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# Genetic stock composition of chum and Chinook salmon bycatch from the 2023 BSAI pollock trawl fishery

## Preliminary Results:

Presented to the North Pacific Fisheries Management Council April 2024

P Barry, K D'Amelio, J Whittle, J Musbach, J Cornett, J Whitney, C Kondzela, & W Larson



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# Chum salmon

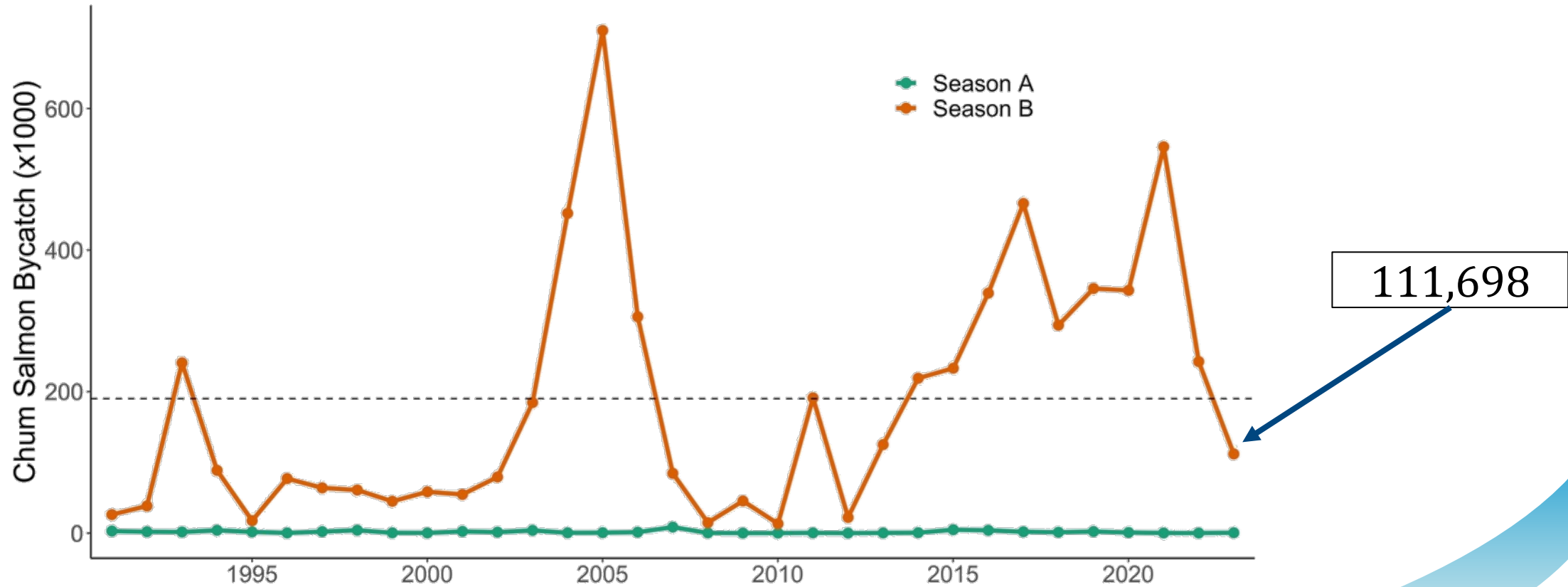


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# Chum Salmon Prohibited Species Catch

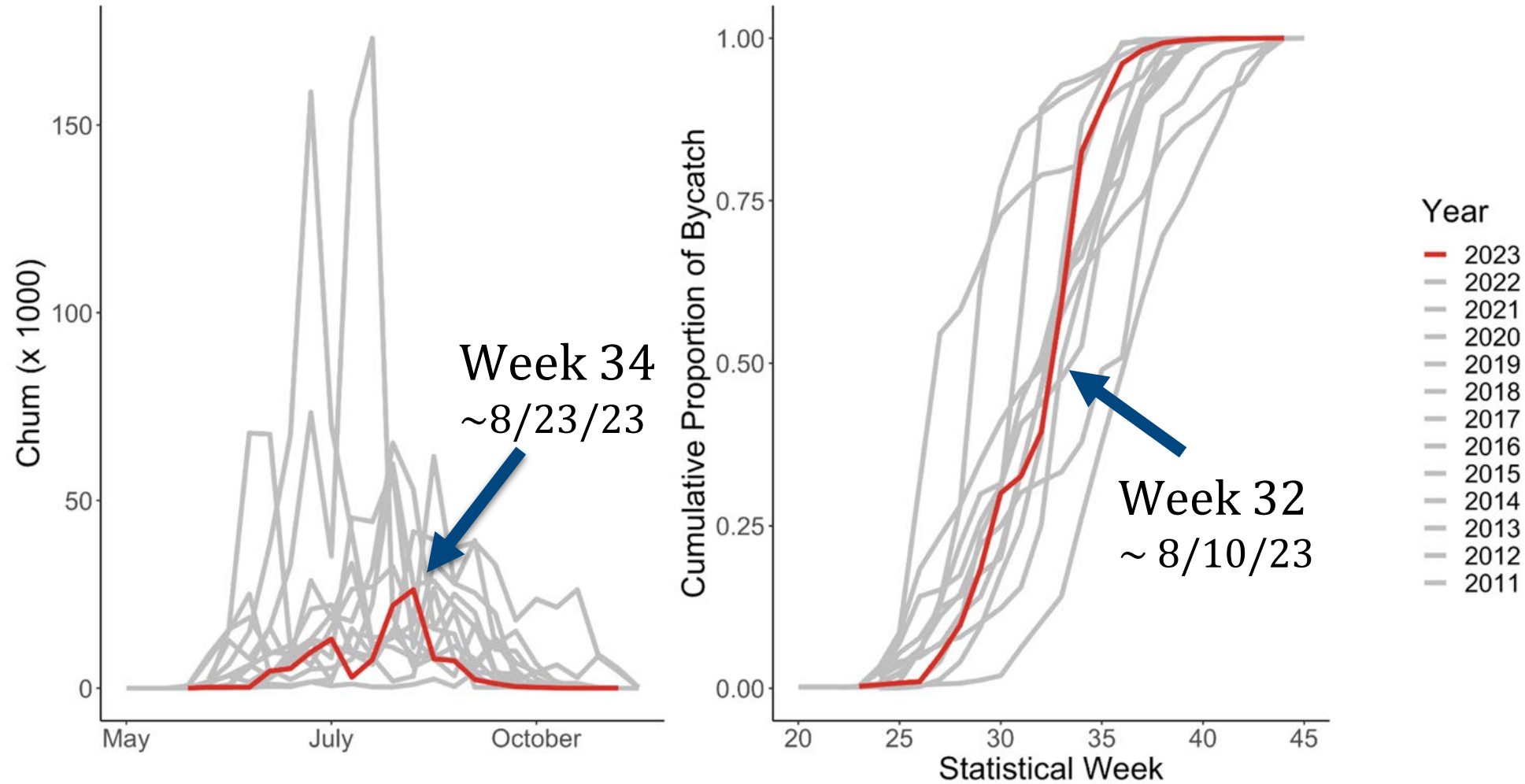
99.6% in B-season

Avg. bycatch 1991-2022 ~ 190,000 chum salmon



111,698

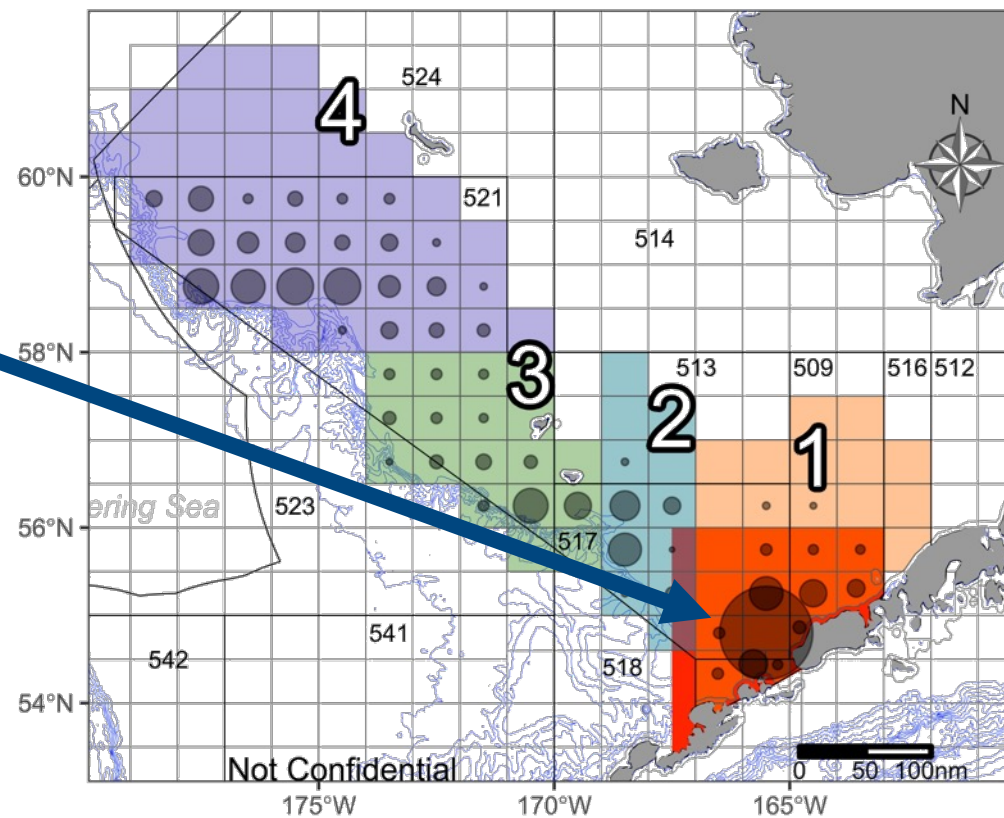
# Timing of chum salmon bycatch - B season





# Spatial distribution of the chum salmon bycatch

- Largest bycatch in statistical area 655430 ~44,035 chum (39.5%)
- Clusters:
  - 1 - 50.8%
  - 2 - 8.0%
  - 3 - 9.3%
  - 4 - 31.9%



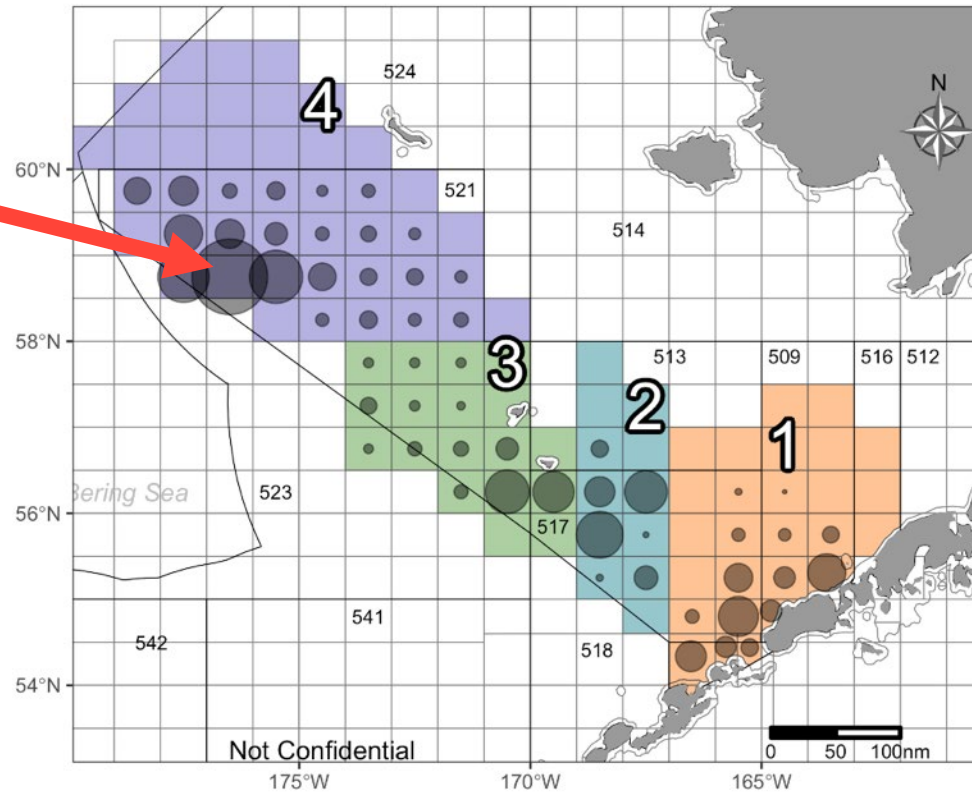
PSC ● 500 ● 5000 ● 20000 ● 44000

# Bycatch Rate (Chum per mt. Pollock)

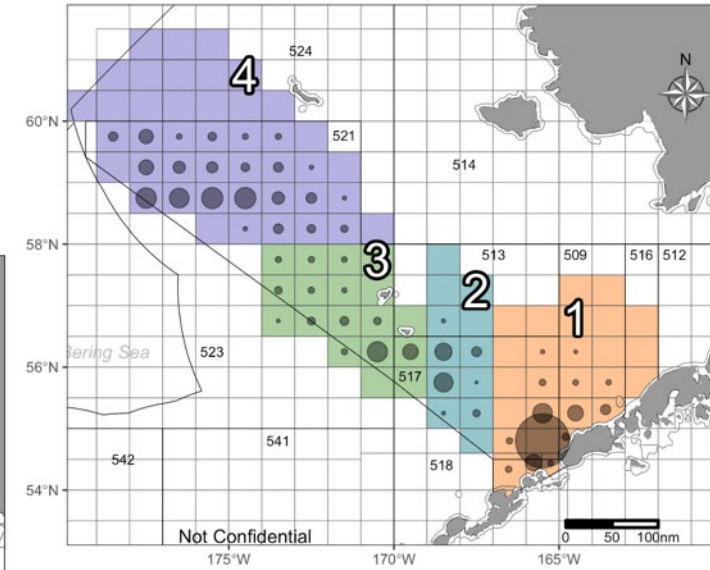
## Bycatch Rates

- Largest statistical area 765830  
1.49 chum per mt. ton pollock
- Clusters:
  - 1 - 0.21
  - 2 - 0.25
  - 3 - 0.08
  - 4 - 0.13

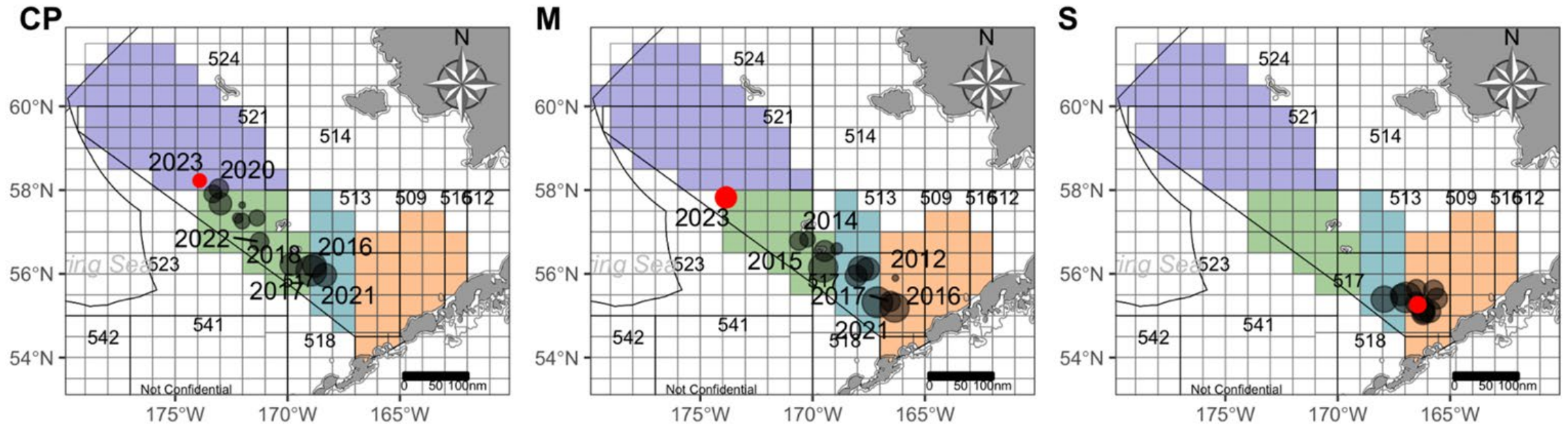
Chum per metric ton of pollock



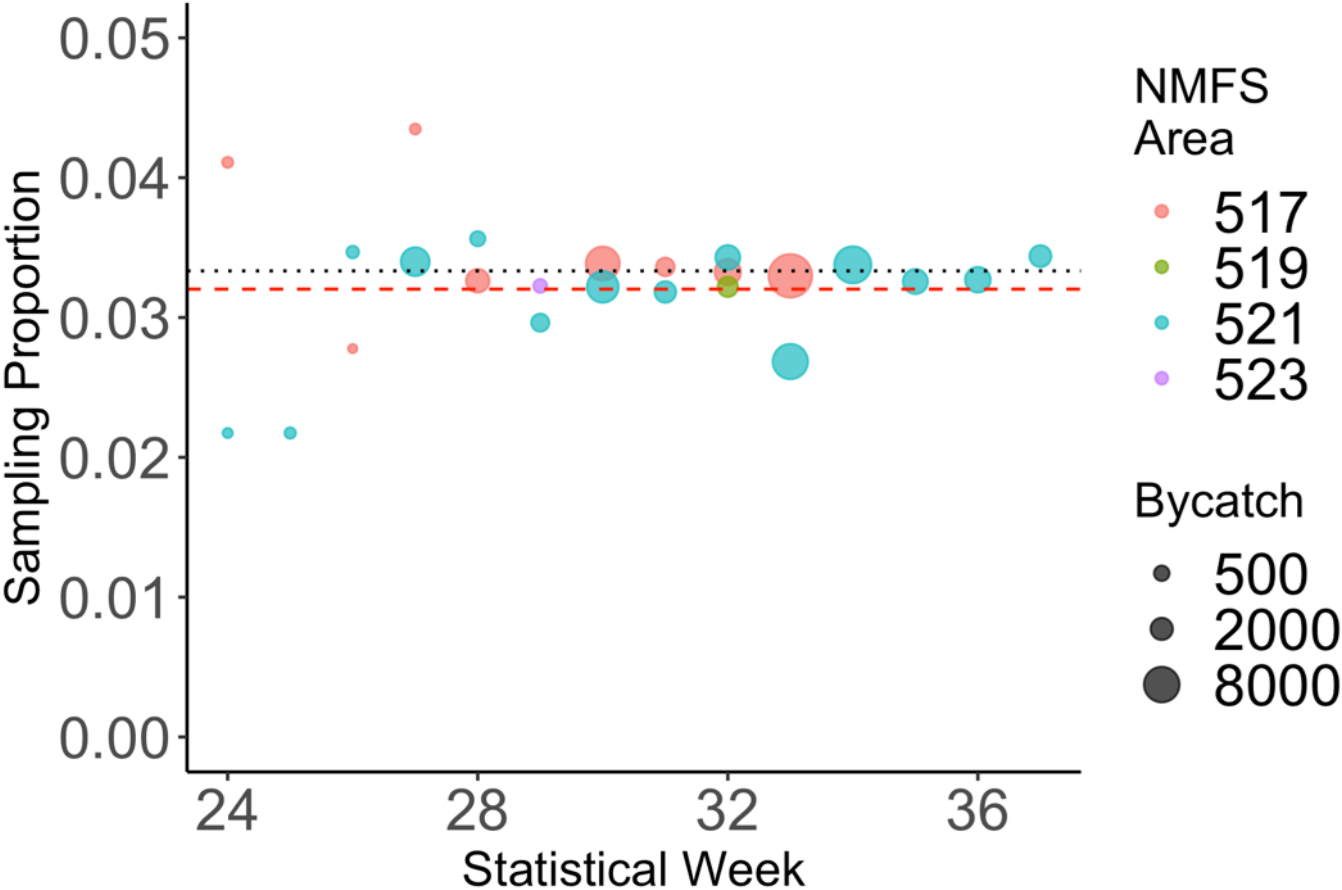
Chum Bycatch



# Changes in spatial distribution of chum salmon bycatch by fishing sector



# Genetic sampling of chum salmon by week and NMFS area



Black dot line = 1 in 30 goal

Red dash line ~ 1 in 31 realized average sampling



# Chum salmon genetic baseline

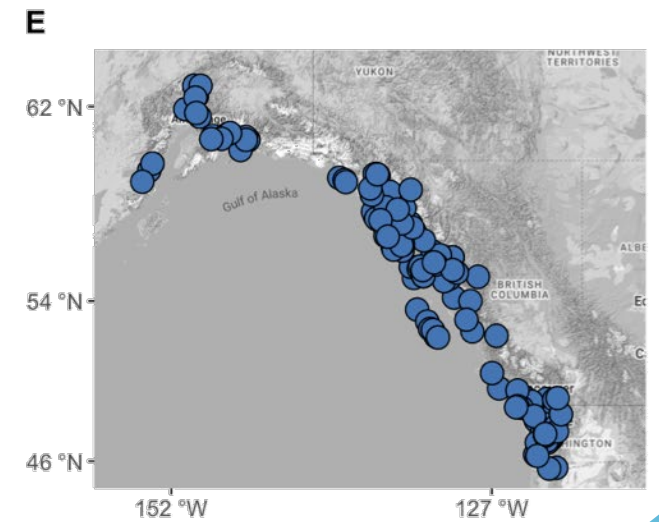
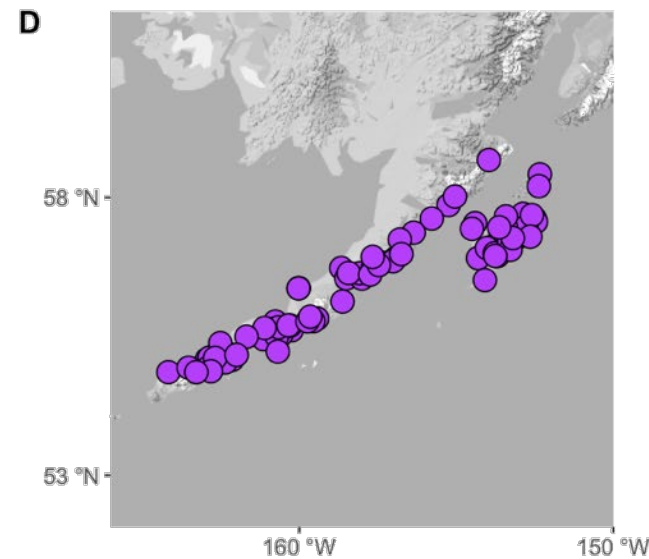
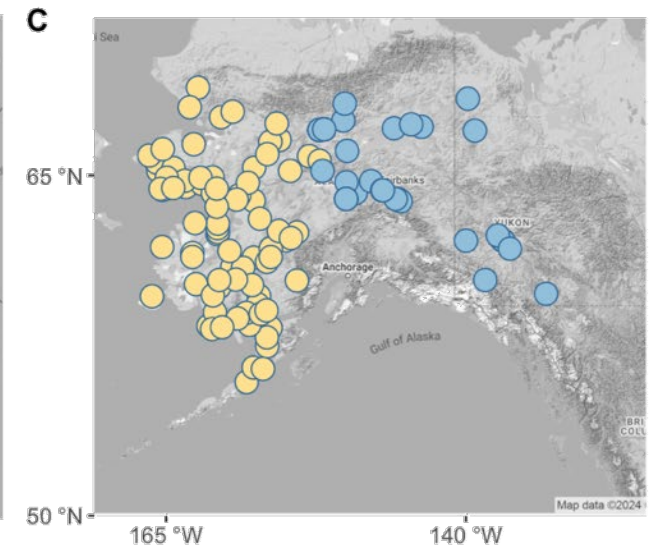
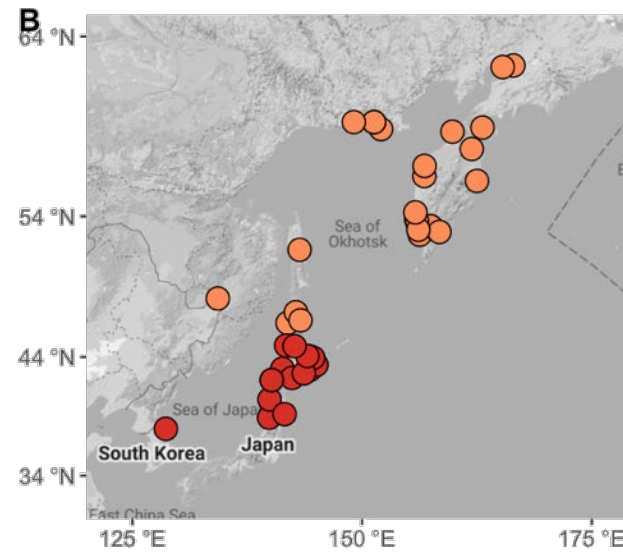
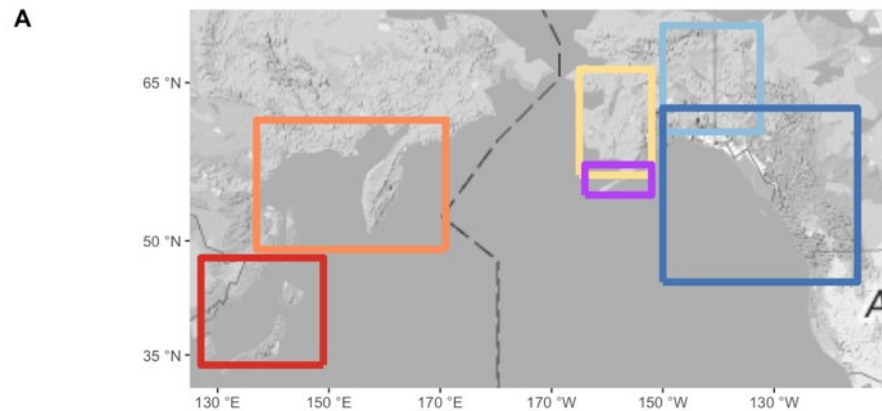
6 reporting groups:

B. NE Asia & SE Asia

C. W Alaska & Up/Mid Yukon

D. SW Alaska

E. EGOA/PNW

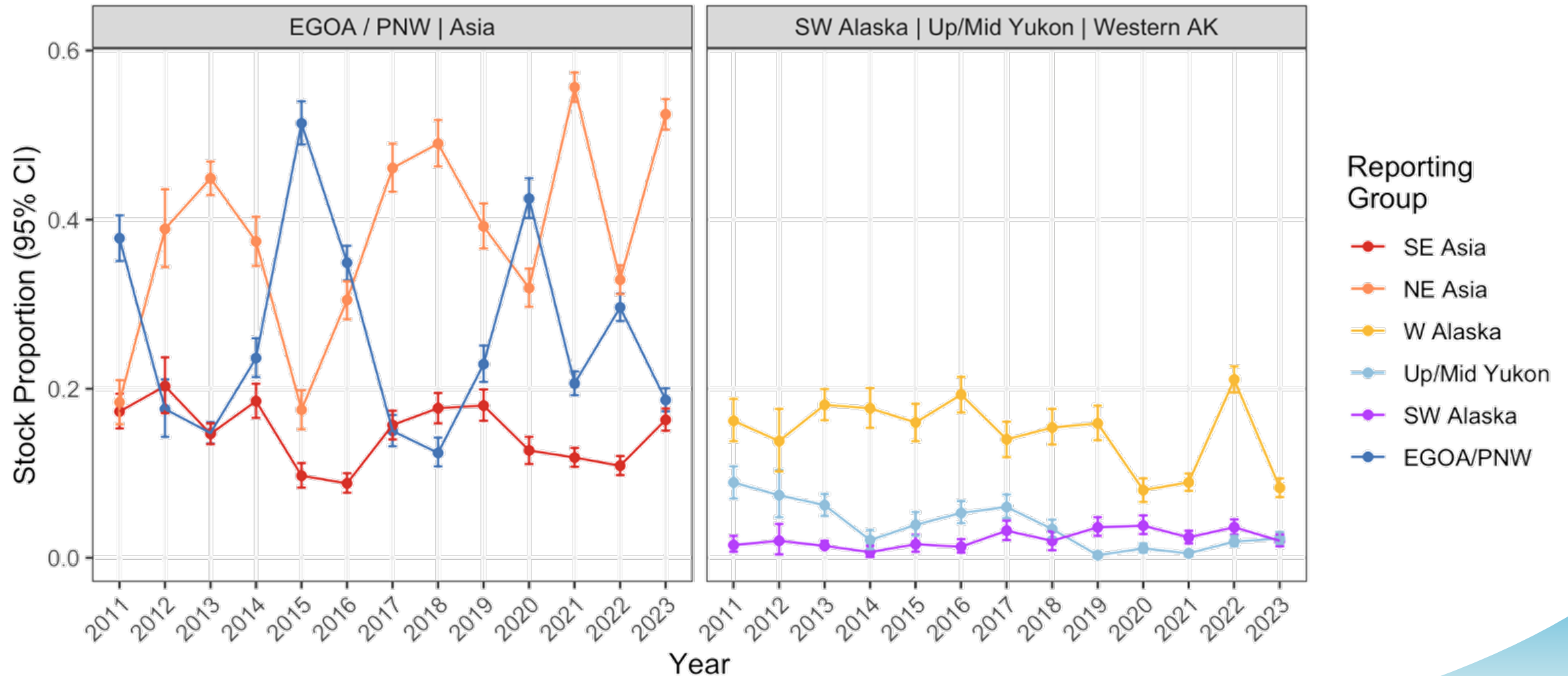


# Chum salmon stock proportions: 2023 B-season

B-season (PSC = 111,698; n = 3277)

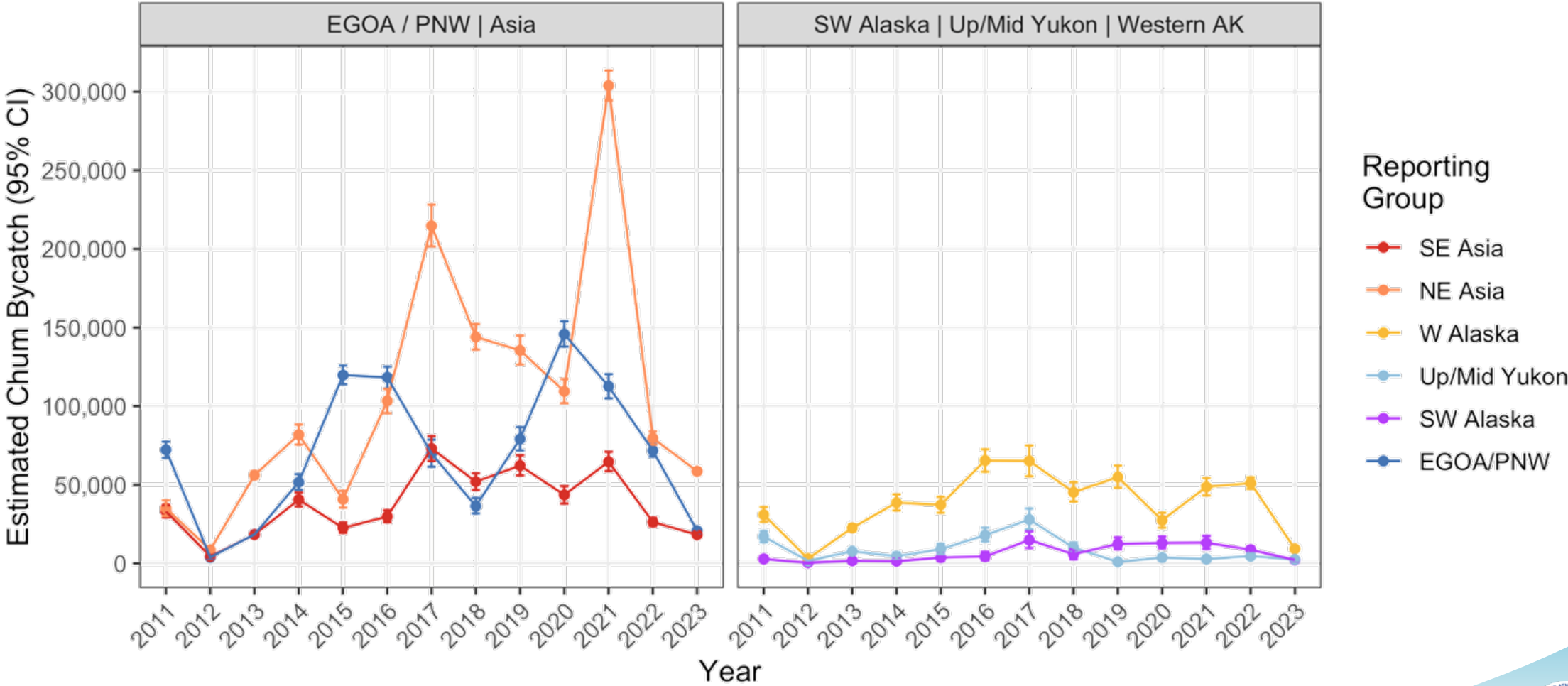
Region	Est. num.	Est. CI	Mean	2.5%	97.5%	P=0	SF
SE Asia	18,221	16,771-19,718	0.163	0.150	0.177	0.00	1.00
NE Asia	58,604	56,573-60,593	0.525	0.506	0.542	0.00	1.00
W Alaska	9,246	8,025-10,481	0.083	0.072	0.094	0.00	1.00
Up/Mid Yukon	2,540	1,857-3,403	0.023	0.017	0.030	0.00	1.00
SW Alaska	2,245	1,498-3,073	0.020	0.013	0.028	0.00	1.00
E GOA/PNW	20,839	19,322-22,402	0.187	0.173	0.201	0.00	1.00

# Stock proportions of chum salmon through time

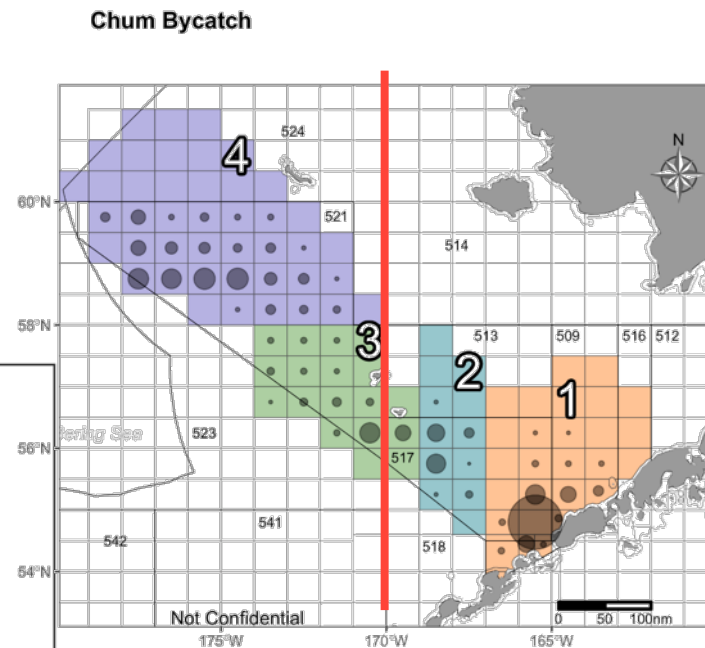
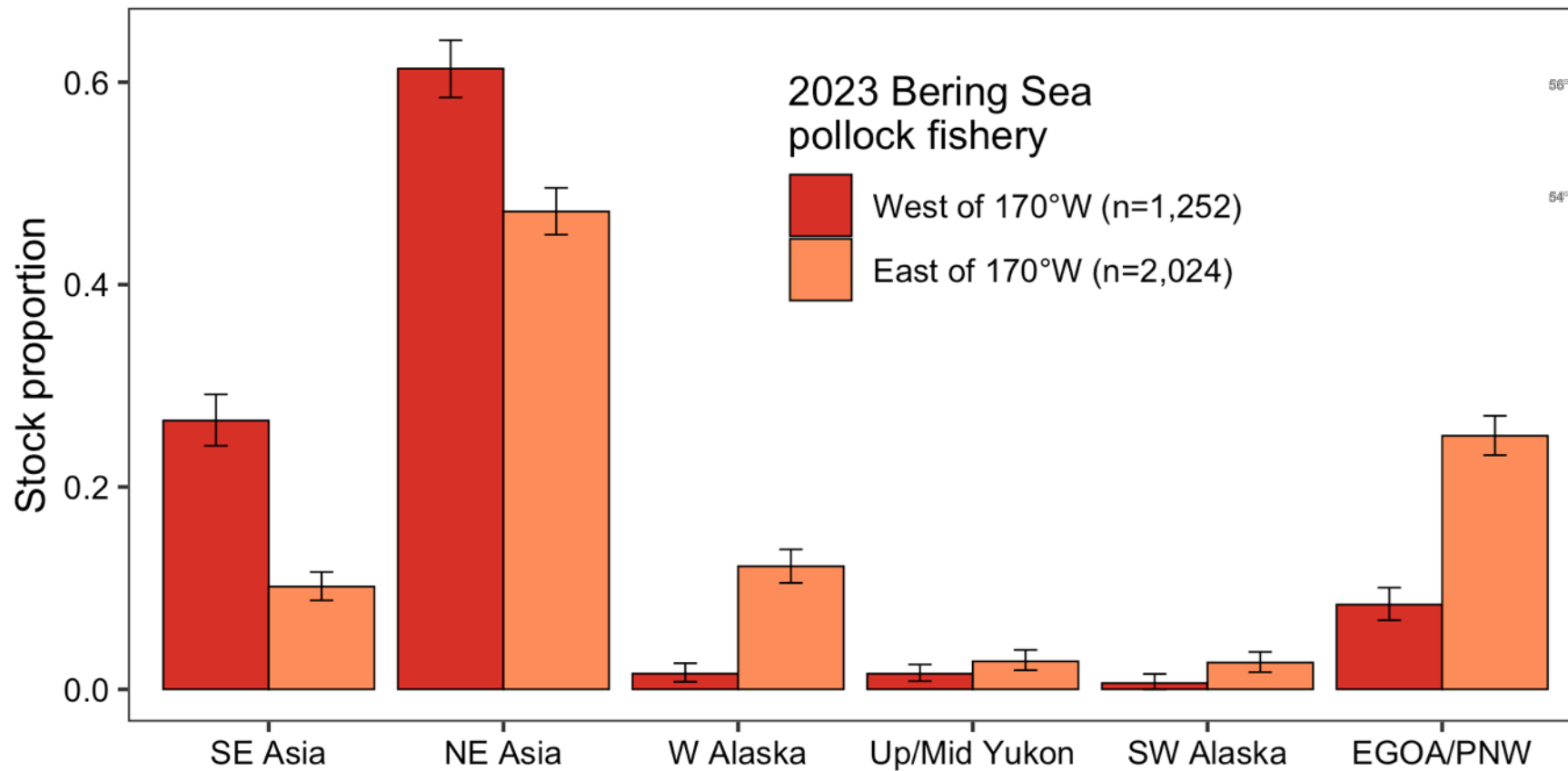




# Estimated number of chum salmon through time



# West and east of 170°W – chum bycatch



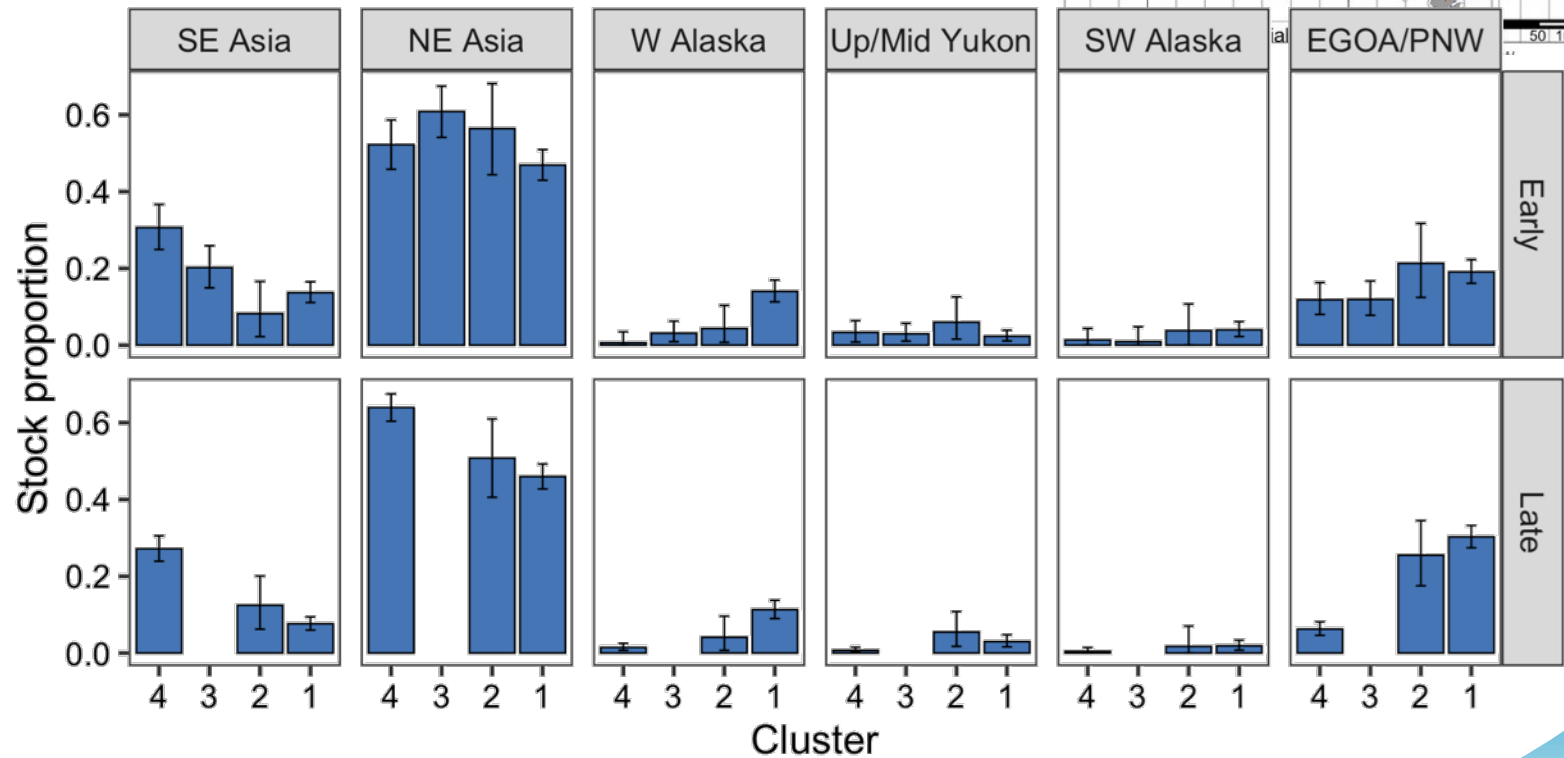
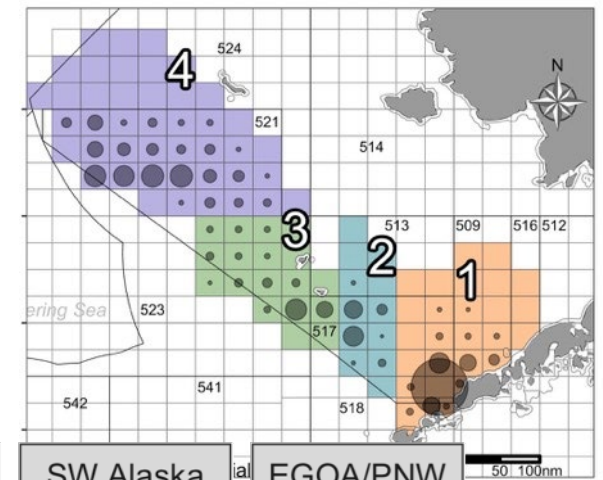
# Spatiotemporal variation - 2023 chum bycatch

## Western Alaska

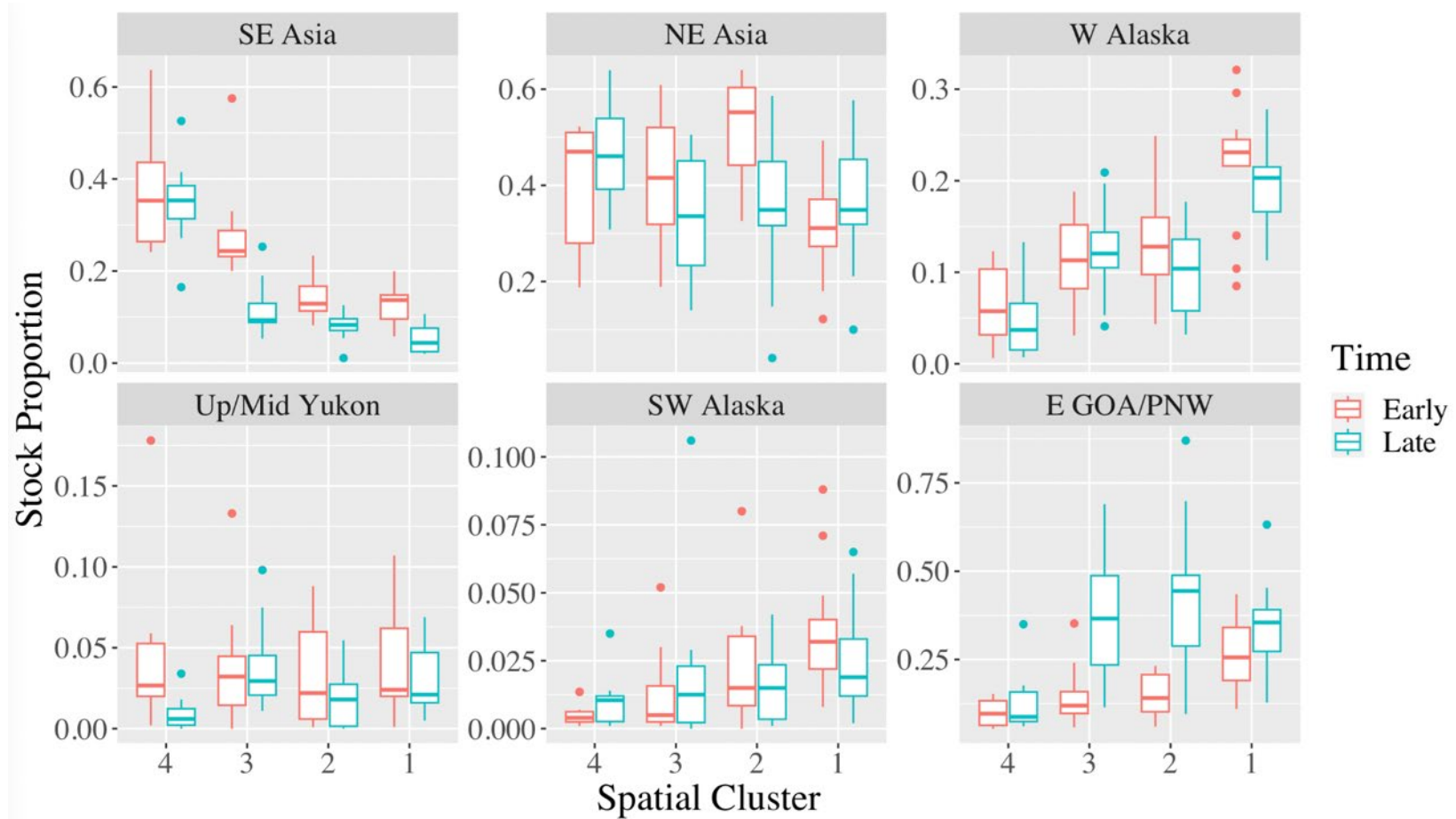
- ↓ East to West
- ⊘ Early to Late

## SW Alaska & Yukon

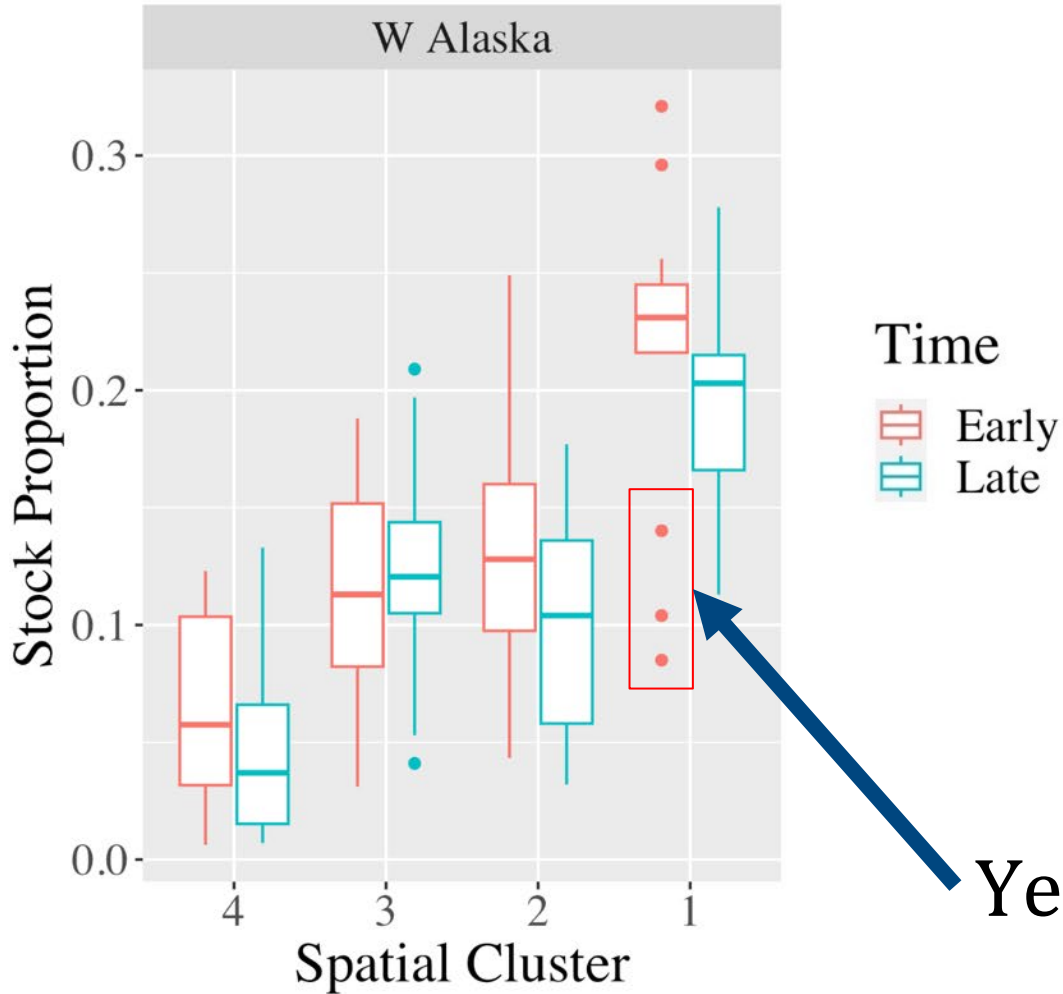
- ⊘ East to West
- ⊘ Early to Late



# Spatiotemporal variation (2011-2023) - chum bycatch

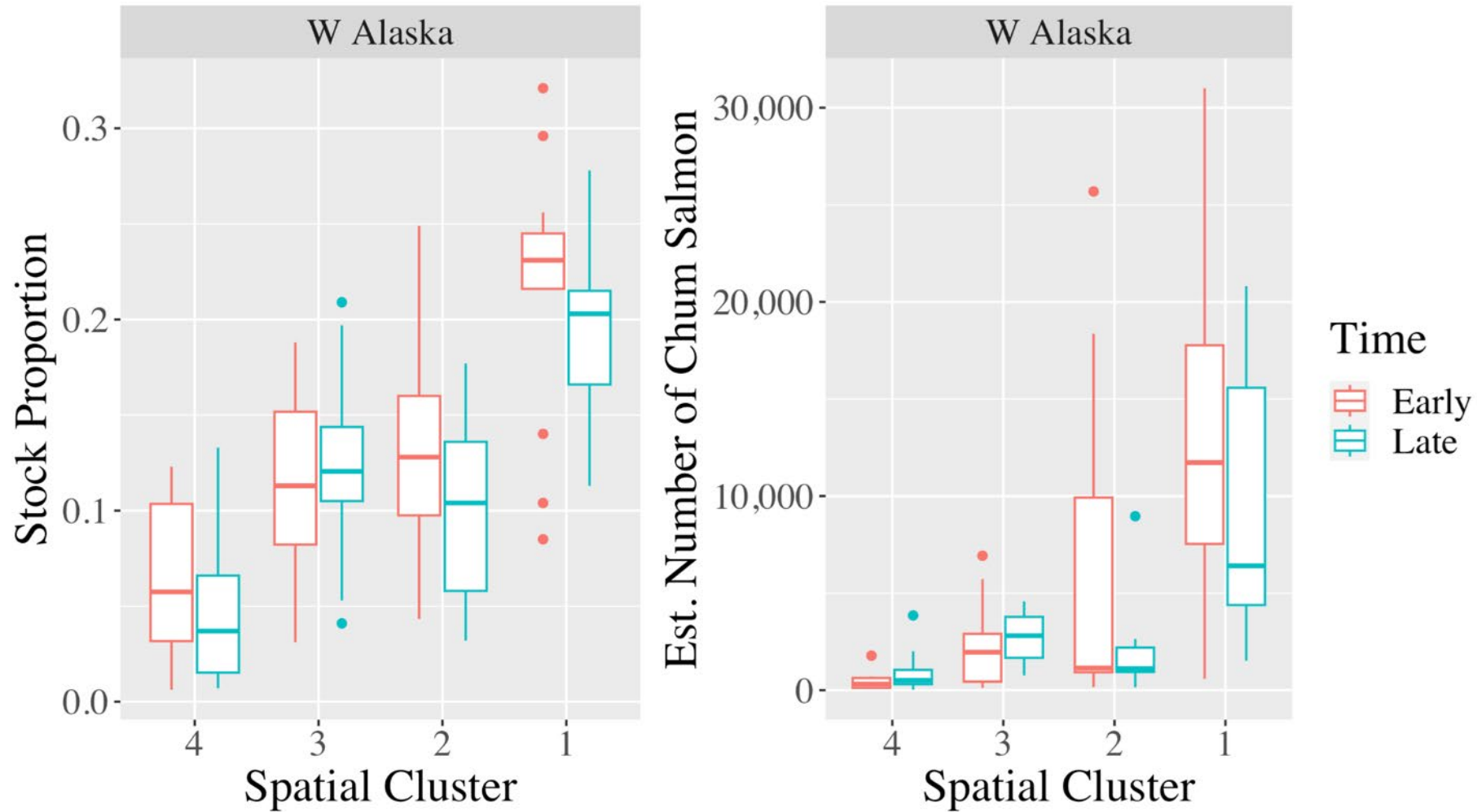


# Spatiotemporal variation (2011-2023) - W Alaska component

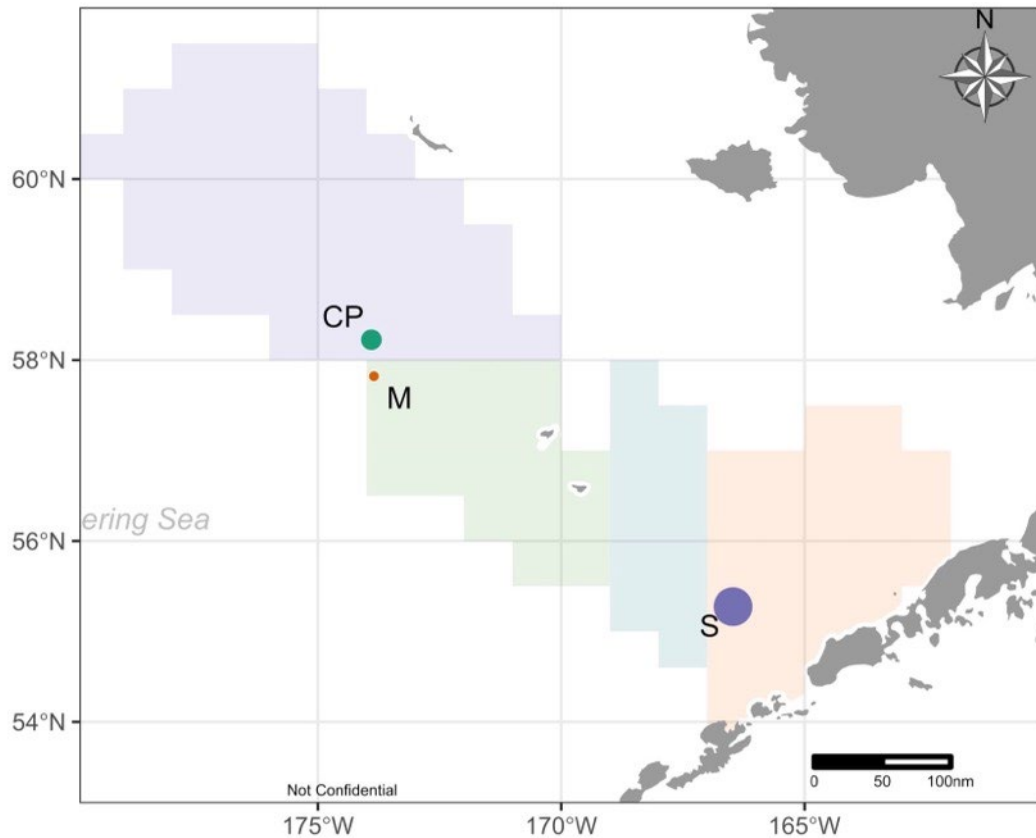


Years: 2020, 2021, 2023

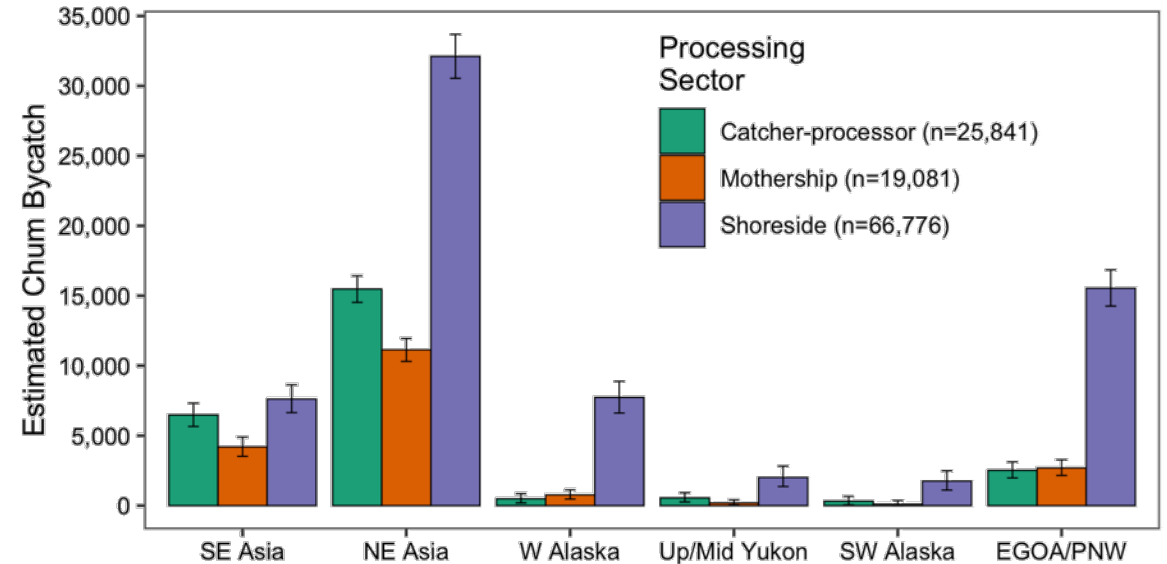
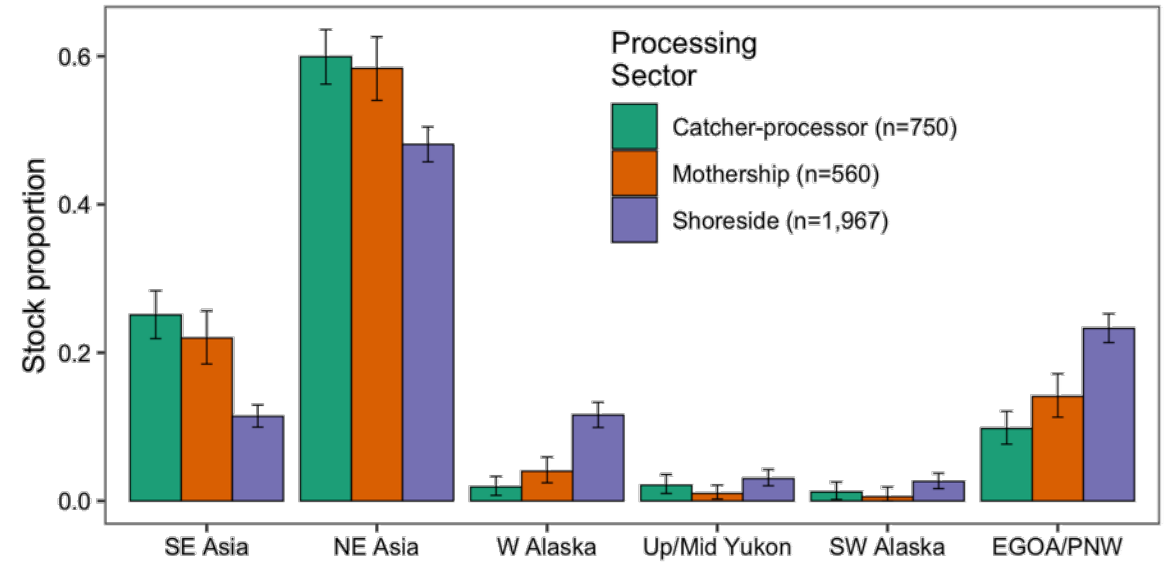
# Spatiotemporal variation (2011-2023) - W Alaska component



# Fishing sectors - 2023 chum bycatch



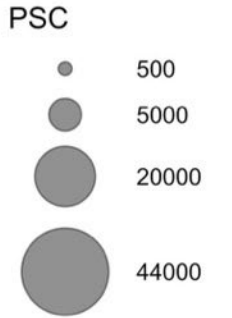
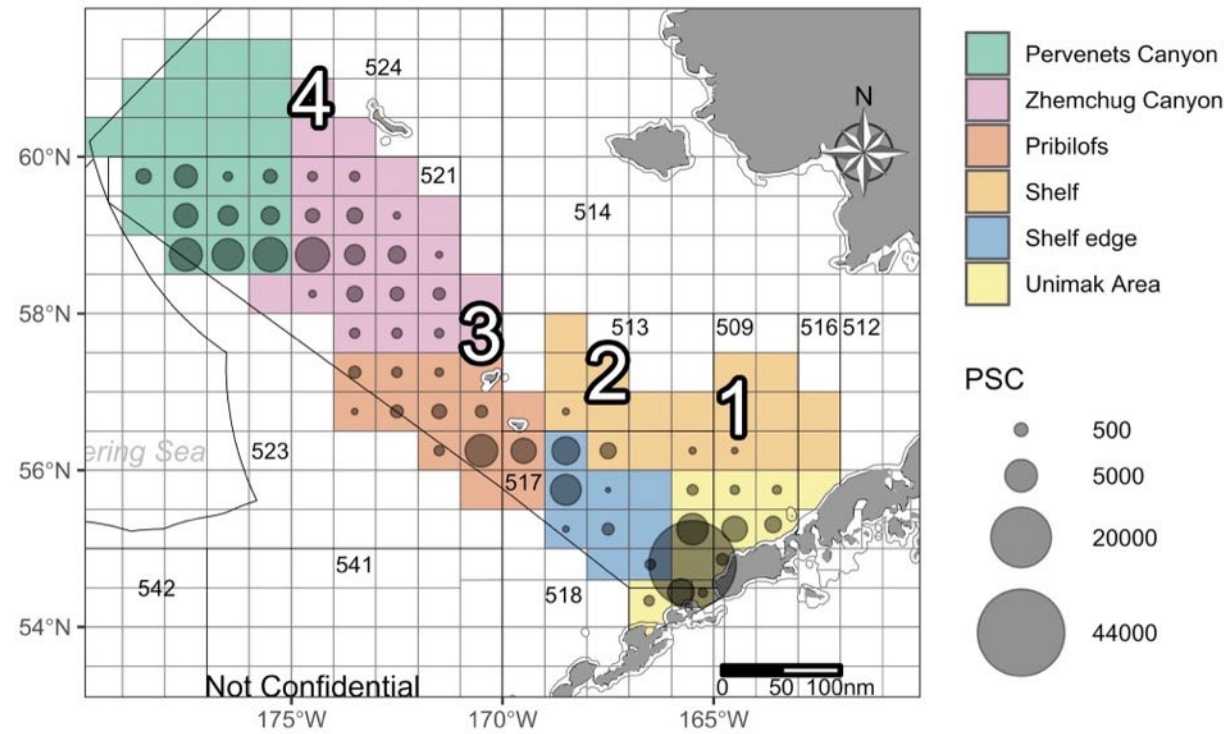
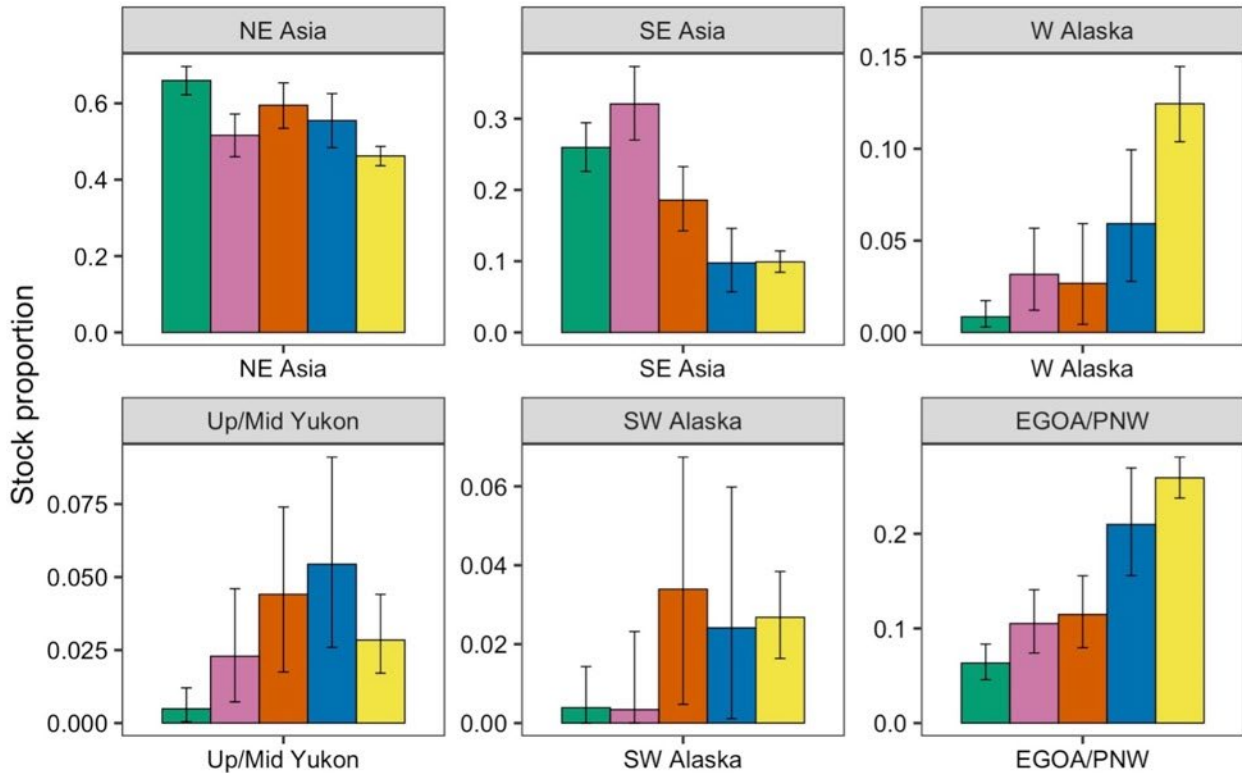
Processing Sector ● CP ● M ● S





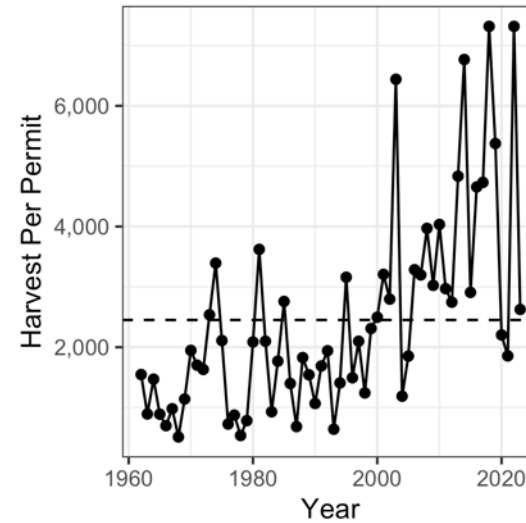
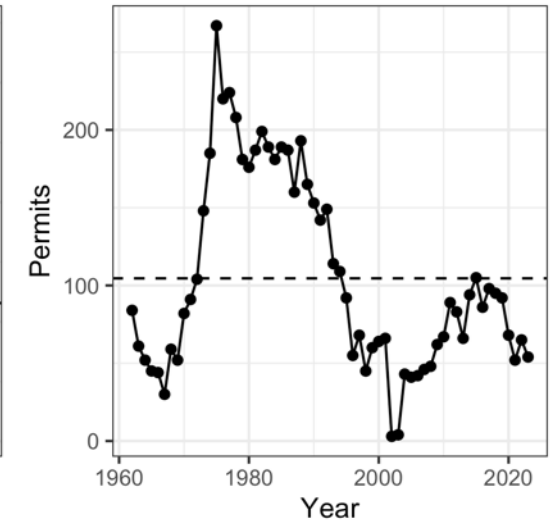
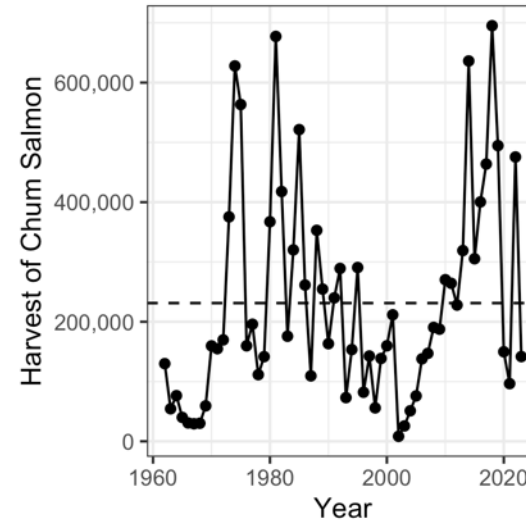
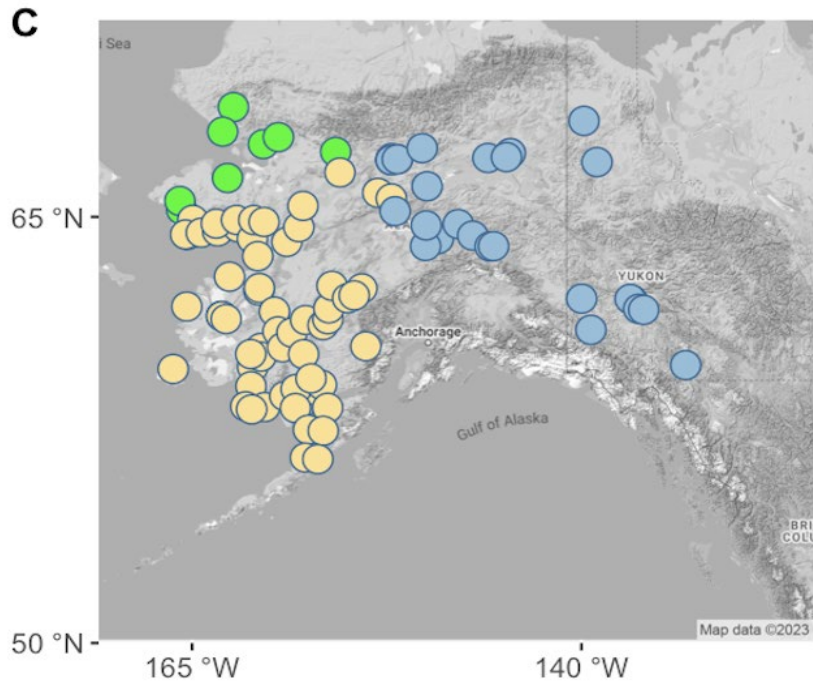
# Fishing grounds - 2023 chum bycatch

\*Note different scales



# Kotzebue Sound analysis- chum salmon

Kotzebue Sound reporting  
group (*Green*):

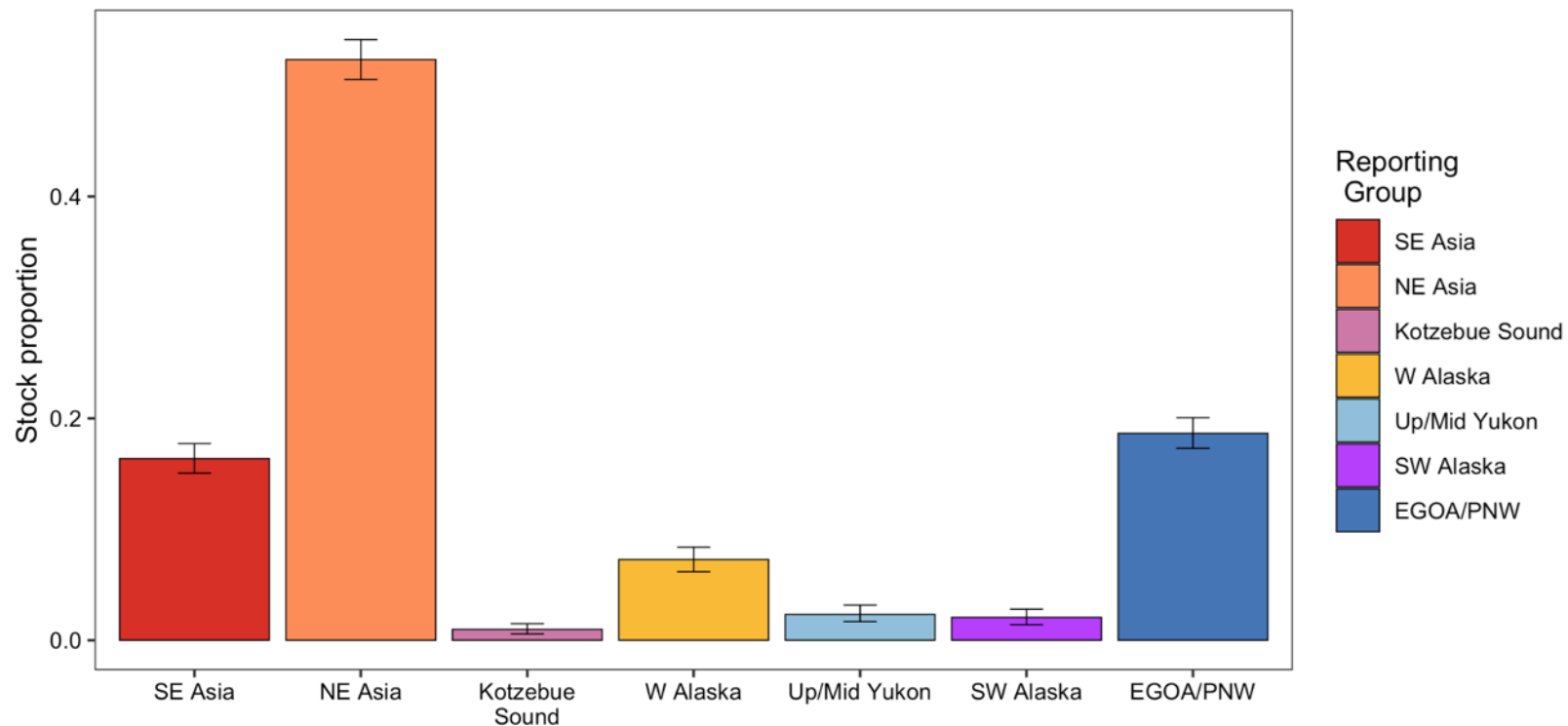


Commercial  
fishing  
information

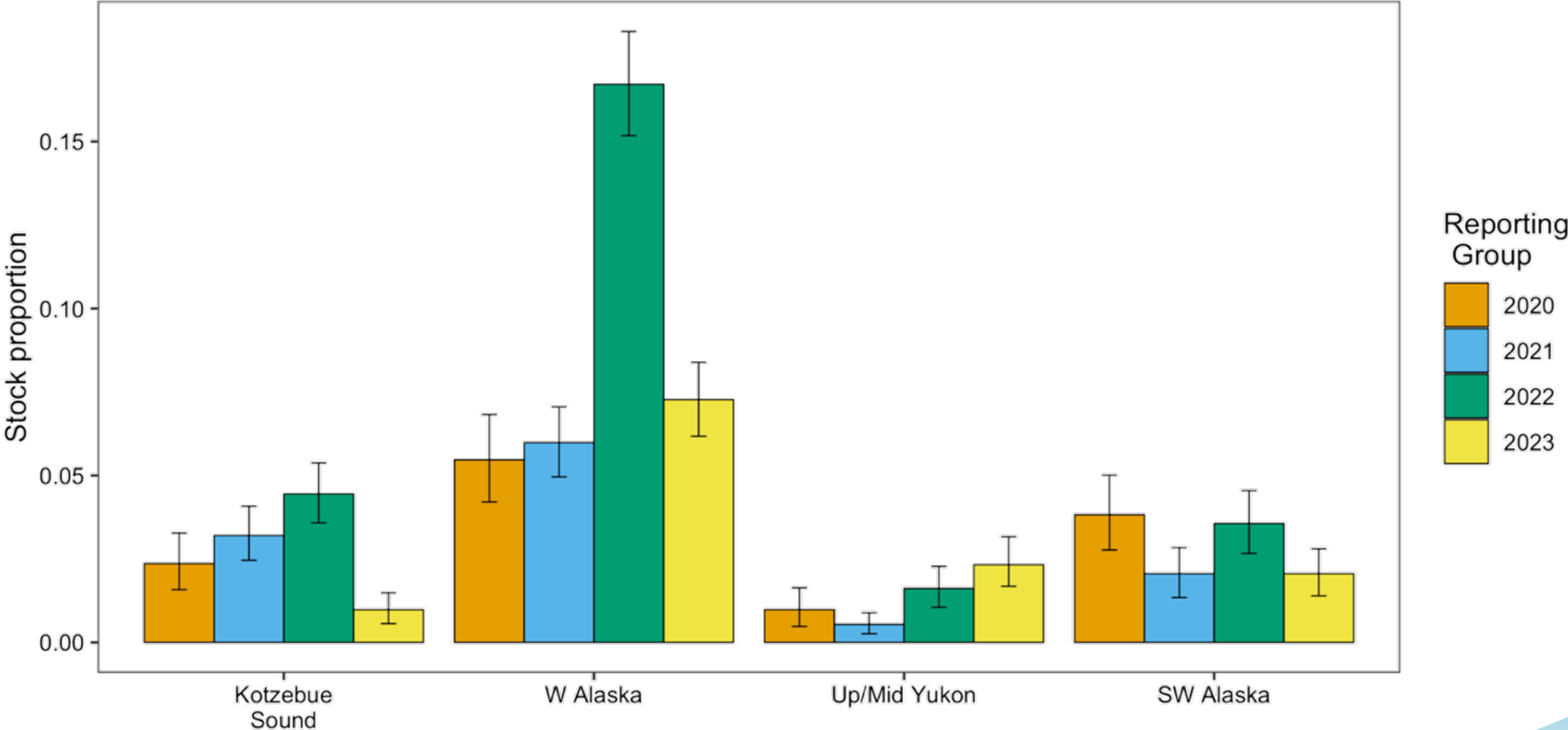
# Kotzebue Sound B-season - chum bycatch

B-season (PSC = 111,698; n = 3,277)

Region	Est. num.	Est. CI	Mean	2.5%	97.5%
SE Asia	18,285	16,823-19,794	0.164	0.151	0.177
NE Asia	58,461	56,450-60,468	0.523	0.505	0.541
Kotzebue Sound	1,095	630-1,660	0.010	0.006	0.015
W Alaska	8,123	6,898-9,370	0.073	0.062	0.084
Up/Mid Yukon	2,596	1,879-3,533	0.023	0.017	0.032
SW Alaska	2,299	1,558-3,130	0.021	0.014	0.028
EGOA/PNW	20,835	19,322-22,404	0.187	0.173	0.201



# Kotzebue Sound time series 2020-2023 - chum bycatch



# Summary - 2023 chum salmon bycatch

- Lower number of chum bycatch.
- Lower proportion of Western Alaska chum salmon:
  - W Alaska + Up/Middle Yukon Reporting Groups
    - **10.6%** (8.9 - 12.4% CI) of total bycatch
    - **11,786** (9,882-13,884 CI) chum salmon
- Consistent trend of greater proportion of W Alaska fish in eastern-most fishing grounds - Cluster 1 and Unimak fishing grounds.
- Shoreside fleet highest proportion of W Alaska fish.



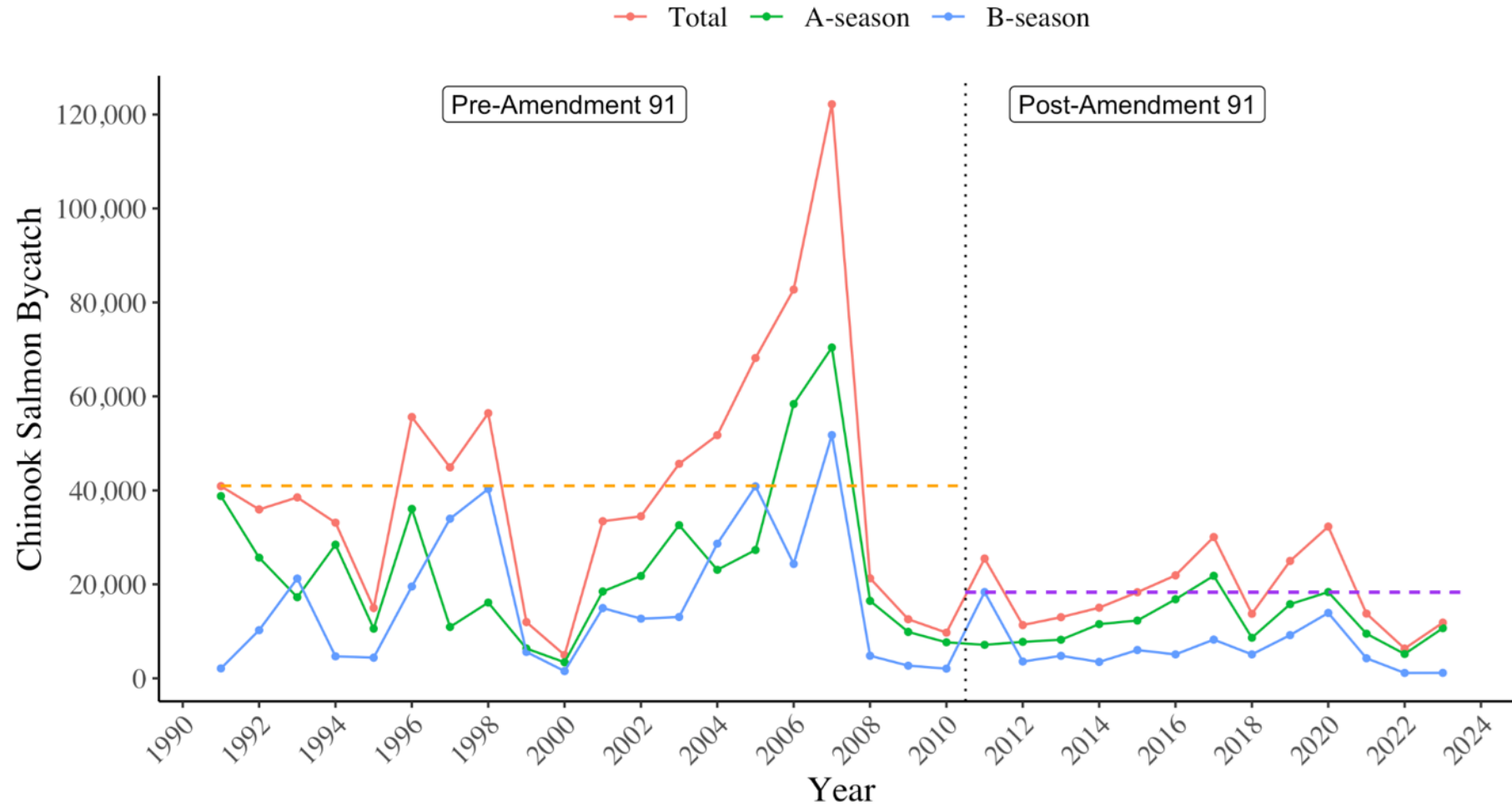


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# Chinook salmon

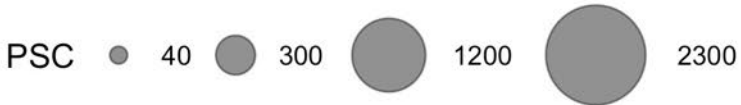
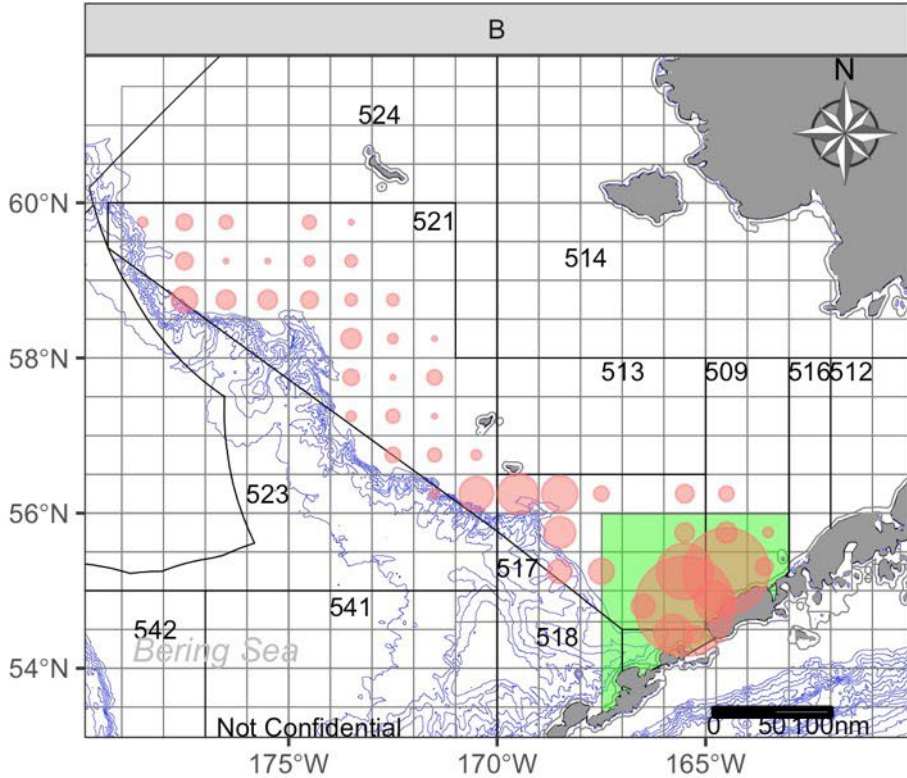
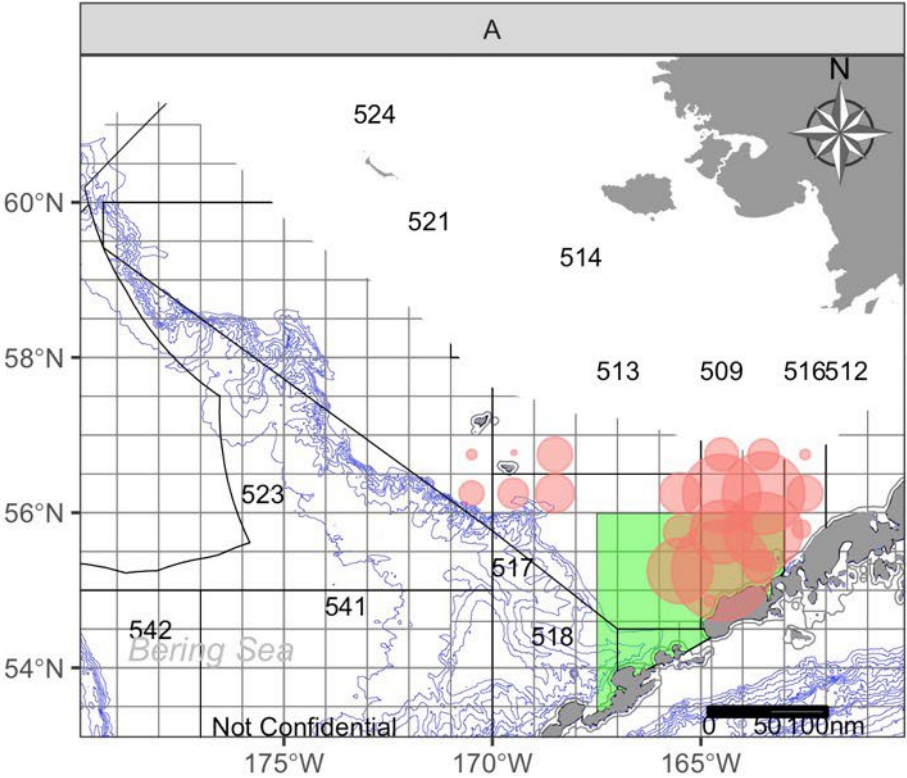


# Chinook Salmon Prohibited Species Catch





# Spatial distribution of the Chinook salmon bycatch



# Chinook salmon genetic baseline

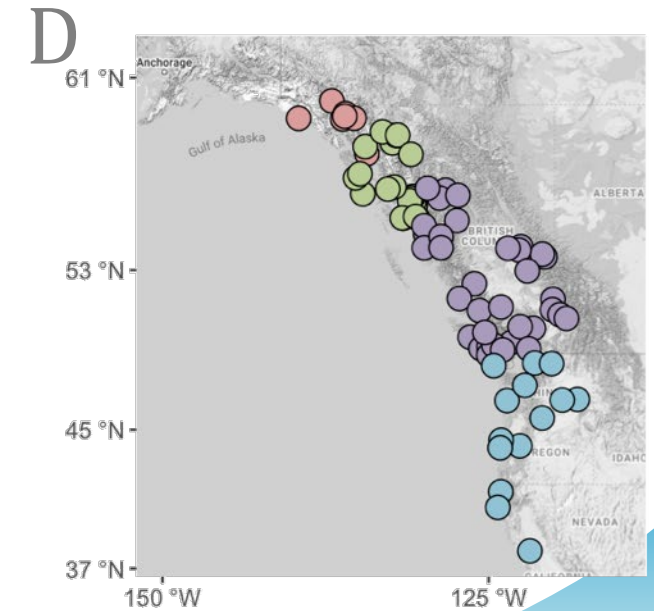
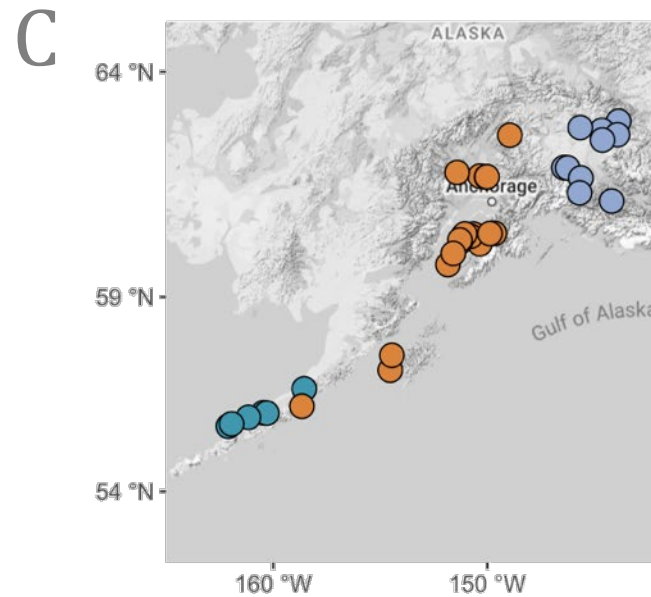
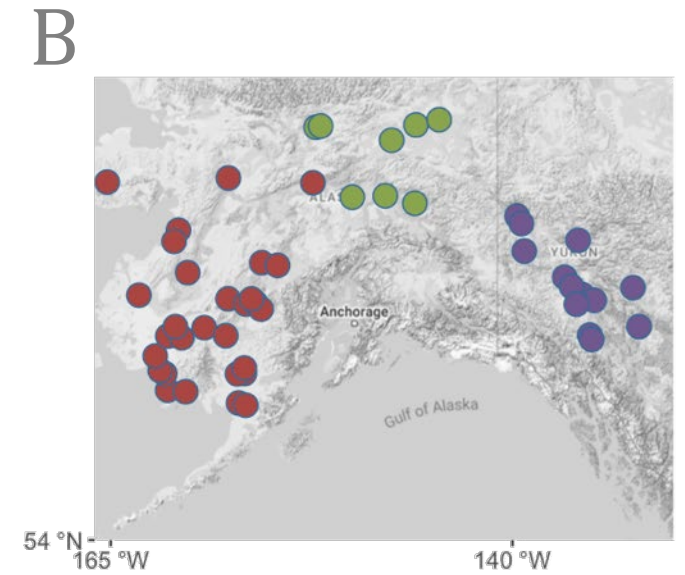
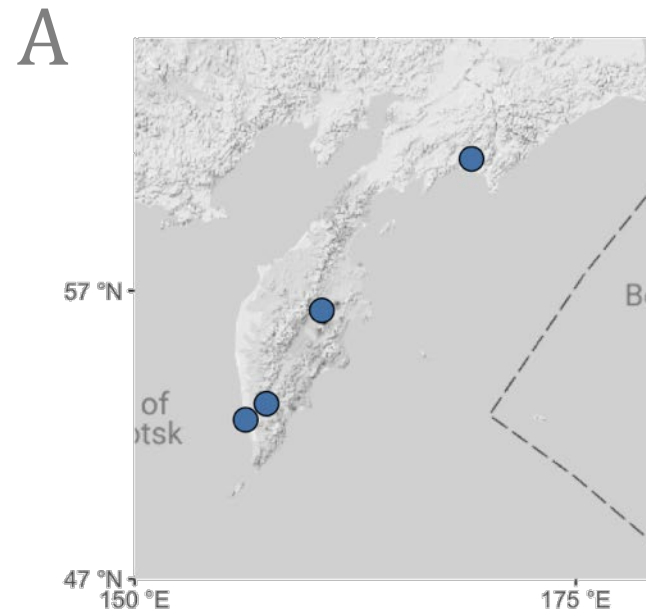
11 reporting groups

A. Russia

B. Coastal W Alaska,  
Middle Yukon, Upper  
Yukon

C. North Alaska  
Peninsula, NW GOA,  
Copper

D. NE GOA, Coastal SEAK,  
British Columbia, West  
Coast US



# A-season

A-season (PSC = 10,609; n = 1002)

Region	Est. num.	Est. CI	Mean	2.5%	97.5%	P=0	SF
Russia	0	0-11	0.000	0.000	0.001	0.84	1.00
Coast W AK	5,302	4,917-5,689	0.500	0.464	0.536	0.00	1.00
Mid Yukon	0	0-31	0.000	0.000	0.003	0.81	1.00
Up Yukon	27	8-79	0.003	0.001	0.007	0.00	1.00
N AK Pen	2,710	2,369-3,065	0.256	0.223	0.289	0.00	1.00
NW GOA	0	0-164	0.000	0.000	0.015	0.76	1.00
Copper	20	0-84	0.002	0.000	0.008	0.28	1.00
NE GOA	41	4-104	0.004	0.000	0.010	0.01	1.00
Coast SE AK	68	0-211	0.006	0.000	0.020	0.14	1.00
BC	1,994	1,715-2,285	0.188	0.162	0.215	0.00	1.00
West Coast US	442	306-597	0.042	0.029	0.056	0.00	1.00

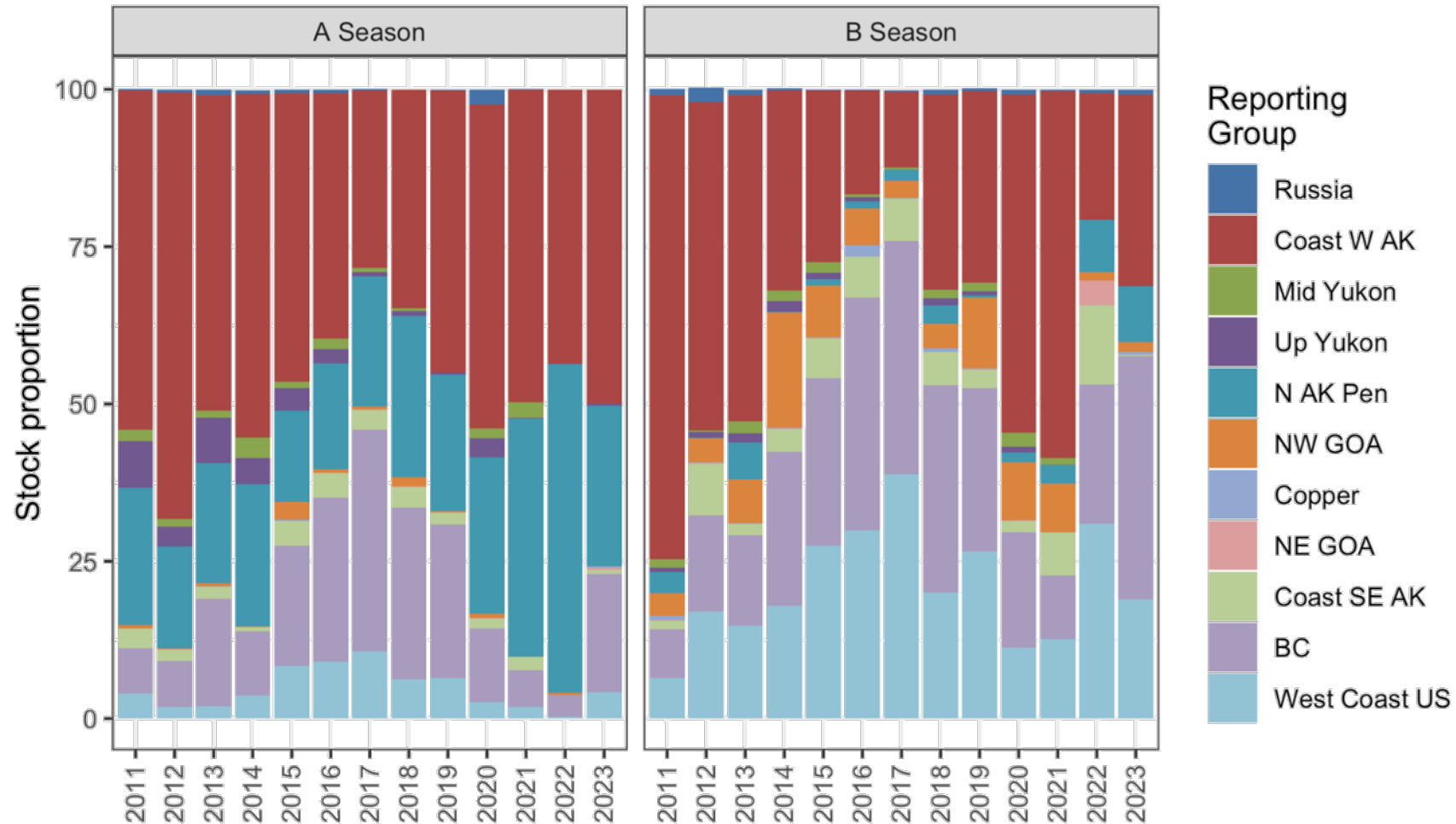
# B-season

B-season (PSC = 1,246; n = 104)

Region	Est. num.	Est. CI	Mean	2.5%	97.5%	P=0	SF
Russia	10	0-50	0.009	0.000	0.040	0.26	1.00
Coast W AK	378	258-506	0.304	0.207	0.406	0.00	1.00
Mid Yukon	0	0-12	0.000	0.000	0.009	0.83	1.00
Up Yukon	0	0-18	0.000	0.000	0.014	0.81	1.00
N AK Pen	110	44-201	0.089	0.035	0.161	0.00	1.00
NW GOA	19	5-87	0.016	0.004	0.070	0.00	1.00
Copper	4	0-38	0.004	0.000	0.031	0.59	1.00
NE GOA	0	0-15	0.000	0.000	0.012	0.84	1.00
Coast SE AK	2	0-82	0.002	0.000	0.066	0.62	1.01
BC	482	352-615	0.387	0.283	0.493	0.00	1.00
West Coast US	235	142-345	0.189	0.114	0.277	0.00	1.00



# Time series of Chinook salmon stock composition



# Summary - Chinook Salmon

- **A-season**
  - Coastal Western Alaska (50.0%), North Alaska Peninsula (25.6%) and British Columbia (18.8%) comprise ~ 95% of the bycatch
  - Middle & Upper Yukon very low proportion (<1%) & number (~27)
- **B-season**
  - British Columbia (38.7%), Coastal Western Alaska (30.4%), and West Coast US (18.9) comprise ~ 88% of the bycatch.
  - Middle & Upper Yukon ~82% probability 0 fish were caught.
- **GOA** (data not shown)
  - High probability (>60%) that no fish from Coastal Western Alaska, Middle Yukon, Upper Yukon, or North Alaska Peninsula were caught.

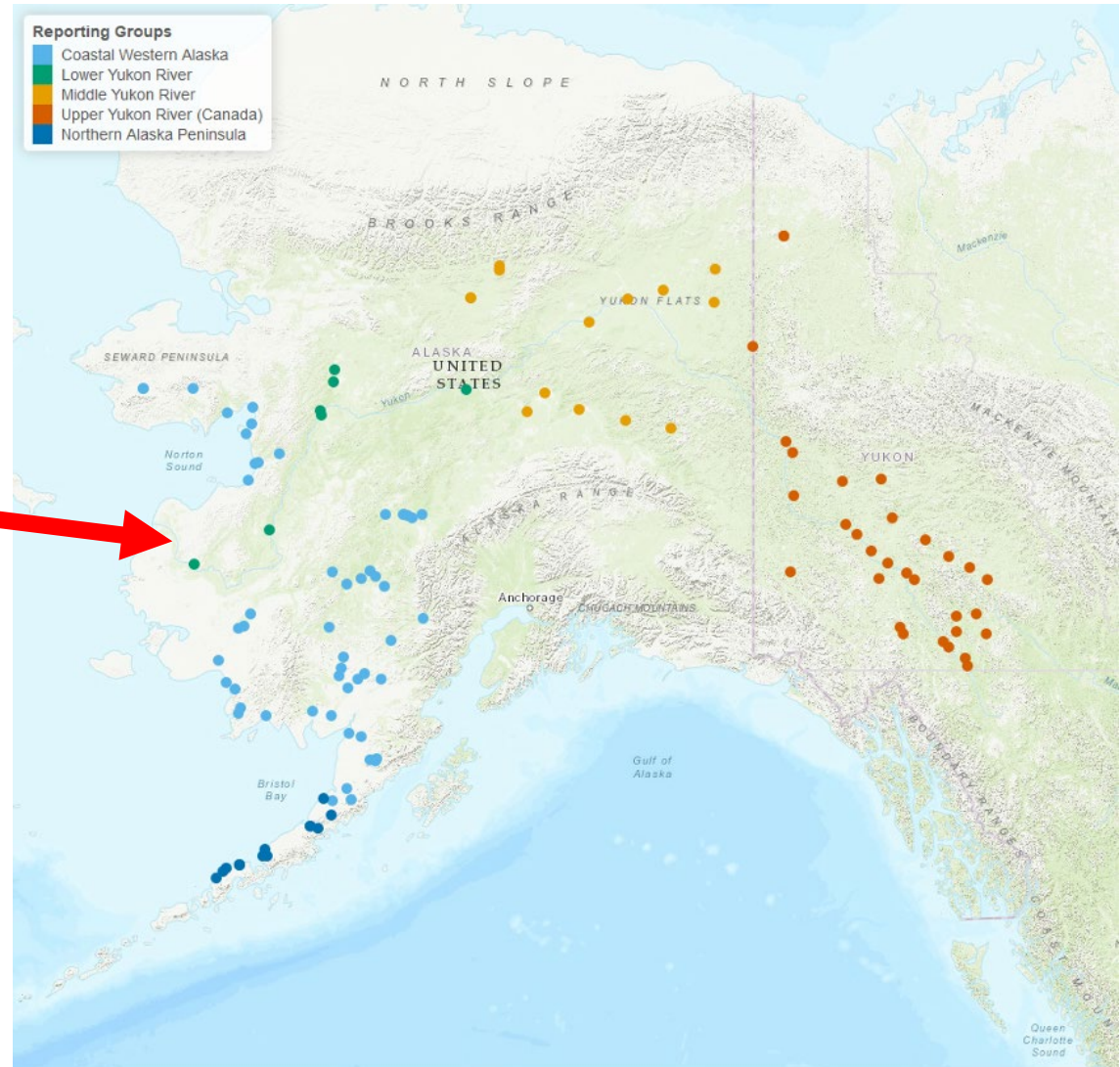
# New Chinook Baseline - Coming 2024

299 markers  
Lower Yukon River!

Collaboration among many labs

- ADF&G:  
Alaska + Russia
- DFO Canada:  
BC
- NOAA: Analysis and spot fill  
genotyping

Lower 48 pops: WDFW, CRITFC, IDFG, ODFW



Liz Lee ADF&G



# Acknowledgements

**Fisheries Observers:** Over 60 observers deployed sampling over 8,500 haul/deliveries

**FMA:** M. Concepcion, M. Ruge, B. Mason, R. Ramirez, M. Vector

**AKFIN:** R. Ames, C. Kohler, M. Callahan, R. Ryzner

**ADF&G GCL:** L. Lee, A. Barclay, S. Gilk-Baumer, K. Shedd

# Questions?

Patrick Barry

[Patrick.Barry@noaa.gov](mailto:Patrick.Barry@noaa.gov)

Prior Years Tech Memos:

<https://www.fisheries.noaa.gov/alaska/science-data/genetics-research-alaska-fisheries-science-center>



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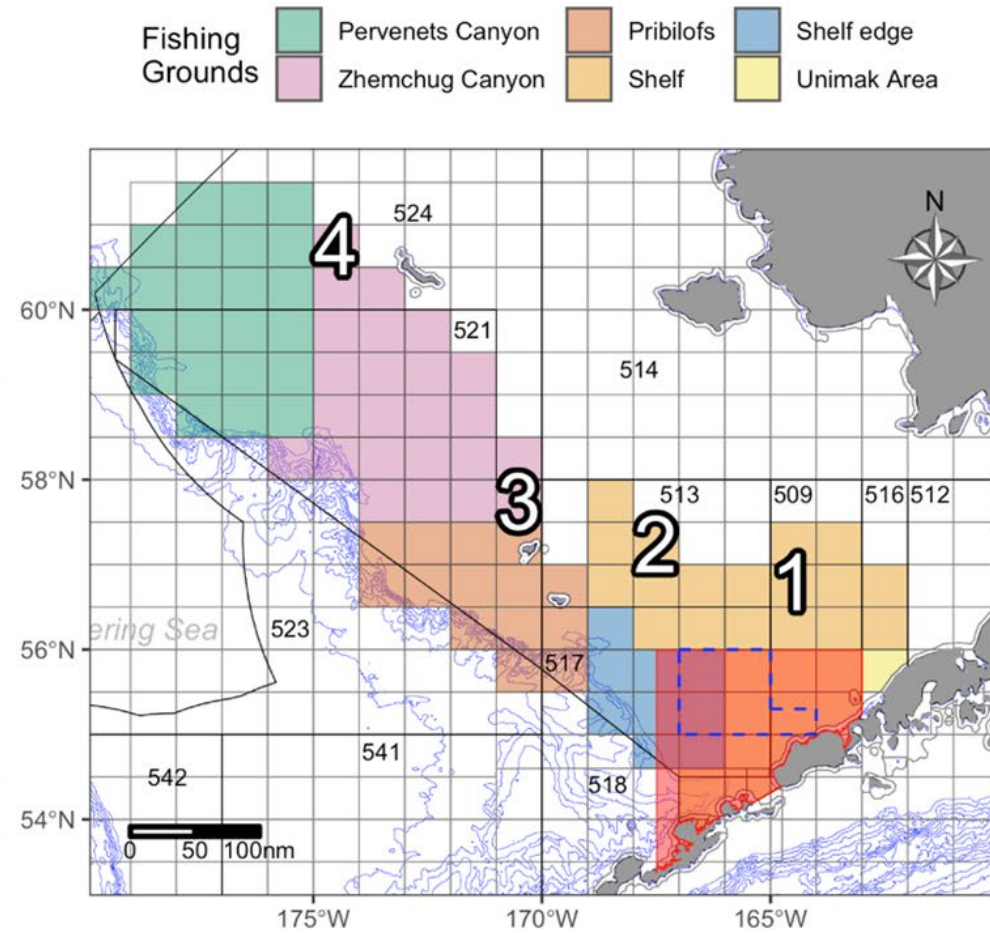
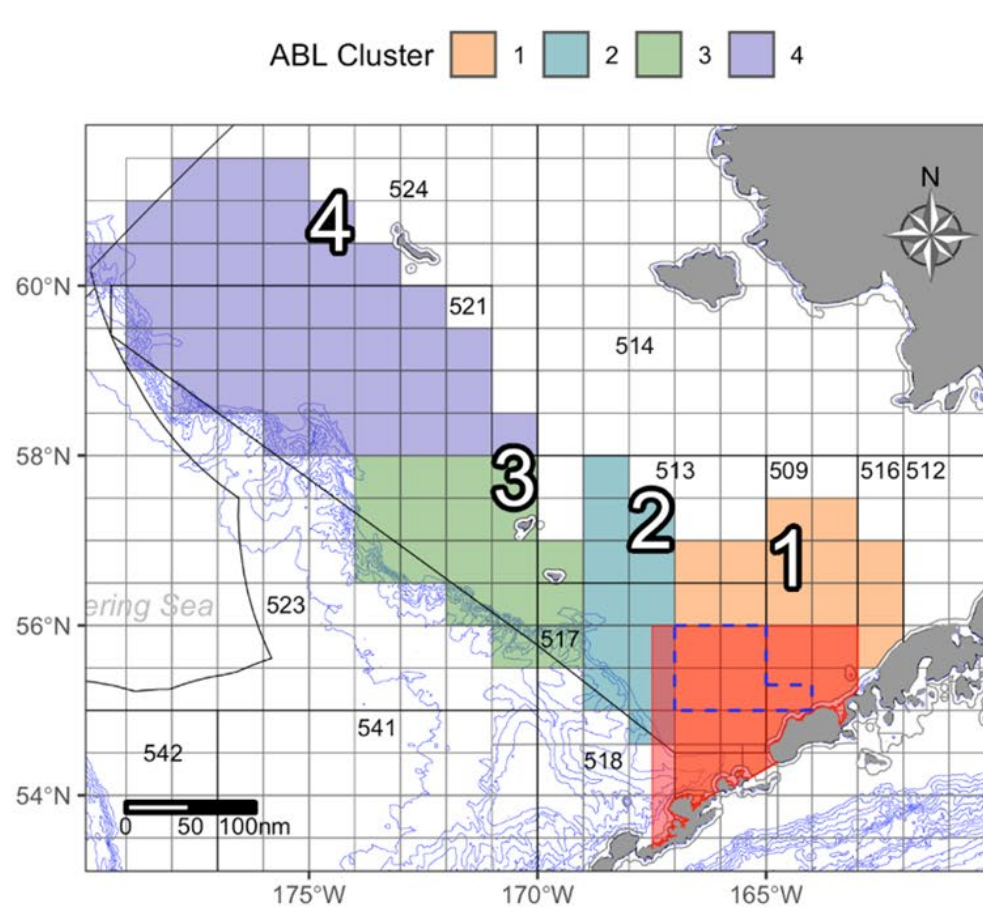


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# Chum salmon - Extra Slides



# Comparison of Spatial Strata

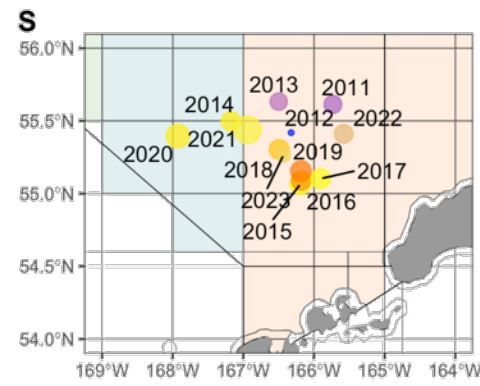
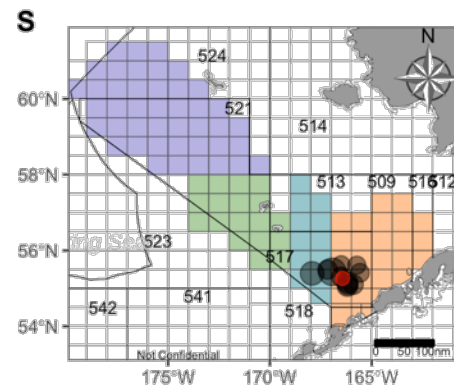
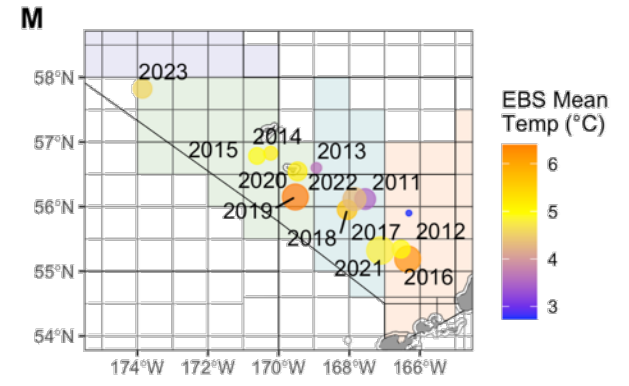
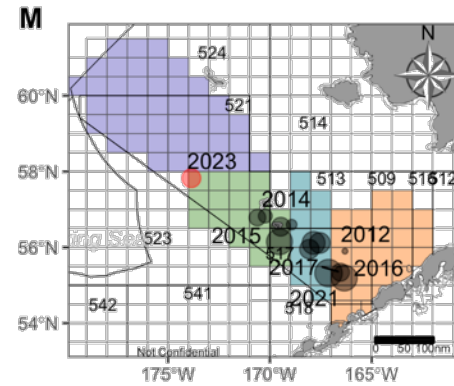
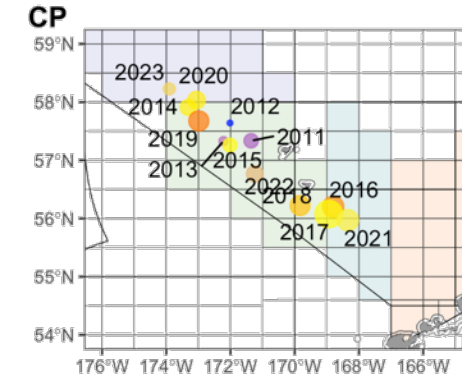
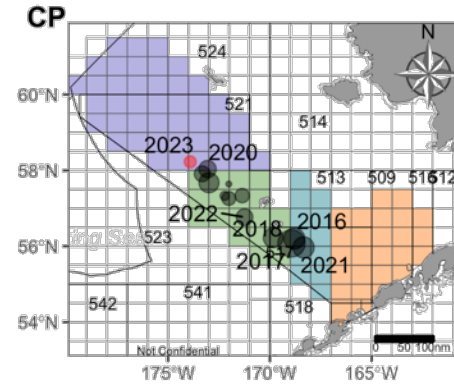


# Distribution of Bycatch

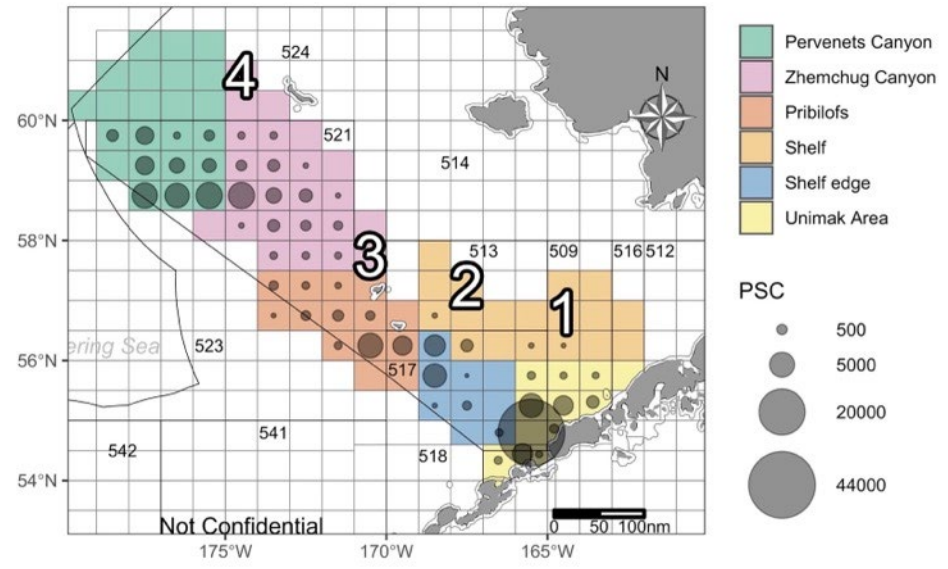
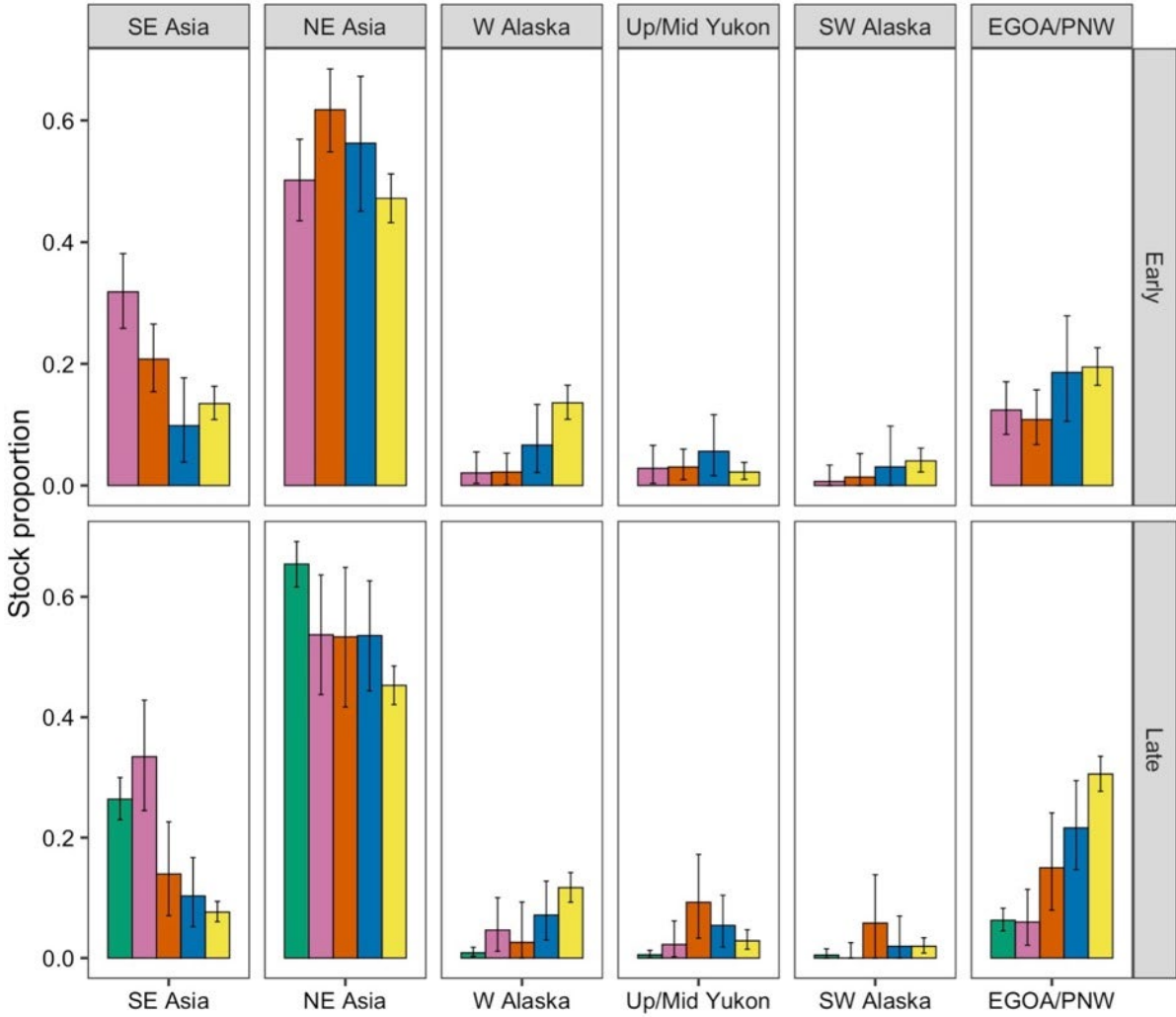
2023

CP & M further west than any other year

Cooler years further on shelf for S and M

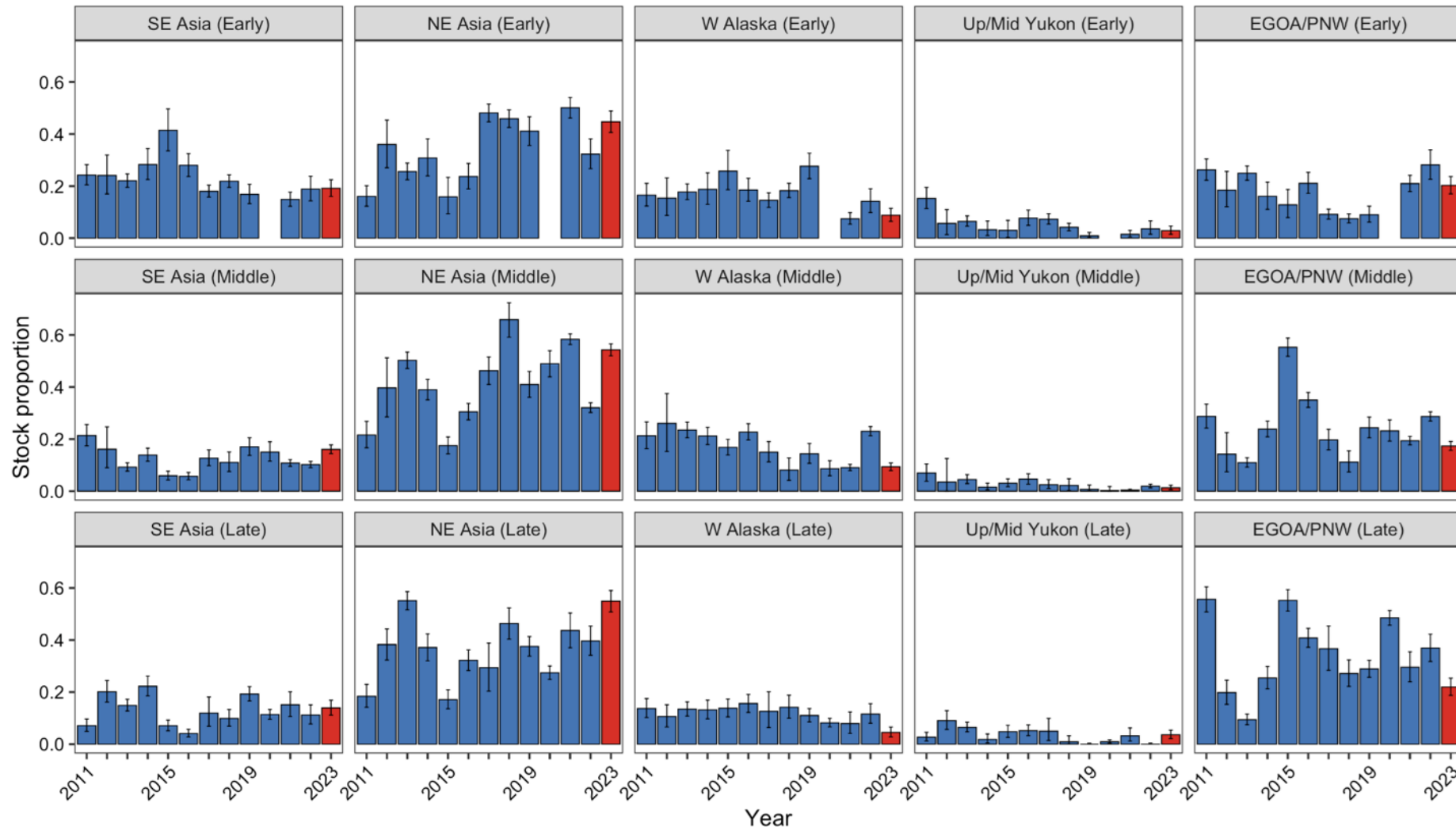


# Fishing Grounds Temporal

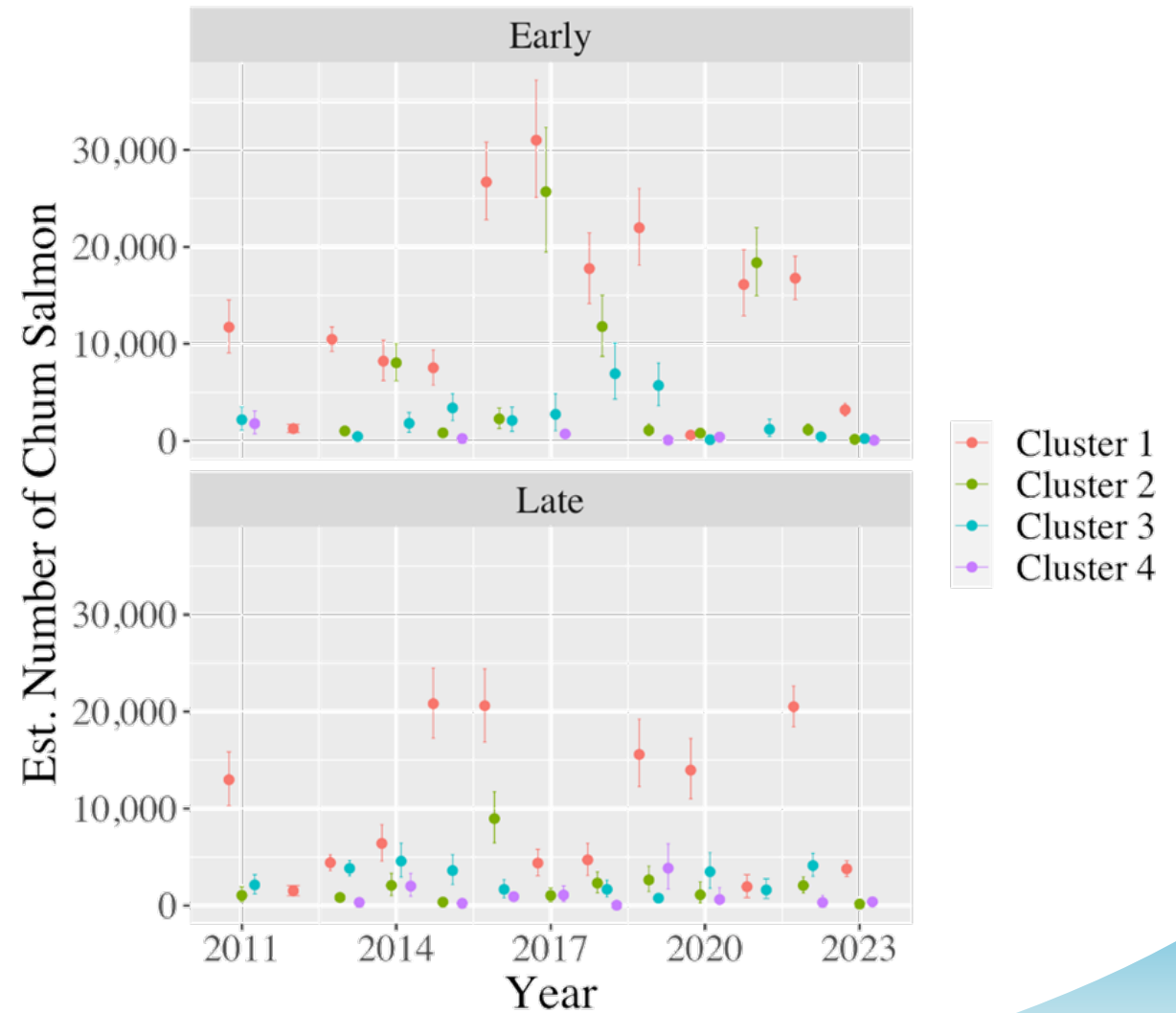
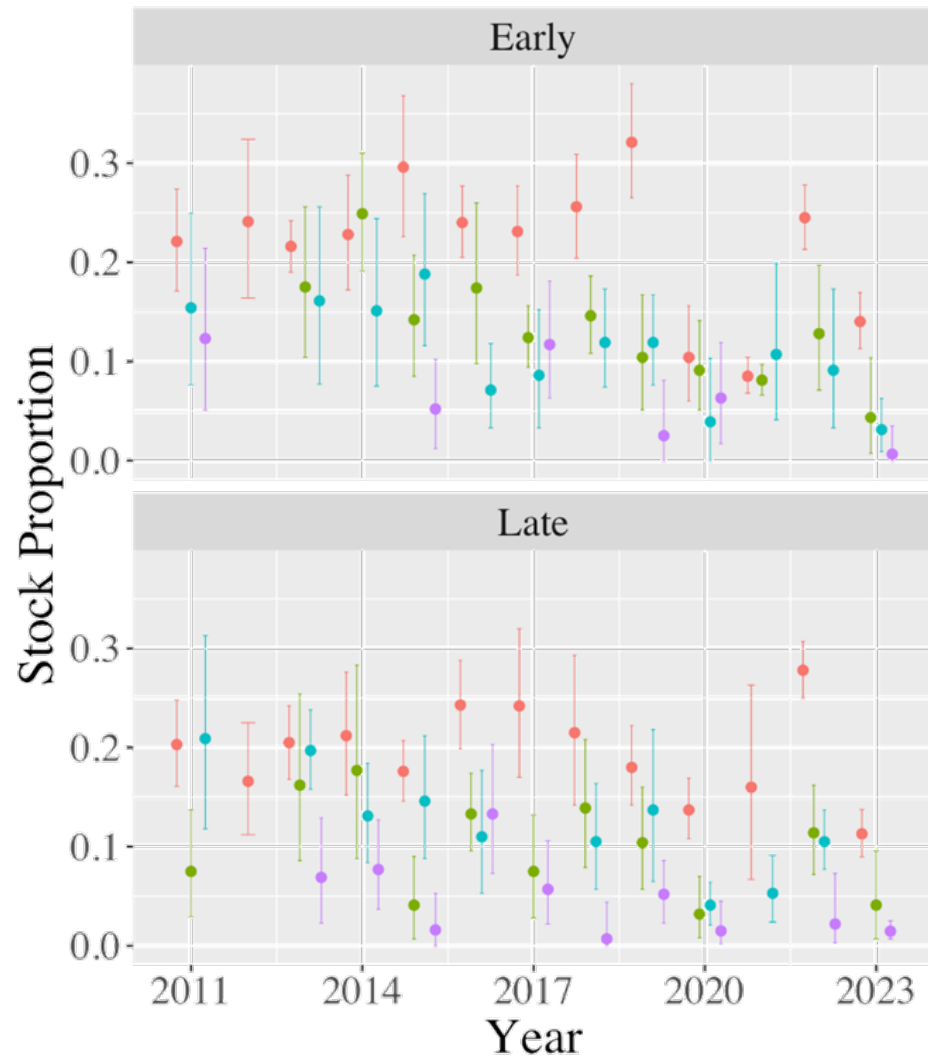




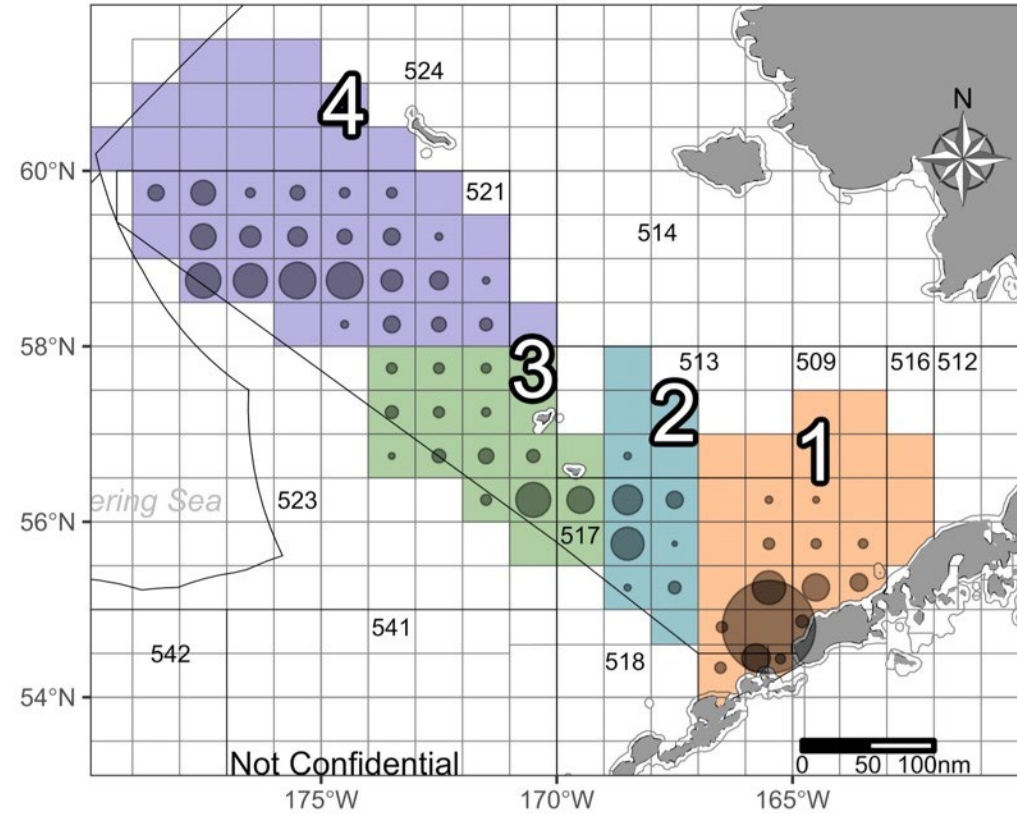
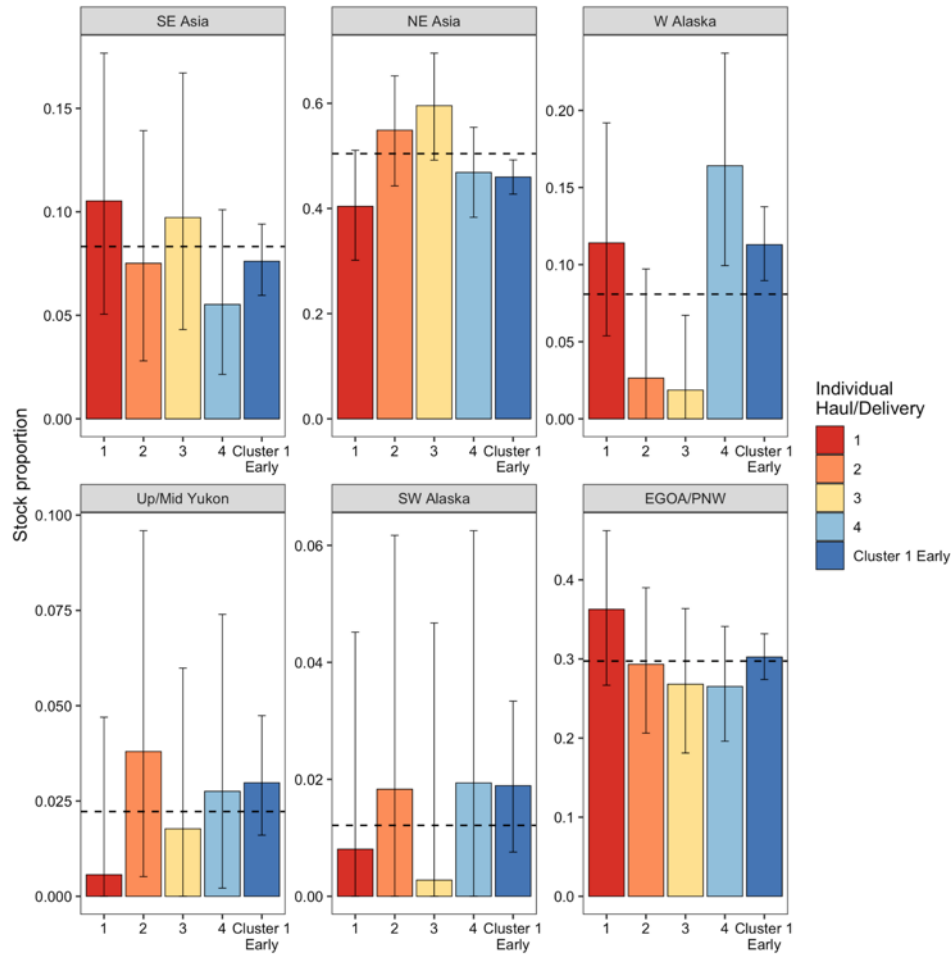
# Early, Middle, Late



# Spatiotemporal variation W Alaska (2011-2023)



# Individual Hauls



PSC ● 500 ● 5000 ● 20000 ● 44000

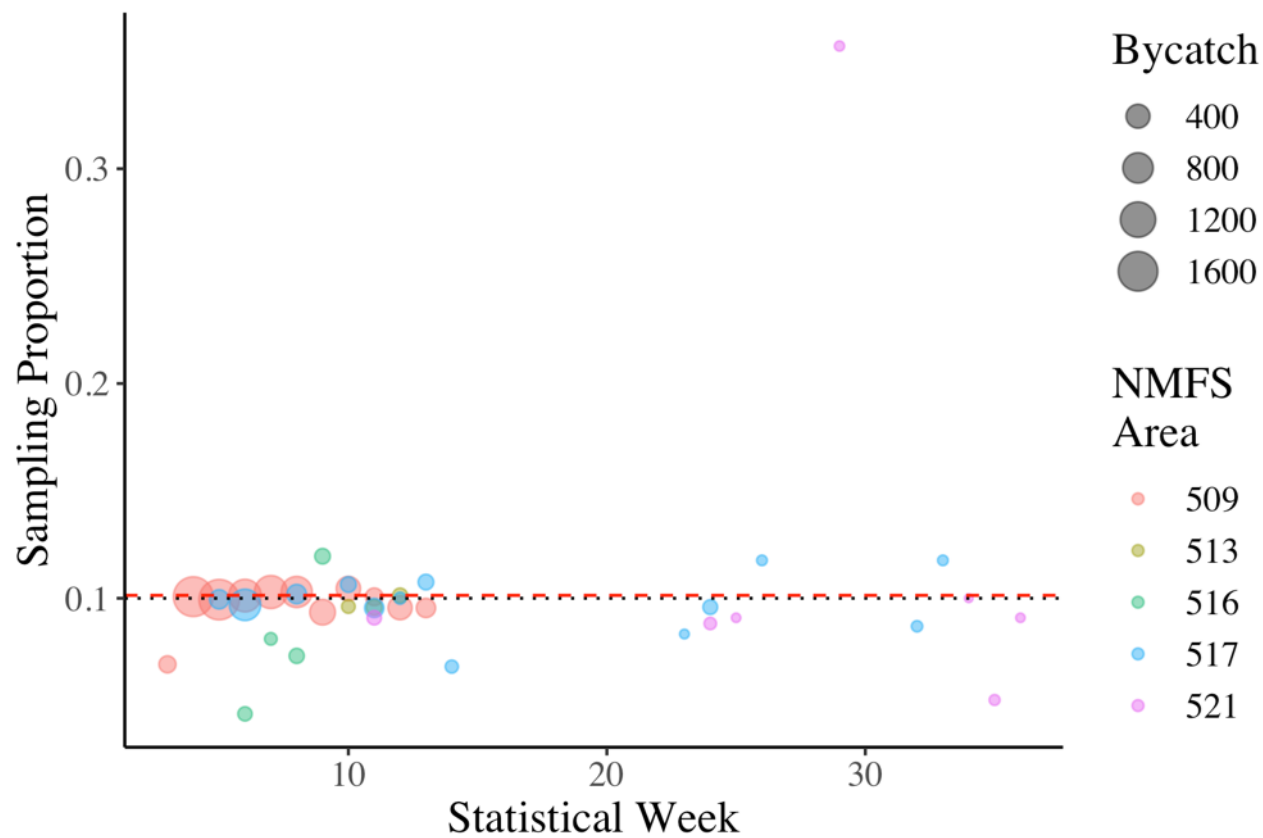


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# Chinook salmon - Extra Slides



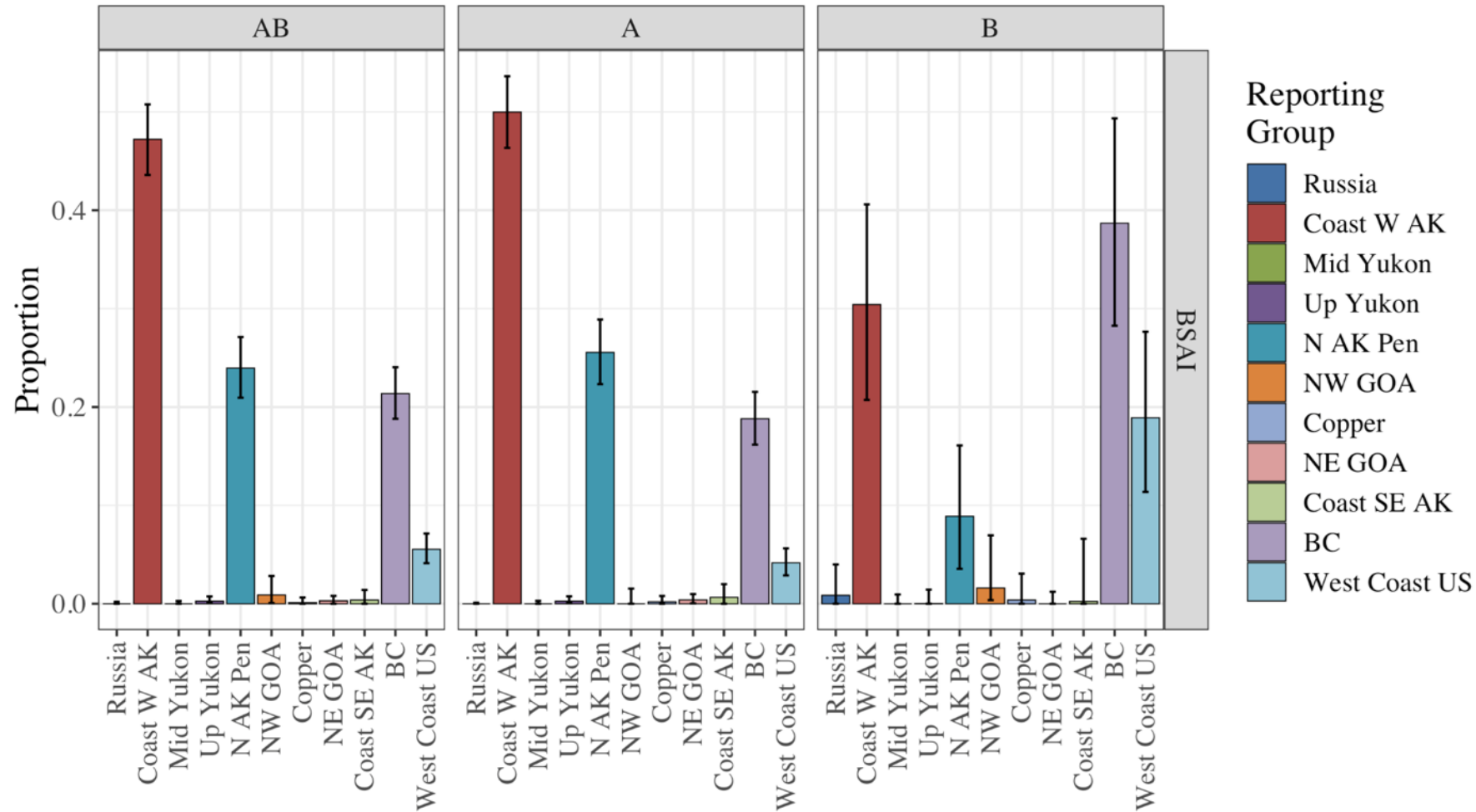
# BSAI genetic sampling of Chinook salmon by week and NMFS area



Black dot line = 1 in 10 goal

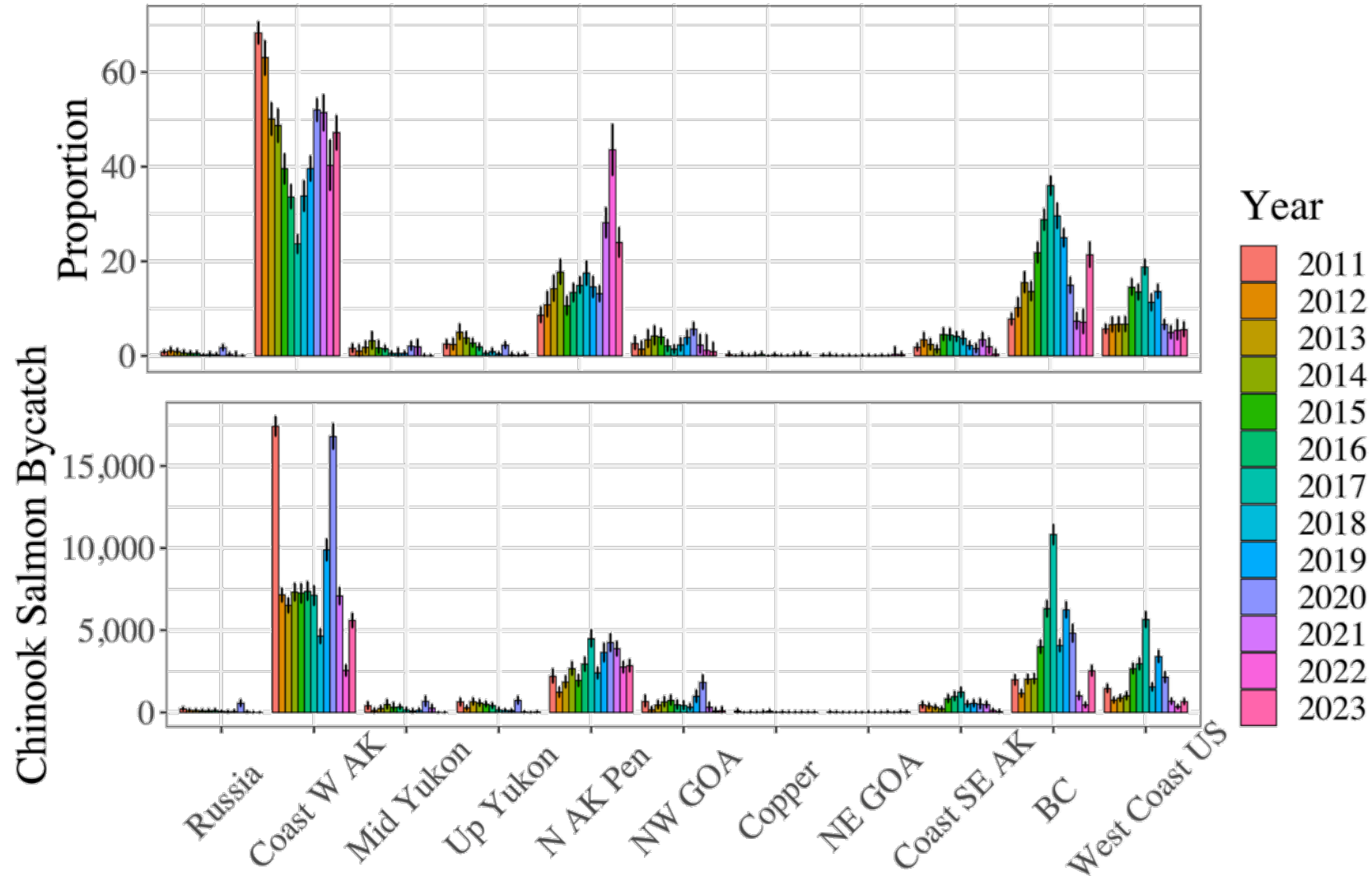
Red dash line ~ 1 in 10 realized average sampling

# A and B seasons Chinook salmon

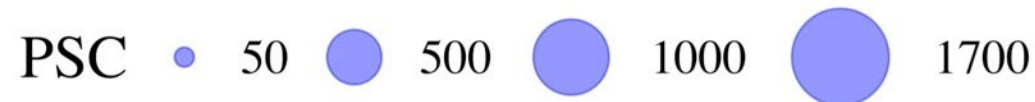
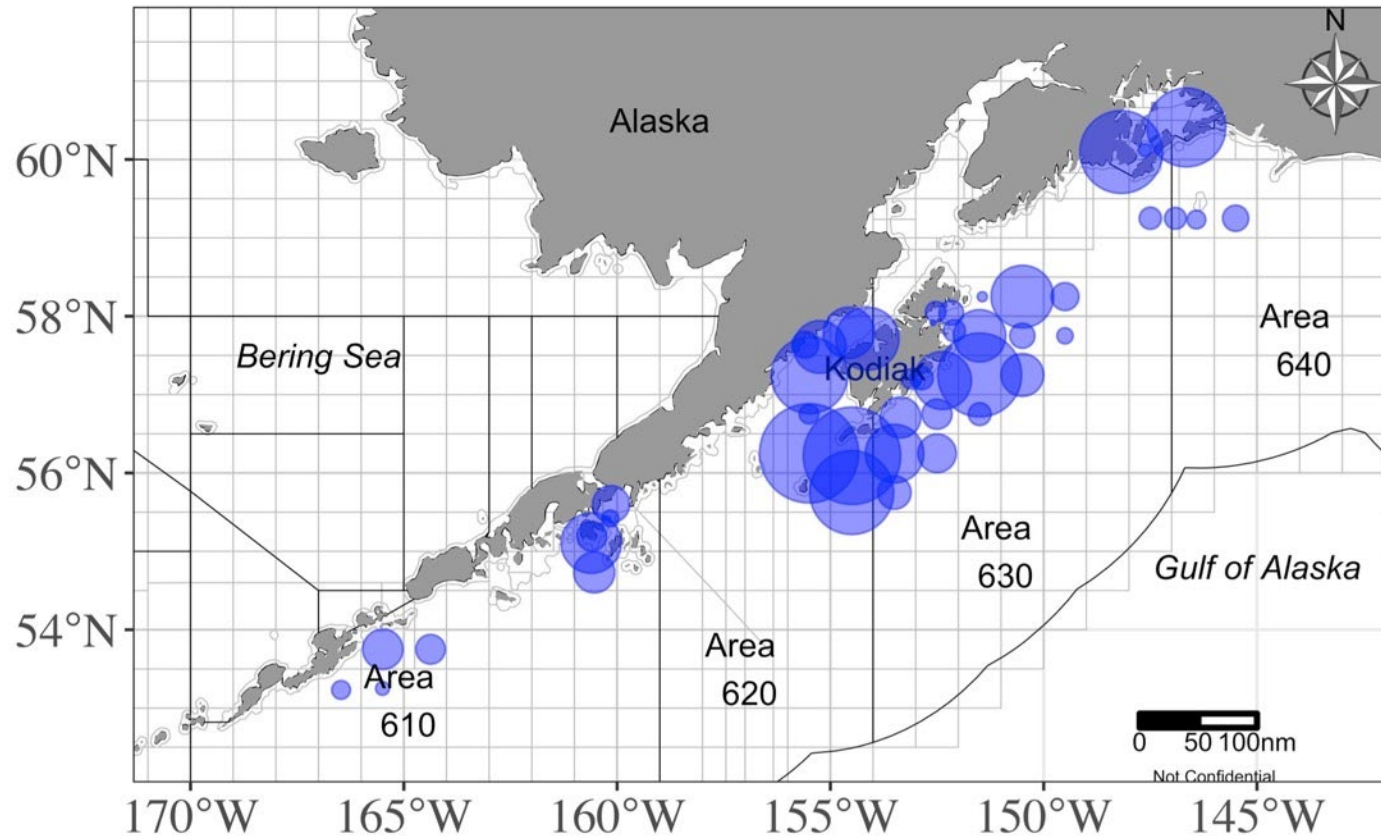




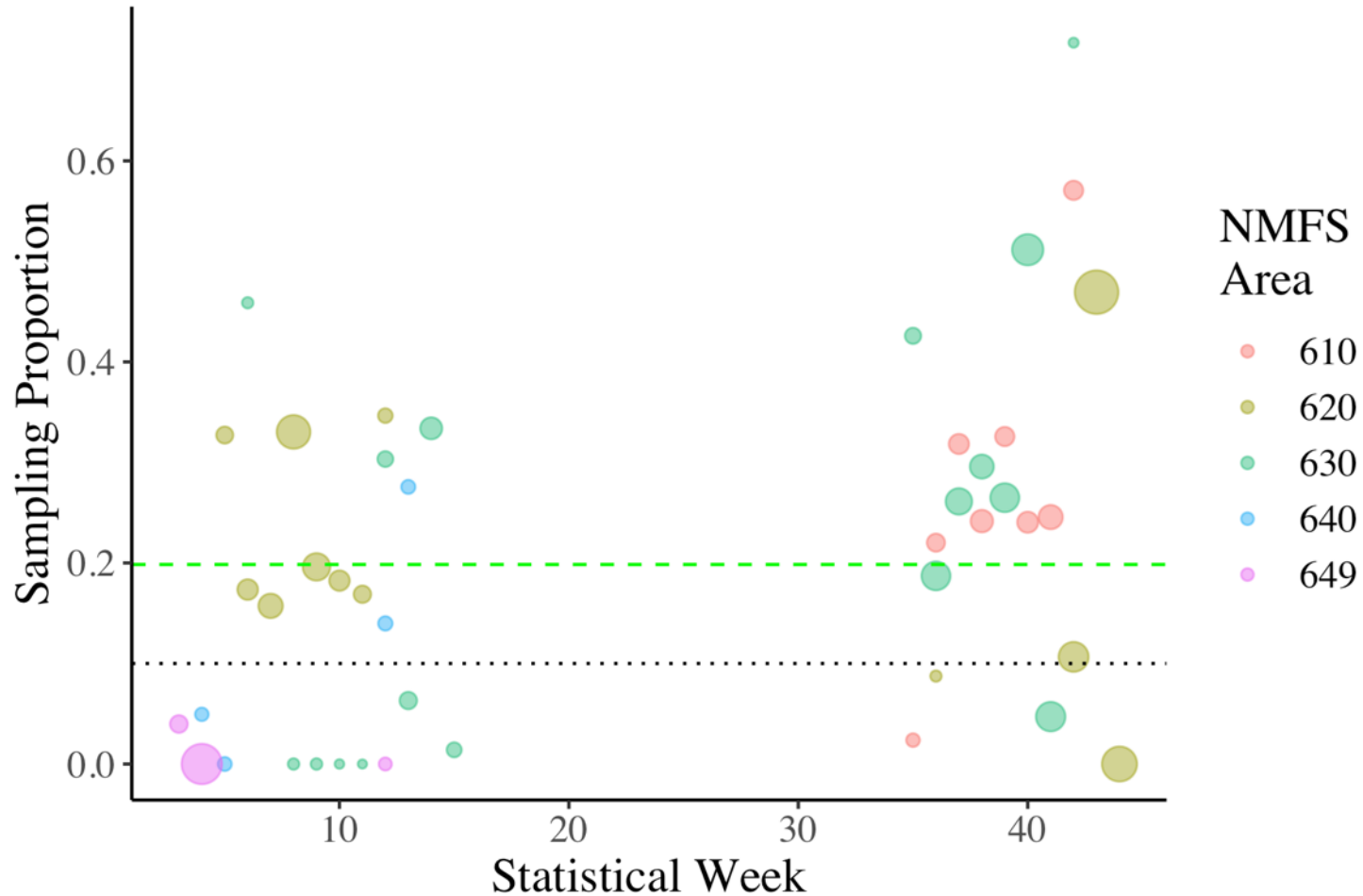
# BSAI A/B season



# GOA Chinook salmon bycatch distribution



# GOA sampling Chinook Salmon

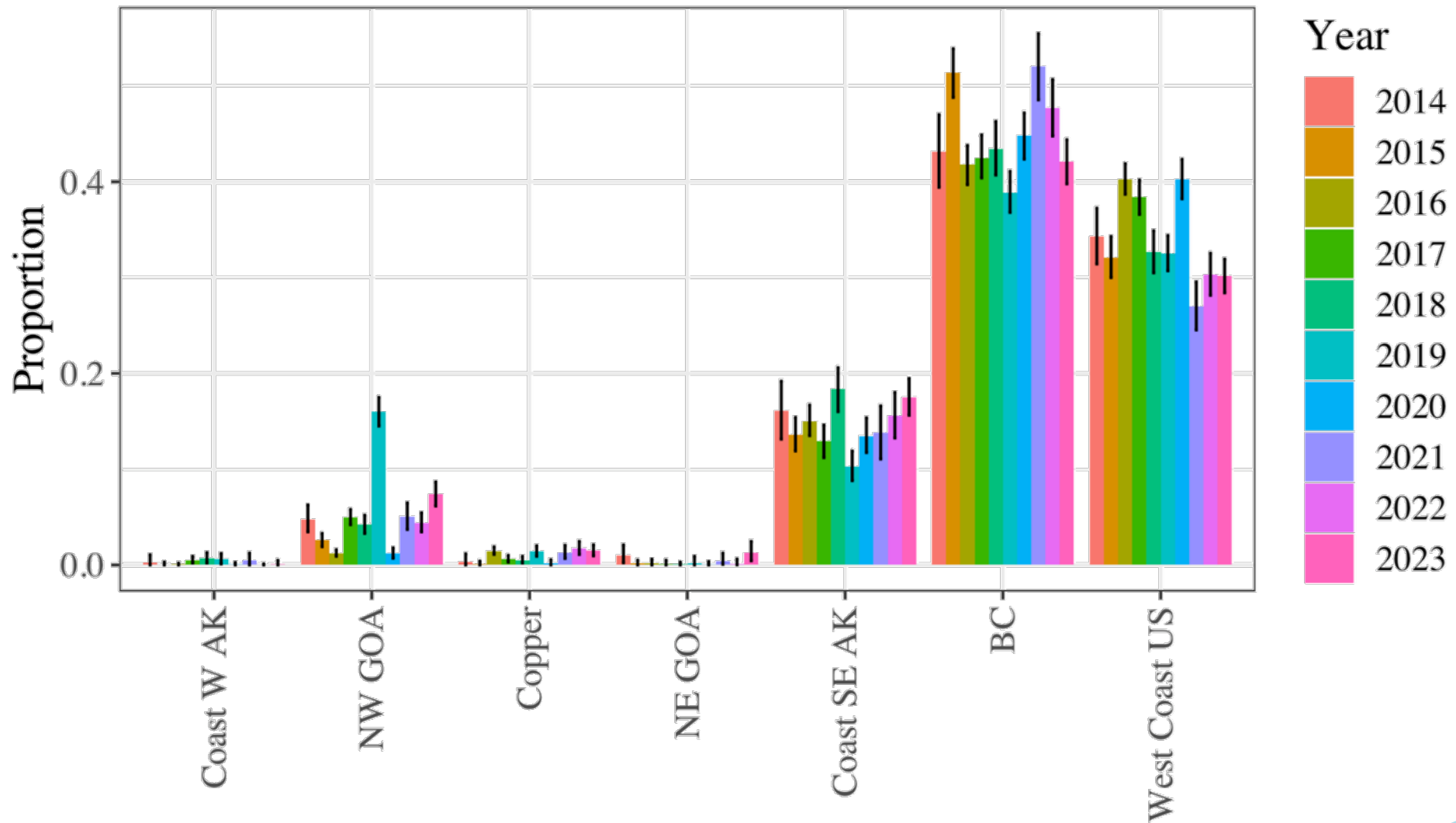


Not atypical

Black dot line = 1 in 10 goal

Green dash line ~ 2 in 10 realized average sampling

# GOA Chinook Salmon 2014-2023



# GOA - Chinook Salmon

GOA (PSC = 18,302; n = 3138)

Region	Est. num.	Est. CI	Mean	2.5%	97.5%	P=0	SF
Russia	0	0-9	0.000	0.000	0.000	0.83	1.00
Coast W AK	9	0-89	0.001	0.000	0.005	0.65	1.00
Mid Yukon	0	0-5	0.000	0.000	0.000	0.84	1.00
Up Yukon	0	0-5	0.000	0.000	0.000	0.84	1.00
N AK Pen	4	0-49	0.000	0.000	0.003	0.69	1.00
NW GOA	1,353	1,126-1,587	0.074	0.062	0.087	0.00	1.00
Copper	273	173-386	0.015	0.009	0.021	0.00	1.00
NE GOA	233	80-450	0.013	0.004	0.025	0.00	1.01
Coast SE AK	3,208	2,859-3,565	0.175	0.156	0.195	0.00	1.00
BC	7,702	7,281-8,127	0.421	0.398	0.444	0.00	1.00
West Coast US	5,517	5,199-5,846	0.301	0.284	0.319	0.00	1.00