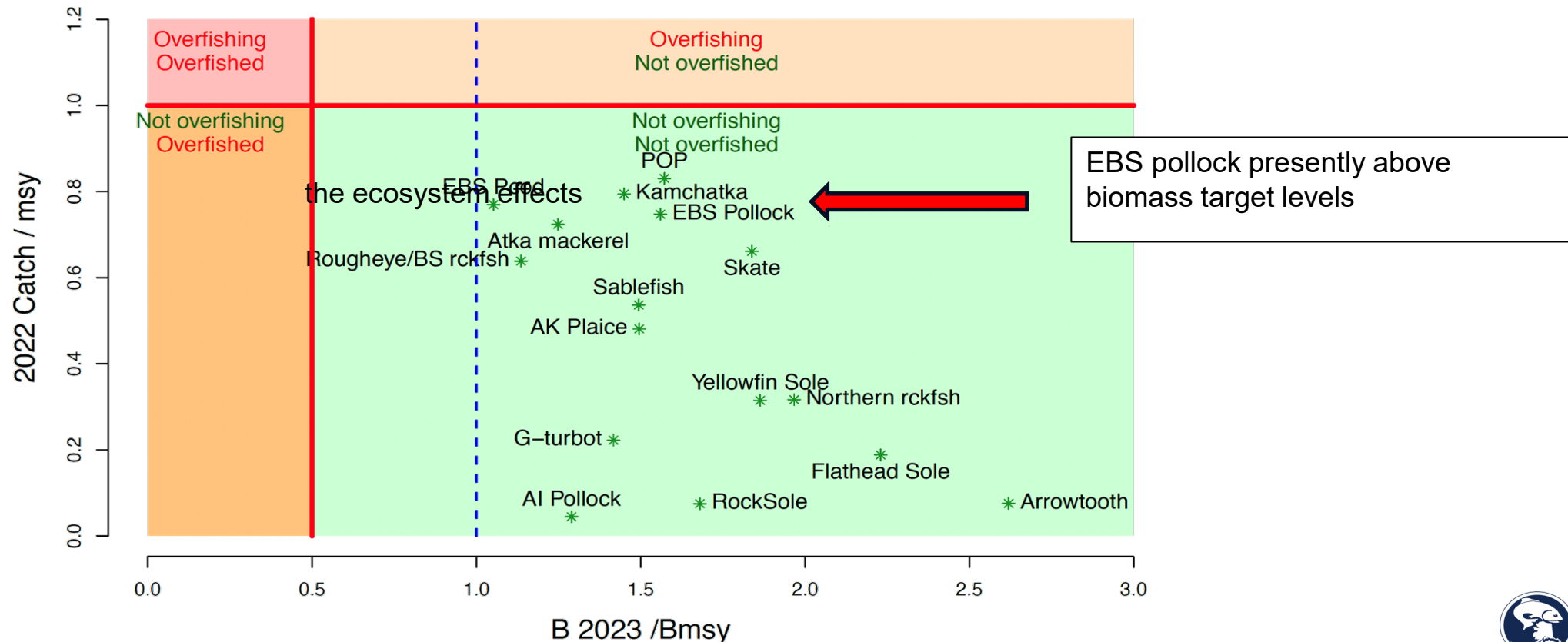


Figure 6-1 Summary of Bering Sea stock status next year and current year catch relative to fishing at Fmsy where FOFL is taken to equal FMSY.



# Pollock spawning, feeding and predators- Status quo

## Pollock spawn during March-May

- East middle shelf warm years, west outer shelf colder years
- Planktonic eggs and larvae for about 90 days
  - Advection affects dispersal (separation from predators)
  - Available feed affects overwintering survival (can vary warm and cold)

## Main prey for juvenile pollock calanoid copepods and euphausiids

- Diets become more piscivorous with age
- Age-0 less able to avoid cold pool, adult pollock move away

## Pollock predators

- Cannibalism might be expected to increase as the biomass of older, larger fish increases
- Fur seal consumption of adult pollock generally increases in years when juveniles less abundant



# Climate impacts and pollock

- Pollock distributions affected by cold pool extent
  - Cold pool extent factors into abundance trends
- Adults tend to avoid cold pool
- During warm years distribution shifts northward
- Tend to move from middle/inner domain to outer with maturation
- Increased metabolic rate in warm years



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# AFA Participation and Revenue Dependence Under the Status Quo



# Bering Sea Pollock Sectors

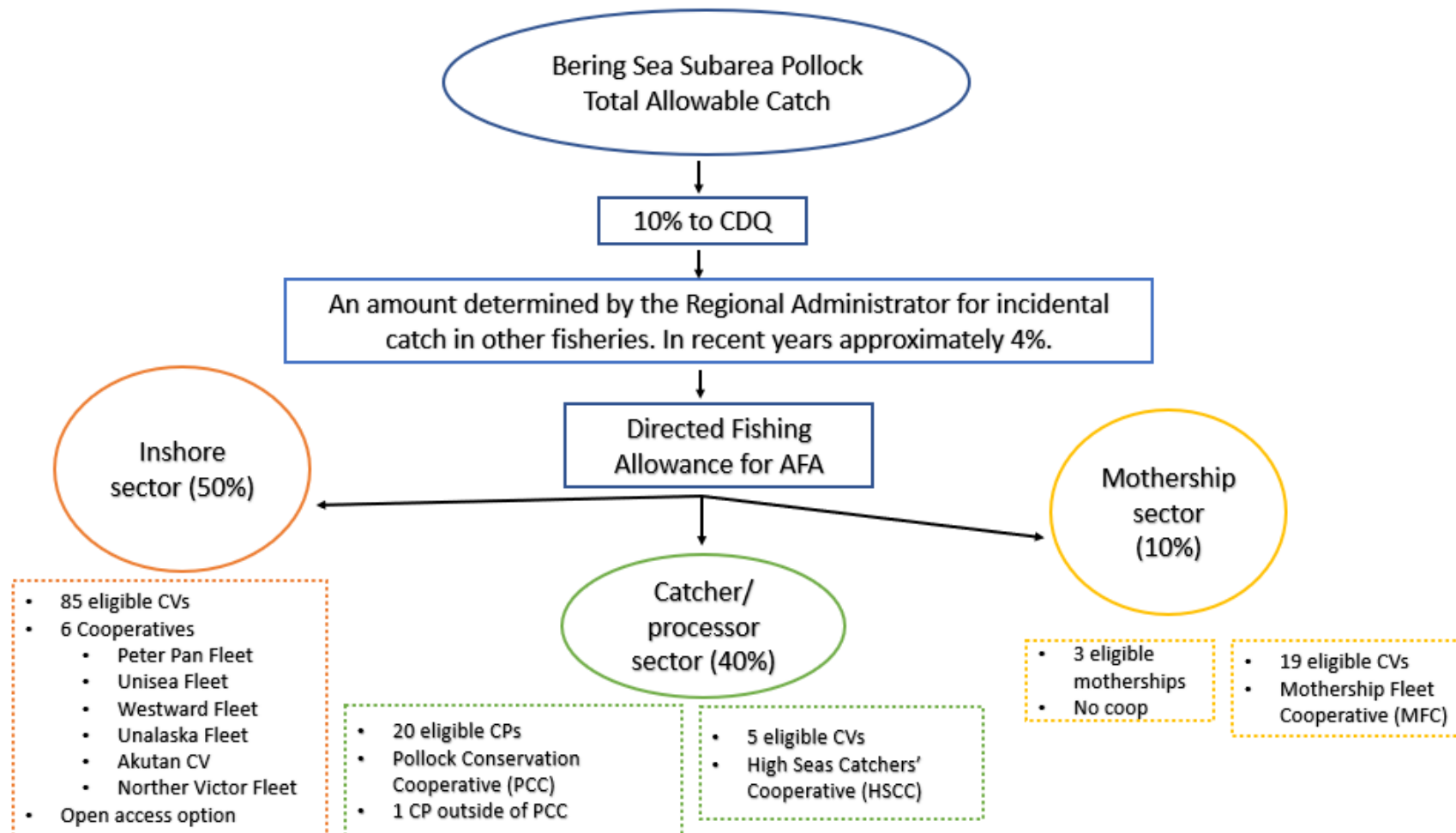


Figure 2.2, page 40



# AFA Participation and Landings

## Participation (2022):

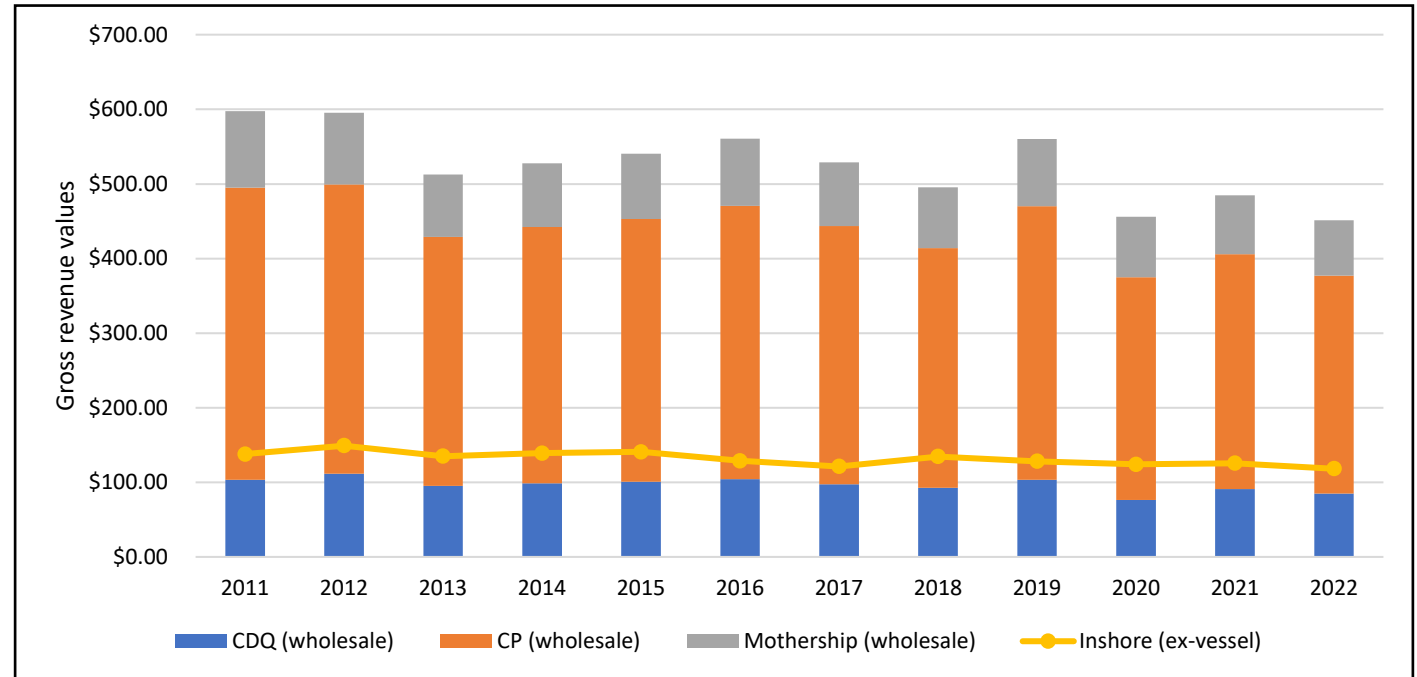
- 13 CPs, 71 inshore CVs and 13 mothership CVs (Table 2-3)
- Generally stable participation, slight decline in shoreside CVs in timeseries (Table 2-3)

## Landings (2022):

- 1.06 mil mt (Table 2-5)
- 587,000 mt in the B season (Table 2-6)
- 98% of the TAC (Table 2-3)
- Typical to harvest 98-99% of TAC (exceptions 2011, 2020)

## B Season Revenue (2022):

- \$264 million gross ex-vessel, across sectors
- \$798 million gross first wholesale, across sectors
- Trends shown in the figure



# Pollock Products and Markets

## Pollock Products and Markets

Draws from Alaska Groundfish Market Profiles published in the 2022 BSAI Groundfish Economic SAFE:

- U.S. accounts for 42% of the global pollock market (2020)
- Russia is a competitor and there can be substitute whitefish species
- B season pollock is primarily made into surimi and fillets which are primarily sold to export markets
  - Between 2016-2020: ~88% surimi and ~72% fillets exported
  - There are domestic markets for both and increased commitments from USDA for purchasing pollock products (15 mlb in 2024)

## Alaska Seafood Market Challenges

Draws from a recent Alaska Seafood Marketing Institute letter highlighting 'extraordinary circumstances' facing Alaska fisheries, including:

- Increased operational costs
- High interest rates
- Labor supply shortfalls
- Supply and demand imbalances
- Geopolitical actions that have constrained market opportunities and impacted competition
- Declines in other species (e.g., crab) that can affect the resilience of processing plants



# CDQ Revenue Dependence on Pollock

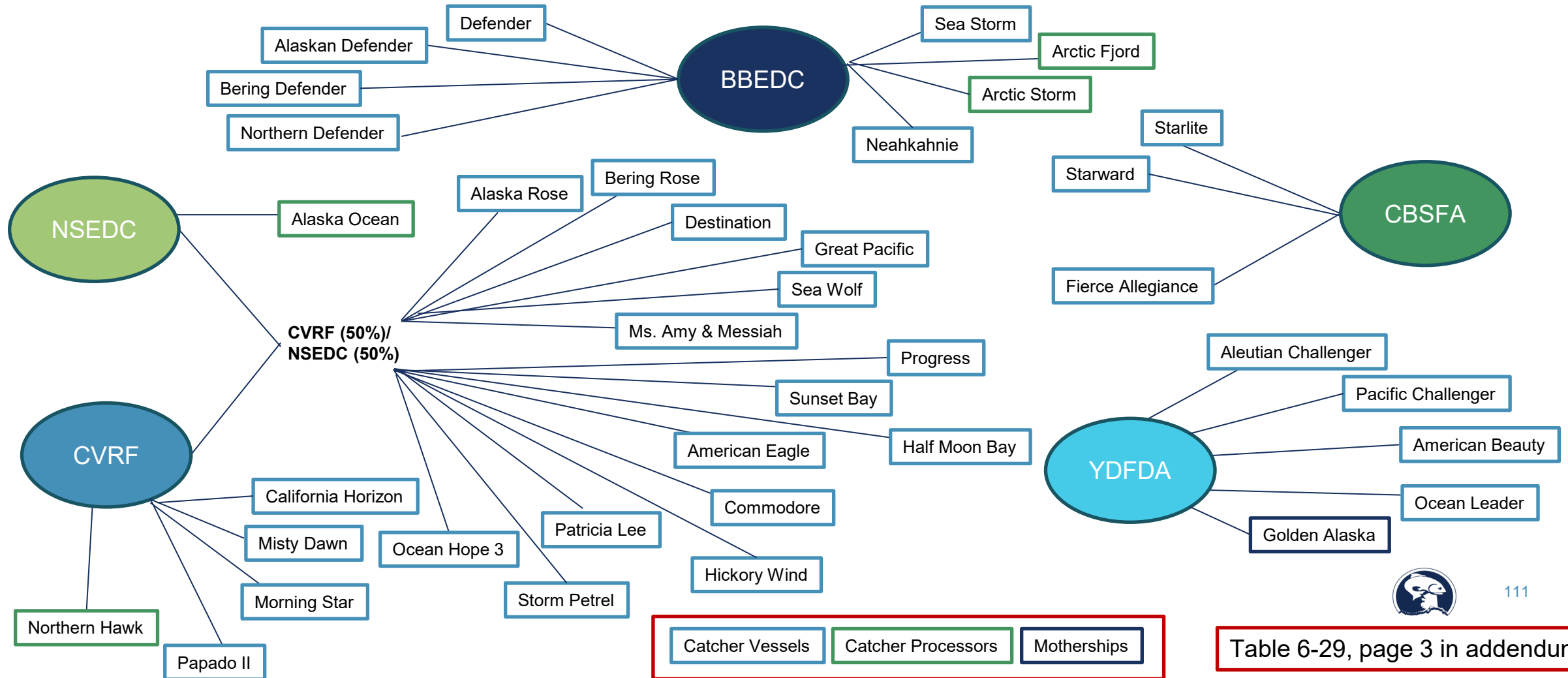
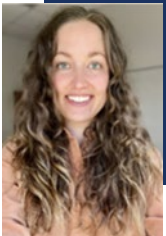


Table 6-29, page 3 in addendum

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# Overview of Community Engagement and Dependence in B Season Pollock Under the Status Quo



# Measures of Community Engagement in or Dependence on Bering Sea Pollock

- Spatial footprint of community engagement in the Bering Sea pollock fishery
  - AFA vessel registered ownership address
  - Location of AFA processor (intent to operate codes)
- Dependence measured by comparing gross revenues earned from B season pollock to revenues earned in all other fisheries
- Estimates of direct fishery-related taxes by locale
- Subset of communities identified as being substantially dependent on the B season fishery based on 1) community of shoreside processing facility operation; 2) CP port call data; 3) measure of minimum consistent engagement (Section 4.1.5)

Seattle, Newport, Kodiak, Akutan, King Cove, Unalaska/Dutch Harbor



# Patterns of Community Engagement in the Harvesting and At-Sea Processing Sectors

## **Ownership of vessels engaged in the harvesting and at-sea processing of B season pollock was concentrated in Seattle City or Seattle MSA (2011-2022)**

- 92.77% of CPs harvesting AFA and CDQ pollock during the B season pollock (see Table 4-1)
- 47.62% of mothership/floating processors (see Table 4-5)
- 80.20% of inshore CVs (see Table 4-10)
- 92.45% of mothership CVs (see Table 4-11)

## **Consistent level of engagement from CVs registered in Kodiak and Newport (2011-2022)**

- 6 CVs with a registered ownership address in Kodiak (Table 4-10 and 4-11)
- 10 CVs with a registered ownership address in Newport (Table 4-10)



# Patterns of Dependence on the B Season Fishery

- **Seattle City/Anchorage CPs:** On average, the B Season pollock fishery contributed 55.27% (\$439.22 million) of CPs' total gross first wholesale revenues (Table 4-3 and 4-4)
- **Seattle City/Dutch Harbor floating processor/motherships:** On average, the B season pollock fishery contributed 58.49% (\$107.96 million) of floating processor/motherships' total gross first wholesale revenues (Table 4-7)
- **Seattle MSA CVs (inshore and mothership combined):** On average, B season pollock fishery contributed 51.45% (\$137.60 million) of total gross ex-vessel revenues (Table 4-13)
- **Kodiak CVs (inshore and mothership combined):** On average, B season pollock fishery contributed 26.45% (\$3.57 million) of these vessels' gross ex-vessel revenues (Table 4-13)
- **Newport inshore CVs:** On average, B season pollock fishery contributed 25.79% (\$5.85 million) of these vessel's gross ex-vessel revenues (Table 4-13)



# Patterns of Community Engagement and Dependence in the Shoreside Processing Component

- Under the status quo, B season pollock deliveries have been made to shoreside processing facilities in Akutan, King Cove, and Unalaska/Dutch Harbor
- The majority of facilities are concentrated in Unalaska/Dutch Harbor
- **Shoreside processing facilities in Akutan/King Cove/Unalaska:** On average, B season pollock fishery contributed 43.73% (\$358.3 million) of these entities total gross first wholesale revenues (Table 4-17)
- Section 4.1.4.1 provides information on the annual processing round for these facilities





# Estimates of Direct Fishery-Related Tax Revenues

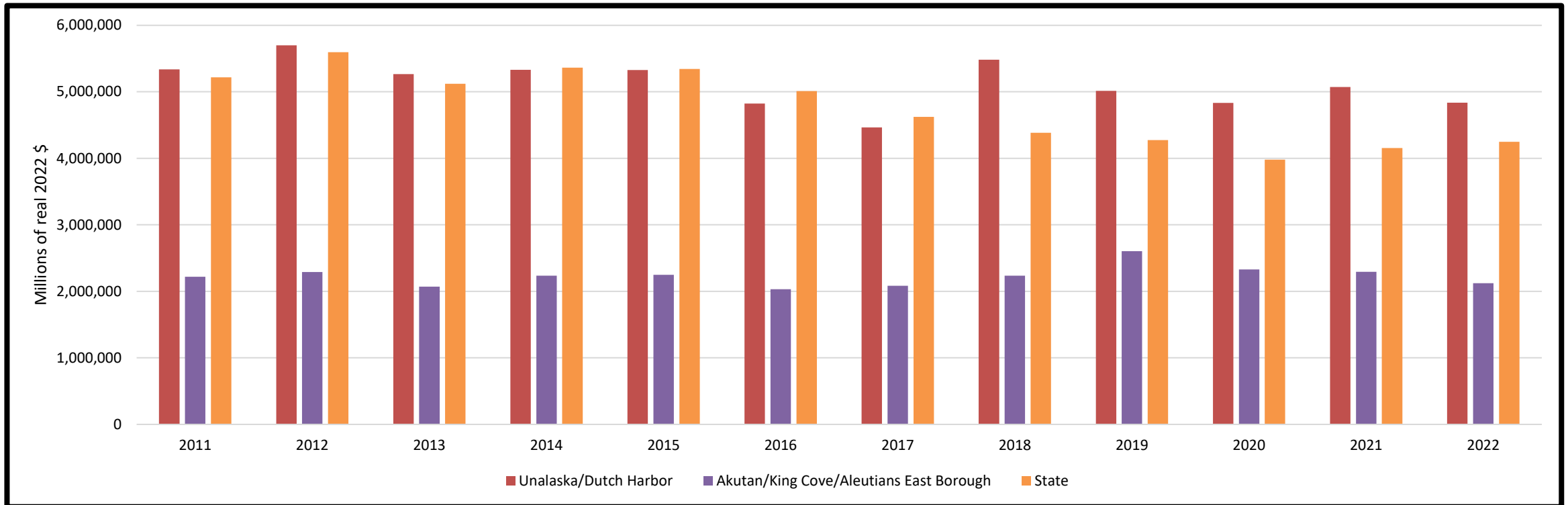
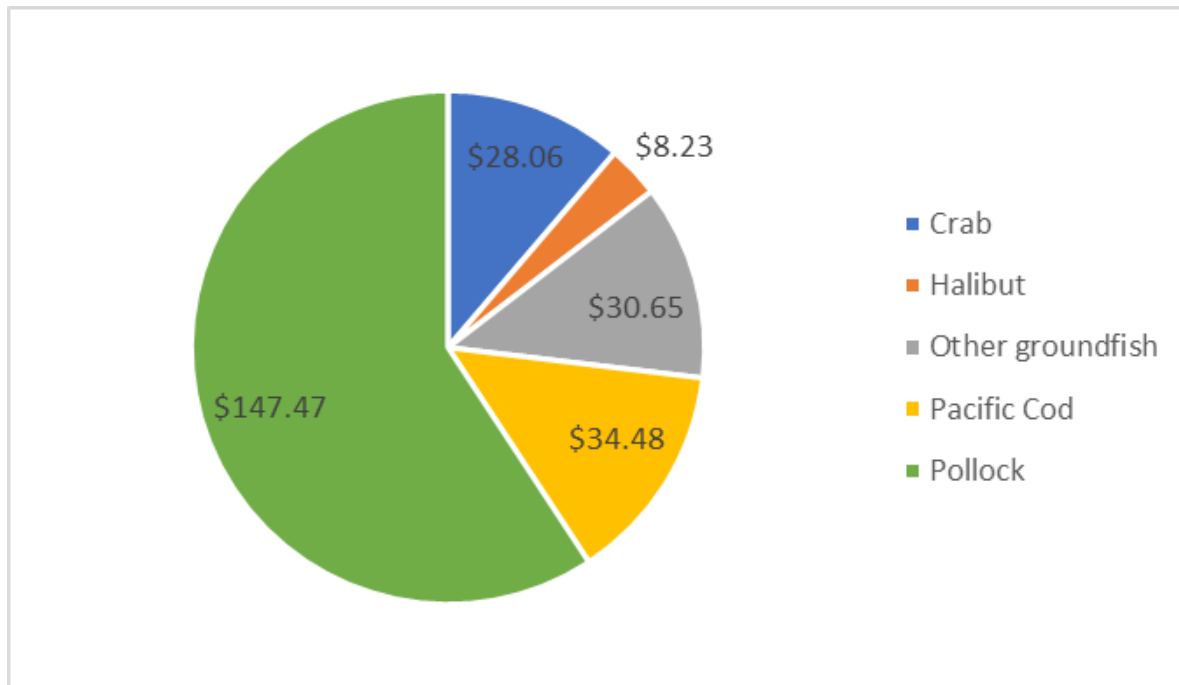


Figure 4-15 SIA Total estimated State and local tax revenues (FBT, FRLT, and City Raw Seafood) generated from the B season pollock fishery by locale, 2011 through 2022 (millions of 2022 real \$)



# Revenue from CDQ Allocations



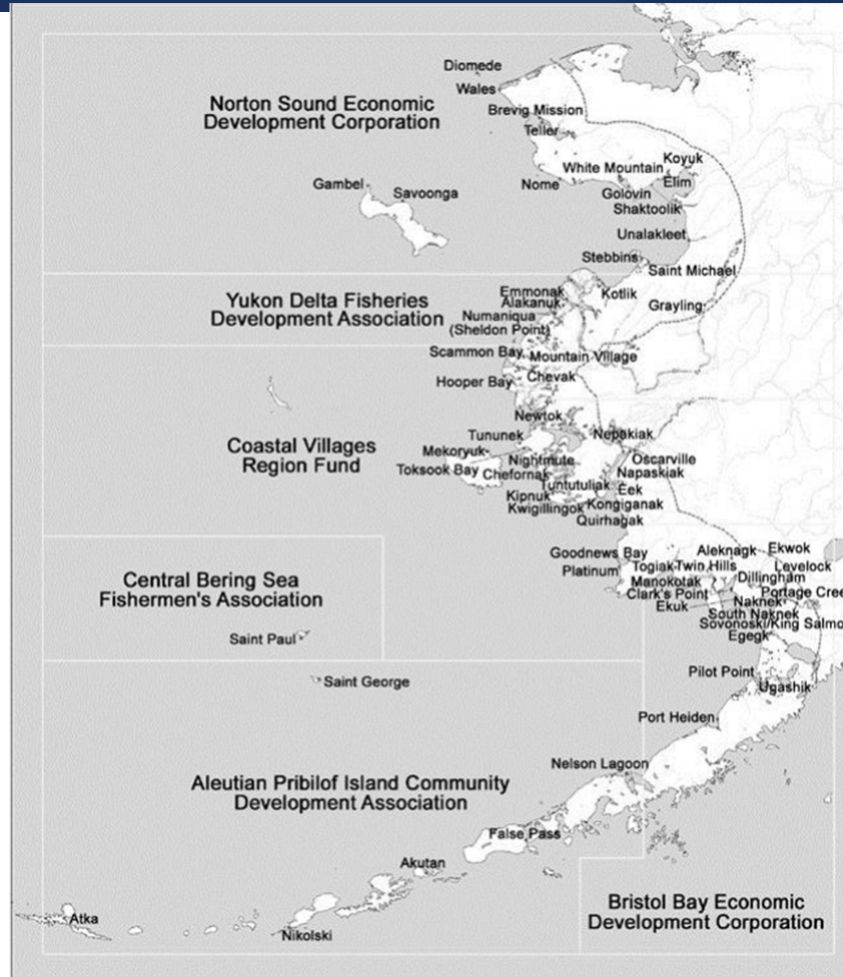
- Between 2011-2022 pollock wholesale value accounted for 59% of the CDQ allocation wholesale value
- However, with crab fishery closures and diminished crab catch limits, pollock has grown to make up a greater proportion
  - In 2022, pollock CDQ accounted for 67% of the CDQ allocation wholesale value



**Figure 6-33** Annual average gross first wholesale revenues (millions of \$) associated with CDQ allocations by species, 2011 through 2022



# CDQ Communities



- 65 CDQ communities indirectly engaged in the Bering Sea pollock fishery through their CDQ groups
- CDQ groups and communities are diverse – vary in the regional economies and programs
- Total population of CDQ communities was 29,959 (U.S. Census) (see Table 4-28 SIA)
- Provide socioeconomic and demographic indicators for all CDQ communities



Figure 4-16 SIA CDQ program, eligible communities and CDQ groups



# Summary of Social and Economic Benefits Provided by CDQ Groups

- Employment opportunities for residents
  - Example: BBEDC's Seasonal Employment Opportunities Program and NSEDC's Norton Sound Seafood Products
- Financial support for local participation in small boat fisheries
  - Example: CBSFA's support for the local halibut fleet
- Community development grants and infrastructure support
  - Example: APICDA's Community Development Grant
- Support for subsidizing fuel, gear, and other equipment
  - Example: CVRF's People Propel



# Summary of Impacts

- The effect of the status quo regulations for chum salmon bycatch on community engagement and participation in the B season pollock fishery is uncertain
  - Communities identified as being substantially engaged in or economically dependent on the B season fishery include Seattle, Kodiak, Newport, Akutan, King Cove, and Dutch Harbor/Unalaska
  - 65 CDQ communities
- Under Alternative 1, patterns of community engagement and dependence on the B season pollock fishery could change





# ALTERNATIVES 2 AND 3 (CHAPTER 6)



# Chum salmon

# Closure dates by sector and apportionment suboption under a chum salmon PSC limit of 200,000

Year	CDQ				CP				Mothership				Inshore			
	3-year avg.	5-year avg.	Pro-rata	AFA	3-year avg.	5-year avg.	Pro-rata	AFA	3-year avg.	5-year avg.	Pro-rata	AFA	3-year avg.	5-year avg.	Pro-rata	AFA
2011					10/29				9/17	9/17	9/17	9/17		10/15	10/15	8/27
2012																
2013																9/14
2014					9/6	9/6	9/6						9/6	8/30	8/30	8/9
2015													8/29	8/22	8/22	8/15
2016	8/6	8/13	8/13		8/6	8/6	8/6	8/13	8/13	8/13	8/13	8/13	9/10	9/10	9/10	8/13
2017	7/8	7/15	7/15	7/15	7/22	7/22	7/22	7/22					8/5	7/29	7/29	7/22
2018	6/30	7/7	7/7	7/7	7/7	7/7	7/7	7/21	9/1	9/8	9/1	9/1	9/1	9/1	9/1	7/28
2019	9/21	9/28	9/28		8/31	8/31	8/31	8/31	8/31	8/31	8/31	8/31	9/7	8/17	8/17	7/27
2020					9/5	9/12	9/12	10/3	10/31	10/31	10/31	10/24	9/5	9/5	9/5	8/29
2021	7/17	7/17	7/17	7/17	7/31	7/31	7/31	8/14	7/31	7/31	7/31	7/31	7/31	7/24	7/31	7/24
2022					8/20	8/27	8/27		8/13	8/13	8/13	8/13	8/20	8/13	8/13	8/13



Table 6-31, DEIS



# Suboption 2: Chum salmon PSC limit index to WAK chum salmon abundance

Year	Yukon River Summer Chum	Yukon River Fall Chum	Yukon River Summer + Fall	Bethel Test Fishery CPUE	Norton Sound Summed
2011	2,406,000	1,244,141	3,650,141	10,028	202,421
2012	2,479,900	1,089,200	3,569,100	6,894	107,359
2013	3,349,600	1,215,809	4,565,409	5,739	188,104
2014	2,467,600	956,669	3,424,269	6,345	215,382
2015	1,978,400	828,453	2,806,853	2,945	259,441
2016	2,581,500	1,390,329	3,971,829	3,998	124,397
2017	3,635,100	2,315,883	5,950,983	6,785	324,148
2018	2,074,700	1,114,684	3,189,384	8,205	363,939
2019	1,689,400	802,964	2,492,364	6,429	234,270
2020	763,200	184,233	947,433	1,443	49,762
2021	156,130	95,249	251,379	327	21,735
2022	478,690	242,465	721,155	2,191	70,702



# Suboption 2a: Three Area index whereby independent thresholds by river reached

<b>Year</b>	<b>Yukon River Summer Chum</b>	<b>Yukon River Fall Chum</b>	<b>Yukon River Summer + Fall</b>	<b>Bethel Test Fishery CPUE</b>	<b>Norton Sound Summed</b>
<b>2011</b>	2,406,000	1,244,141	3,650,141	10,028	202,421
<b>2012</b>	2,479,900	1,089,200	3,569,100	6,894	107,359
<b>2013</b>	3,349,600	1,215,809	4,565,409	5,739	188,104
<b>2014</b>	2,467,600	956,669	3,424,269	6,345	215,382
<b>2015</b>	1,978,400	828,453	2,806,853	2,945	259,441
<b>2016</b>	2,581,500	1,390,329	3,971,829	3,998	124,397
<b>2017</b>	3,635,100	2,315,883	5,950,983	6,785	324,148
<b>2018</b>	2,074,700	1,114,684	3,189,384	8,205	363,939
<b>2019</b>	1,689,400	802,964	2,492,364	6,429	234,270
<b>2020</b>	763,200	184,233	947,433	1,443	49,762
<b>2021</b>	156,130	95,249	251,379	327	21,735
<b>2022</b>	478,690	242,465	721,155	2,191	70,702



## Suboption 2b: Yukon Summer Chum

<b>Year</b>	<b>Yukon River Summer Chum</b>	<b>Yukon River Fall Chum</b>	<b>Yukon River Summer + Fall</b>	<b>Bethel Test Fishery CPUE</b>	<b>Norton Sound Summed</b>
<b>2011</b>	2,406,000	1,244,141	3,650,141	10,028	202,421
<b>2012</b>	2,479,900	1,089,200	3,569,100	6,894	107,359
<b>2013</b>	3,349,600	1,215,809	4,565,409	5,739	188,104
<b>2014</b>	2,467,600	956,669	3,424,269	6,345	215,382
<b>2015</b>	1,978,400	828,453	2,806,853	2,945	259,441
<b>2016</b>	2,581,500	1,390,329	3,971,829	3,998	124,397
<b>2017</b>	3,635,100	2,315,883	5,950,983	6,785	324,148
<b>2018</b>	2,074,700	1,114,684	3,189,384	8,205	363,939
<b>2019</b>	1,689,400	802,964	2,492,364	6,429	234,270
<b>2020</b>	763,200	184,233	947,433	1,443	49,762
<b>2021</b>	156,130	95,249	251,379	327	21,735
<b>2022</b>	478,690	242,465	721,155	2,191	70,702



## Suboption 2c: Yukon Summer and Fall chum

<b>Year</b>	<b>Yukon River Summer Chum</b>	<b>Yukon River Fall Chum</b>	<b>Yukon River Summer + Fall</b>	<b>Bethel Test Fishery CPUE</b>	<b>Norton Sound Summed</b>
<b>2011</b>	2,406,000	1,244,141	3,650,141	10,028	202,421
<b>2012</b>	2,479,900	1,089,200	3,569,100	6,894	107,359
<b>2013</b>	3,349,600	1,215,809	4,565,409	5,739	188,104
<b>2014</b>	2,467,600	956,669	3,424,269	6,345	215,382
<b>2015</b>	1,978,400	828,453	2,806,853	2,945	259,441
<b>2016</b>	2,581,500	1,390,329	3,971,829	3,998	124,397
<b>2017</b>	3,635,100	2,315,883	5,950,983	6,785	324,148
<b>2018</b>	2,074,700	1,114,684	3,189,384	8,205	363,939
<b>2019</b>	1,689,400	802,964	2,492,364	6,429	234,270
<b>2020</b>	763,200	184,233	947,433	1,443	49,762
<b>2021</b>	156,130	95,249	251,379	327	21,735
<b>2022</b>	478,690	242,465	721,155	2,191	70,702



# Summary of years in which index thresholds reached

Management area		Index threshold	Suboption 1 3 Area index	Suboption 2a Yukon Summer	Suboption 2b Yukon Summer and Fall
Yukon	Summer	950,000	no PSC limit: 2011-2019  If 2/3 areas above threshold, PSC limit in following year = X 2022	no PSC limit 2011-2019  If Summer run above threshold PSC limit = X 2020-2022	no PSC limit 2011-2019  If 1 or no areas above threshold, PSC limit in following year = X 2020-2022
	Fall	575,000			
Kuskokwim		2,800	If 1 or no areas above thresholds PSC limit in following year = X 2020-2021		
Norton Sound		57,000			



# Alternative 3 WAK thresholds

Suboption 1 (3-year average)	6.10% 2,440 - 3,233	21.90% 8,760 - 11,607	9.10% 3,640 - 4,823	62.90% 25,160 - 33,337
Year	CDQ	CP	Mothership	Inshore
<b>2011</b>	NA	8,917	4,430	32,444
<b>2012</b>	NA	NA	NA	3,932
<b>2013</b>	NA	2,468	801	28,219
<b>2014</b>	NA	8,715	NA	31,650
<b>2015</b>	NA	5,133	1,928	36,262
<b>2016</b>	3,031	21,946	13,758	38,236
<b>2017</b>	22,674	33,435	4,673	35,288
<b>2018</b>	6,272	17,644	4,503	30,391
<b>2019</b>	2,898	5,090	7,637	40,237
<b>2020</b>	NA	1,926	1,148	25,620
<b>2021</b>	6,092	7,736	3,447	33,522
<b>2022</b>	902	8,037	7,891	37,278



# Pollock forgone, overall chum salmon avoided and % reduction (annual and B season) of each cumulatively (2011-2022) with sector allocations: cap 200,000

If a 200,000 chum PSC limit had been in place 2011-2022:		Sum of Forgone B Season Pollock (mt)	Reduction as % of B Season Total	Reduction as % of Annual Total	Sum of B Season Chum Avoided (#)	Reduction as % of B Season Total	Reduction as % of Annual Total
3-year avg. sector apportionment	<b>Total</b>	<b>1,783,255</b>	<b>20.4%</b>	<b>11.8%</b>	<b>852,347</b>	<b>25.3%</b>	<b>25.2%</b>
	CDQ	189,218	21.4%	12.1%	99,035	43.5%	43.2%
	CP	808,749	25.9%	14.9%	347,317	36.1%	35.9%
	Mothership	117,955	14.9%	8.6%	65,310	23.3%	23.2%
	Inshore	667,332	16.9%	9.9%	340,685	17.9%	17.9%
5-year avg. sector apportionment	<b>Total</b>	<b>1,907,248</b>	<b>21.8%</b>	<b>12.6%</b>	<b>994,447</b>	<b>29.5%</b>	<b>29.4%</b>
	CDQ	164,173	18.5%	10.5%	63,497	27.9%	27.7%
	CP	785,612	25.1%	14.5%	325,469	33.9%	33.7%
	Mothership	114,457	14.5%	8.4%	62,513	22.3%	22.2%
	Inshore	843,005	21.3%	12.4%	542,968	28.6%	28.5%
Pro-rata sector apportionment	<b>Total</b>	<b>1,889,098</b>	<b>21.6%</b>	<b>12.5%</b>	<b>866,573</b>	<b>25.7%</b>	<b>25.6%</b>
	CDQ	164,173	18.5%	10.5%	63,497	27.9%	27.7%
	CP	785,612	25.1%	14.5%	325,469	33.9%	33.7%
	Mothership	117,955	14.9%	8.6%	65,310	23.3%	23.2%
	Inshore	821,358	20.8%	12.1%	412,297	21.7%	21.7%
AFA sector apportionment	<b>Total</b>	<b>2,235,419</b>	<b>25.5%</b>	<b>14.8%</b>	<b>1,092,360</b>	<b>32.4%</b>	<b>32.3%</b>
	CDQ	147,739	16.7%	9.5%	61,612	27.0%	26.9%
	CP	621,440	19.9%	11.4%	235,752	24.5%	24.4%
	Mothership	120,149	15.2%	8.8%	66,894	23.9%	23.8%
	Inshore	1,346,090	34.1%	19.9%	728,102	38.3%	38.2%



**Estimated total WAK chum saved by sectors and years under a 200,000 chum salmon PSC limit and suboption 1 (3-year average) apportionment scheme as well as cumulative total across all years (2011-2022) as shown in Table 6-46**

<b>Year</b>	<b>CDQ</b>	<b>CP</b>	<b>Mothership</b>	<b>Inshore</b>	<b>Total</b>
<b>2011</b>	0	3	940	0	<b>943</b>
<b>2012</b>	0	0	0	0	<b>0</b>
<b>2013</b>	0	0	0	0	<b>0</b>
<b>2014</b>	0	1,026	0	3,871	<b>4,897</b>
<b>2015</b>	0	0	0	9,289	<b>9,289</b>
<b>2016</b>	601	12,216	6,016	796	<b>19,628</b>
<b>2017</b>	19,012	17,830	0	6,076	<b>42,918</b>
<b>2018</b>	3,066	7,198	612	3,326	<b>14,203</b>
<b>2019</b>	635	844	3,469	9,412	<b>14,361</b>
<b>2020</b>	0	805	0	10,518	<b>11,323</b>
<b>2021</b>	696	2,956	661	17,535	<b>21,848</b>
<b>2022</b>	0	2,830	2,017	636	<b>5,484</b>
<b>Total</b>	<b>24,009</b>	<b>45,708</b>	<b>13,716</b>	<b>61,460</b>	<b>144,893</b>





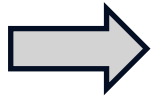
## Summary of impacts to chum salmon under Alternatives 2-3

- Reduction in the number of chum salmon caught as bycatch in the Bering Sea pollock fishery may have a positive and indirect impact on the overall health of the resource as more adult chum salmon may return to their natal streams.
- The proposed action is focused on reducing WAK chum salmon bycatch in particular, and increased adult chum salmon returns could increase abundance, which may improve run strength over time.
- **Analysts are unable to quantify the relative magnitude of these potential indirect and positive benefits for at least three primary reasons.**
- **unable to determine the absolute impact of chum salmon bycatch occurring in the Bering Sea pollock fishery on chum salmon returns or the overall run size**
- **unable to break out the WAK genetic stock reporting group (Coastal Western Alaska + Upper/Middle Yukon reporting groups) into smaller river systems or areas because of the current understanding of genetic structure among Western Alaska chum salmon**
- **uncertainty in the level of bycatch reduction that would need to be achieved to result in escapement goals being met or improvements in chum salmon harvest opportunities.**



# WAK chum salmon PSC impacts under Alternative 2 200,000 chum salmon PSC limit and suboption 1 (3-year average) apportionment scheme compared with commercial and subsistence catches

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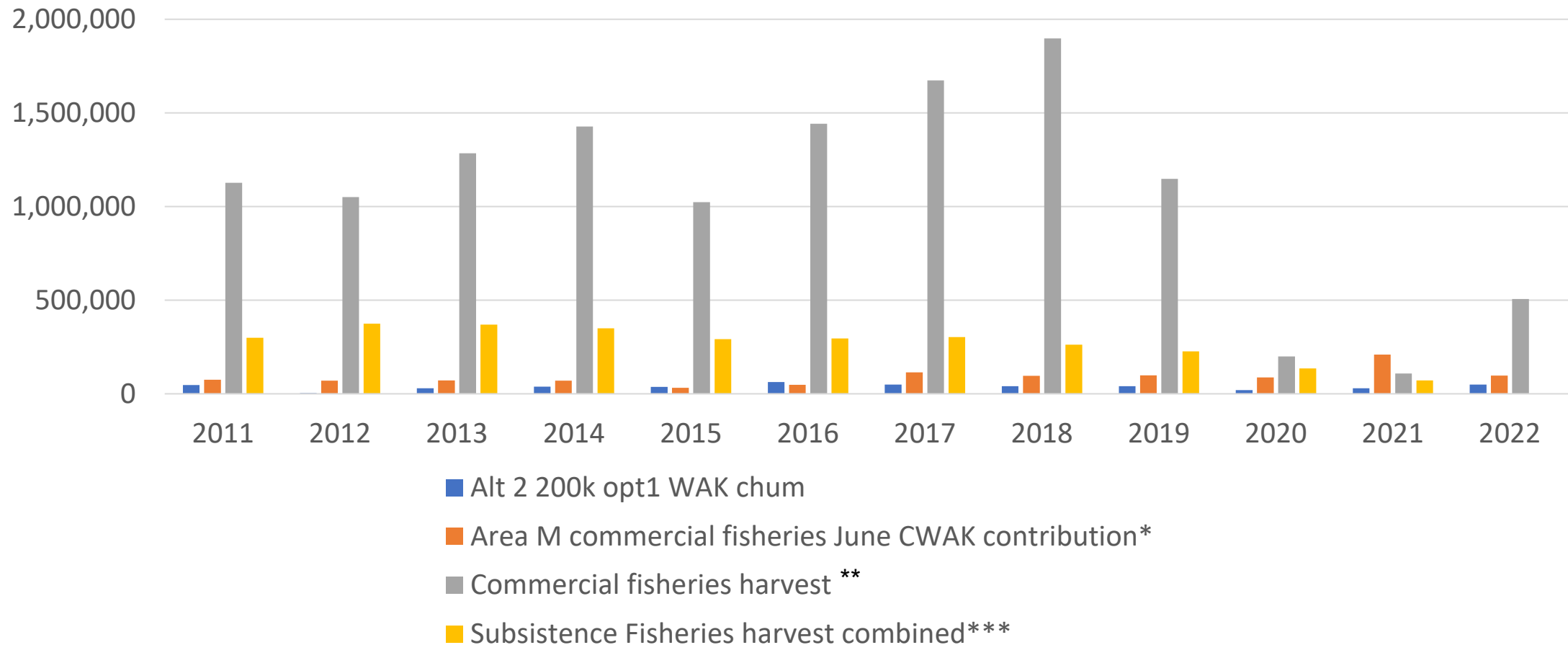


Year	Alt 2 200k opt1 Total WAK chum	Area M commercial fisheries June CWAK contribution*	Commercial fisheries harvest combined**	Subsistence Fisheries harvest combined***
2011	47,077	76,200	1,127,036	300,236
2012	4,701	71,111	1,050,826	375,033
2013	30,415	71,830	1,284,375	370,174
2014	38,355	70,225	1,427,221	350,473
2015	37,095	32,169	1,024,274	292,236
2016	63,825	48,711	1,442,798	295,818
2017	50,252	115,360	1,673,404	302,987
2018	41,202	96,744	1,897,667	262,721
2019	41,822	98,833	1,148,516	227,419
2020	19,899	88,223	199,723	135,459
2021	29,664	210,348	108,747	71,592
2022	50,240	97,937	506,873	NA

- Area M CWAK contribution uses Dann et al 18% estimate applied across June harvest for all years
- \*\* Sum of commercial catch across Bristol Bay, Kotzebue, Yukon summer and fall, Kuskokwim, Norton Sound Port Clarence
- \*\*\* Sum of subsistence catch across Bristol Bay, Kotzebue, Yukon summer and fall, Kuskokwim, Norton Sound Port Clarence

# WAK chum salmon PSC impacts under Alternative 2 200,000 chum salmon PSC limit and suboption 1 (3-year average) apportionment scheme compared with commercial and subsistence catches

Comparison of overall catch removals WAK chum



# Potential Impacts to Communities and Regions Engaged in and Dependent on Subsistence Harvests of Chum Salmon Under the Proposed Action Alternatives

- The magnitude of the potential positive and indirect effects for communities engaged in and dependent on subsistence harvests of chum salmon resulting from the proposed action alternatives are uncertain
- To the extent that any of the action alternatives result in savings of WAK chum to a level where inseason managers are able to provide less restricted (or unrestricted) subsistence opportunities, there could potentially be positive and indirect social impacts
  - Mixed economies, sharing networks, and food security
  - Cultural practices, wellbeing, and identity



# Potential Impacts to Communities and Regions Engaged in Commercial Chum Salmon Fishing, Under Action Alternatives

- Commercial salmon fisheries would continue to be managed by the State of Alaska
  - Surplus above escapement needs and subsistence would be made available for other consumptive uses, such as commercial fishing opportunities.
- Although the marginal impacts on WAK salmon returns not able to be quantified for the similar reasons, **to the extent that any of the action alternatives result in savings of WAK chum to the river system of origin, this could have a positive indirect effect on commercial fishing opportunities in these management areas.**
- For the reason discussed previously, even a few hundred fish made available to commercial harvesters could provide a family or multiple families with income needed to support subsistence or other cost of living expenditures.





# Pollock Under Alternative 2 and 3

# Impacts to pollock under Alternatives 2-4

Impacts to pollock stock and food web of lower pollock catches under alternatives 2-4 in the B season

## **Pollock stock**

- More adults
- Average size at age may decrease
- prey limitation and density-dependance

## **Pollock prey**

- Possibly fewer prey items
- Greater impact on competitors

## **Predators of pollock**

- Possibly more pollock as prey for seabirds, larger fish, marine mammals and fur seals
- More cannibalism, could lead to lower recruitment



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# Analysis of Potentially Forgone Revenue for Bering Sea Pollock Sectors





# Analysis of Potentially Forgone Revenue for the Bering Sea Pollock Sectors

- This section primarily **focuses on costs** (or reduced benefits) of a chum PSC limit (i.e., applies to both Alternative 2 and 3) on the pollock sectors.
- Relies on the retrospective tables for a frame of reference for possible reductions in **gross ex-vessel revenue** and **gross first wholesale revenue** from unharvested pollock.
- However, **these tables are one piece of the analysis**. Given an expectation that *fishing patterns would be altered under a constraining chum PSC limit*, the analysis includes additional context for expected impacts.
- Lack of empirical data means much of this analysis is qualitative and characterized as expected directional impacts, highlighting important external factors and the potential distributional impact of the costs.

The importance of external factors in the magnitude of impacts.



# Approach to Forgone Revenue Analysis



- Operational impacts
- Avoidance costs
- Potential forgone revenue based on retrospective tables
- Broader implications of a B season pollock closure
- Specific considerations under Alternative 3



# Fleet Operational Effects

## Differences from the Chinook PSC limit:

- Encounter patterns differ as do associated risk of a sudden increase in PSC
- “Very constraining” limit could elicit a different operational response (e.g., less participation, more test tows, stand-downs?)
- Transferability of PSC may be more important – “very constraining” limit could result in pockets of stranded pollock within coops
- This chum limit would be in addition to the Chinook PSC limit (i.e., PSC tradeoffs discussion)

## Similarities to the Chinook PSC limit:

- Could be apportioned to the vessel level by the coops to avoid race for fish
- Could build in buffers to reduce likelihood of pollock forgone
- Still unlikely that chum PSC would be transferred frequently or efficiently

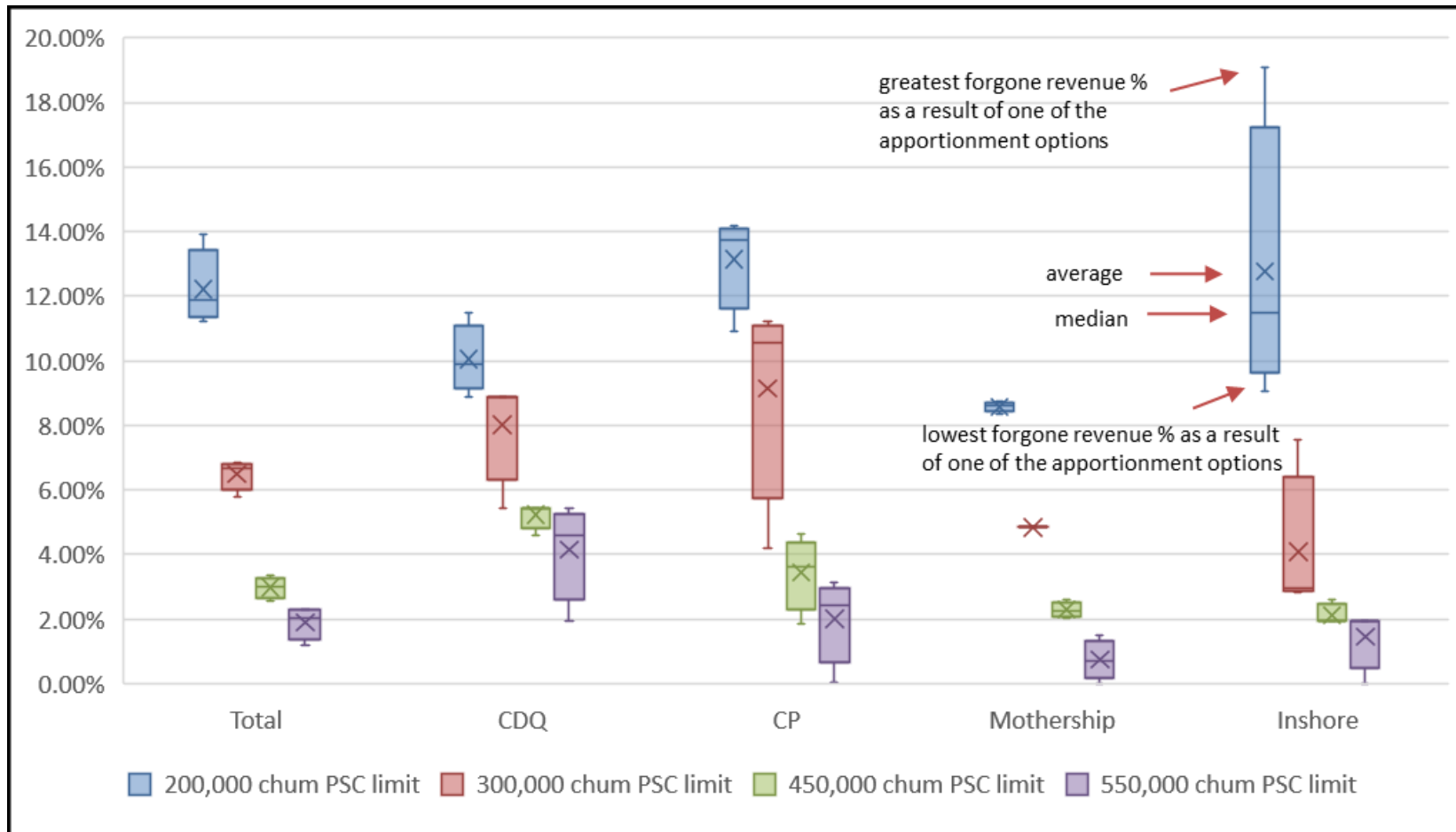


# Increased Avoidance Costs

Increased travel costs	Increase in fuel usage and opportunity cost given transit time to move away from chum
Increased costs (and decreased value) with lower operational efficiency in harvesting, which may require longer trips/seasons	<p>Potential to move to areas with potentially lower pollock CPUE or lower quality products</p> <p>If lower CPUE and time spent moving means longer trips/seasons – increased costs associated with crew provisions, observer costs, increased Chinook concerns later in the season. Lower compensation for the crew that make share-based wages, unless payment structure specifically designed to insulate</p>
Increased costs and risks associated with exploring new fishing areas	<p>Increased use of test tows to identify high pollock CPUE and low chum salmon encounters which could result in greater costs in the gear damage.</p> <p>Greater risk for encountering other PSC species</p>
Potential gear conflicts or safety at sea concerns	Decreased flexibility in time or space for pollock fishing that could possibly contribute to gear conflicts or safety concerns.



# Potentially Forgone Revenue



Hypothetical reduction in gross wholesale revenue as a % of annual total pollock wholesale revenue 2011-2022, under four chum salmon apportionments



# Implications of a B Season Closure

- A closure would present a clearer picture of impacts compared to avoidance, which can be more imbedded in operational changes
- Adverse impacts of a closure may be more widespread, whereas avoidance cost may be more centralized and incurred by certain entities
- **The degree of impacts of a B season closure would greatly depend on the point in the B season when the closure occurred and how much pollock was left unharvested**
  - Pollock could also be 'stranded' at the cooperative level due to an expectation of inefficient transfer of PSC
- Not all AFA vessels and companies are equally reliant on B season pollock, thus impacts may be more pronounced for some companies than others
  - Most vessels are primarily reliant on pollock, but some diversified into BS Pacific cod, yellowfin sole, west coast fisheries (e.g., hake)
  - Could be some spillover impacts if vessel shift away from B season pollock; however, sideboards can limit opportunities





# Implications of a B Season Closure – CDQ Groups and Crew

- **CDQ groups** could be adversely affected by a pollock B season closure.
  - These groups rely on revenue generated from both their CDQ pollock allocation as well as additional investments in AFA vessels.
  - Like other AFA companies, CDQ groups will still have obligations for certain costs (e.g., debt service on vessels), thus decreased pollock revenue could affect their ability to support their community program in the way they have under status quo
- A closure would adversely impact AFA **crew** through reduced employment and income. If closures become common in the B season the variability and uncertainty of employment may lead to challenges with crew retention.



- **These impact categories are further discussed in relation to associated communities**



# Implications of a B Season Closure – Processors and Markets

- Primarily **export markets**, thus depending on the extent of closures, minimal impact to U.S. consumers expected
- **However**, if repeated B season closures occur, and result in more widespread impacts to the viability of **processing entities**, this could have cascading effects for the multiple species they process and the associated U.S. consumers of those species.
  - Some processing plants in the region are affiliated through joint ownership, and so the sustainability of one plant could have implications for other plants
  - Other processing entities (i.e., crab processing share holders) rely on the infrastructure of these plants as well for custom processing
- **B season closures could exacerbate the current market challenges on processors**
- Analysts do not have access to processor cost data, so cannot empirically predict what level of unharvested pollock may be unsustainable. However, operational costs are extremely high in the AI (and increasing) and this region has experienced processor consolidation.





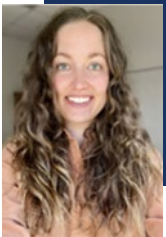
## Points of Consideration Under Alternative 3

- AFA sectors will not know what their WAK chum catch is in season, therefore may be more of a reliance on historical WAK chum encounter data
- If this results in more conservative fishing behavior or more targeted avoidance, there may be increase avoidance costs associated with the marginal difference between Alternative 2 and the addition of Alternative 3.



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# Potential Impacts to Communities Engaged in or Dependent on Harvests and Deliveries of B Season Pollock Under the Proposed Action Alternatives



# Conceptual Framework

- Community engagement
  - Vessel and processor ties
- Relative dependence on the fishery
  - B season revenues, community fleet, and estimates of tax revenues derived from the fishery
- Vulnerability (or degree of exposure)
  - Whether a community is affiliated with a sector harvesting pollock, receiving deliveries of pollock, or both
- Resilience
  - Economic diversity



# Potential Impacts to Seattle MSA

- **High degree of vulnerability** to potentially adverse effects
- Potential for adverse and indirect effects if any sector were to close prior to its B season allocation being harvested
  - Forgone revenues
  - Impacts to skipper and crew income
- Absent a closure, anticipated there would be avoidance costs
  - Potential for indirect and negative effects on trip length, crew morale, as well as overall job satisfaction
- The community of Seattle has a **high degree of resilience**



# Potential Impacts to the Communities of Kodiak and Newport

## Kodiak

- On average, B season pollock fishery contributed 26.45% (\$3.57 million) of total revenues
- Kodiak community fleet is large and diverse – participating in other groundfish, IFQ, crab, and salmon fisheries
- On average, B season pollock contributed 2.83% of the community fleet's total revenues (2011-2022)
- Remote island community whose economic base has long been anchored in commercial fisheries
- Place-based identity centered on fishing

## Newport

- On average, B season pollock fishery contributed 25.79% (\$5.85 million) of total revenues
- Large commercial fleet that prosecutes local West Coast fisheries and Alaska fisheries; regional support services
- On average, B season pollock contributed 20.54% of the community fleet's total revenues (2011-2022)
- Located in lower 48 and on the road system, more typical commercial development and wage-earning opportunities
- Place-based identity centered on fishing



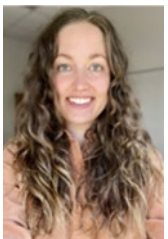
# Potential Impacts to Unalaska/Dutch Harbor

- Unalaska/Dutch Harbor has a relatively **high degree of vulnerability** under the proposed action alternatives
  - Four shoreside processing facilities and a primary location for product transfers
- If a sector were to close prior to the B season TAC being harvested, the community would experience adverse effects inclusive of but not limit to direct fishery-related taxes
  - On average, estimated the B season pollock fishery (FBT, FRLT, and local raw seafood taxes) contributed \$5.12 million in revenues
    - 15.9% of the City's total general fund revenues (on average, 2011-2022) (see Table 5-3)
- Center of support services for the BSAI region
  - Absent a closure, there could experience some positive and indirect economic effects resulting from avoidance behaviors but uncertain whether



# Potential Impacts to Akutan and King Cove

- Akutan, King Cove, and the Aleutians East Borough would be indirectly and adversely affected by a closure prior to a cooperative's B season TAC being harvested
  - Akutan and King Cove are each home to one shoreside processing facility during the analyzed period
- Estimated fishery-related tax revenues derived from the B season pollock fishery for community grouping ranged between \$2.03 million and \$2.60 million



# Other Potential Cross-Cutting Community Effects

- Shoreside processing entities and the communities where they are located could be adversely affected *absent a closure*
  - If harvesters target areas with low salmon bycatch rates but these areas have lower quality product or could only be processed into certain product forms, the shoreside price paid could decrease
  - Inshore processors and communities may experience negative impacts if B season deliveries are slower or lower in volume, such that sufficient quantities of raw fish may not be provided for plants to operate profitably
  - High volume fisheries like pollock can support processor's capacity to engage in other small-scale operations
    - Not a key source of income for the plant but an important income source for local fishermen and plural incomes in rural communities





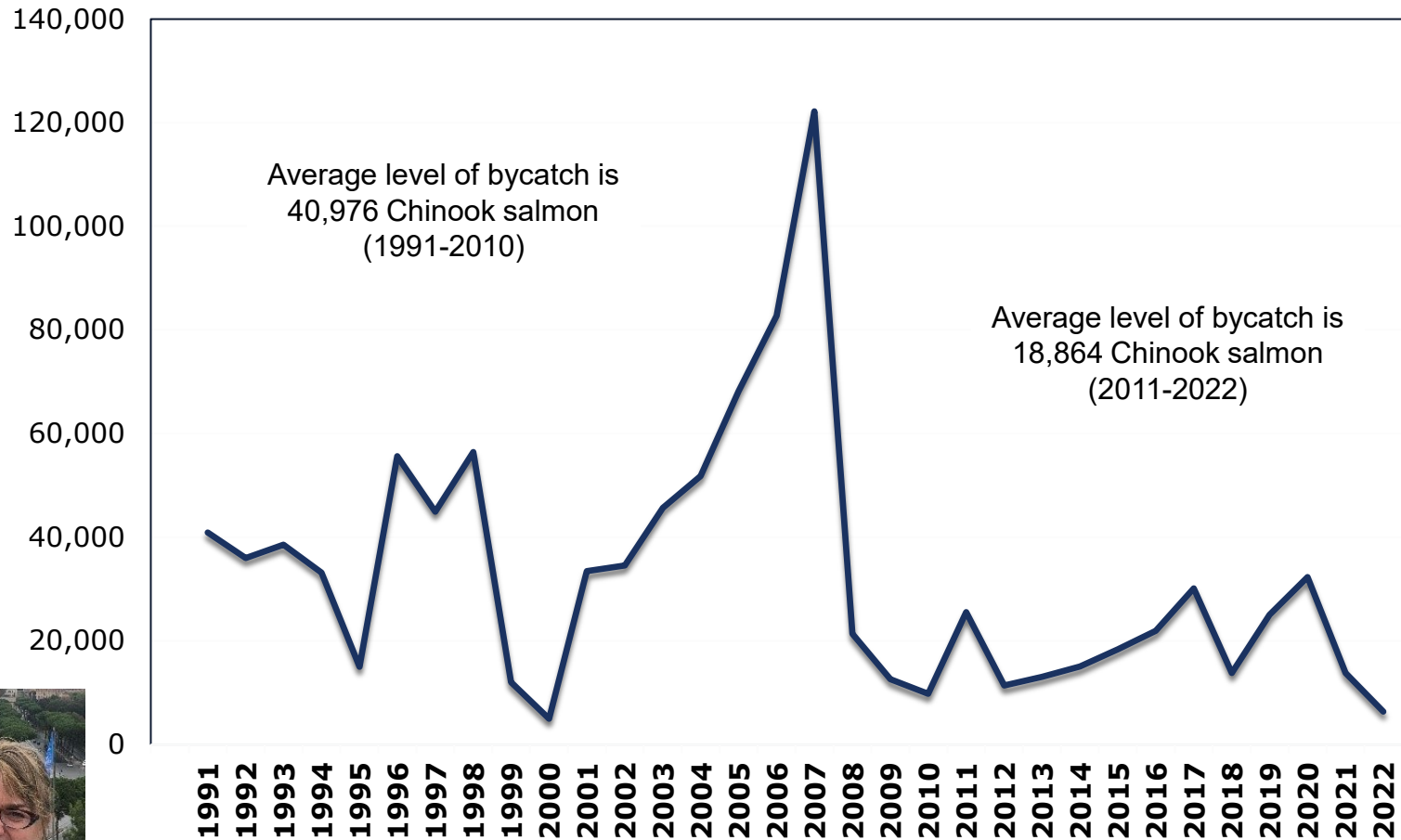
# Potential Impacts to CDQ Communities Under the Proposed Action Alternatives

- The extent to which the proposed action alternatives would affect CDQ communities participating in the Bering Sea pollock fishery through their respective CDQ groups is uncertain
- Each CDQ group would receive an apportionment of the overall PSC limit and many CDQ groups have also made additional investments into the AFA sectors
- To the extent the potential action alternatives could reduce revenue payments or increase avoidance costs to a degree where the CDQ groups would be unable to sustain programs in their communities, CDQ communities could be adversely and negatively impacted
- Adverse impacts could be mitigated by adaptive fishing behaviors on part of CDQ partners but the ability of harvesters to modify their fishing behavior is uncertain





# Chinook Salmon Under the Status Quo



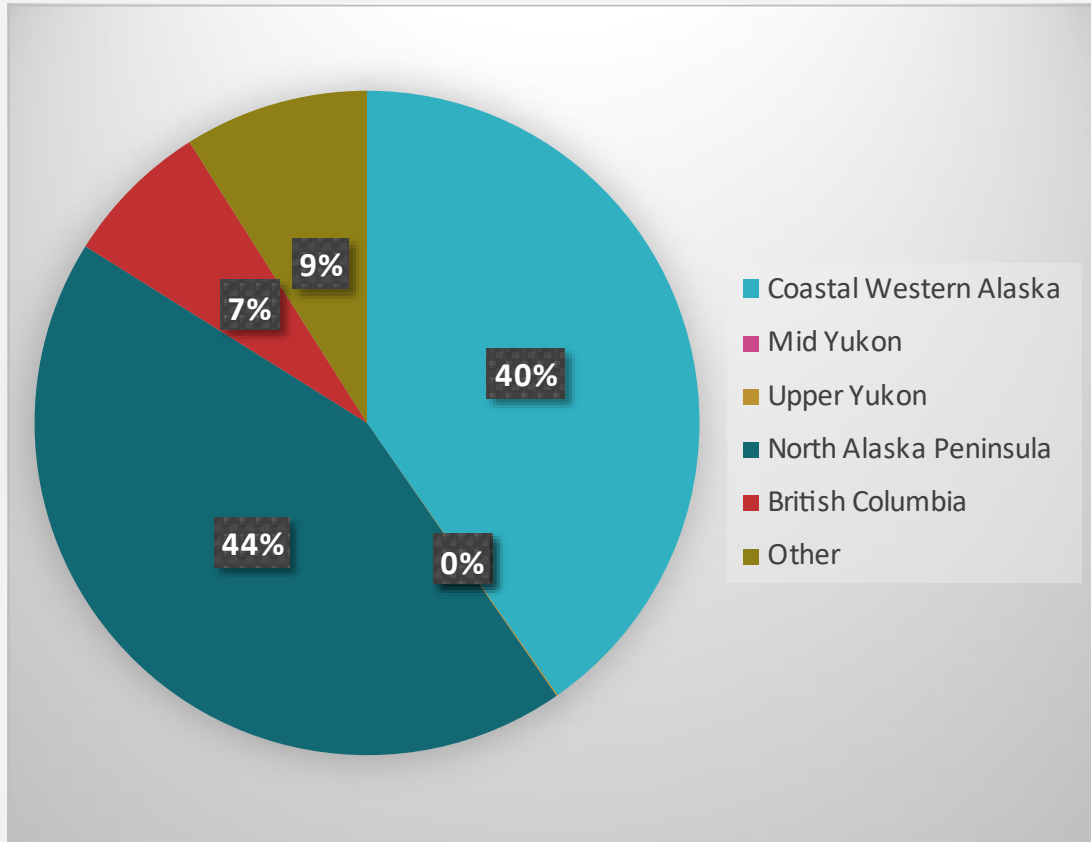
Year	Chinook
2011	25,499
2012	11,351
2013	13,036
2014	15,037
2015	18,329
2016	22,005
2017	30,076
2018	13,731
2019	24,985
2020	32,203
2021	13,784
2022	6,337



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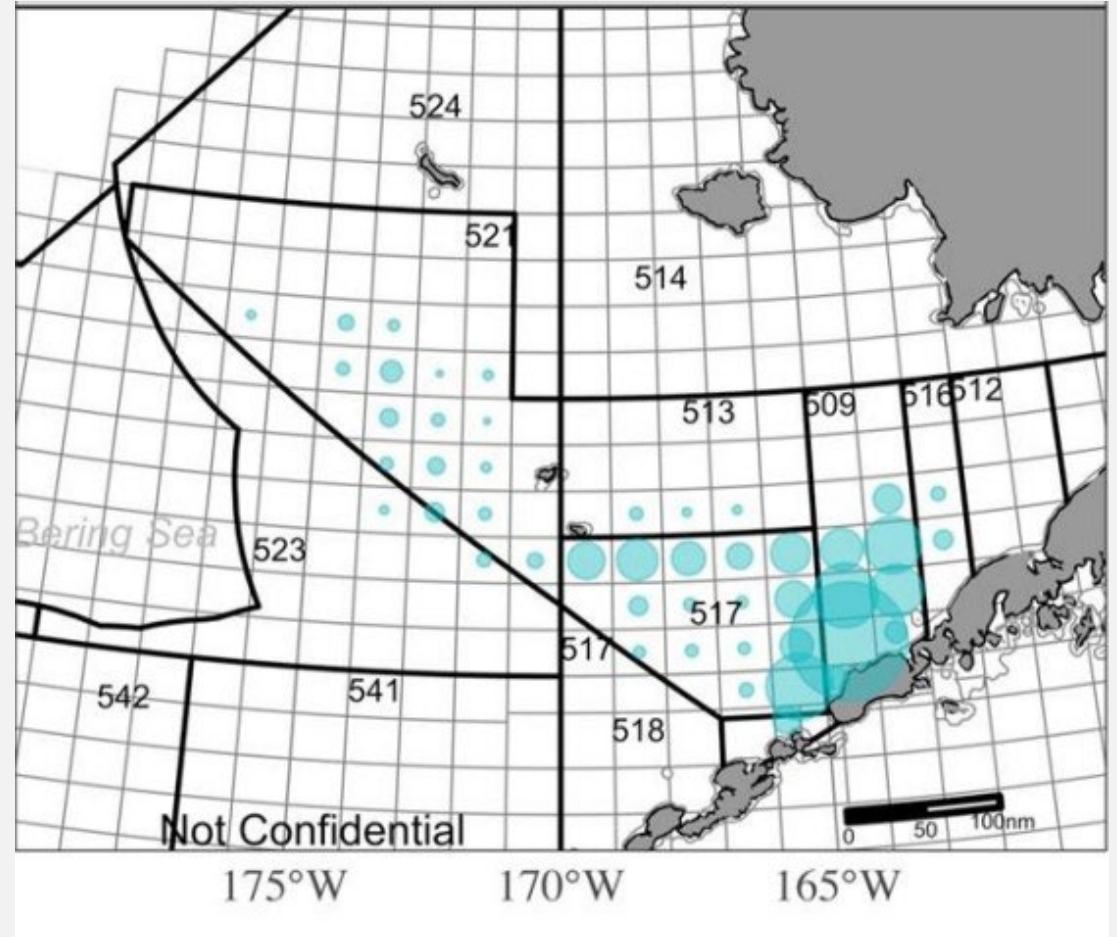
*The Bering Sea pollock fishery caught 6,337 Chinook salmon as bycatch in 2022*

**2022 stock composition estimates**



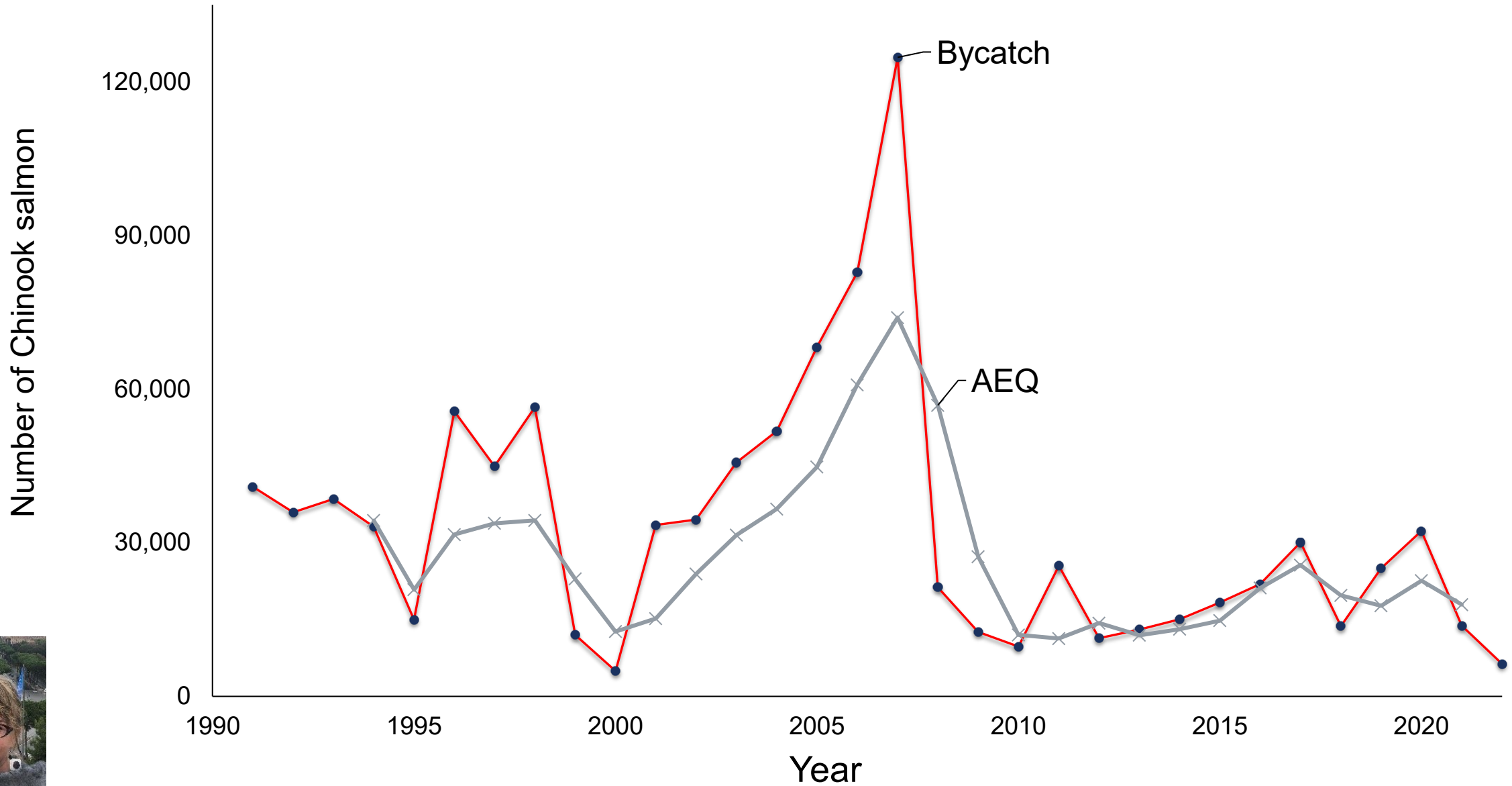
Notes: Pie chart displays the genetic stock reporting groups as a proportion of the total Chinook salmon bycatch in the 2022 Bering Sea pollock fishery.

**Spatial distribution of the Chinook bycatch**



Notes: Circles represent the amount of total bycatch in each ADF&G groundfish statistical area (smaller grey boxes embedded within larger Federal reporting areas).

# Bering Sea Chinook Salmon: Bycatch vs AEQ



**Estimated Chinook salmon AEQ mortality (numbers of fish) due to PSC in the AFA pollock fishery, 2001-2021 for Coastal western Alaska (includes middle Yukon; top panel) and for the Upper Yukon (bottom) stock groupings.**

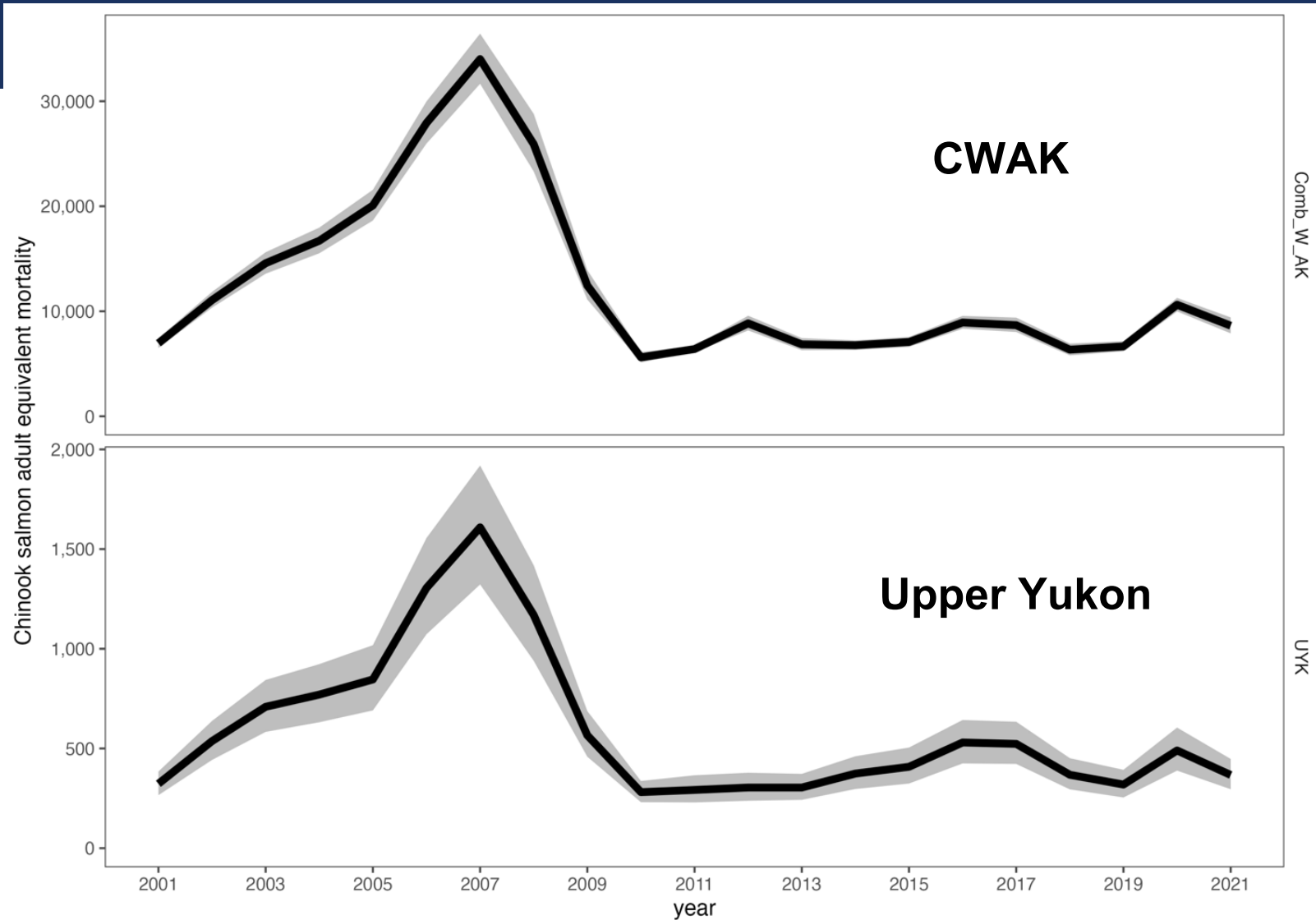
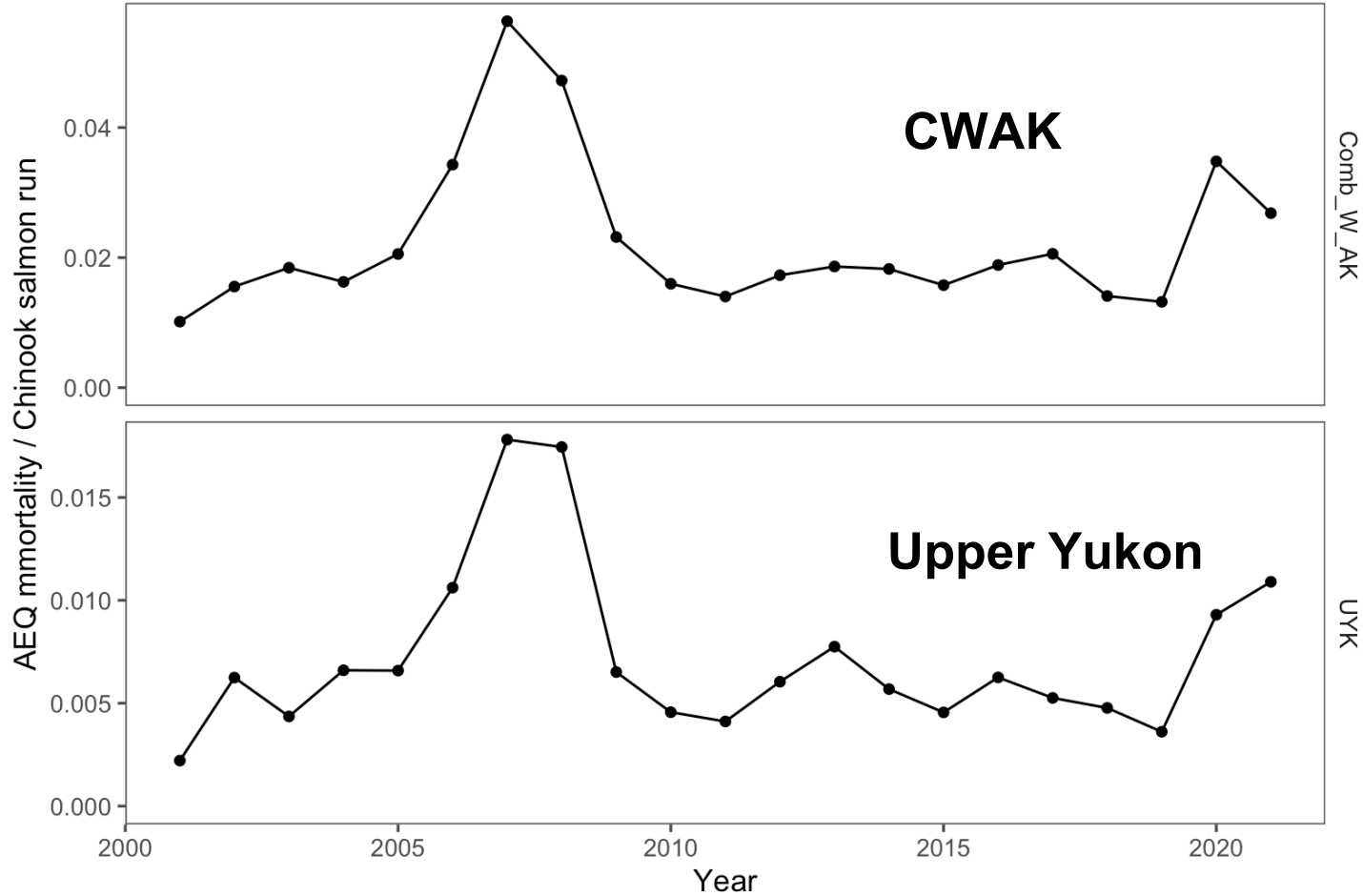


Figure 6-23 page 152



**Estimated Chinook salmon AEQ mortality impact %s (ratio of AEQ over run-strength estimates) due to PSC in the AFA pollock fishery, 2001-2021 for Coastal western Alaska (includes middle Yukon; top panel) and for the Upper Yukon (bottom) stock groupings<sup>70</sup>**



Year	CWAK PSC mortality rate	Upper Yukon PSC mortality rate
2011	1.40%	0.42%
2012	1.72%	0.61%
2013	1.85%	0.78%
2014	1.81%	0.58%
2015	1.57%	0.46%
2016	1.88%	0.63%
2017	2.04%	0.53%
2018	1.41%	0.48%
2019	1.32%	0.37%
2020	3.40%	0.94%
2021	2.64%	1.10%
Mean	1.91%	0.63%





# Chinook Salmon Under Alternatives 2 and 3



## Cumulative Chinook avoided under a cap of 200,000 chum and 4 sector apportionments (2011-2022)

If a 200,000 chum PSC limit had been in place 2011-2022:		Sum of B Season Chinook Avoided (#)	Reduction as % of B Season Total	Reduction as % of Annual Total
3-year avg. sector apportionment	<b>Total</b>	<b>32,874</b>	<b>39.3%</b>	<b>14.5%</b>
	CDQ	1,441	42.2%	9.6%
	CP	11,277	59.4%	15.6%
	Mothership	3,235	47.8%	21.1%
	Inshore	16,921	31.0%	13.7%
5-year avg. sector apportionment	<b>Total</b>	<b>36,778</b>	<b>43.9%</b>	<b>16.3%</b>
	CDQ	1,168	34.2%	7.8%
	CP	11,055	58.2%	15.3%
	Mothership	3,140	46.4%	20.5%
	Inshore	21,415	39.2%	17.3%
Pro-rata sector apportionment	<b>Total</b>	<b>36,835</b>	<b>44.0%</b>	<b>16.3%</b>
	CDQ	1,168	34.2%	7.8%
	CP	11,055	58.2%	15.3%
	Mothership	3,235	47.8%	21.1%
	Inshore	21,377	39.2%	17.3%
AFA sector apportionment	<b>Total</b>	<b>54,182</b>	<b>64.7%</b>	<b>23.9%</b>
	CDQ	705	20.7%	4.7%
	CP	9,511	50.1%	13.2%
	Mothership	3,553	52.5%	23.1%
	Inshore	40,413	74.1%	32.6%

Table 6-48, Page 226



## Chinook salmon PSC avoided and % reduction under a 200,000 chum salmon PSC limit and Sector apportionment of Option 3, Suboption 1 (3-year average)

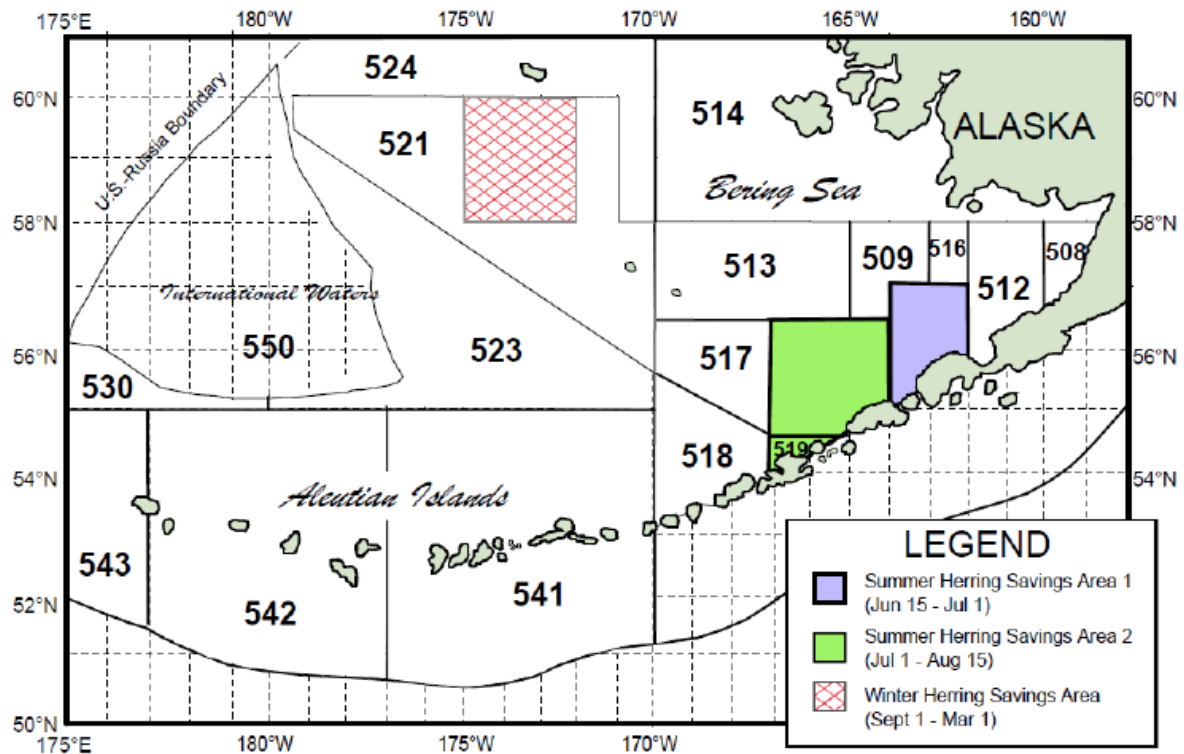
Sector	Year	Week-end date	Status Quo B Season Chinook Bycatch (#)	Potential Number of Chinook Salmon Avoided in B Season Total	Number of Chinook Salmon Avoided as % of B Season Total	Sector	Year	Week-end date	Status Quo B Season Chinook Bycatch (#)	Potential Number of Chinook Salmon Avoided in B Season Total	Number of Chinook Salmon Avoided as % of B Season Total	Number of Chinook Salmon Avoided as % of Annual Total	
CDQ	Total		3,413	1,441	42.2%	9.6%	Mothership	Total		6,774	3,235	47.8%	21.1%
	2011		334		0.0%	0.0%		2011	9/17/2011	2,426	2,332	96.1%	80.8%
	2012		5		0.0%	0.0%		2012		49		0.0%	0.0%
	2013		48		0.0%	0.0%		2013		48		0.0%	0.0%
	2014		36		0.0%	0.0%		2014		180		0.0%	0.0%
	2015		250		0.0%	0.0%		2015		559		0.0%	0.0%
	2016	8/6/2016	352	273	77.6%	17.1%		2016	8/13/2016	366	233	63.7%	16.1%
	2017	7/8/2017	388	224	57.7%	8.9%		2017		476		0.0%	0.0%
	2018	6/30/2018	358	300	83.8%	23.2%		2018	9/1/2018	364	103	28.3%	13.9%
	2019	9/21/2019	719	408	56.7%	17.1%		2019	8/31/2019	538	392	72.9%	26.8%
	2020		557		0.0%	0.0%		2020	10/31/2020	1,472		0.0%	0.0%
	2021	7/17/2021	329	236	71.7%	20.1%		2021	7/31/2021	222	141	63.5%	15.3%
2022		37		0.0%	0.0%	2022	8/13/2022	74	34	45.9%	10.7%		
CP	Total		18,989	11,277	59.4%	15.6%	Inshore	Total		54,569	16,921	31.0%	13.7%
	2011	10/29/2011	1,652	31	1.9%	0.9%		2011		13,951		0.0%	0.0%
	2012		92		0.0%	0.0%		2012		3,433		0.0%	0.0%
	2013		448		0.0%	0.0%		2013		4,255		0.0%	0.0%
	2014	9/6/2014	567	252	44.4%	5.6%		2014	9/6/2014	2,718	907	33.4%	9.9%
	2015		2,374		0.0%	0.0%		2015	8/29/2015	2,848	1,519	53.3%	14.3%
	2016	8/6/2016	2,403	2,005	83.4%	22.6%		2016	9/10/2016	1,987	897	45.1%	8.9%
	2017	7/22/2017	1,475	809	54.8%	7.8%		2017	8/5/2017	6,134	2,851	46.5%	18.8%
	2018	7/7/2018	1,259	1,064	84.5%	22.8%		2018	9/1/2018	3,215	773	24.0%	11.0%
	2019	8/31/2019	3,127	2,680	85.7%	26.0%		2019	9/7/2019	4,863	1,257	25.8%	11.6%
	2020	9/5/2020	4,151	3,599	86.7%	31.6%		2020	9/5/2020	7,807	6,726	86.2%	42.4%
	2021	7/31/2021	1,187	775	65.3%	16.5%		2021	7/31/2021	2,571	1,839	71.5%	26.4%
2022	8/20/2022	254	62	24.4%	3.5%	2022	8/20/2022	787	152	19.3%	4.0%		

Table 6-49, page 225



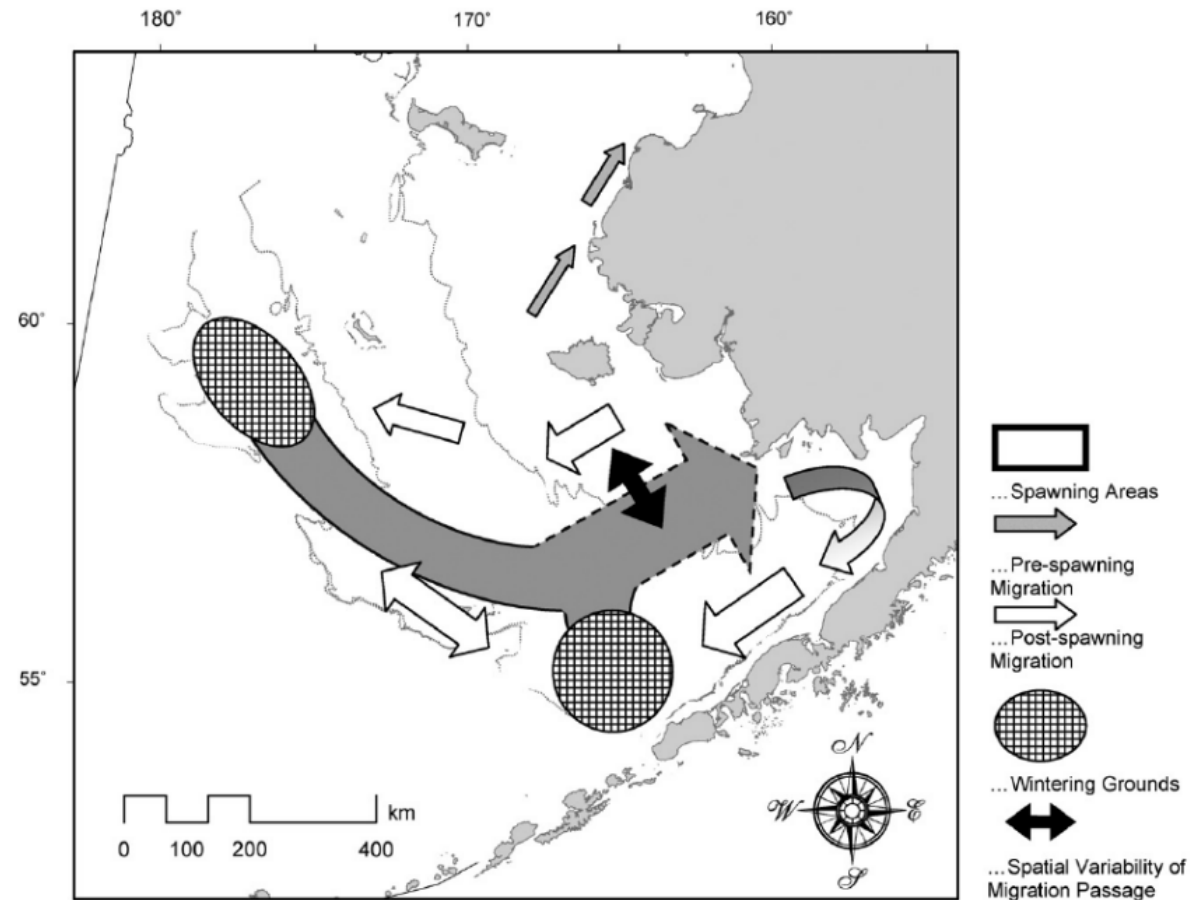


# Herring Under the Status Quo



Herring Savings areas and timing

### Hypothesized Herring Migration Routes (from Tojo et al 2007)



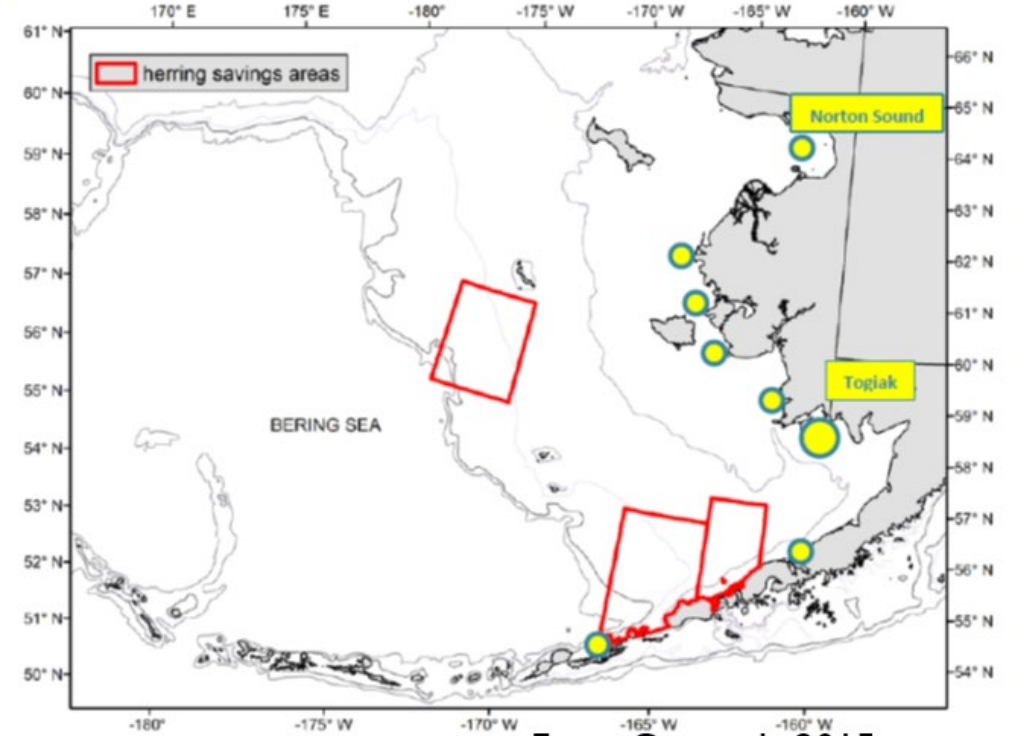
Figures 6-27 and 6-28 pages 154-156



# Major Herring Fisheries in the Bering Sea



Spawning area	2016	2017	2018	2019	2020	2021	2022	2023	2024
Norton Sound	48,794	31,007	31,007	31,007	31,007	31,007	31,007	31,007	31,007
Cape Romanzof	4,366	4,678	4,678	3,300	3,300	3,300	3,300	3,300	3,300
Nunivak Island	140	3,540	3,540	4,464	4,464	4,464	4,464	4,464	4,464
Nelson Island	27,422	4,785	4,785	4,916	4,916	4,916	4,916	4,916	4,917
Cape Avinof	9,456	3,126	3,126	1,890	1,890	1,890	1,890	1,890	1,890
Goodnews Bay	8,263	4,724	4,724	4,724	4,724	4,724	4,724	4,724	4,724
Security Cove	8,540	4,781	4,781	4,762	4,762	4,762	4,762	4,762	4,762
Togiak	147,185	142,453	124,062	197,355	195,793	214,768	324,350	286,853	195,984
Port Moller/ Port Heiden	8,932	2,184	2,268	2,291	2,350	2,449	2,463	2,463	2,463
<b>Total</b>	<b>263,098</b>	<b>201,278</b>	<b>182,971</b>	<b>254,709</b>	<b>253,207</b>	<b>272,281</b>	<b>381,876</b>	<b>344,379</b>	<b>253,511</b>



From Ormseth, 2015



# Herring PSC limit: 1% of estimated biomass (ADF&G) for Bering Sea stocks

## Herring (includes CDQ fisheries)

### Trawl Gear

Seasons	Account	Units	Total Catch	Limit	Remaining	% Taken
	Pacific Cod	MT	1	18	17	5%
	Pollock Pelagic	MT	3,059	3,066	7	100%
	Pollock, Atka Mackerel, Other Species	MT	28	41	13	68%
	Rock Sole, Flathead Sole, Other Flatfish	MT	135	99	-36	136%
	Rockfish	MT	2	10	8	21%
	Turbot, Arrowtooth, Kamchatka, Sablefish	MT	0	10	10	5%
	Yellowfin Sole	MT	86	200	114	43%
<b>Total:</b>			<b>3,312</b>	<b>3,444</b>	<b>132</b>	<b>96%</b>

- Apportioned to fishery categories in specifications process annually
- Pollock Pelagic target accrues highest amount of herring annually



# Herring PSC differs by sector and season

## Herring PSC in the AFA pollock fishery by season and sector 2011-2023

Year	CP			M			S			CDQ			all sectors
	A	B	Total	A	B	Total	A	B	Total	A	B	Total	Total
<b>2011</b>	0	124	124	0	3	3	1	236	238	0	12	12	<b>377</b>
<b>2012</b>	122	400	522	0	117	117	3	1,608	1,611	5	103	108	<b>2,358</b>
<b>2013</b>	0	763	763	0	4	4	0	191	191	0	1	1	<b>959</b>
<b>2014</b>	0	7	7	0	3	3	0	136	136	0	14	14	<b>159</b>
<b>2015</b>	358	5	364	9	5	13	45	1,059	1,104	4	1	5	<b>1,487</b>
<b>2016</b>	362	47	409	137	14	151	71	654	725	7	139	147	<b>1,431</b>
<b>2017</b>	206	27	233	29	25	54	21	646	668	5	3	8	<b>963</b>
<b>2018</b>	23	18	42	1	6	7	41	381	422	1	2	3	<b>473</b>
<b>2019</b>	160	4	164	0	12	12	45	866	911	5	9	13	<b>1,100</b>
<b>2020</b>	1,414	97	1,511	444	36	480	901	822	1,724	139	7	146	<b>3,861</b>
<b>2021</b>	131	5	137	51	129	180	384	970	1,354	28	8	36	<b>1,707</b>
<b>2022</b>	35	126	161	106	149	255	300	974	1,274	2	12	13	<b>1,703</b>
<b>2023</b>	111	256	366	150	632	783	149	1,736	1,885	2	39	41	<b>3,075</b>



**Figure 6-31 Herring PSC (t) by pollock CV sector by A season (upper panel) and B season (lower panel) with HSAs. (2011-2022), Black dots are to show magnitude of catch (in red).**

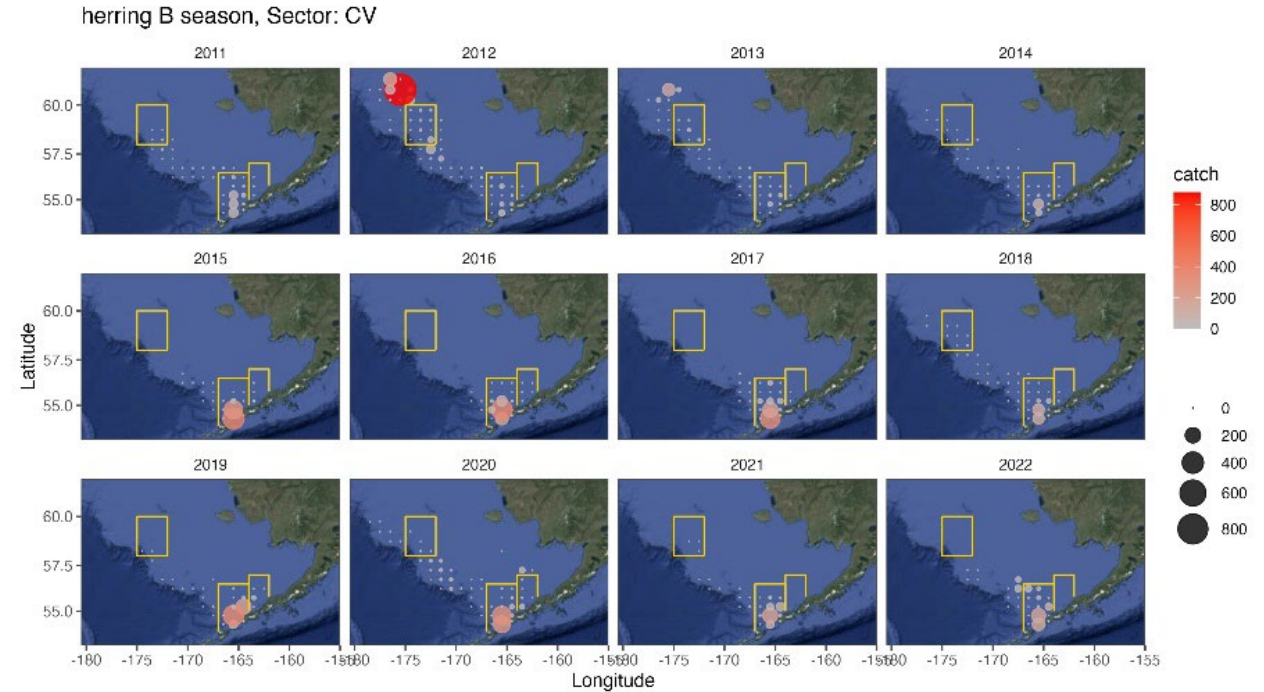
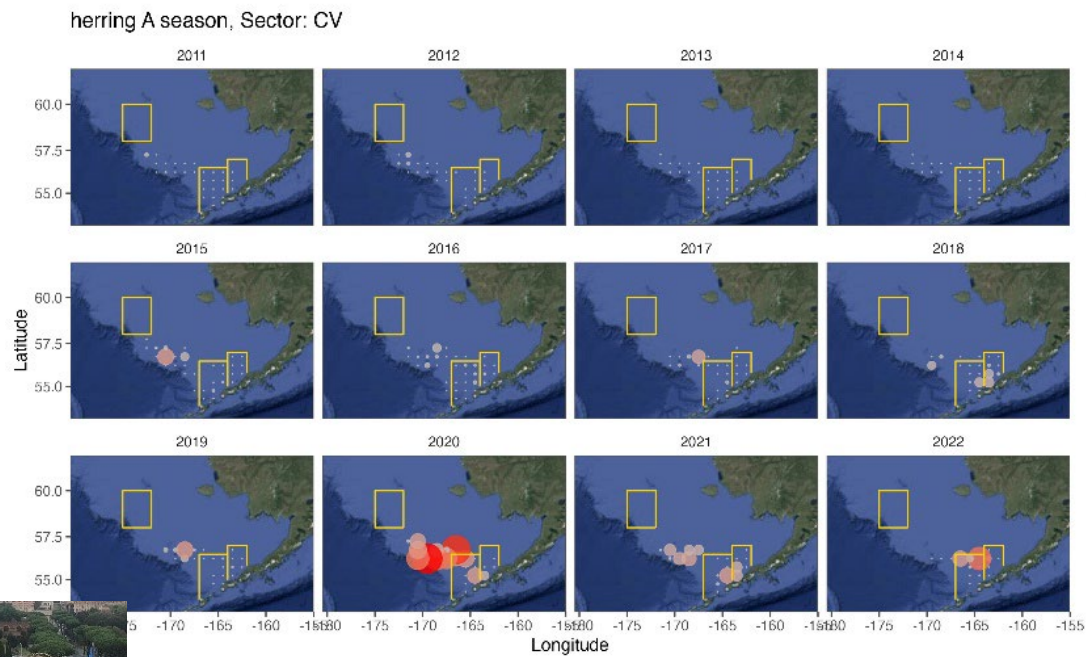


Figure 6-31, page 160





Figure 6-32 Herring PSC (t) by pollock CP sector by A season (upper panel) and B season (lower panel) with HSAs. (2011-2022). Black dots are to show magnitude of catch (in red).

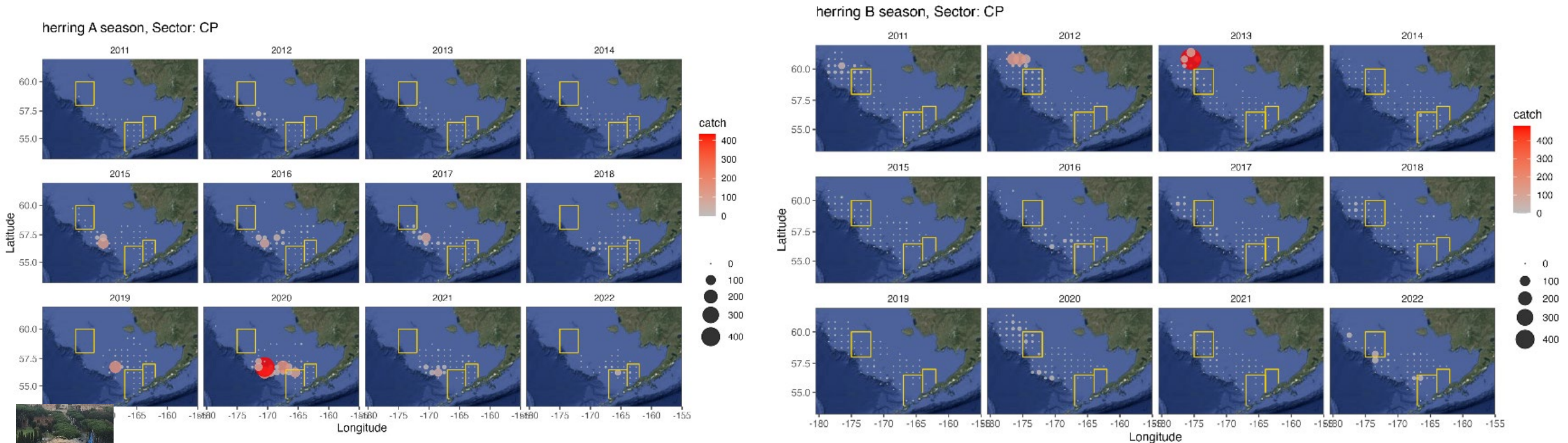


Figure 6-32, page 161

# Pollock pelagic herring PSC limit and catch 2011-2023

Year	Herring PSC (mt)	PSC limit (mt)	% of limit
2011	346	1,737	19.90%
2012	2,167	1,600	135.41%
2013	959	2,165	44.29%
2014	151	1,776	8.52%
2015	1,386	2,242	61.82%
2016	1,425	2,151	66.23%
2017	956	1,800	53.09%
2018	307	1,662	18.49%
2019	1,080	2,313	46.69%
2020	3,720	2,299	161.82%
2021	1,698	2,472	69.00%
2022	1,678	3,400	49.00%
2023	3,059	3,066	99.77%





# Herring Under Alternatives 2 and 3

**Table 6-50 Week-end date, herring bycatch, herring avoided and % of total reduction in herring PSC cumulatively (2011-2022) with sector allocation (Option 3, suboption 1): cap 200,000**

Sector	Year	Week-end date	Status Quo B	Potential Herring	Amount of Herring	Amount of Herring	Sector	Year	Week-end date	Status Quo B	Potential Herring	Amount of Herring	Amount of Herring
			Season Herring Bycatch (mt)	Bycatch Avoided in B Season (mt)	Bycatch Avoided (mt) as % of B Season Total	Bycatch Avoided (mt) as % of Annual Total				Season Herring Bycatch (mt)	Bycatch Avoided in B Season (mt)	Bycatch Avoided (mt) as % of B Season Total	Bycatch Avoided (mt) as % of Annual Total
CDQ	<b>Total</b>		<b>311</b>	<b>3</b>	<b>0.96%</b>	<b>0.59%</b>	Mothership	<b>Total</b>		<b>503</b>	<b>82</b>	<b>16.37%</b>	<b>6.43%</b>
	2011		12		0.00%	0.00%		2011	9/17/2011	3	0	1.51%	1.44%
	2012		103		0.00%	0.00%		2012		117		0.00%	0.00%
	2013		1		0.00%	0.00%		2013		4		0.00%	0.00%
	2014		14		0.00%	0.00%		2014		3		0.00%	0.00%
	2015		1		0.00%	0.00%		2015		5		0.00%	0.00%
	2016	8/6/2016	139	0	0.05%	0.05%		2016	8/13/2016	14	0	2.87%	0.26%
	2017	7/8/2017	3	1	41.53%	17.75%		2017		25		0.00%	0.00%
	2018	6/30/2018	2	0	13.80%	10.30%		2018	9/1/2018	6	1	18.80%	16.50%
	2019	9/21/2019	9	0	0.39%	0.25%		2019	8/31/2019	12	11	91.58%	90.69%
	2020		7		0.00%	0.00%		2020	10/31/2020	36		0.00%	0.00%
	2021	7/17/2021	8	1	14.06%	3.07%		2021	7/31/2021	129	70	53.90%	38.68%
2022		12		0.00%	0.00%	2022	8/13/2022	149	0	0.10%	0.06%		
CP	<b>Total</b>		<b>1,623</b>	<b>164</b>	<b>10.13%</b>	<b>3.71%</b>	Inshore	<b>Total</b>		<b>8,544</b>	<b>475</b>	<b>5.56%</b>	<b>4.58%</b>
	2011	10/29/2011	124	0	0.00%	0.00%		2011		236		0.00%	0.00%
	2012		400		0.00%	0.00%		2012		1,608		0.00%	0.00%
	2013		763		0.00%	0.00%		2013		191		0.00%	0.00%
	2014	9/6/2014	7	0	2.38%	2.37%		2014	9/6/2014	136	0	0.00%	0.00%
	2015		5		0.00%	0.00%		2015	8/29/2015	1,059	23	2.15%	2.06%
	2016	8/6/2016	47	14	29.84%	3.40%		2016	9/10/2016	654	0	0.01%	0.01%
	2017	7/22/2017	27	18	68.36%	7.85%		2017	8/5/2017	646	63	9.78%	9.47%
	2018	7/7/2018	18	2	9.18%	4.03%		2018	9/1/2018	381	0	0.02%	0.01%
	2019	8/31/2019	4	2	50.46%	1.17%		2019	9/7/2019	866	93	10.74%	10.21%
	2020	9/5/2020	97	35	36.58%	2.35%		2020	9/5/2020	822	35	4.25%	2.03%
	2021	7/31/2021	5	4	67.65%	2.68%		2021	7/31/2021	970	246	25.34%	18.15%
2022	8/20/2022	126	89	70.92%	55.50%	2022	8/20/2022	974	15	1.54%	1.18%		





# PSC Trade-offs

# Summary of impacts

200,000	Apport.	WAK Chum	Total Chum	Pollock Forgone	Chinook	Herring
	Suboption					
	1) 3-yr avg	144,893	852,347	1,783,255	32,874	725
	2) 5-yr avg	147,243	994,447	1,907,248	36,778	890
	3) pro-rata	147,270	866,573	1,889,098	36,835	873
	4) AFA	188,786	1,092,360	2,235,419	54,182	1,216
300,000	Apport.	WAK Chum	Total Chum	Pollock Forgone	Chinook	Herring
	Suboption					
	1) 3-yr avg	60,669	474,719	1,071,457	17,841	488
	2) 5-yr avg	62,127	479,507	1,052,203	15,847	365
	3) pro-rata	62,017	478,110	1,037,812	15,814	365
	4) AFA	75,897	460,807	952,571	19,626	550
450,000	Apport.	WAK Chum	Total Chum	Pollock Forgone	Chinook	Herring
	Suboption					
	1) 3-yr avg	30,821	171,870	527,984	6,891	303
	2) 5-yr avg	29,205	153,079	471,574	4,383	302
	3) pro-rata	30,155	157,469	474,701	4,465	302
	4) AFA	16,483	172,531	418,368	6,595	336
550,000	Apport.	WAK Chum	Total Chum	Pollock Forgone	Chinook	Herring
	Suboption					
	1) 3-yr avg	24,805	124,335	274,502	2,317	30
	2) 5-yr avg	16,145	95,095	359,623	2,800	246
	3) pro-rata	16,159	95,295	370,537	2,872	256
	4) AFA	5,689	28,736	204,635	2,172	280



# Bycatch rate Chinook and chum over two time frames (pre- and post A91)

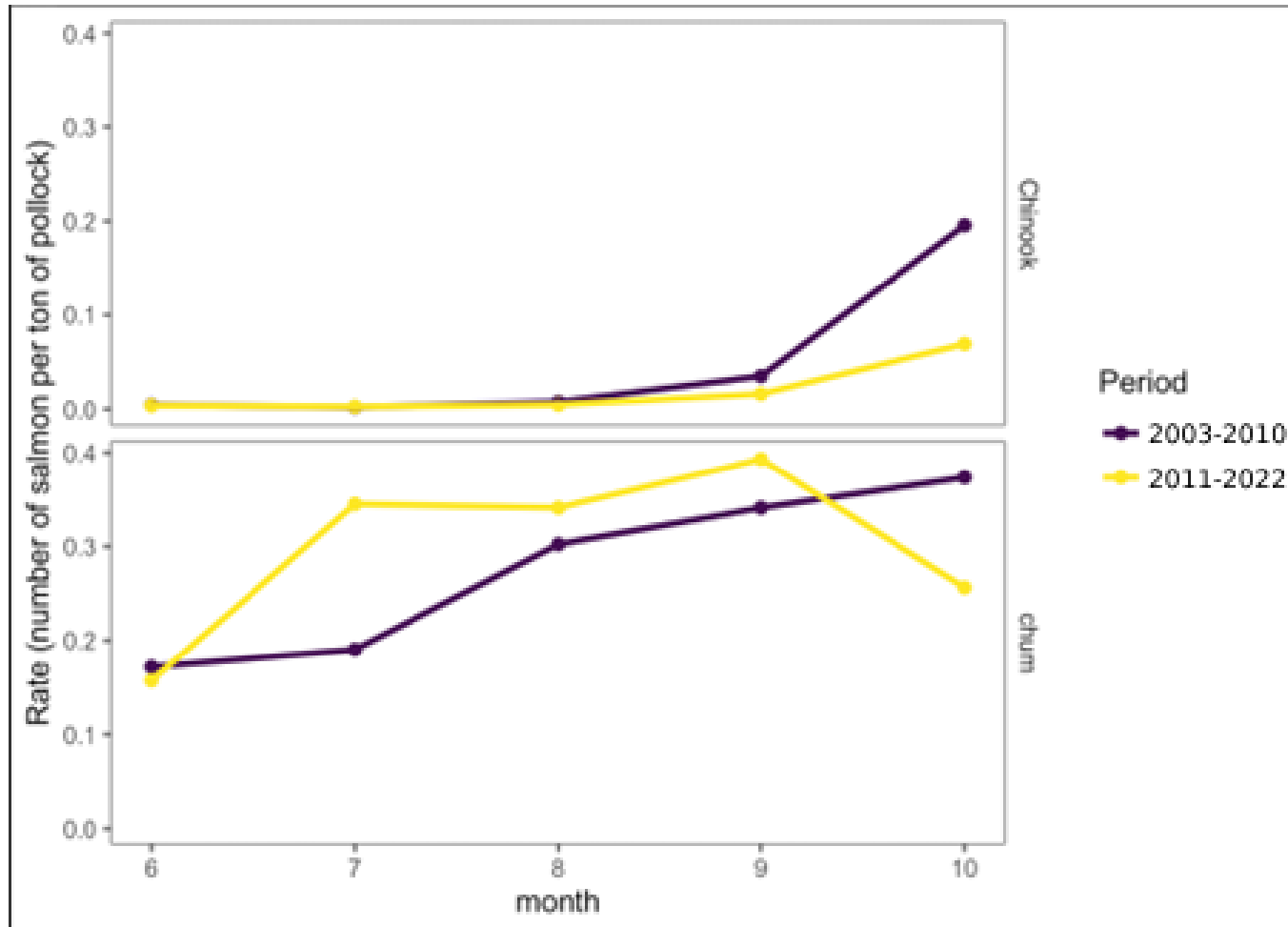


Figure 6-39, page 230



# Monthly rates of Chinook and chum bycatch pre and post A91 (and east and west of 170)

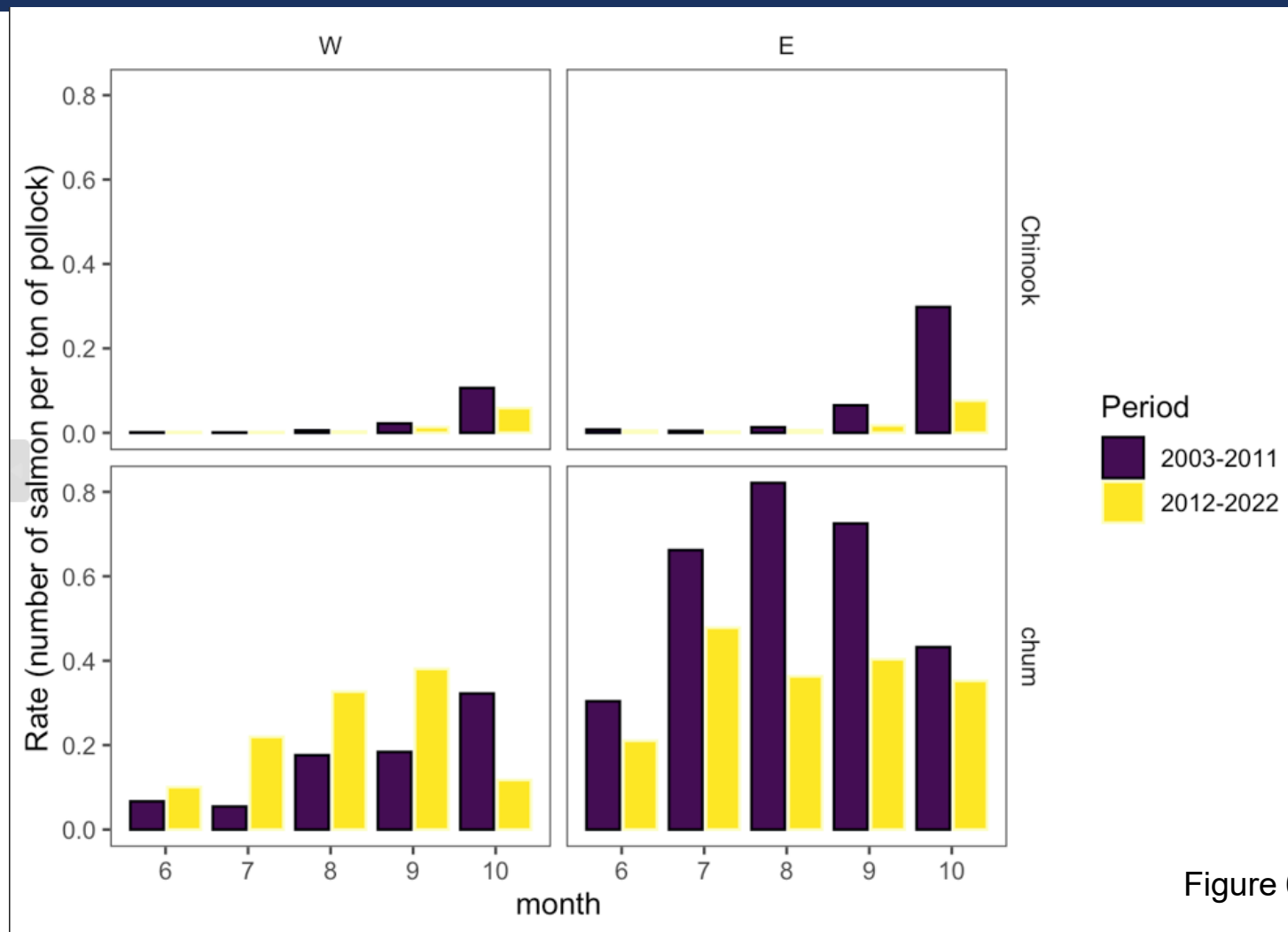


Figure 6-40 page 231





Alternative	Measure	Chinook PSC	Chum PSC	WAK Chum PSC	Flexibility for Pollock Fishing
<b>2</b>	Overall chum PSC limit	<p>↑ If B season extends</p> <p>↔↑ Depending on fleet movement</p> <p>↓ If sector or fishery is closed</p>	<p>↓ But degree of reduction depends on fishing behavior and the value selected for the overall limit</p>	<p>↔ Expect fleet to target areas with low chum bycatch rates</p> <p>↓ If sector or fishery is closed or when combined with other incentives</p>	<p>↔ Would anticipate flexibility at higher overall PSC limit values</p> <p>↓ Flexibility decreases at lower PSC limit values</p>
<b>3</b>	WAK chum threshold (must be combined with Alt 2)	<p>Would anticipate being similar to Alternative 2. Alternative 3 would not require pollock fishing to cease inseason but rather the fishery could operate under a lower overall limit in the future.</p>			
<b>4</b>	Optimize avoidance in shelf edge fishing grounds	↔	↔↓	↔↓	↔
	Bi-weekly closure area consideration	↔	↔↓	↔↓	↔
	Required use of excluder device for duration of B season	↔	↔↓	↔	↔
	Required RHS closure for all vessels regardless of performance	↔	↓	↔↓	↔↓





Dutch Harbor, ASMI Industry and Partner Use

# STAFF ASSESSMENT OF IPA PROPOSALS UNDER ALTERNATIVE 4

# Current and Potential Future Approaches

- Staff provided input to the Council at the February 2024 meeting that a full impact analysis could not be provided by April 2024
  - A policy choice before the Council at this time is to finalize Alternative 4
- Used a qualitative approach that describes each provision and compares it to the status quo elements of the RHS program
  - Staff would plan to use a qualitative approach in the future as well, although some further information could be provided depending on the elements in the alternative
  - Several challenges to providing a quantitative analysis now or in the future including the dynamic nature of the program and characterizing impacts under the status quo



# Common Features of the IPA Proposals

- Primary strategy for chum salmon bycatch avoidance is fleet movement
  - Potential measures considered within the context of each sector's operational dynamics
- Considered whether the provisions would minimize chum salmon and WAK chum bycatch with minimum impacts to pollock CPUE
- Considered reducing Base Rate floors by 25% and 50%
- Considered proportion of WAK to non-WAK chum
- Bycatch avoidance measures in fishing grounds areas rather than genetic cluster areas



# Fishing Grounds and Cluster Areas

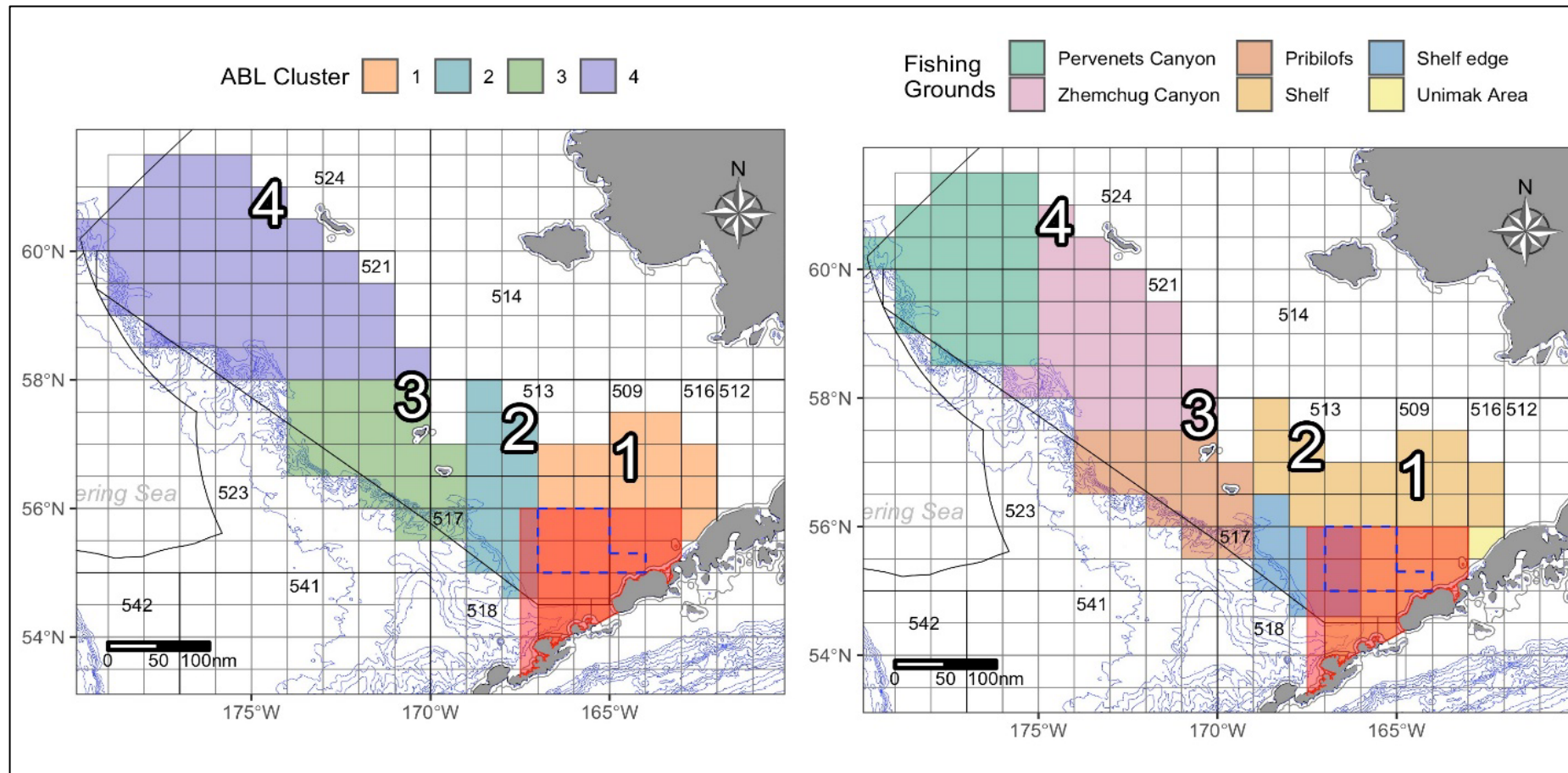


Figure 6-43 Comparison of Auke Bay Labs (ABL) genetic cluster areas to fishing grounds areas for genetic analysis



# Summary of Provisions in the CV Proposal

Proposed Provision	Related Measure Under Current Program	Potential Benefits of Provisions
Weekly use of latest chum genetics, bycatch rate, and CPUE information to assess stat areas historical WAK and non-WAK chum proportions	Genetic information used to inform stair-stepped Base Rate floor and size of closure areas east and west of 168	More timely use of genetic information and genetic information applied at finer spatial scale
Stat area close to all vessels when area rate is 3 times the weekly bycatch rate	ADF&G stat area eligible for RHS closure when area rate is above calculated Base Rate; not applicable to all vessels	Reduce potential for bycatch spikes; known areas of high bycatch are closed to all vessels
Information from weekend fishing evaluated on Monday for potential closure	RHS closures issued weekly (Friday to Friday); Above average vessels (Tier 1) permitted to fish in the closure area	More timely assessment of bycatch and catch data with applied management action; may not necessarily result in a greater number of closures but more vessels (Tier 1) excluded
Move along rules for inshore CV and mothership CV fleets	No move along rule incorporated into Inshore SSIP or MSSIP in current program	More timely assessment of bycatch and catch data; would potentially reduce number of closures as managers and vessels are more responsive to conditions on the fishing grounds





# Summary of Provisions in the CP Proposal

Proposed Provision	Related Measure Under Current Program	Potential Benefits of Provisions
Weekly use of latest chum genetics, bycatch rate, and CPUE information to optimize prioritization of closures	Genetic information used to inform stair-stepped Base Rate floor and size of closure areas east and west of 168	More timely use of genetic information and genetic information applied at finer spatial scale
Closure applies to all vessels when weekly stat area bycatch rates are very high	Closures apply when stat area rate is greater than 5 chum per mt of pollock ( <i>2022 amendment</i> )	Reduce potential for bycatch spikes; known areas of high bycatch are closed to all vessels
Outlier provisions	If a vessel is identified as a poor performer for two consecutive B seasons, it is prohibited from fishing in closure areas for the season ( <i>2022 amendment</i> )	Vessel-level incentive to keep bycatch low year after year
Bi-weekly assessment of closure areas	Tuesday-Friday, Friday-Tuesday closures ( <i>2022 amendment</i> )	More timely assessment of bycatch and catch data with applied management action; potential to reduce spikes in bycatch
Use of excluder device for full B season	Excluder devices required September 1 – end of B season	Potentially greater chum escapement from pollock nets
Weekly bycatch reports to Western and Interior Alaska salmon users	Third-party receives reports	Increased transparency and public communication on performance



# Using Genetic Information in RHS Closures for Chum Salmon Avoidance – Likelihood Assessment or Optimization

- Chum genetics database based on genetic information from Auke Bay Labs that pools prior years of data to form maps depicting the likely weekly proportions
- Fishing grounds areas compared to genetic cluster areas
  - Table 6-63 and 6-64 provide WAK and non-WAK chum proportions early and late period (pg. 276 and 277)
  - Table 6-65 and 6-66 provide the same information by fishing grounds (pg. 278 and 279)
- **Regardless of how likelihood assessments are conducted in the future – either by fishing grounds or cluster areas as the spatial units of analysis – WAK chum salmon are encountered in higher proportions nearest the Alaska Peninsula**
- Possible this provision would lead to a reduction in WAK chum salmon bycatch in the future





# Required Closures for all Vessels Regardless of Performance if Chum Bycatch Rates are Very High

- Closure would apply to all CPs when the bycatch rate is 5 chum per mt of pollock
- Closure would apply to all CVs when an ADF&G groundfish statistical area has an area rate three times higher than the weekly calculated rate
- Measures would likely reduce chum salmon bycatch compared to the status quo
  - Scenario analysis by Sea State showed that this provision would have resulted in additional closures, the majority of which in the shelf edge and Unimak Areas



# Move Along Rule and Bi-Weekly Closure Evaluations

- CV Proposal includes the use of a move along rule
  - Developed and applied regardless of a closure to minimize the risk of increased chum salmon bycatch
- Both proposals (CVs and CP) include bi-weekly use of closure areas
- These measures would likely to reduce chum salmon bycatch compared to the status quo
  - Reduce risk of periodically high spikes in bycatch
  - Increased frequency of data evaluation



# Outlier Provisions and Excluder Devices – CP IPA Proposal

## Outlier Provision

- Provides a vessel-level incentive to avoid chum salmon bycatch
- Staff are unable to quantify potential additional avoidance resulting from this incentive
- Expected harvesters would want to maintain operational flexibility



## Excluder Devices

- Status quo regulations require the use of salmon excluder devices from January 20 to March 31, and from September 1 until the end of the B season
- Adding a provision would require the use of a salmon excluder from June 10 – September 1
- It is possible that requiring the use of a salmon excluder device throughout the entire B season may result in some additional chum salmon avoidance



# Additional Weekly Reporting to Western Alaska Salmon Users

- Potential measure identified in the CP IPA proposal
- Status quo regulations require the IPAs to:
  - *"Identify at least one third party group that include entities representing Western Alaskans who depend on salmon and have an interest in salmon bycatch reduction but do not directly fish in a groundfish fishery"*
- Not anticipated to result in additional chum salmon avoidance relative to the status quo but the provision could increase transparency and accountability



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# Questions?

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**Thank you** to contributors!

