

*Science, Service, Stewardship*



NOAA Technical Memorandum NMFS-AFSC-345

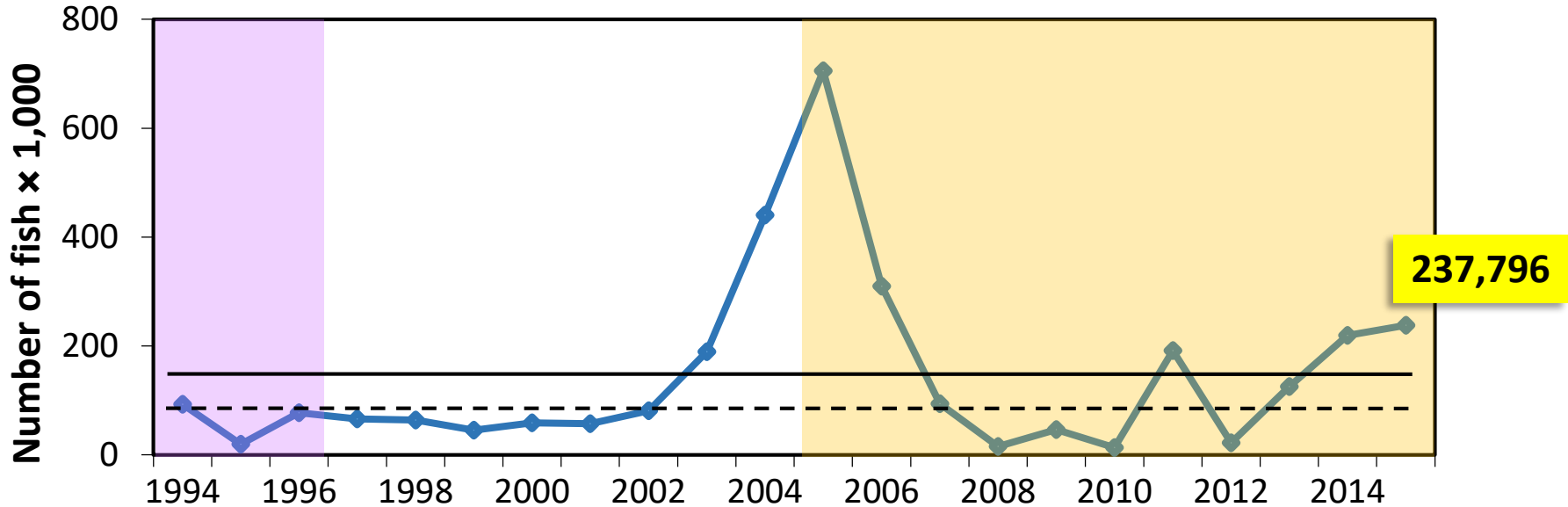
# Genetic Stock Composition Analysis of **Chum** Salmon from the Prohibited Species Catch of the **2015** Bering Sea Walleye Pollock Trawl Fishery and Gulf of Alaska Groundfish Fisheries

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Genetics Program  
Auke Bay Laboratories  
Juneau, AK

**NOAA**  
**FISHERIES**  
**SERVICE**

April 4-6, 2017

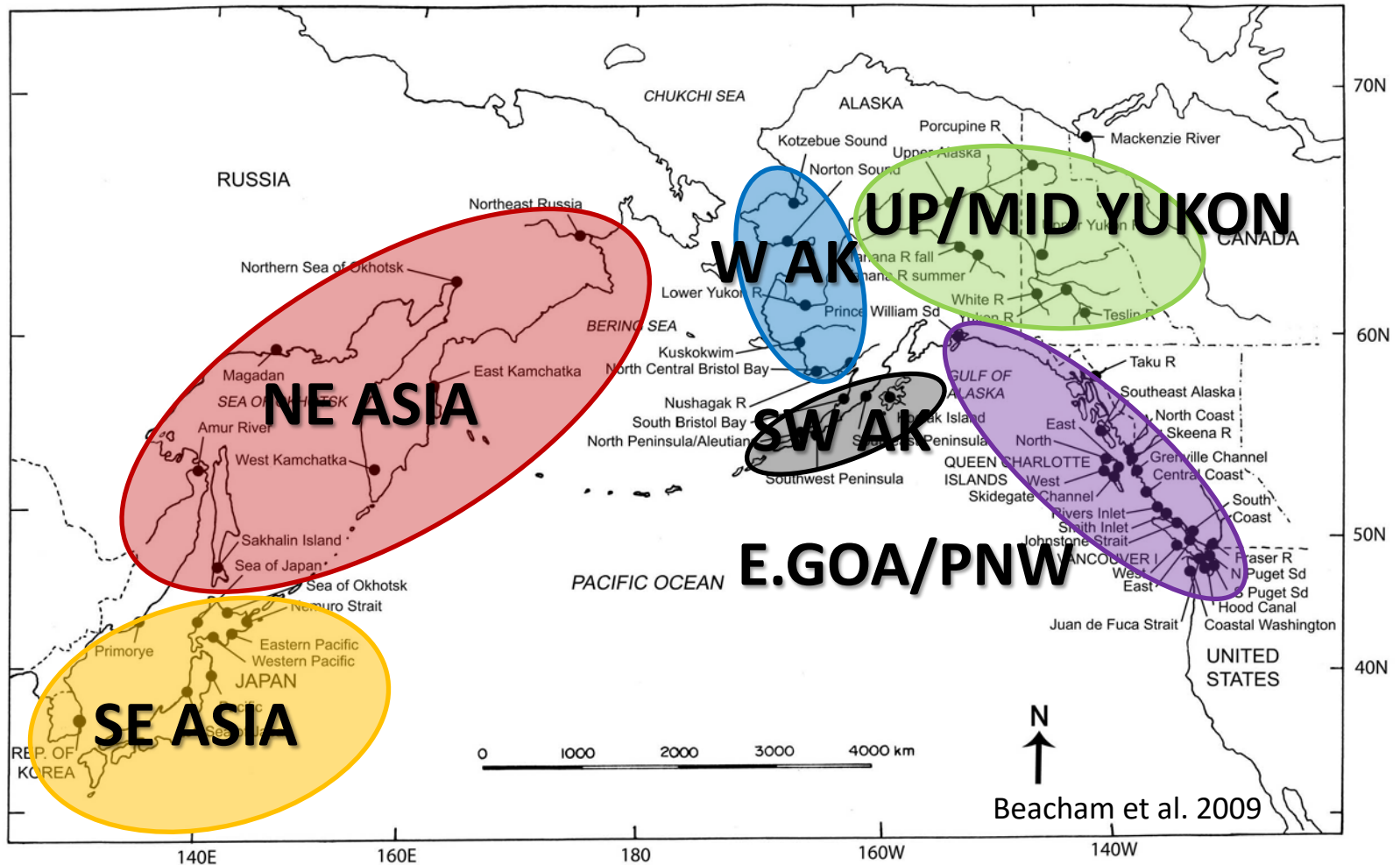
# Bering Sea, chum salmon bycatch from pollock-directed fishery



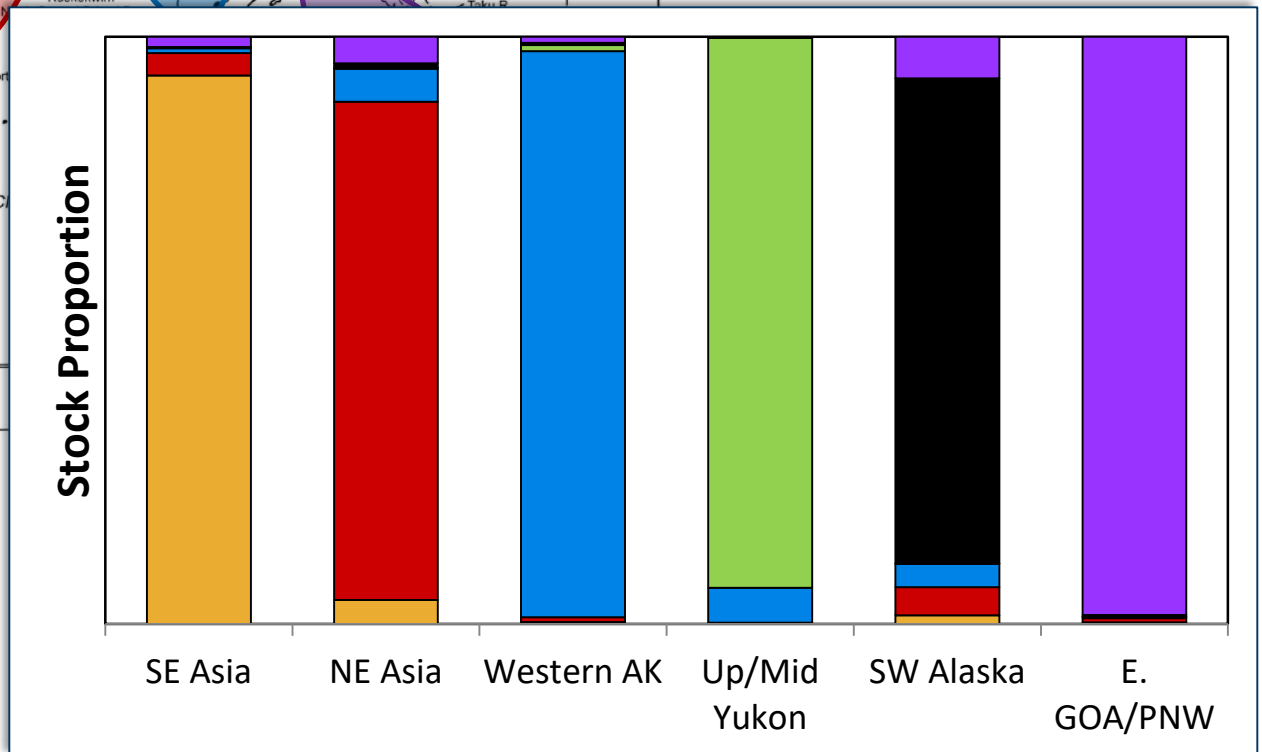
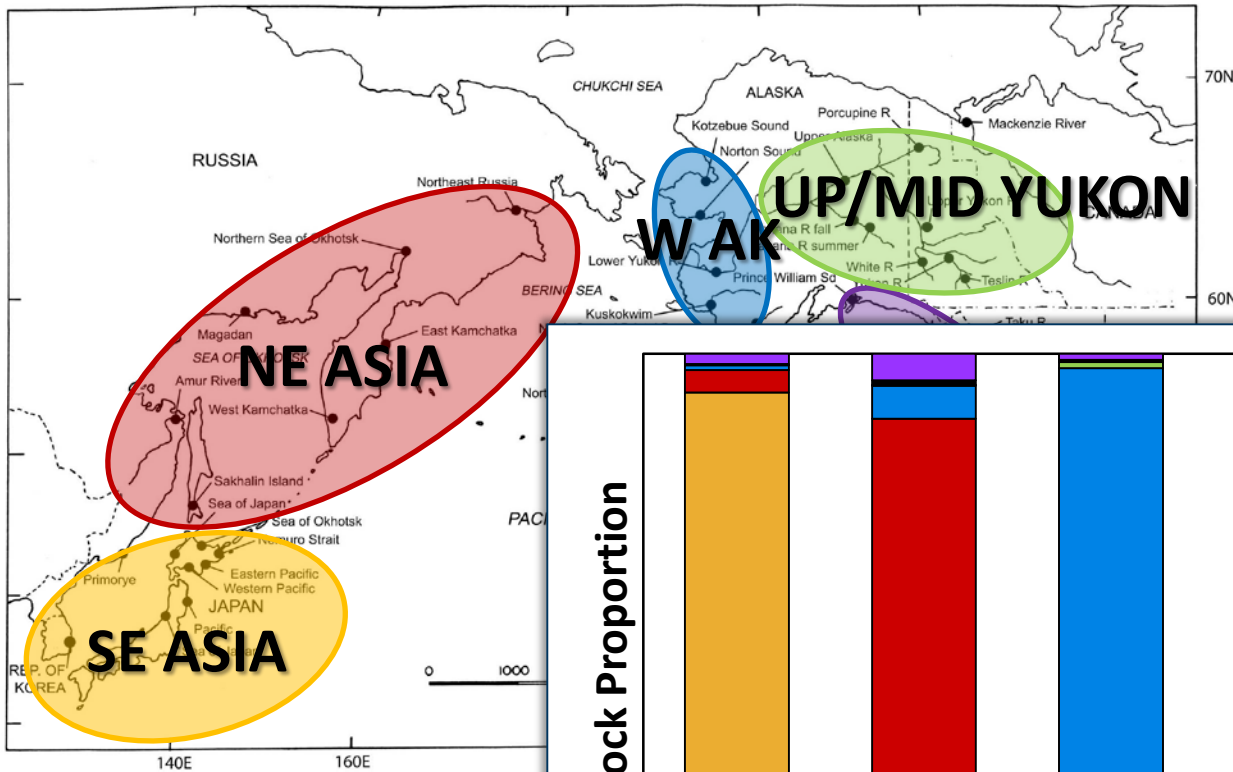
1994: Scales  
1994-1996: Allozymes

Genetic sample size			
2005	1,084	2011	1,472
2006	1,367	2012	673
2007	1,279	2013	4,094
2008	629	2014	1,741
2009	1,437	2015	2,041
2010	1,048		

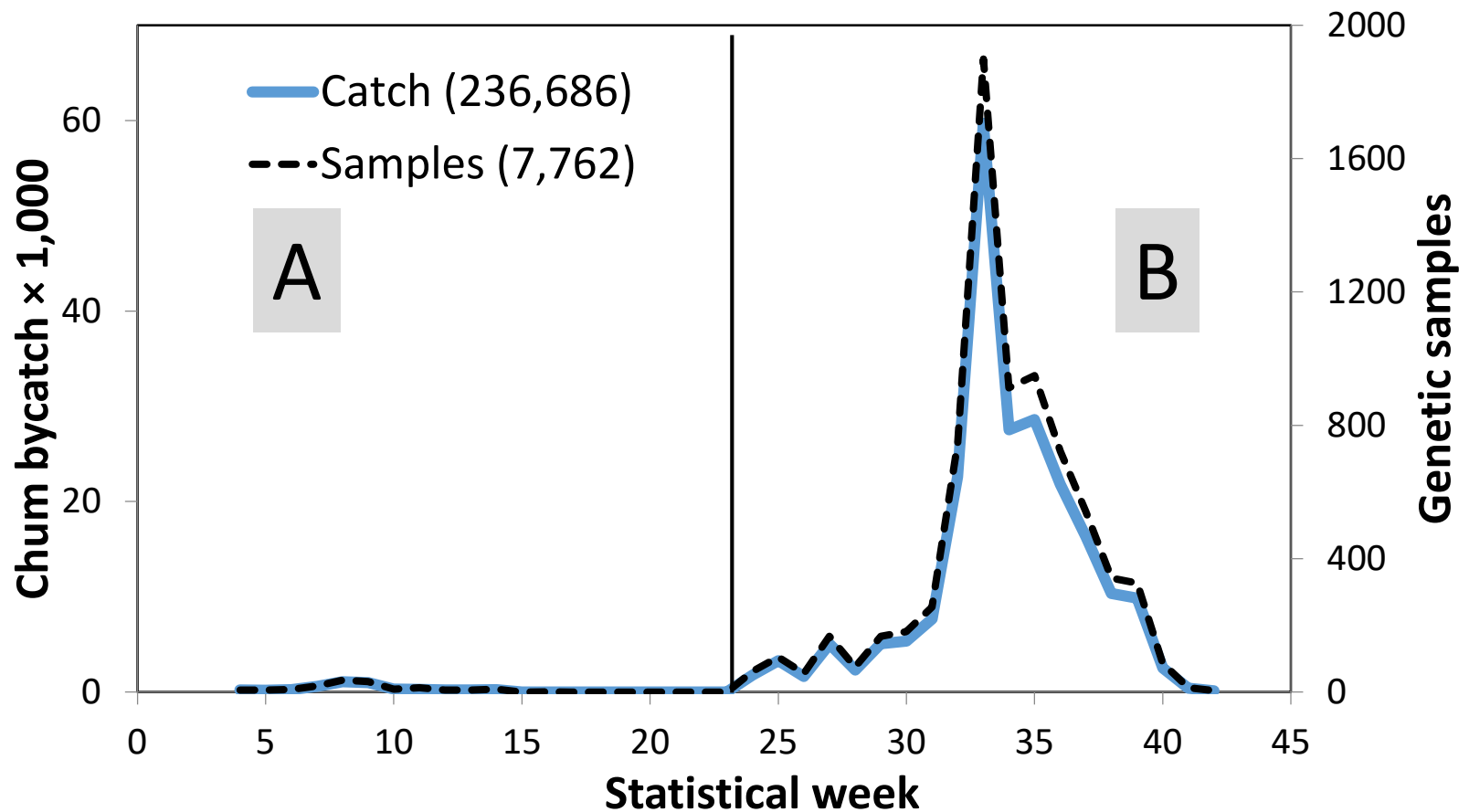
# Chum salmon stock groupings



# 100% chum baseline simulations

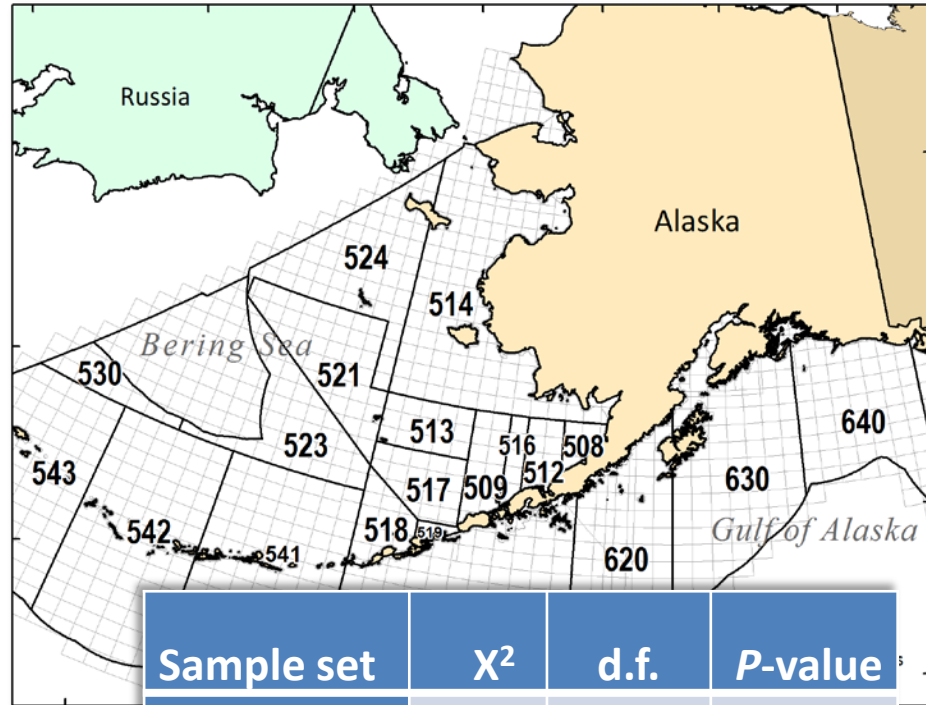


# 2015 Bering Sea chum salmon bycatch

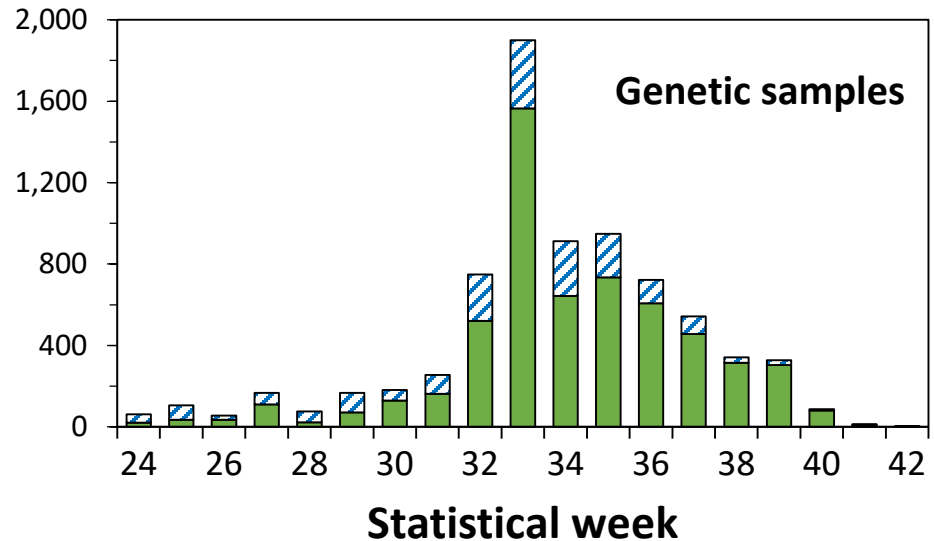
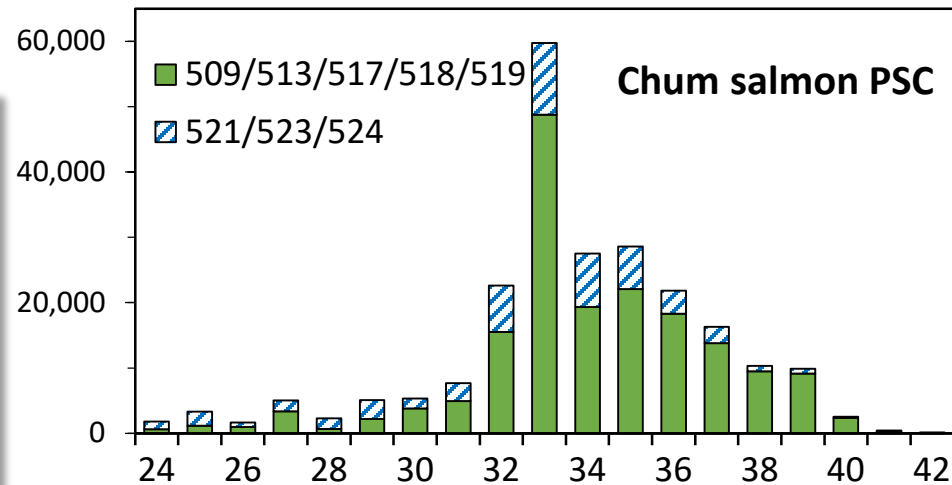


# 2015 Bering Sea chum salmon bycatch

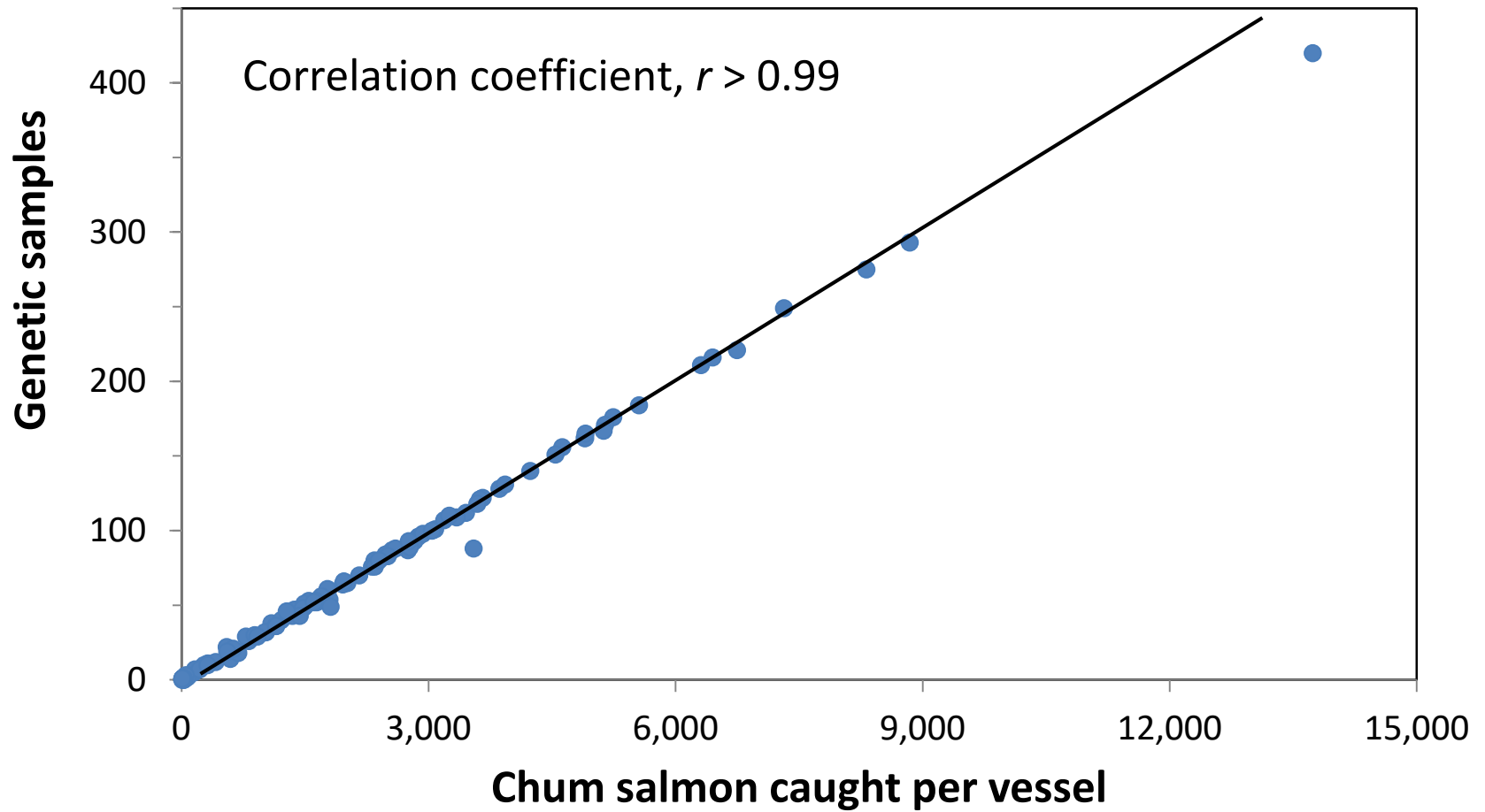
## Statistical areas



Sample set	X <sup>2</sup>	d.f.	P-value
Collected	4.92	16	>0.99
Genotyped	3.95	16	>0.99
Analyzed	8.49	16	0.93



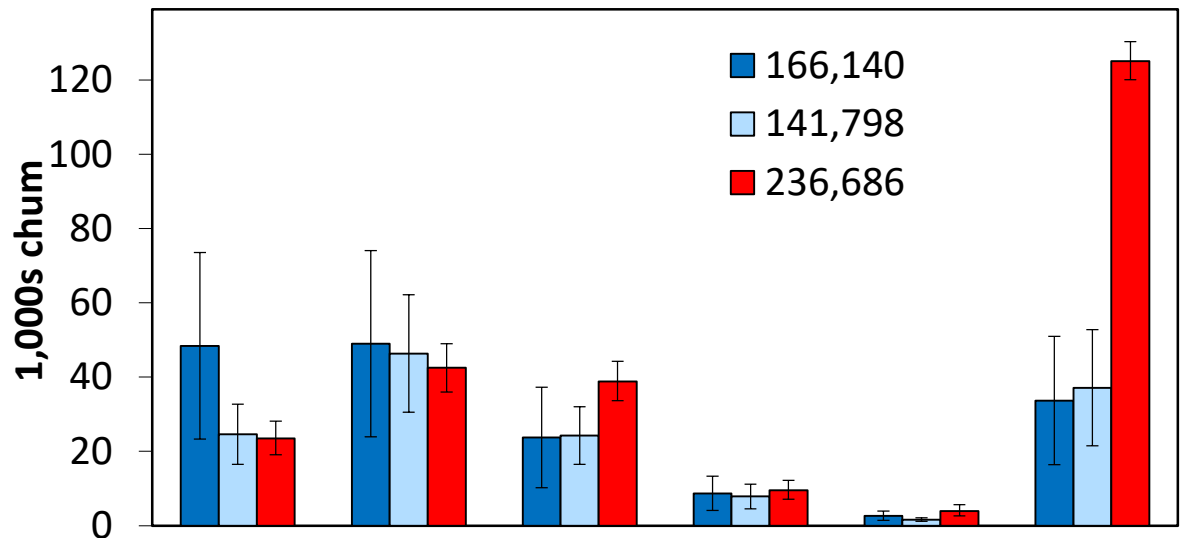
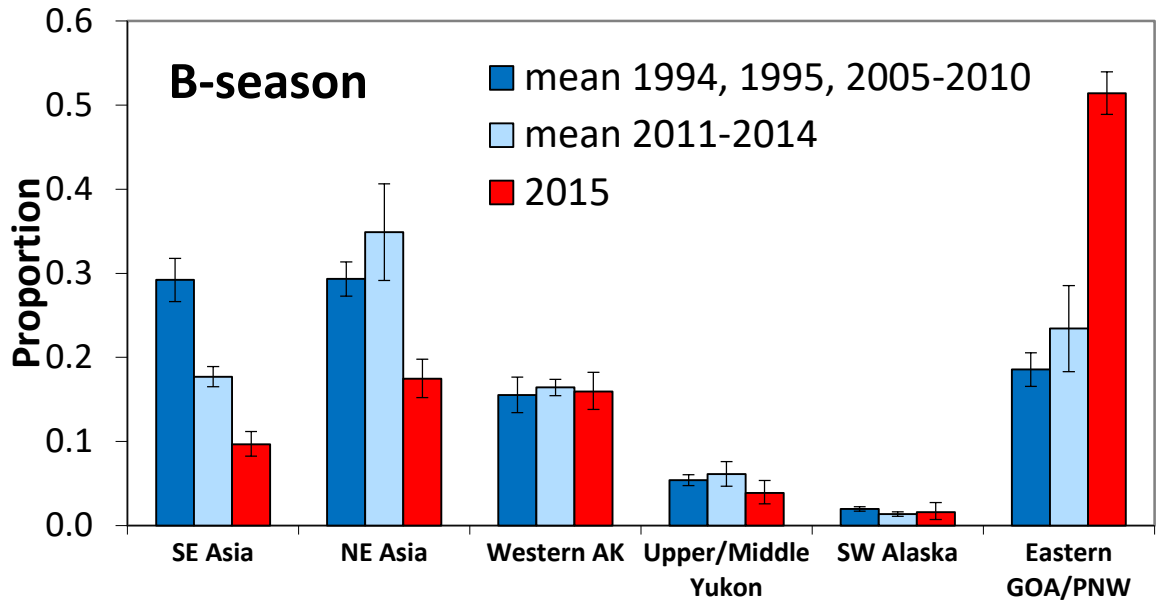
# 2015 Bering Sea chum salmon bycatch



# 2015 Bering Sea chum salmon bycatch

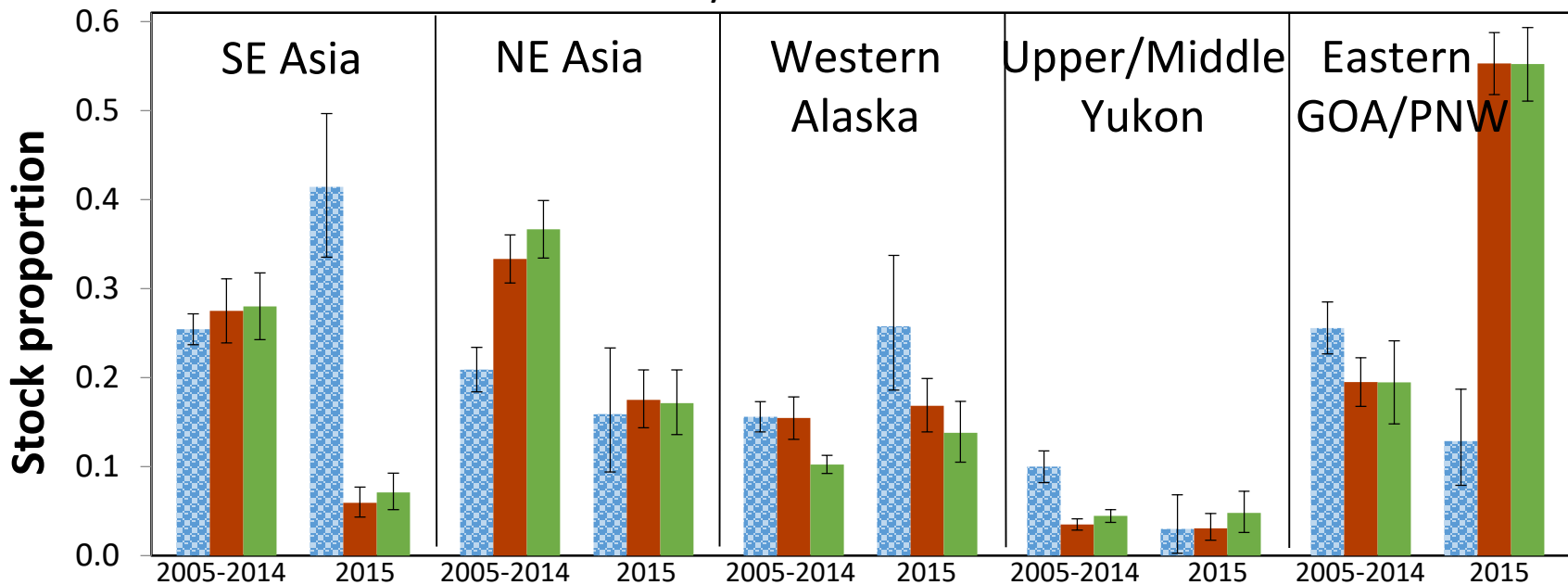
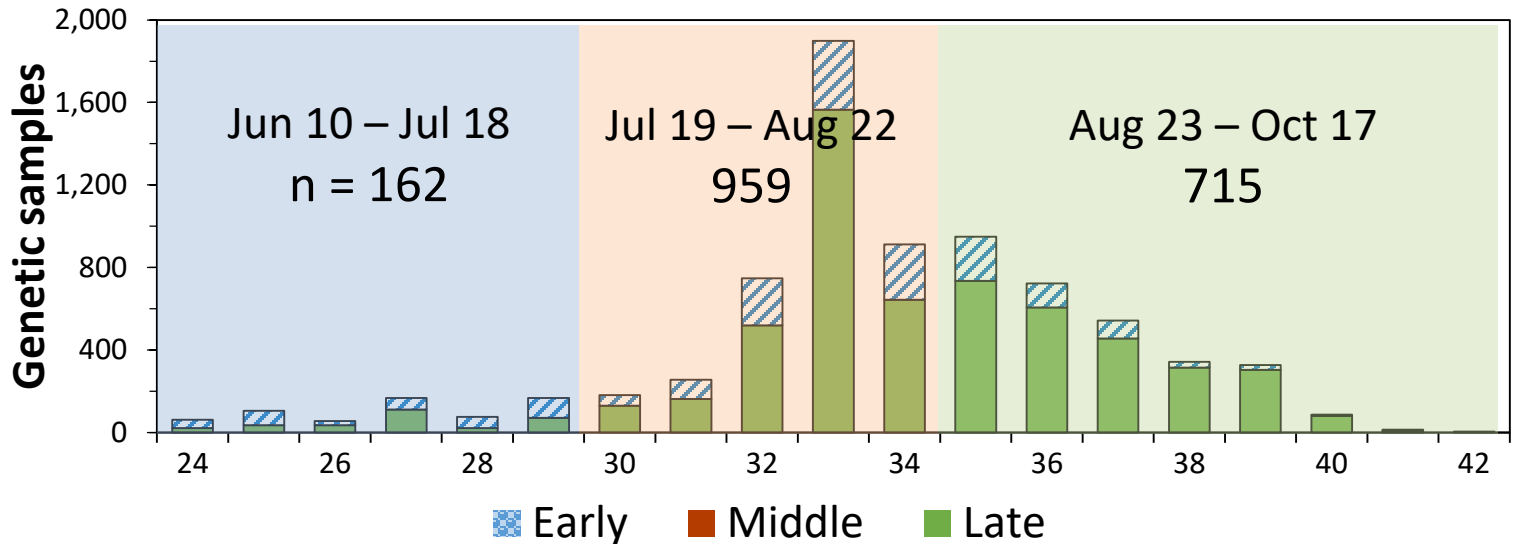
## Stock proportions (1,836 samples)

BAYES Region	Mean	SD
SE Asia	<b>0.097</b>	<b>0.008</b>
NE Asia	<b>0.175</b>	<b>0.012</b>
Western Alaska	<b>0.160</b>	<b>0.011</b>
Upper/Middle Yukon	<b>0.039</b>	<b>0.007</b>
SW Alaska	<b>0.016</b>	<b>0.005</b>
Eastern GOA/PNW	<b>0.514</b>	<b>0.013</b>

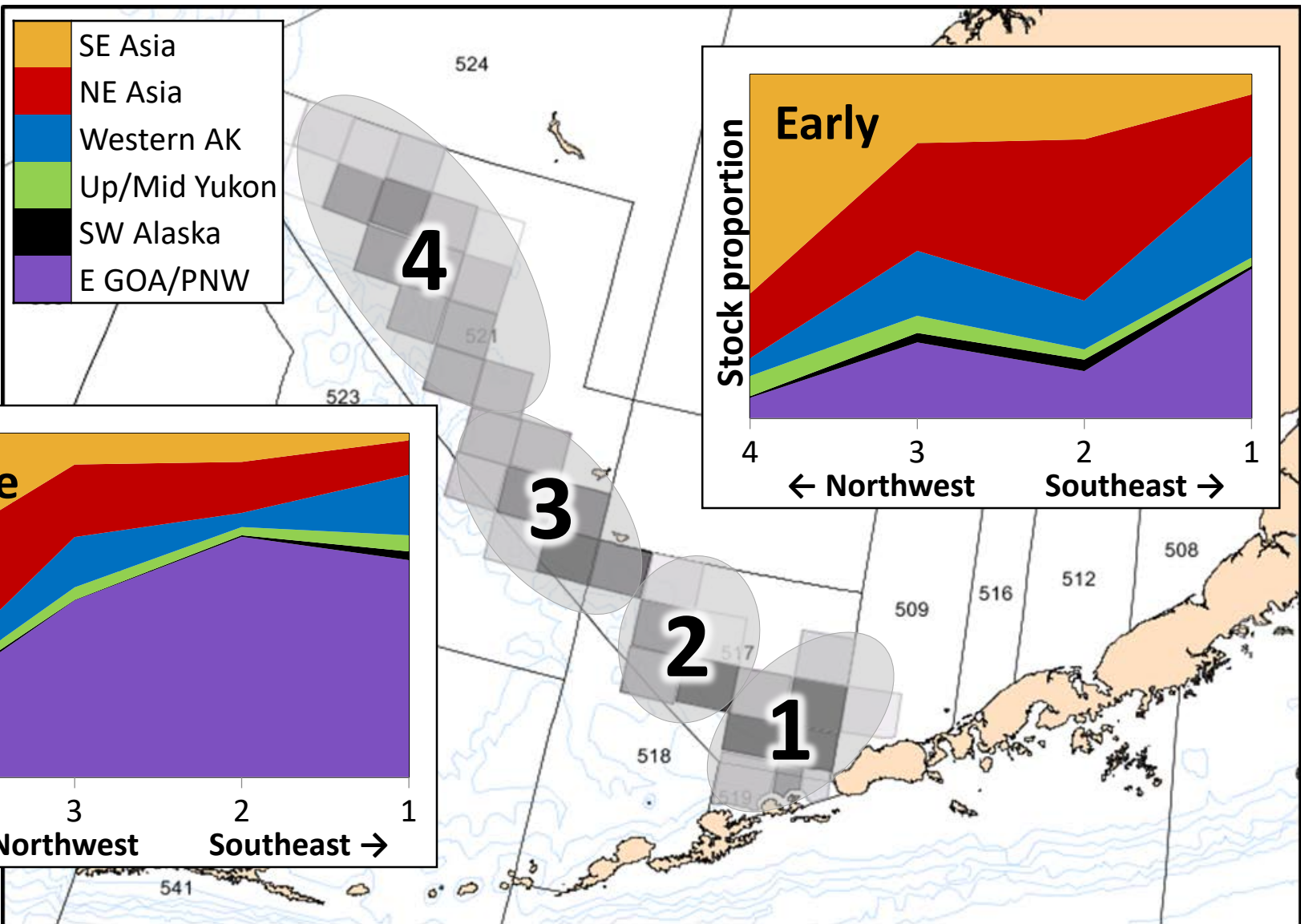




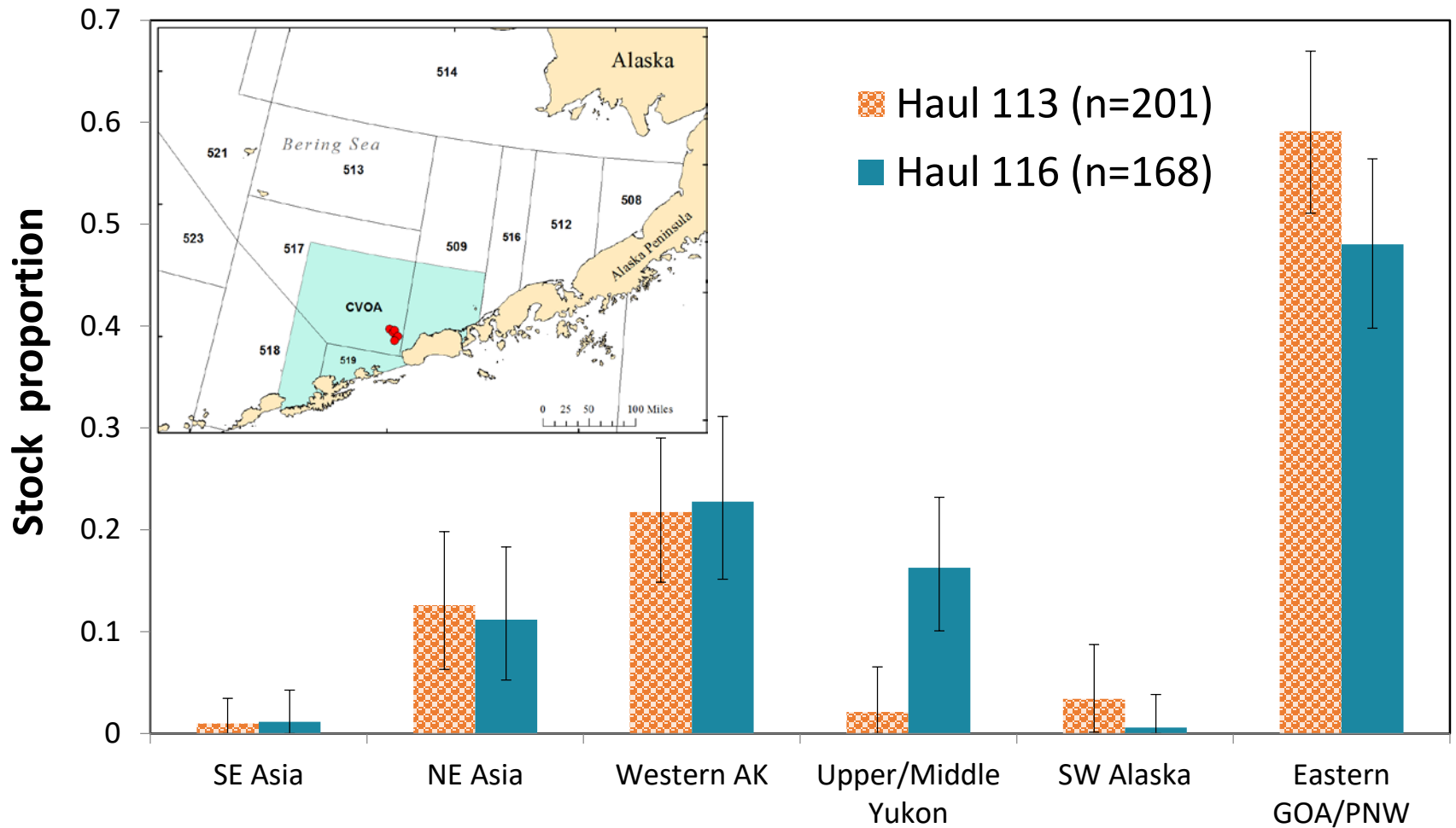
# 2015 Bering Sea chum salmon bycatch



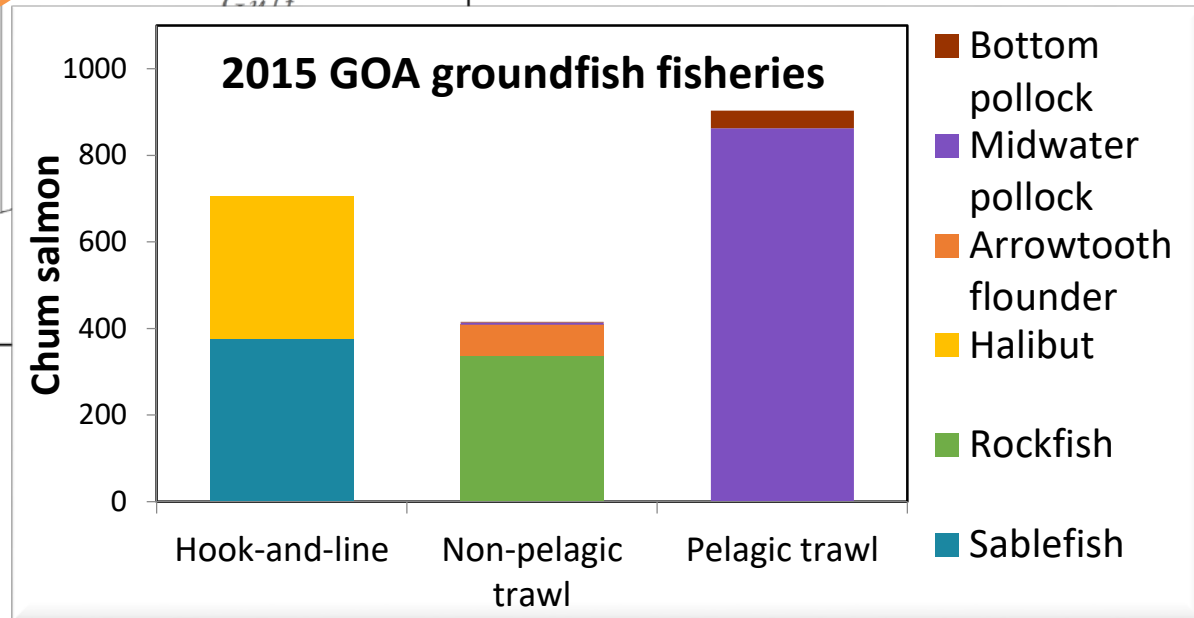
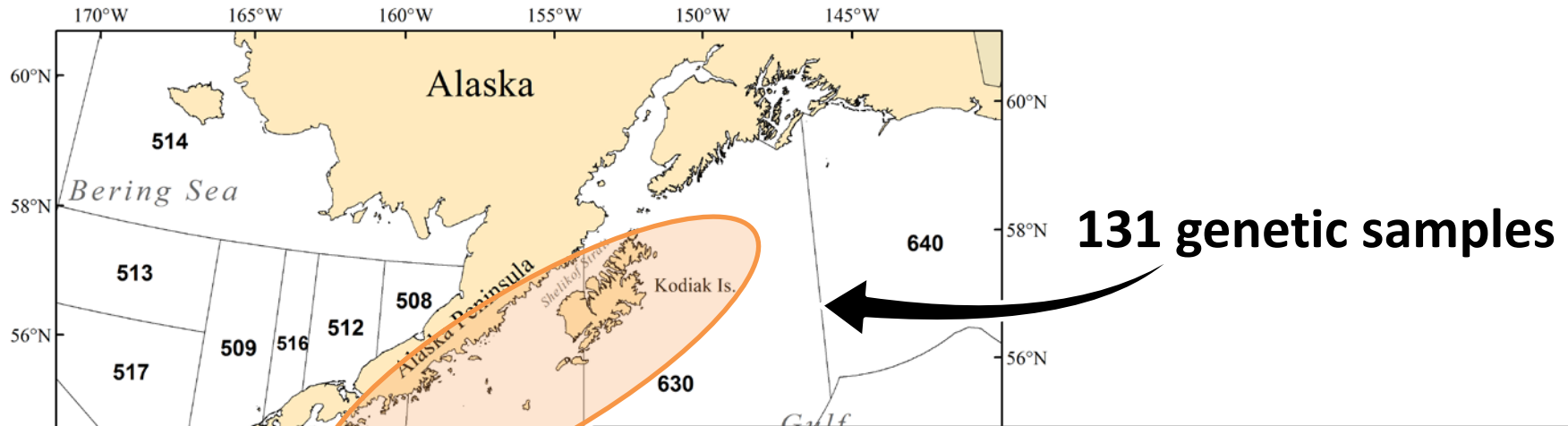
# 2015 Bering Sea chum salmon bycatch



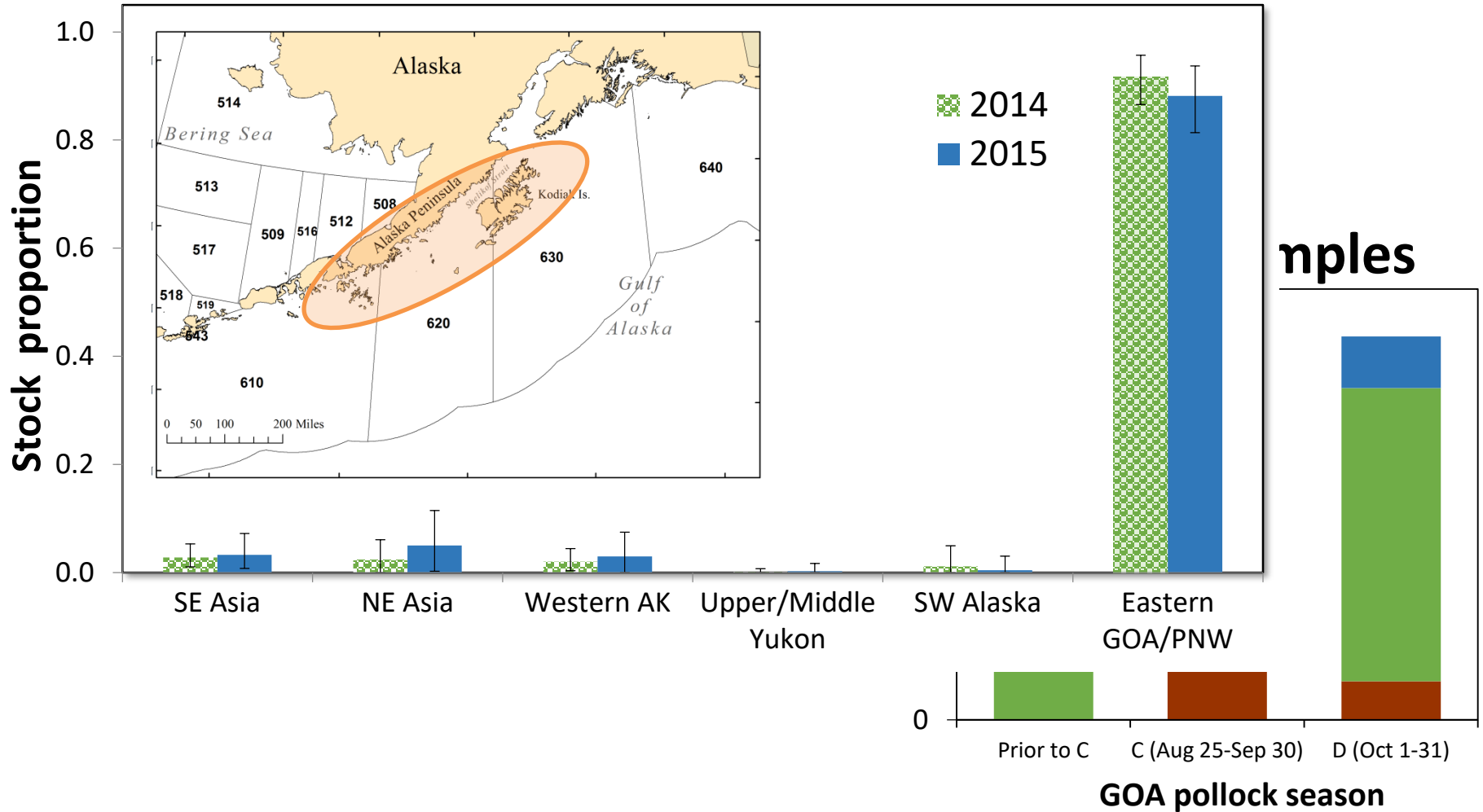
# 2015 salmon excluder device



# 2015 Gulf of Alaska chum salmon bycatch



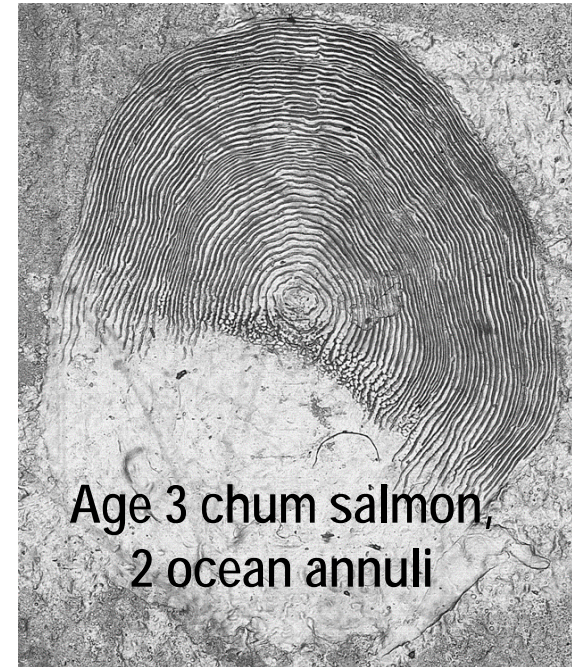
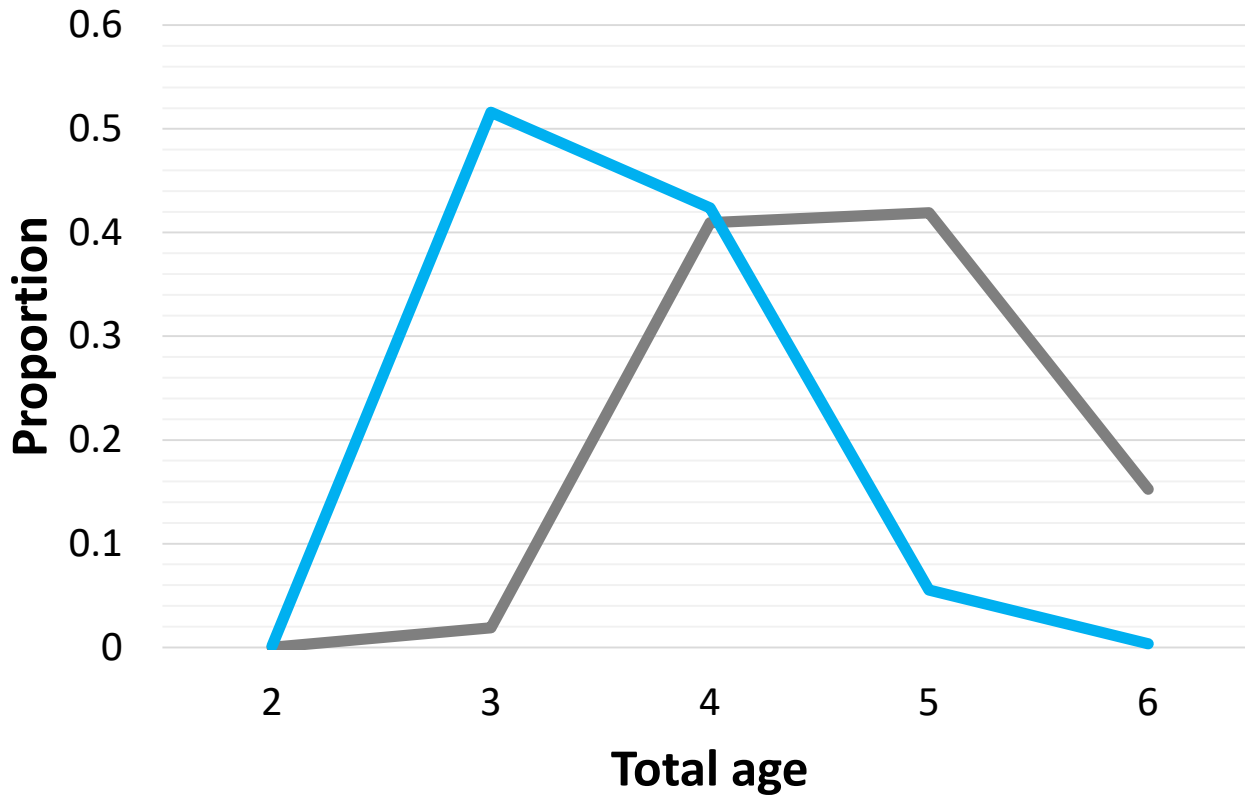
# 2015 Gulf of Alaska chum salmon bycatch



# 2015 Bering Sea chum salmon bycatch

## Age composition

— A Season — B Season

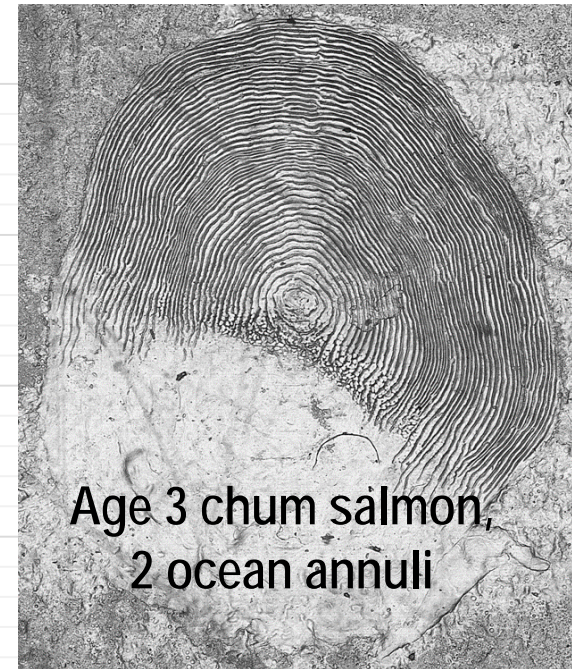
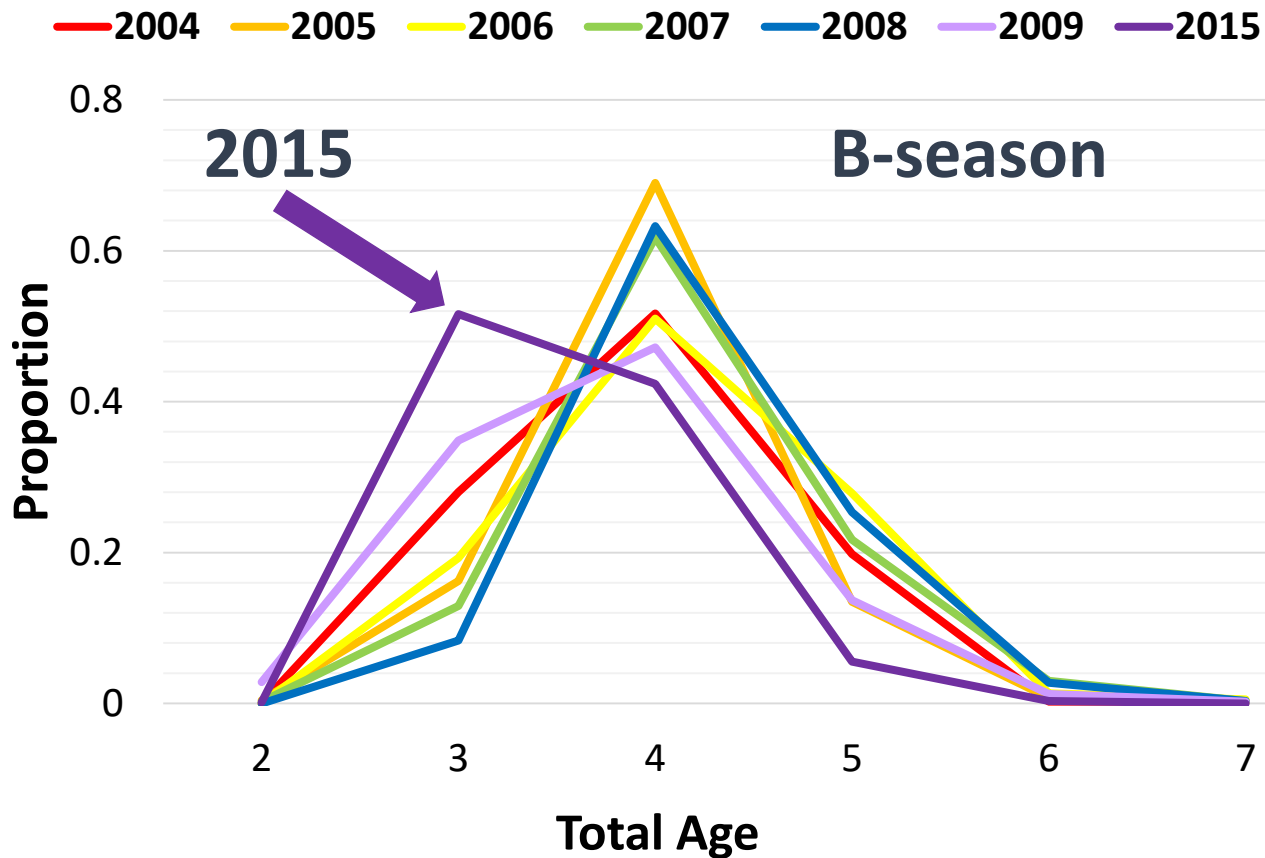


Ellen Yasumiishi, Alaska Fisheries Science Center



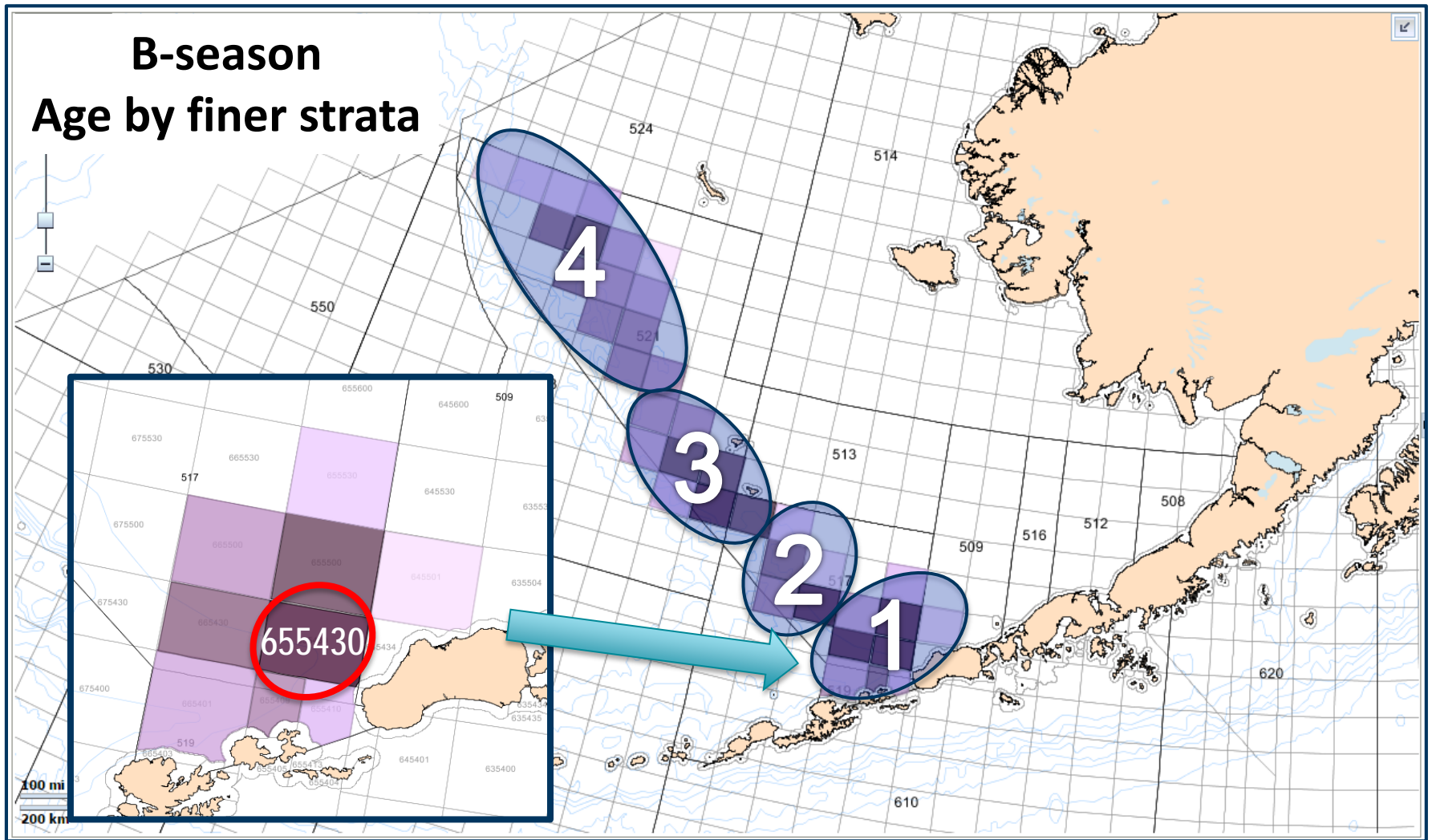
# 2015 Bering Sea chum salmon bycatch

## Age composition



Ellen Yasumiishi, Alaska Fisheries Science Center

# 2015 Bering Sea chum salmon bycatch

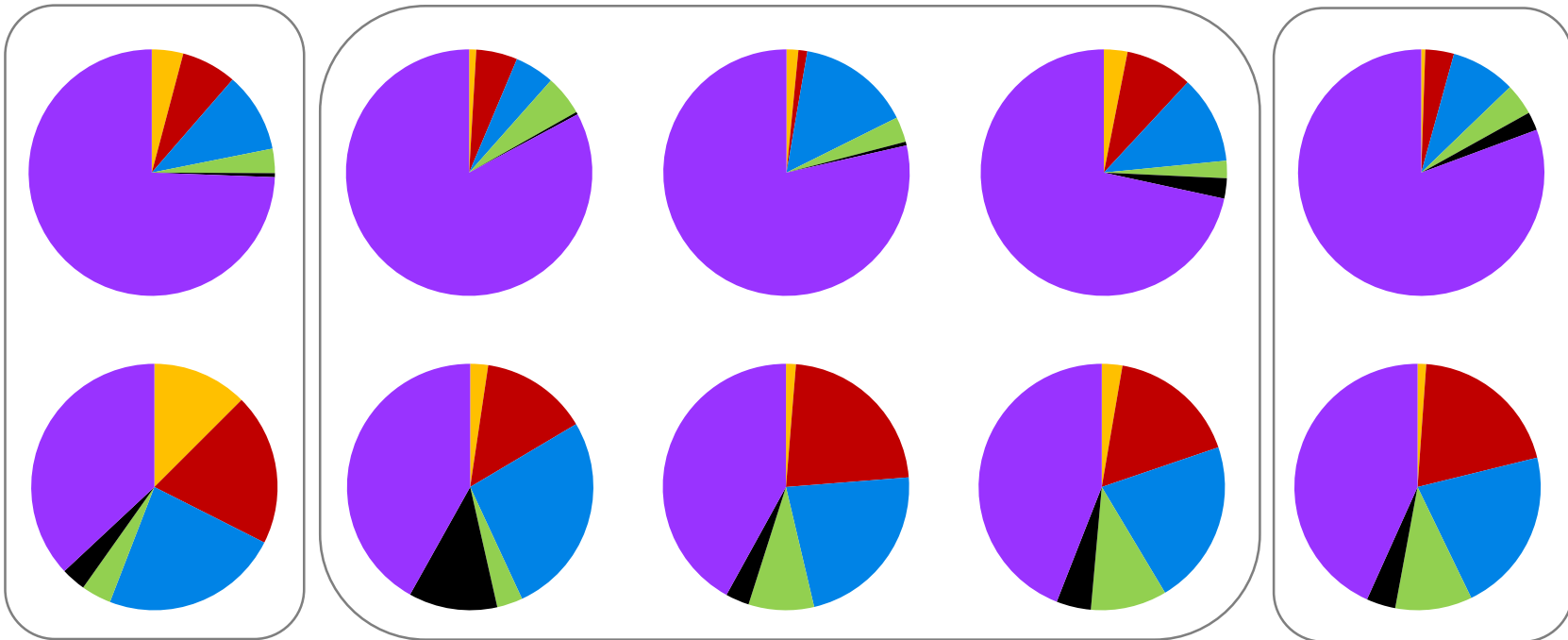




# 2015 Bering Sea chum salmon bycatch



Age 3



Age 4

B-season total

Cluster 1 Wk 31-33

Cluster 1 Wk 34-36

Cluster 1 Wk 37-39

ADFG stat area 655430

# Salmon bycatch – future direction?

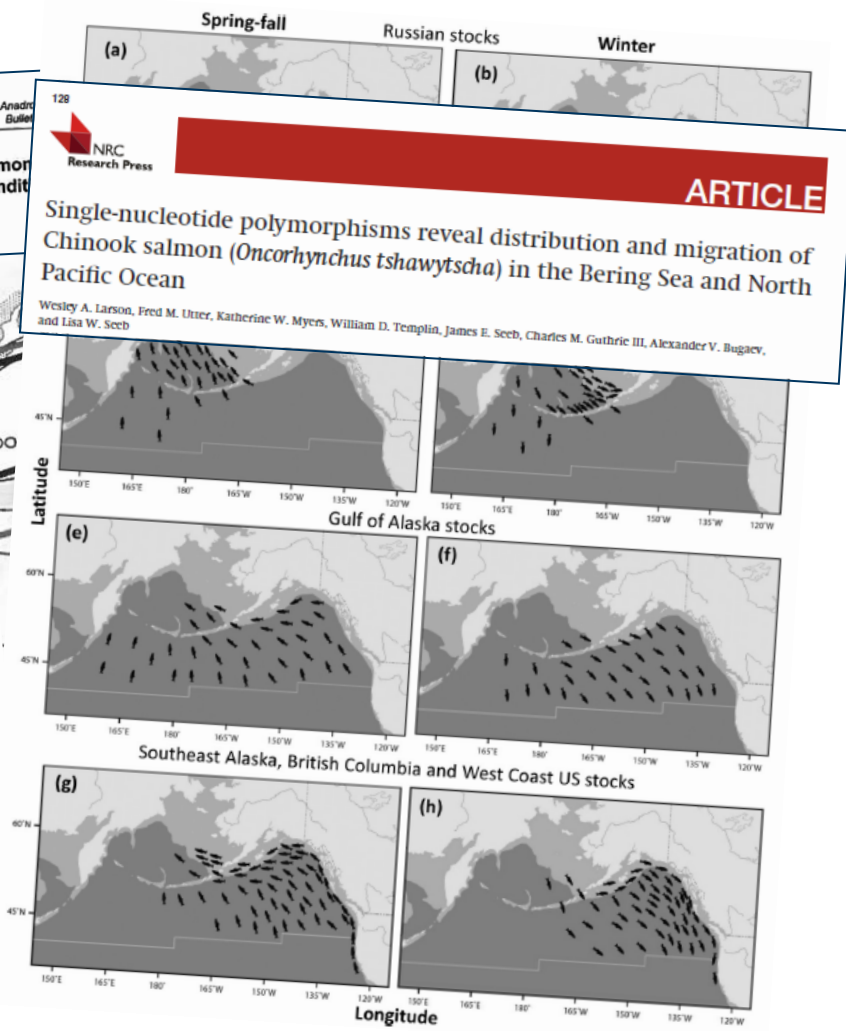
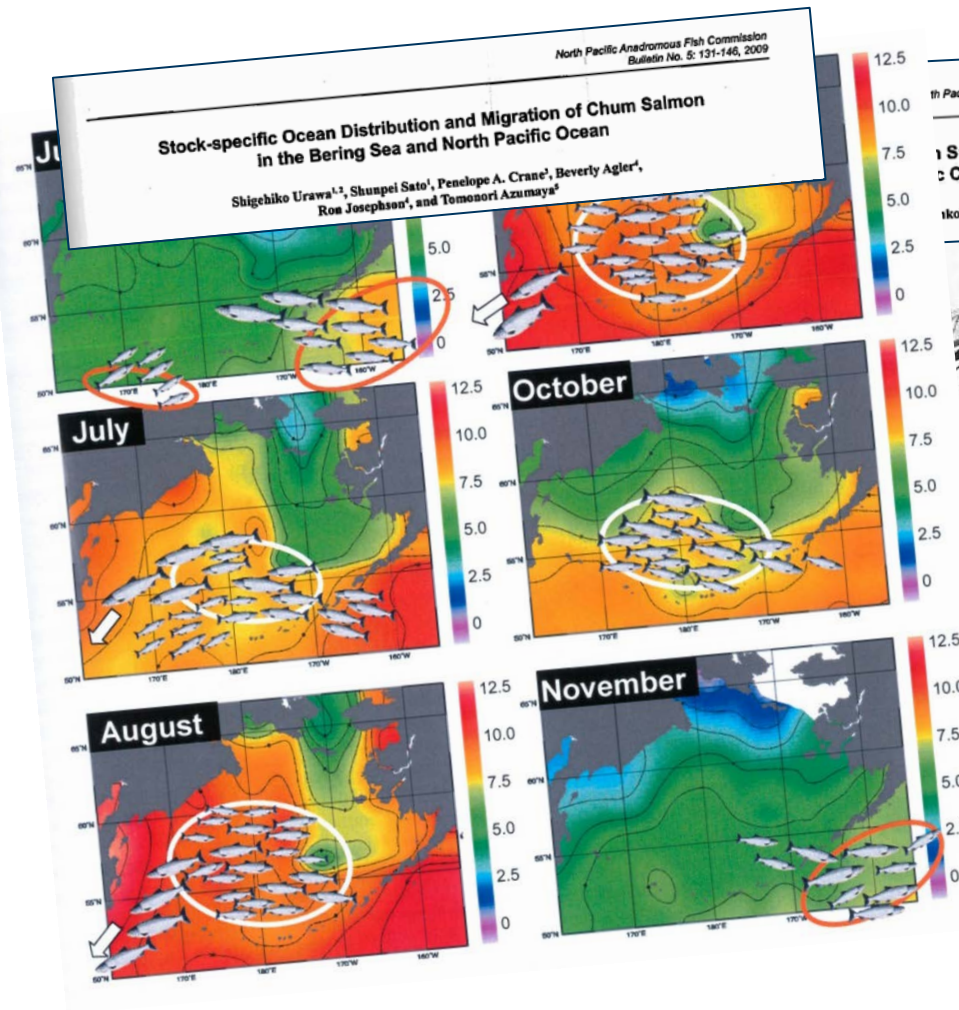
## Relatively large datasets

- From large portions of Bering Sea and GOA shelf during much of the year.
- Multiple years, 2005-2017.
- Systematic sampling in Bering Sea since 2011.
- Improved sampling in GOA.

How can this add to our understanding of ocean distribution?

Are there analyses/models that may inform groundfish management and users of salmon resources?

# Salmon ocean distribution



# Analyses that inform management?

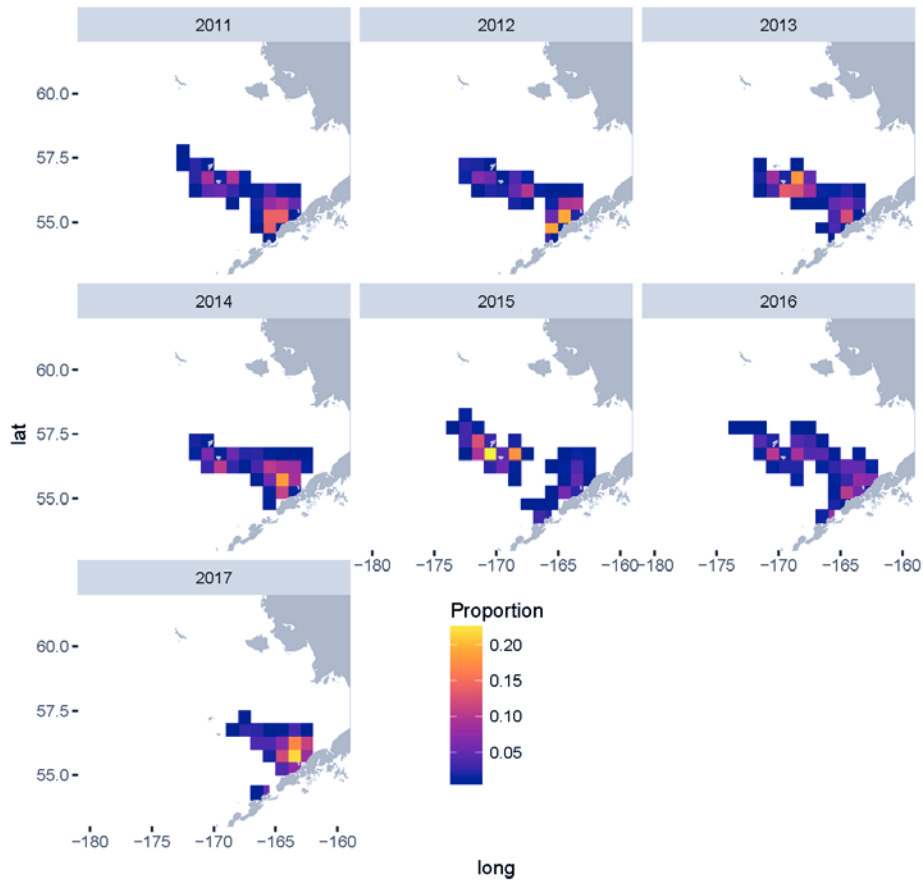
E.g., model stock estimates by:

- Location – how to define areas, how large an area?
- Time – week, season, year
- Vessel effort
- Age of salmon
- Water temperature
- Run size
- Pink salmon abundance?

# Bering Sea pollock fleet effort

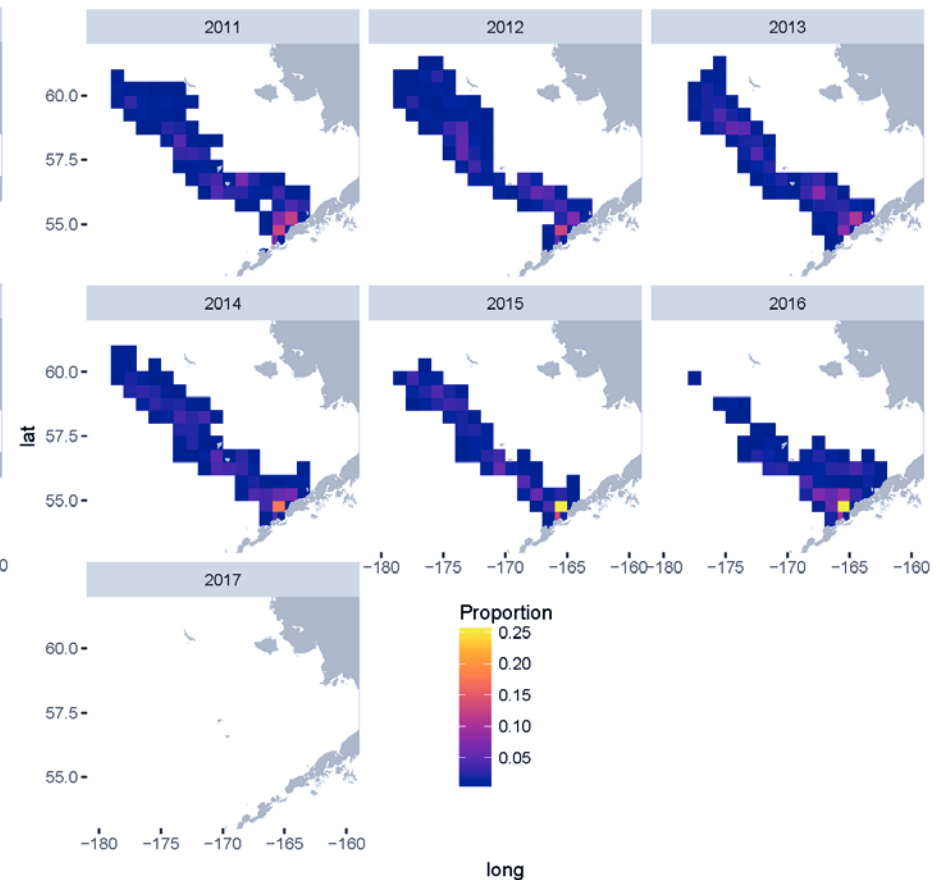
## A-season, Jan-Apr

Proportion of A season hauls that occurred in each stat area



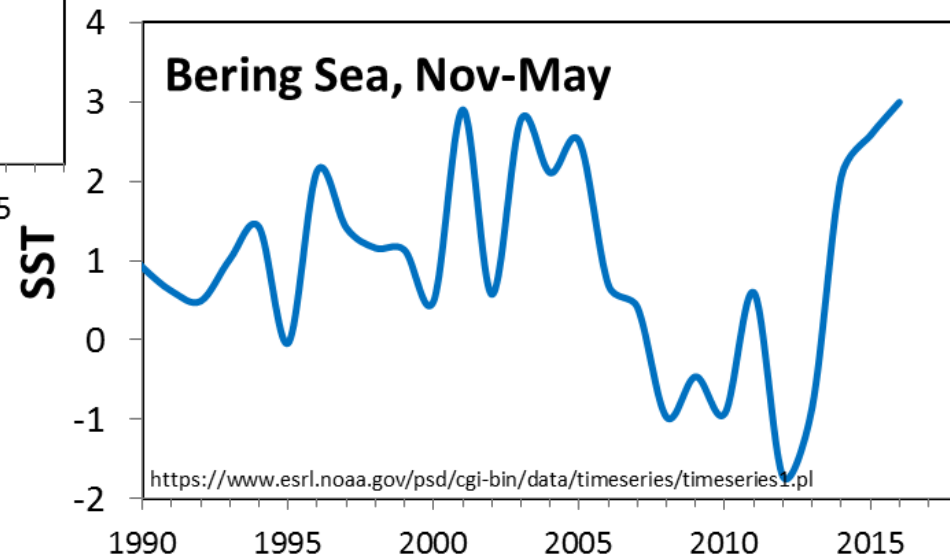
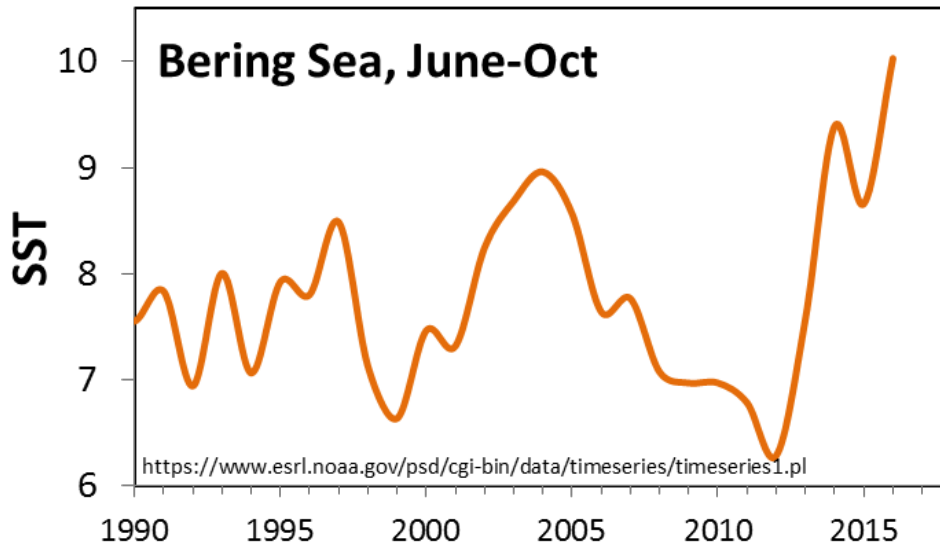
## B-season, Jun-Oct

Proportion of B season hauls that occurred in each stat area



Jordan Watson, Alaska Fisheries Science Center

# Sea surface temperature



Kalnay, E. and Coauthors, 1996: The NCEP/NCAR Reanalysis 40-year Project. Bull. Amer. Meteor. Soc., 77, 437-471.



# Run size


CBCnews | British Columbia

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## 'Largest' recorded chum salmon run: 2 million fish nets, burden boats

'I knew guys that were having nets starting to sink there were so many extra fish'

By Yvette Brend, CBC News | Posted: Nov 04, 2016 8:09 PM PT | Last Updated: Nov 05, 2016 11:37 AM PT



Chum salmon in two stages of their life. The 'silverbright' would be caught out at sea. The striped 'dog salmon' would be closer to spawning grounds. (Shaun Strobel/Skipper Otto's)

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Record numbers of chum salmon — two million fish — returned to B.C.'s West Coast this year, bringing good news for fishermen fatigued by word of record lows of Fraser River sockeye.


"We've had significant abundances ... it's all good news," said Jennifer Nener, Fisheries and Oceans Canada's regional salmon director, earlier this week.

That news got even better with the Johnstone Strait haul hitting 1.3

The Columbian News Sports Business Life Opinion Blogs Neighbors Obituaries

## Chum salmon return to Columbia in big numbers

### Pacific blob, El Niño could be trouble for future populations



A fish biologist displays a bright spawning chum salmon male he has just tagged at Woods Landing just east of the Interstate 205 Bridge on the Columbia River. (The Columbian files)

By Dameon Pesanti, Columbian staff writer  
Published: January 8, 2016, 8:48 PM

This winter's Columbia River chum salmon return could be the largest in more than a decade.

Fisheries biologists monitoring the return say the 2015 run could be as high as 20,000 salmon — the largest since 2002. In 1999, the federal government listed the Columbia River chum salmon as threatened under the Endangered Species Act.

According to the Washington Department of Fish and Wildlife, the vast majority of returning chums are wild in origin. The

# Acknowledgements

## NMFS-ABL

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## PSMFC-AKFIN

Rob Ames

Bob Ryznar

## NMFS-FMA

North Pacific Groundfish and Halibut Observers

Chris Rilling

Julie Blair

Ren Narita

Lisa Thompson

Liz Chilton

Brian Mason



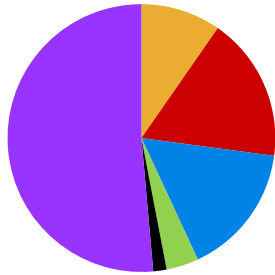
# Bering Sea chum salmon bycatch



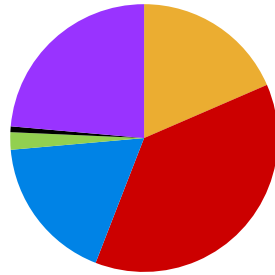
2015 A



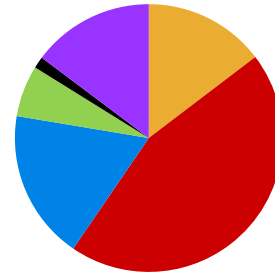
2015 B



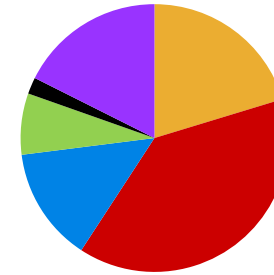
2014



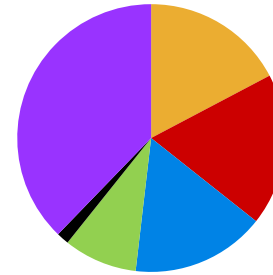
2013



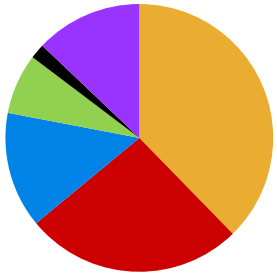
2012



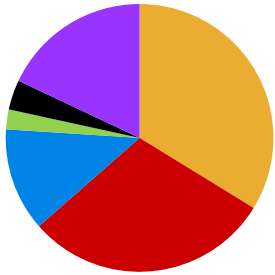
2011



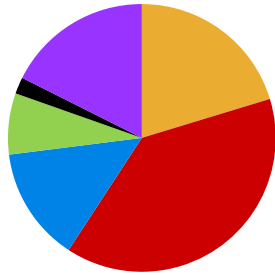
2010



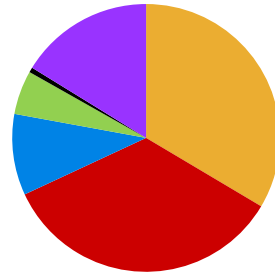
2009



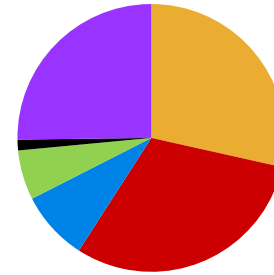
2008



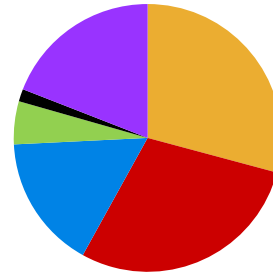
2007



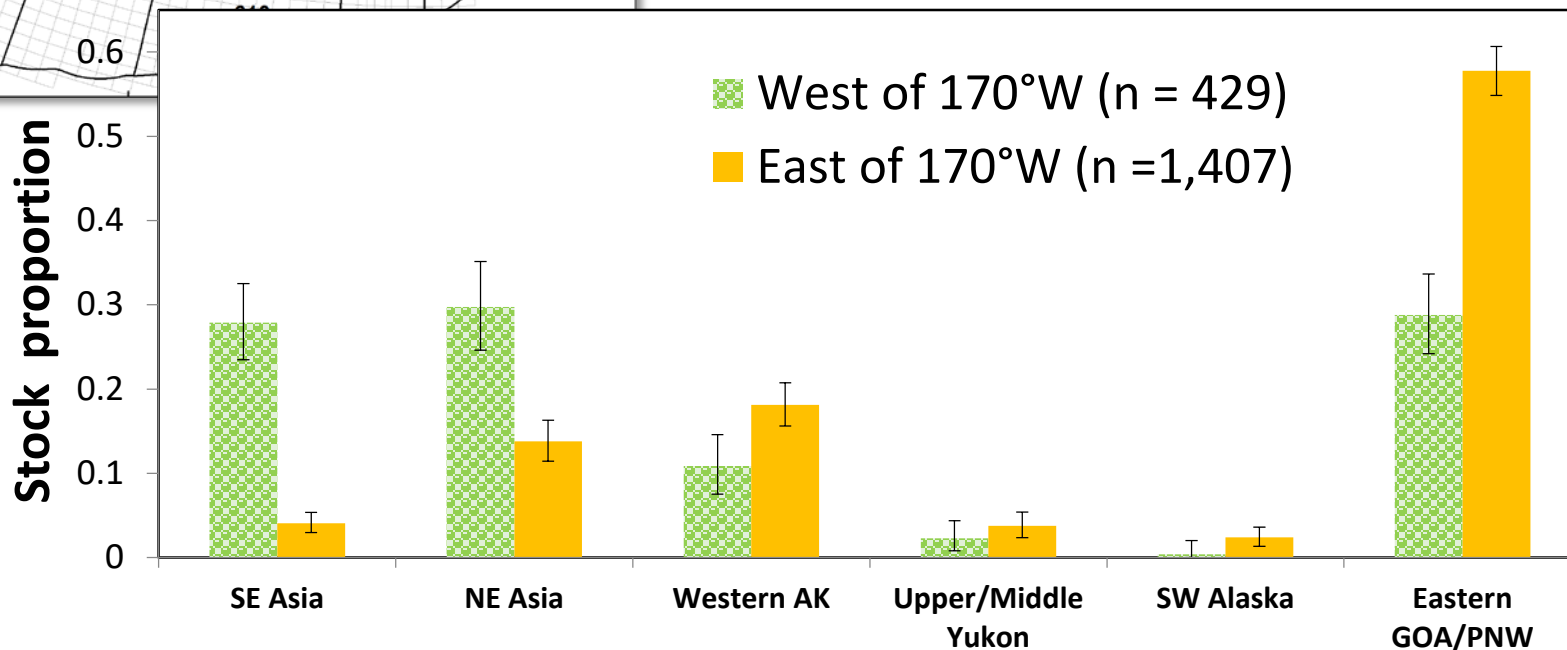
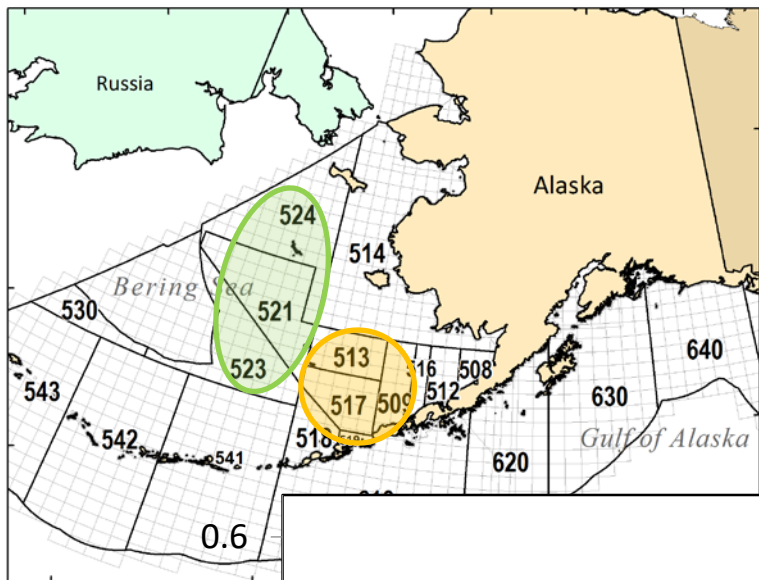
2006



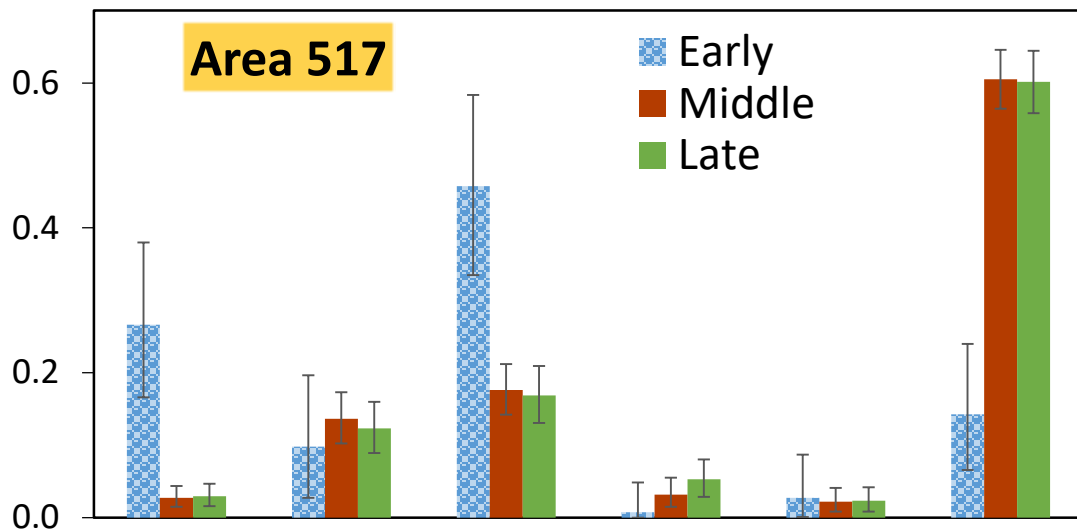
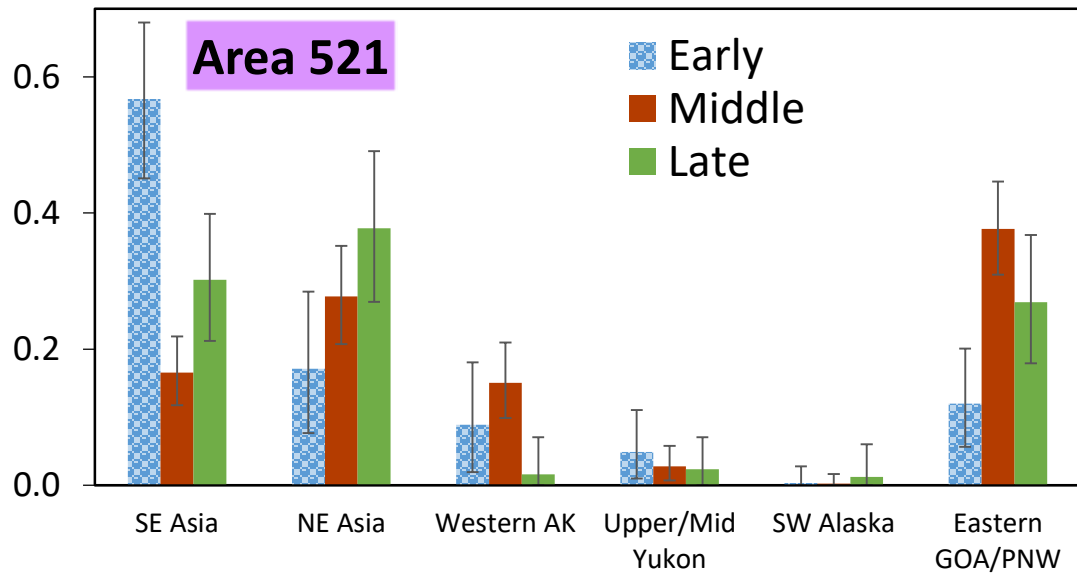
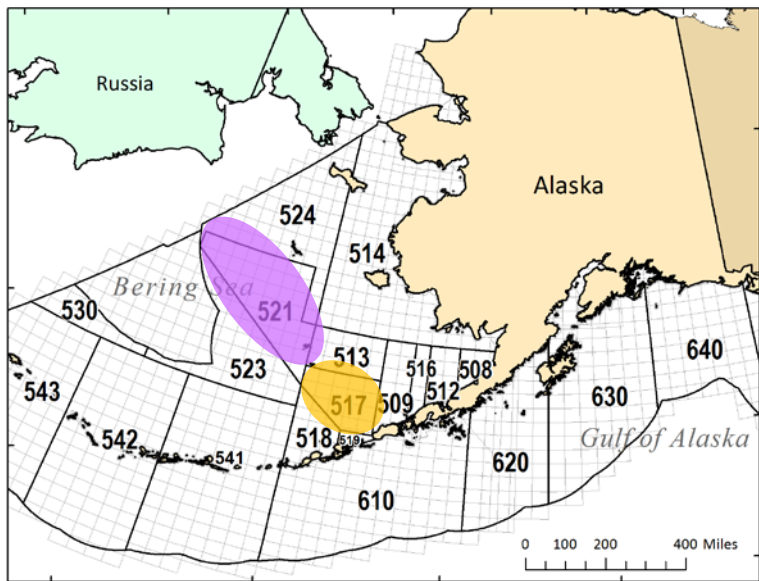
2005



# 2015 Bering Sea chum salmon bycatch



# 2015 Bering Sea chum salmon bycatch



# CIAP-WASC chum salmon collections

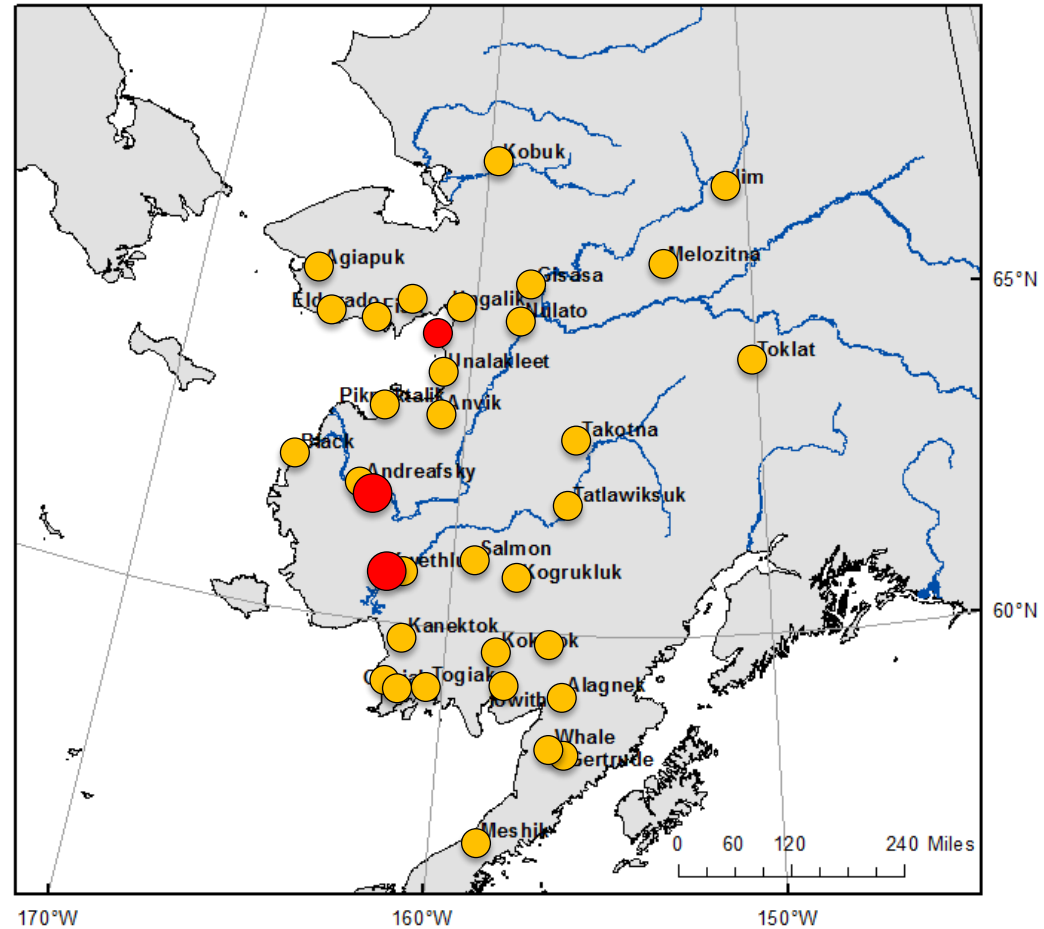
## Goal II

### Objective 1 ●

Genotype 144 samples from each of 32 collections at pre-existing and new microsatellite markers.

### Objective 2 ●

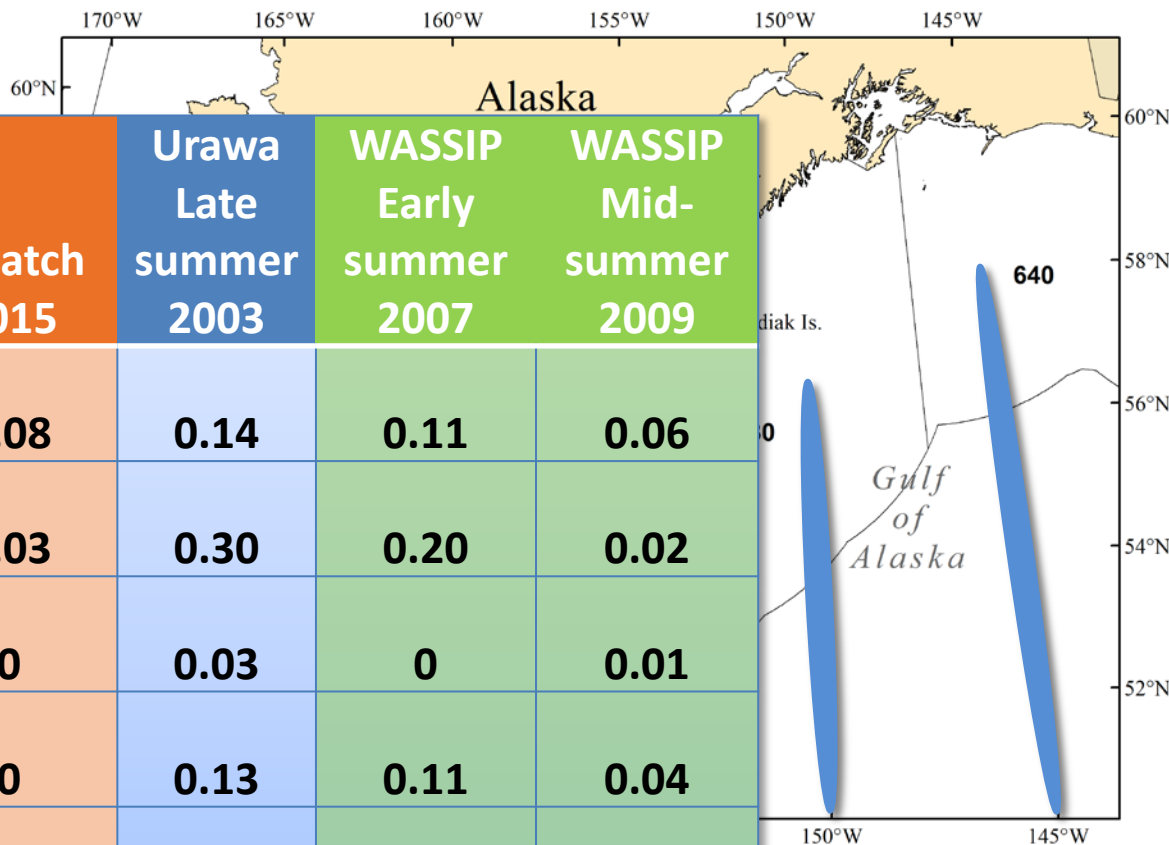
Genotype mixture samples from lower Yukon and Kuskokwim rivers.



# 2015 GOA Chum Salmon Bycatch

## Stock Proportions

Region	Bycatch		Urawa	WASSIP	WASSIP
	2014	2015	Late summer 2003	Early summer 2007	Mid-summer 2009
Asia	0.05	0.08	0.14	0.11	0.06
Western Alaska	0.02	0.03	0.30	0.20	0.02
Up/Mid Yukon	0	0	0.03	0	0.01
SW Alaska	0.01	0	0.13	0.11	0.04
Eastern GOA/PNW	0.92	0.88	0.40	0.58	0.88



WASSIP, 2007-2009



WASSIP, ADFG Eastern District, Chignik Mgt Area

# Principal coordinate analysis

## 11 microsattellites

