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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

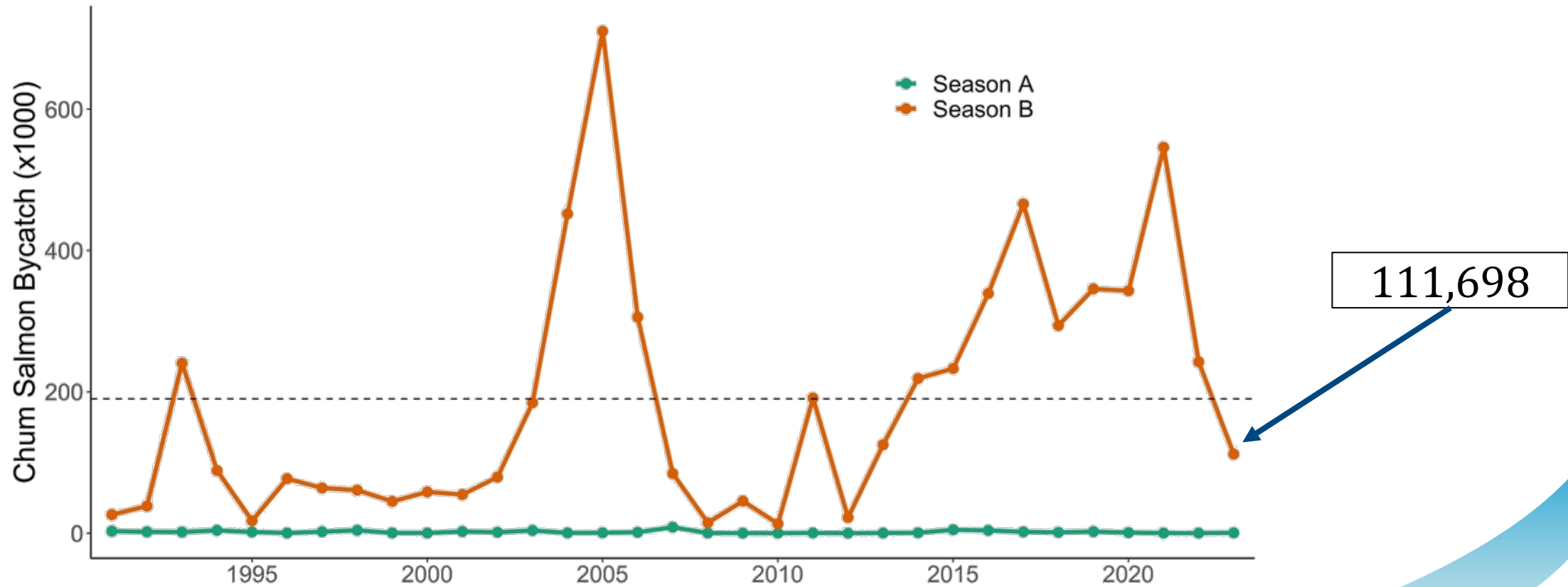


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Chum Salmon Prohibited Species Catch

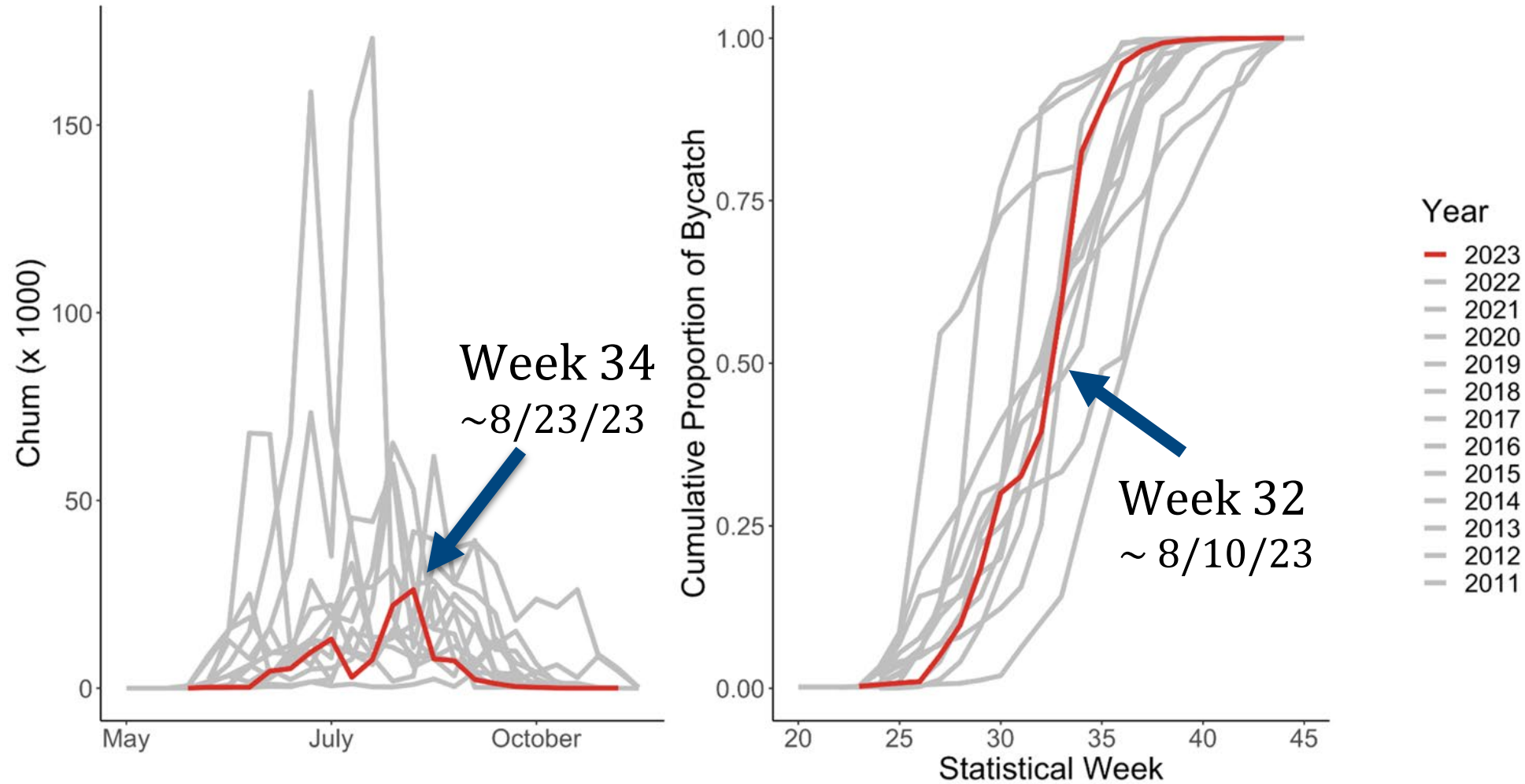
99.6% in B-season

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



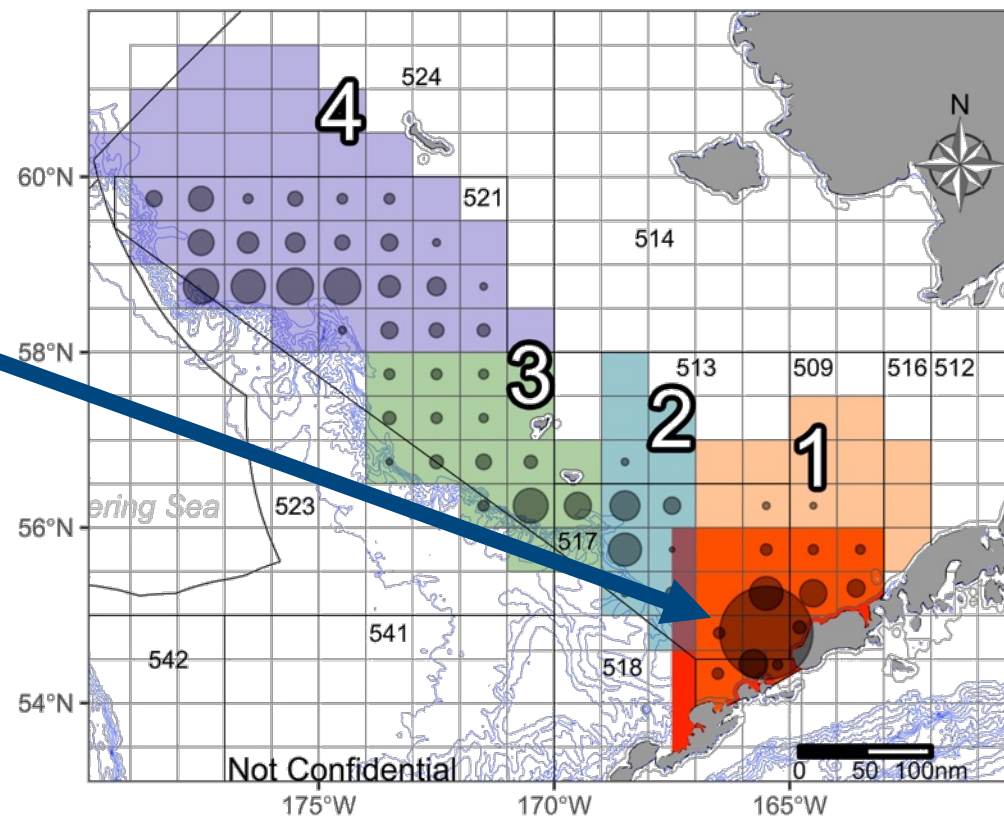
111,698

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%

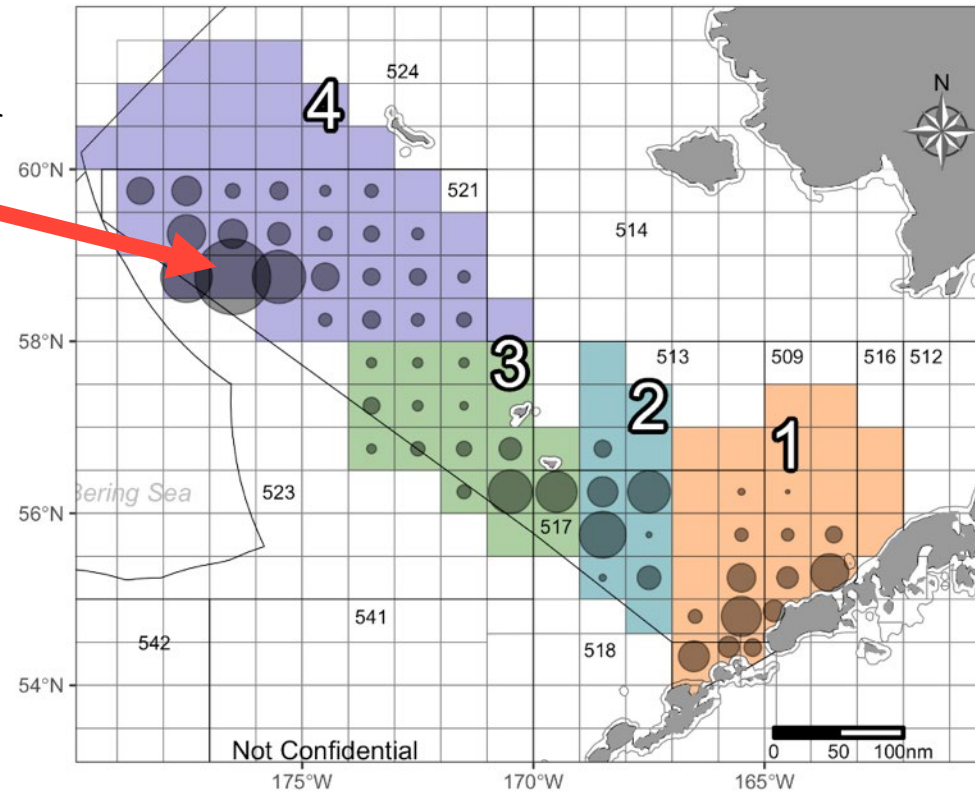


Bycatch Rate (Chum per mt. Pollock)

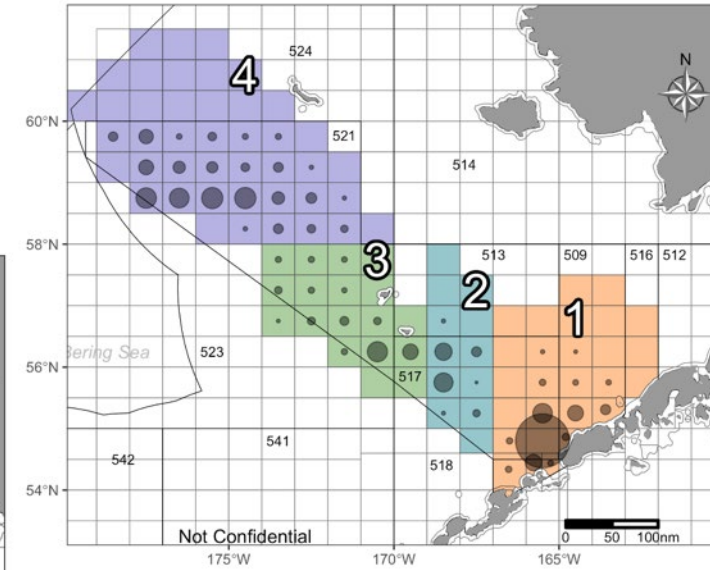
Bycatch Rates

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

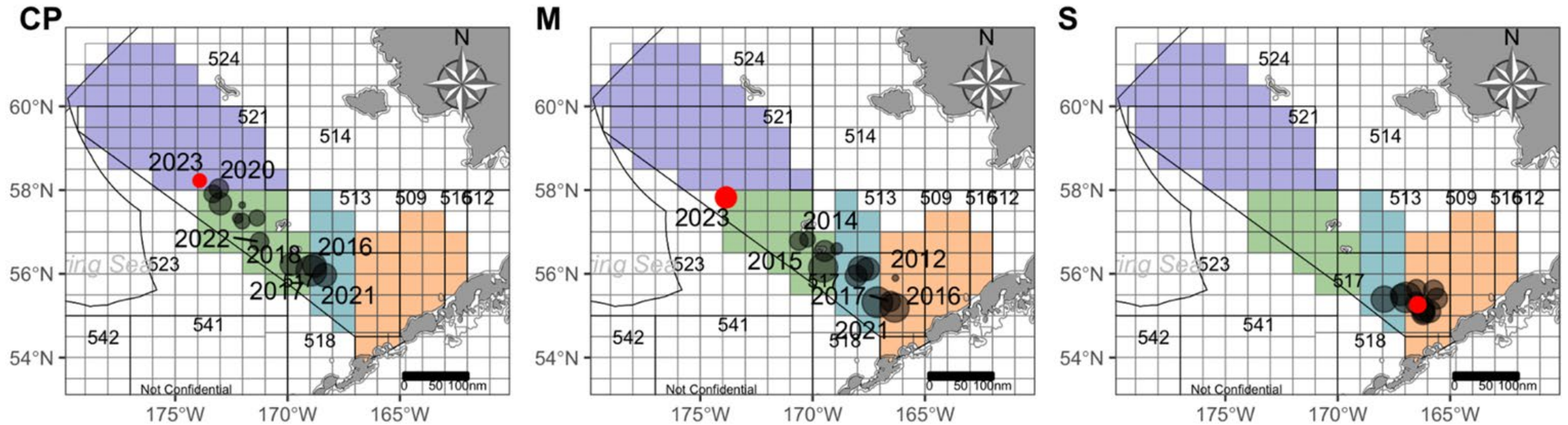
Chum per metric ton of pollock



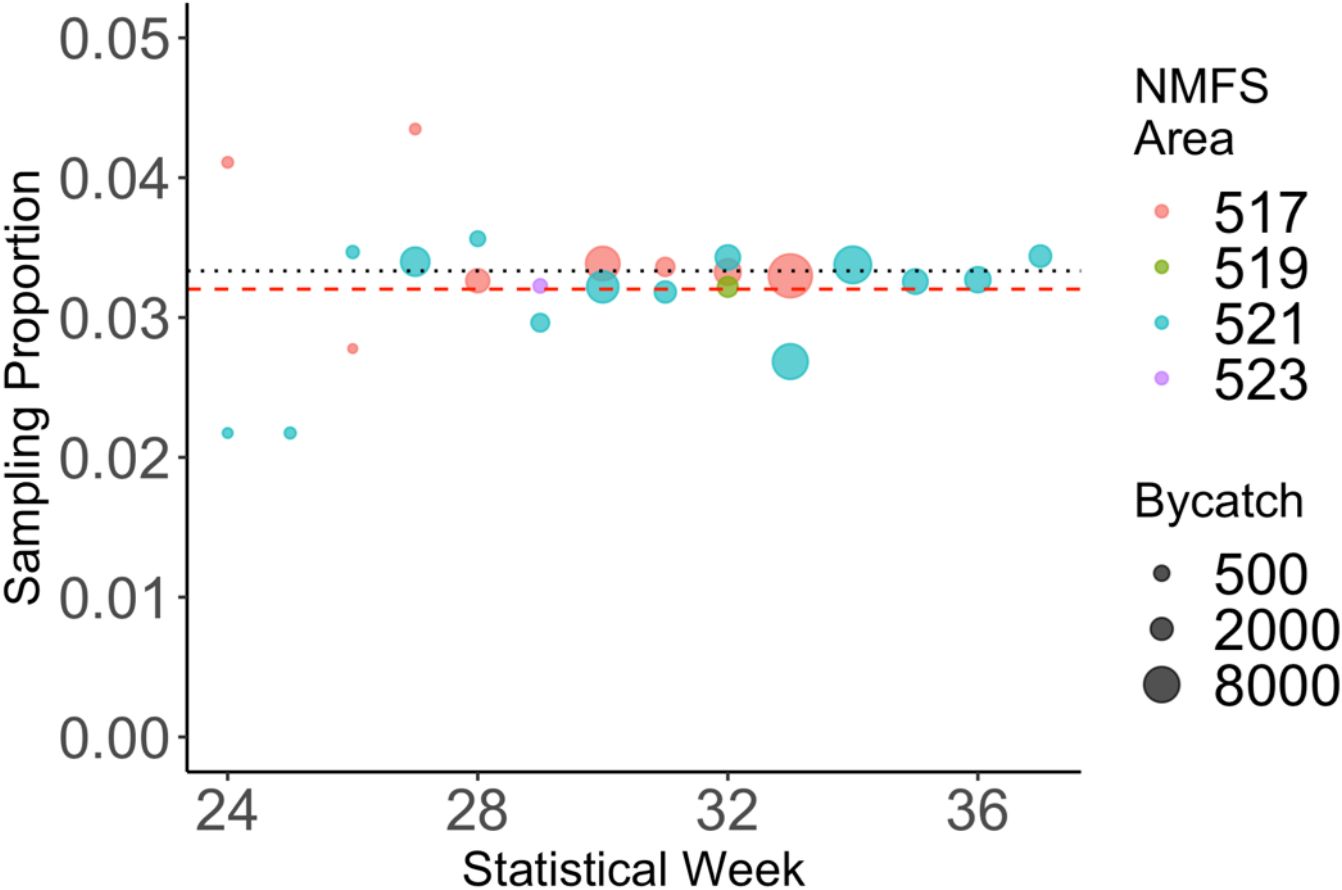
Chum Bycatch



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

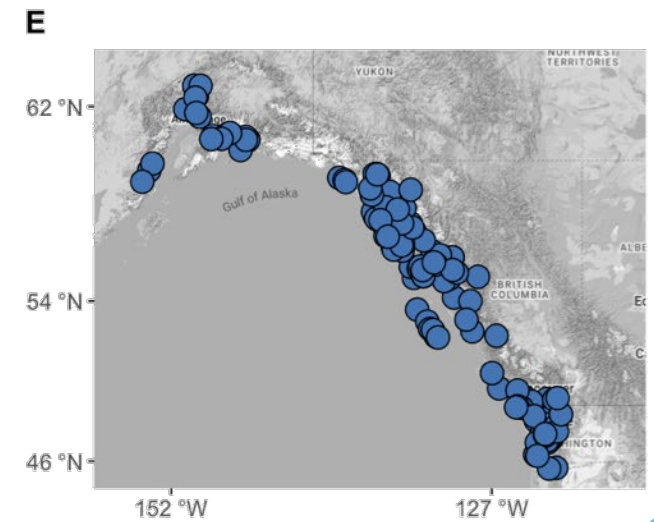
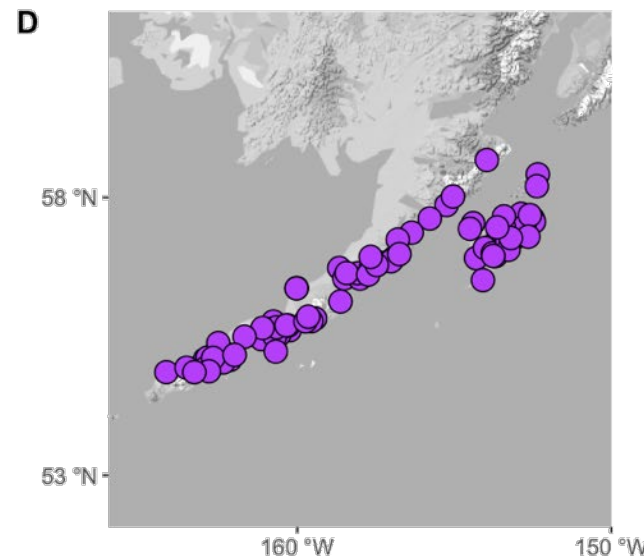
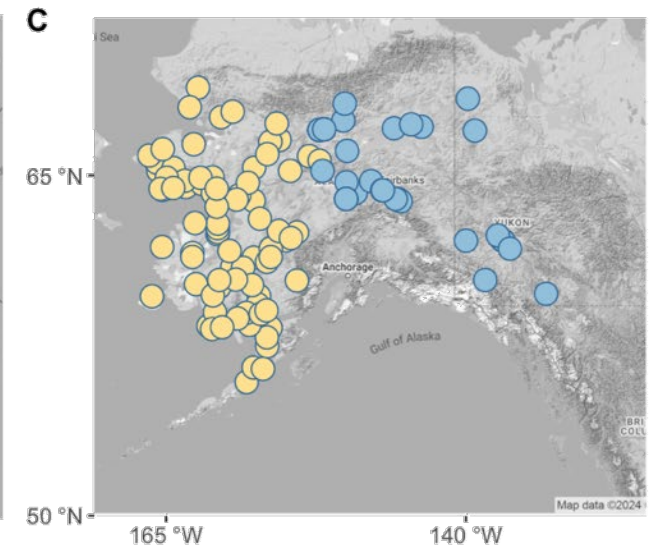
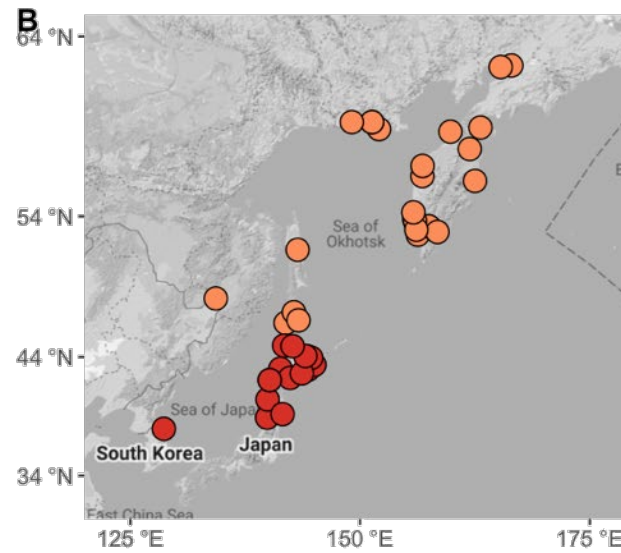
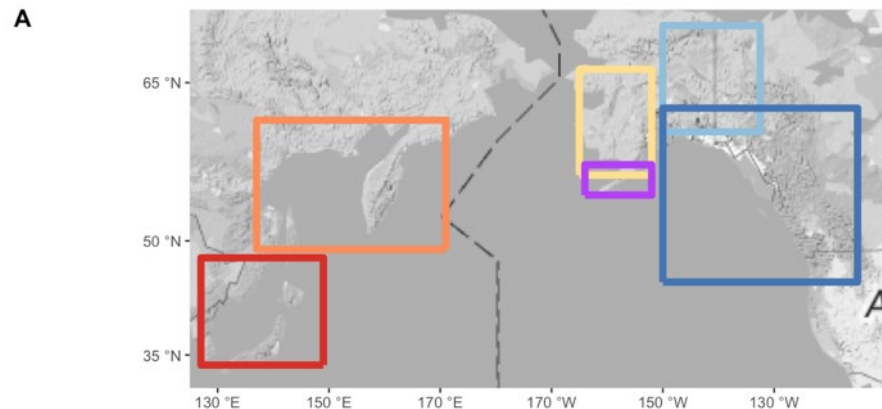
6 reporting groups:

B. NE Asia & SE Asia

C. W Alaska & Up/Mid Yukon

D. SW Alaska

E. EGOA/PNW

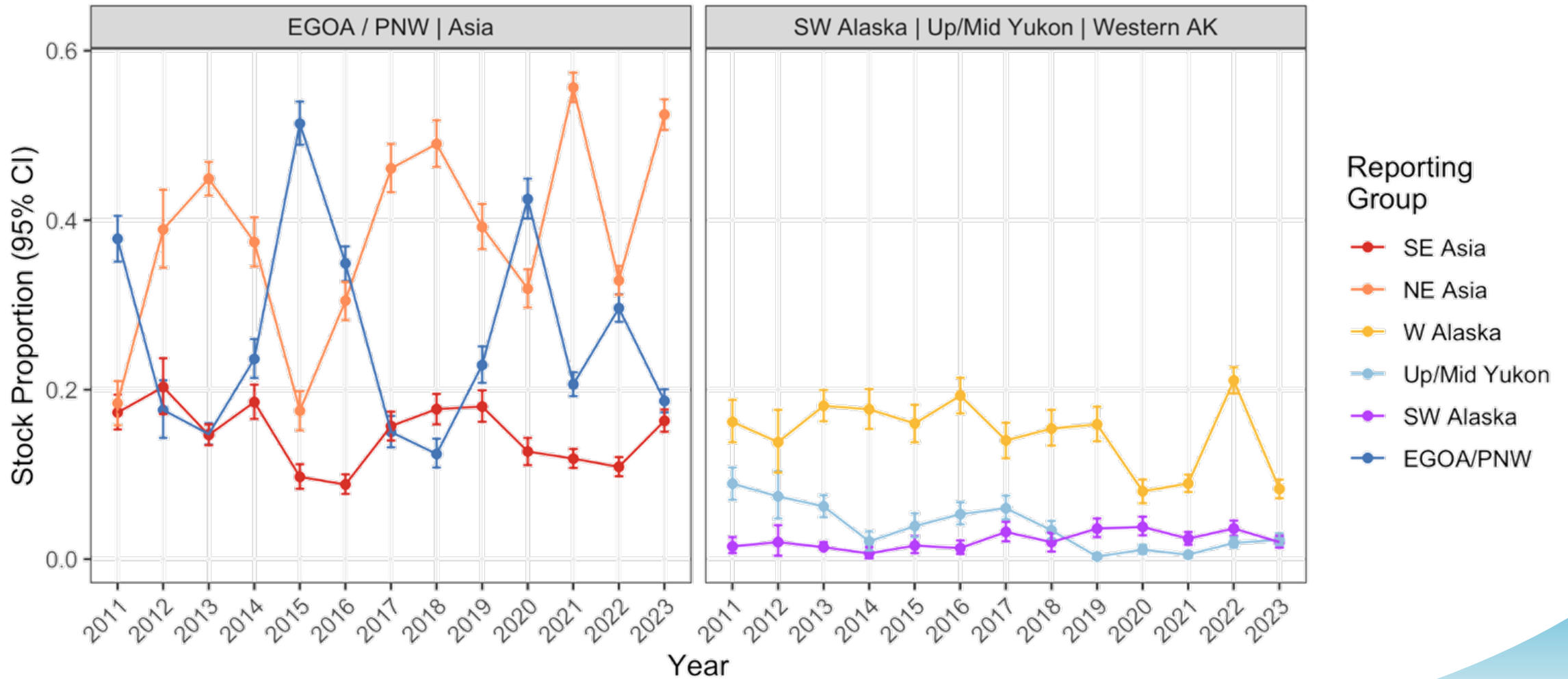


Chum salmon stock proportions: 2023 B-season

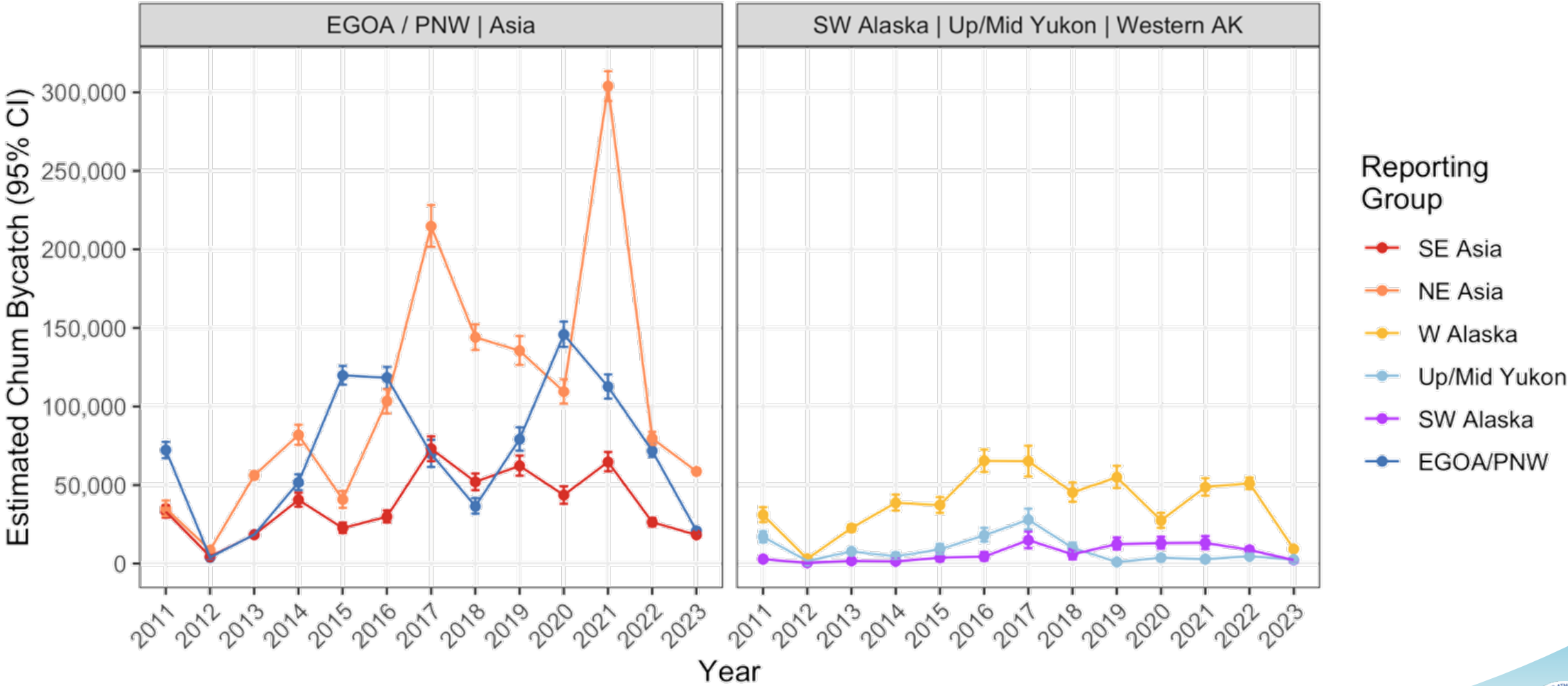
B-season (PSC = 111,698; n = 3277)

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

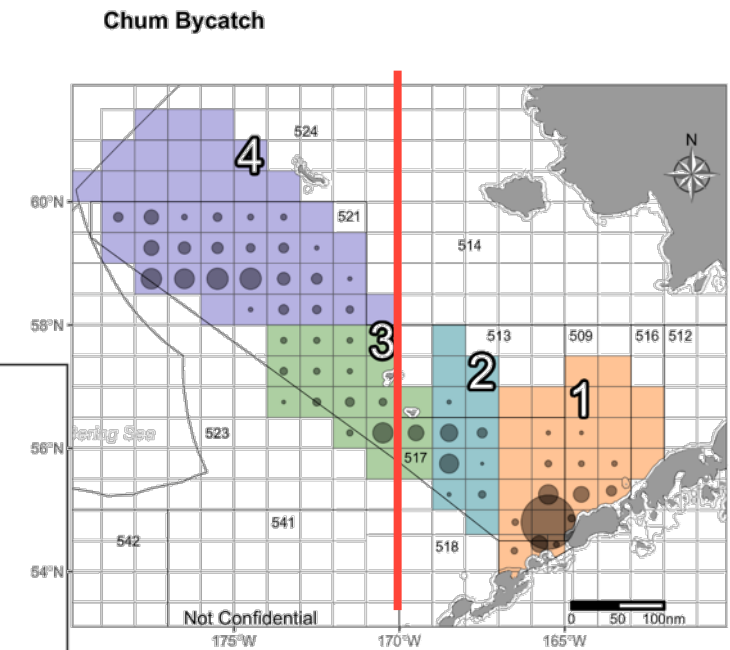
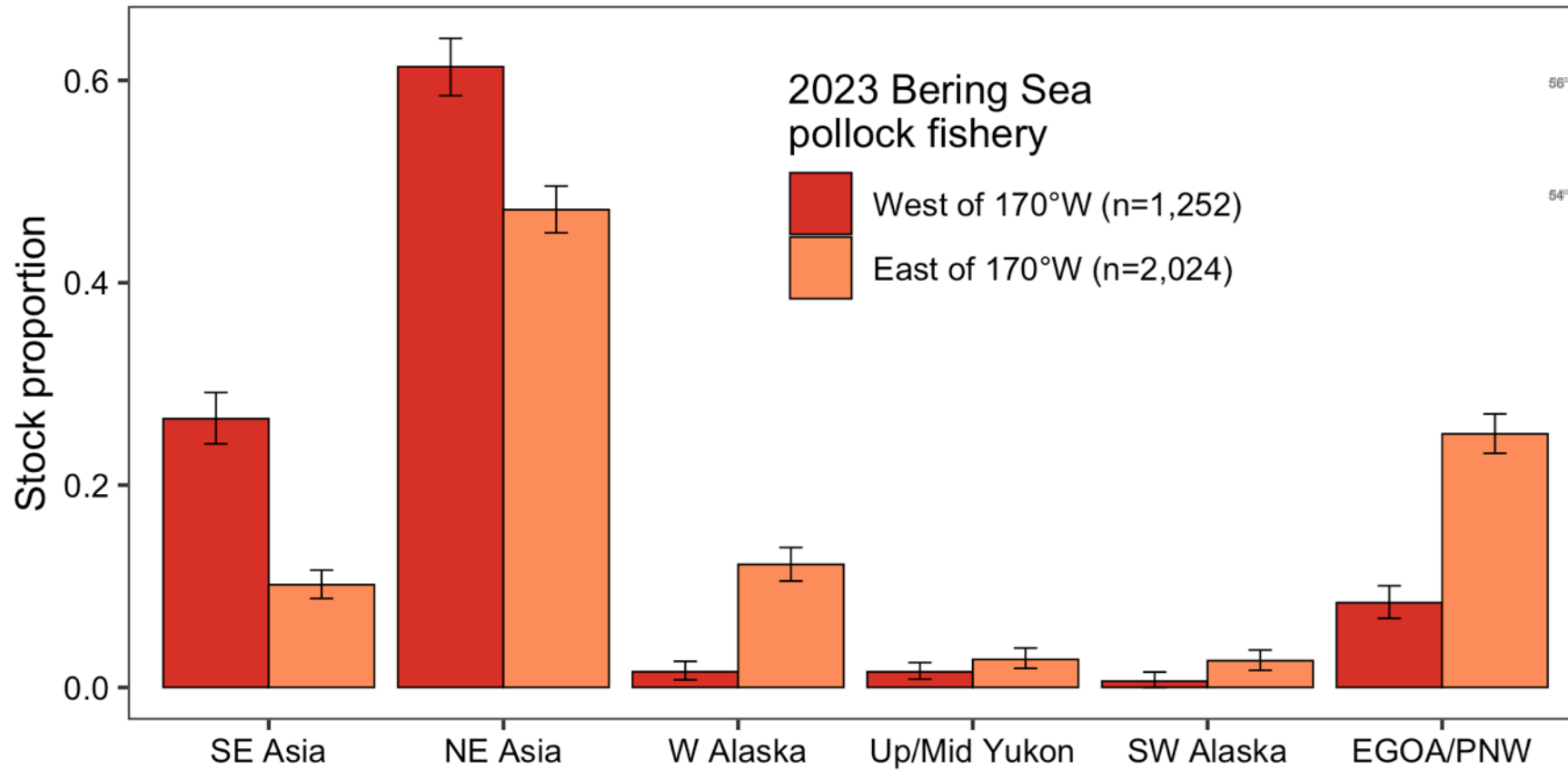
Stock proportions of chum salmon through time



Estimated number of chum salmon through time



West and east of 170°W – chum bycatch



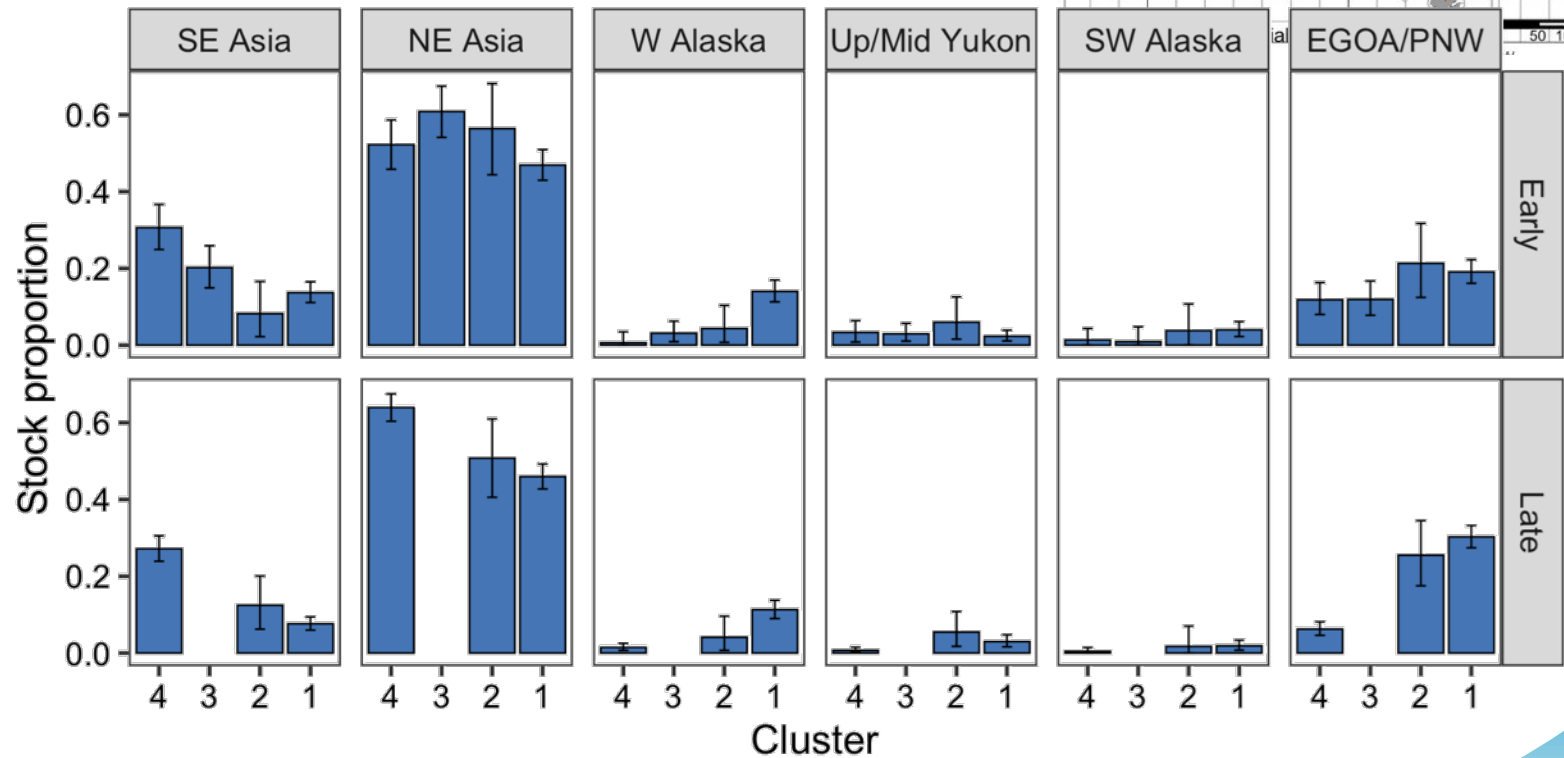
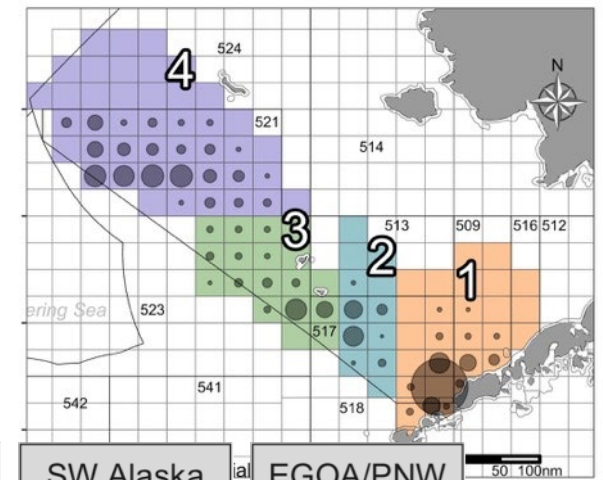
Spatiotemporal variation - 2023 chum bycatch

Western Alaska

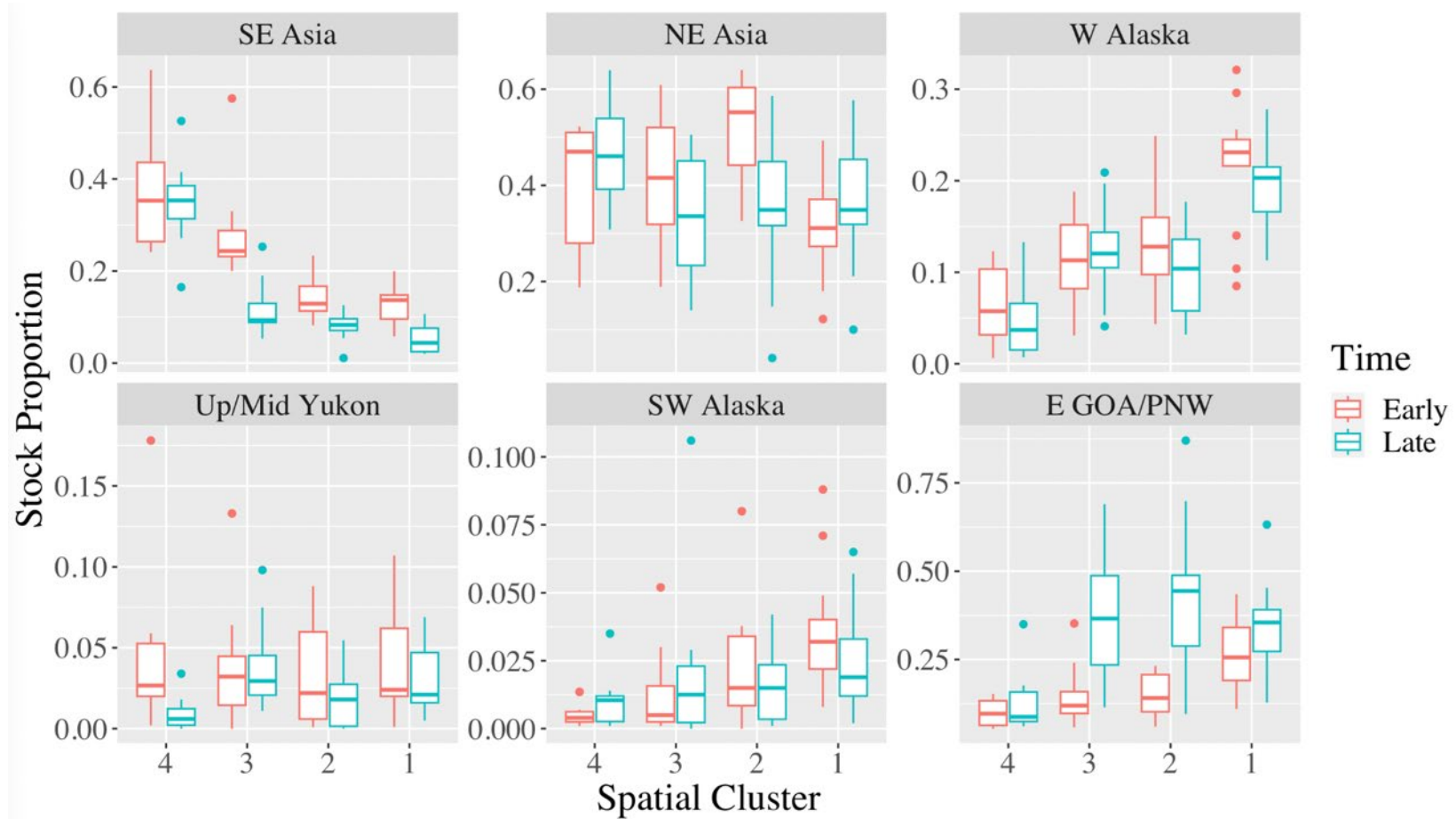
- ↓ East to West
- ⊘ Early to Late

SW Alaska & Yukon

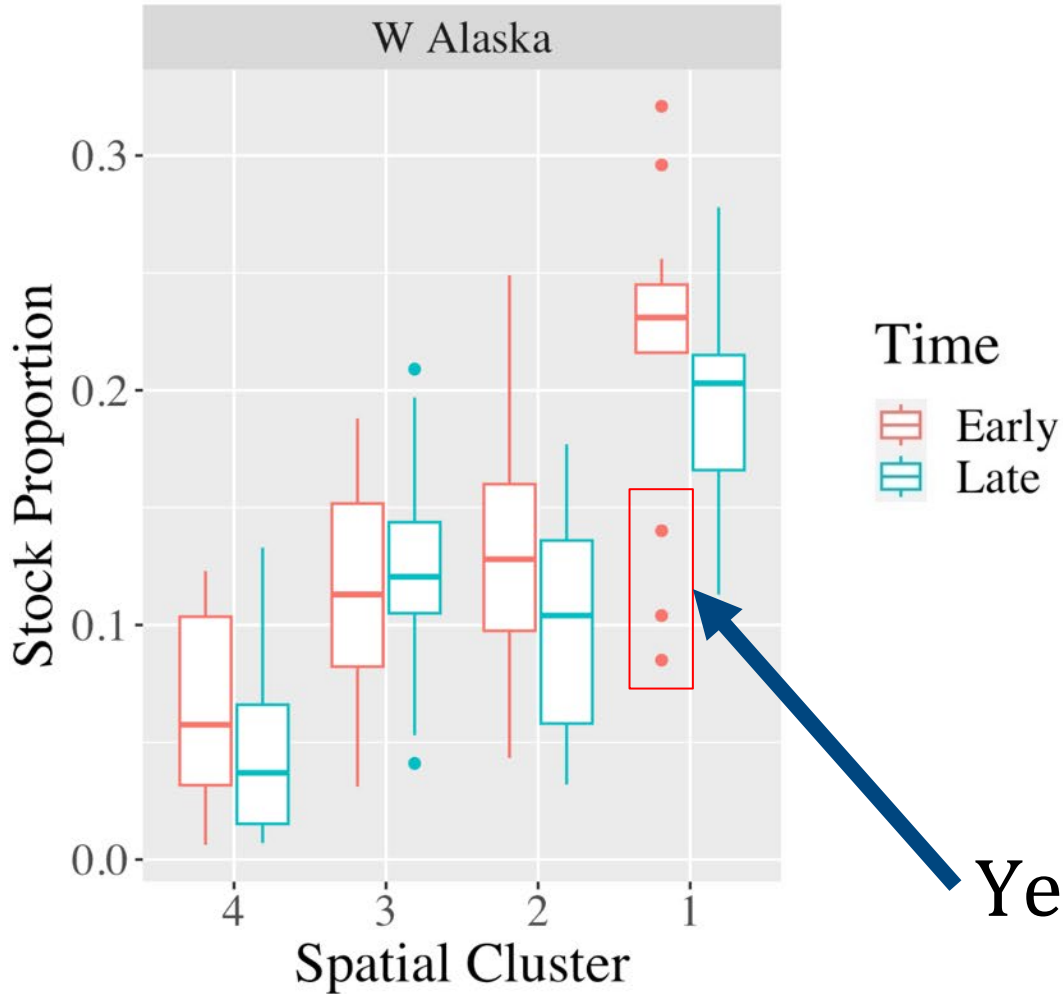
- ⊘ East to West
- ⊘ Early to Late



Spatiotemporal variation (2011-2023) - chum bycatch

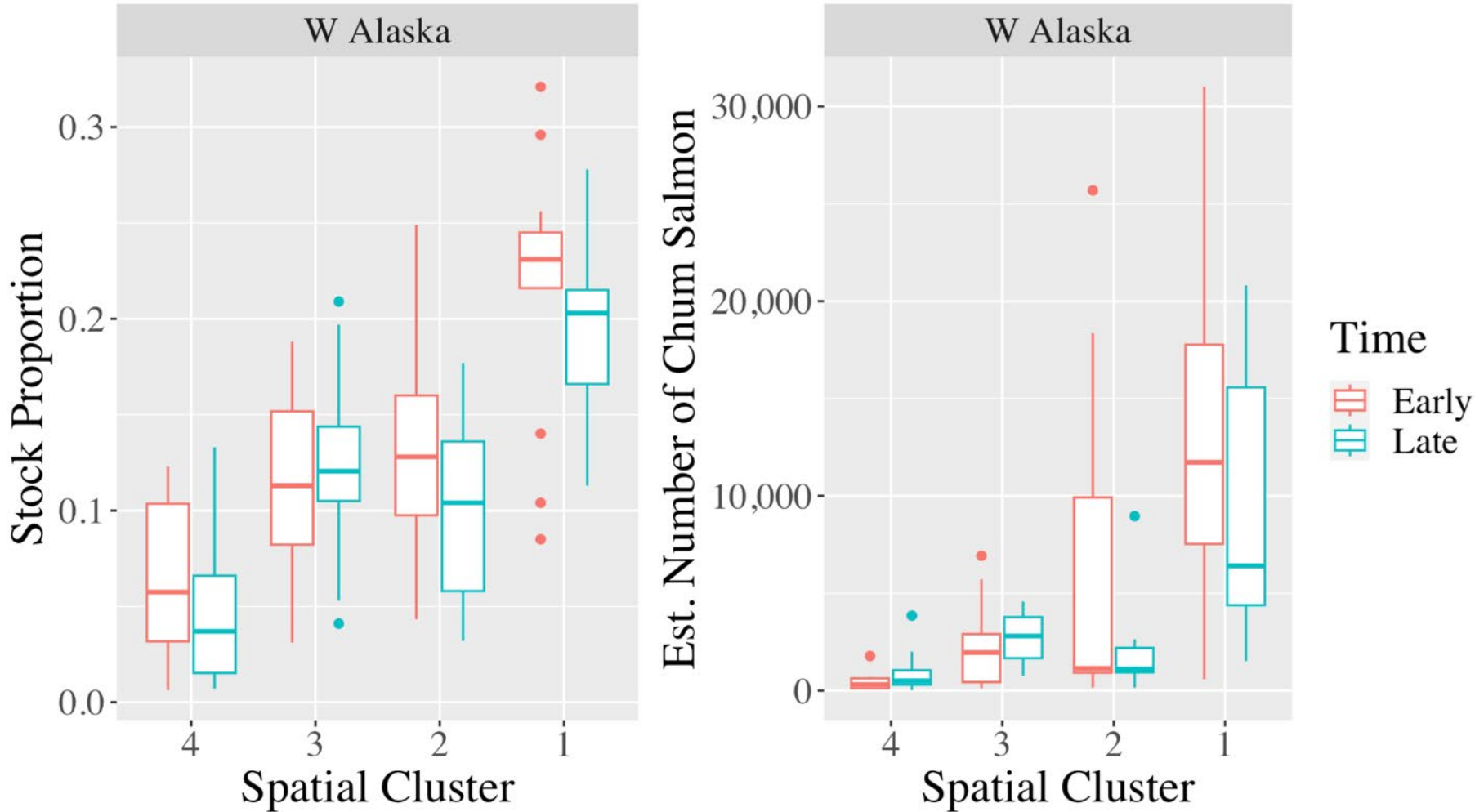


Spatiotemporal variation (2011-2023) - W Alaska component

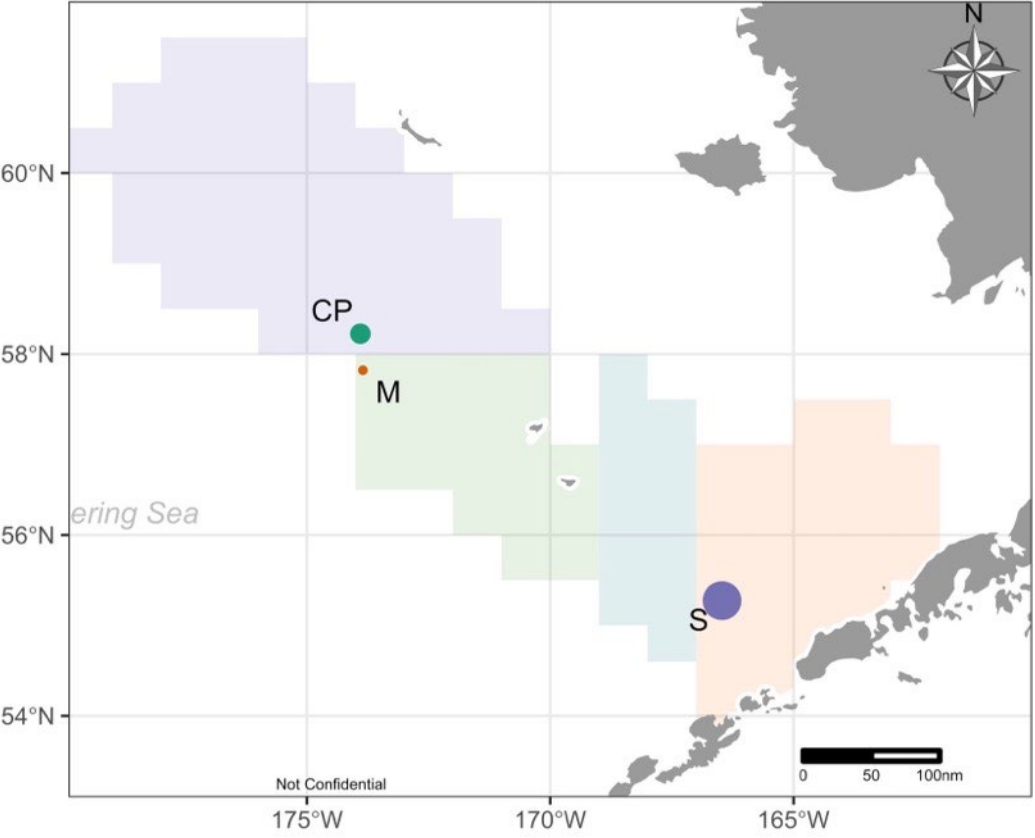


Years: 2020, 2021, 2023

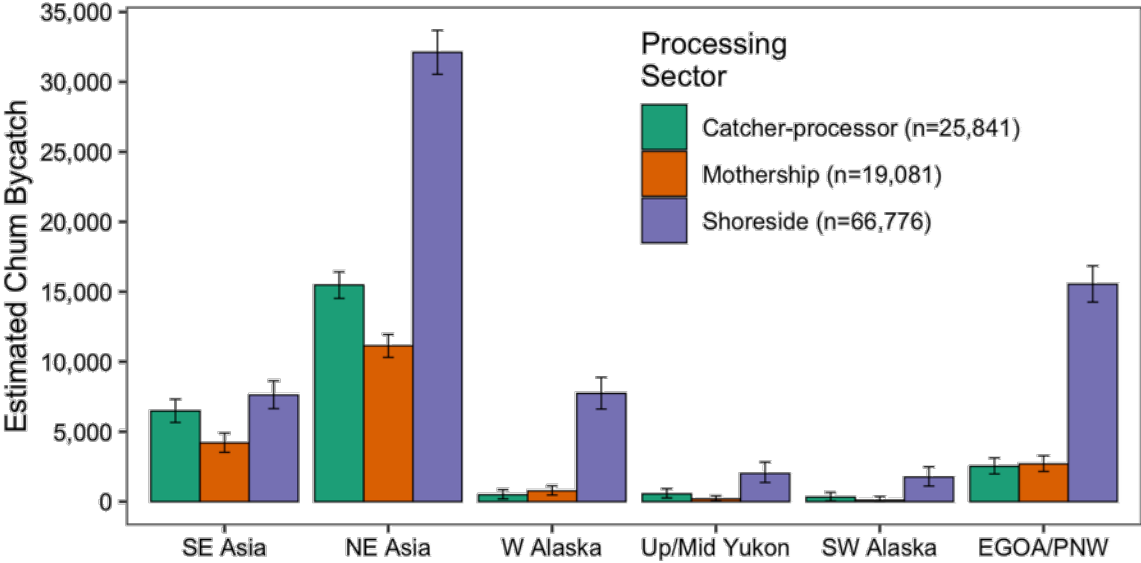
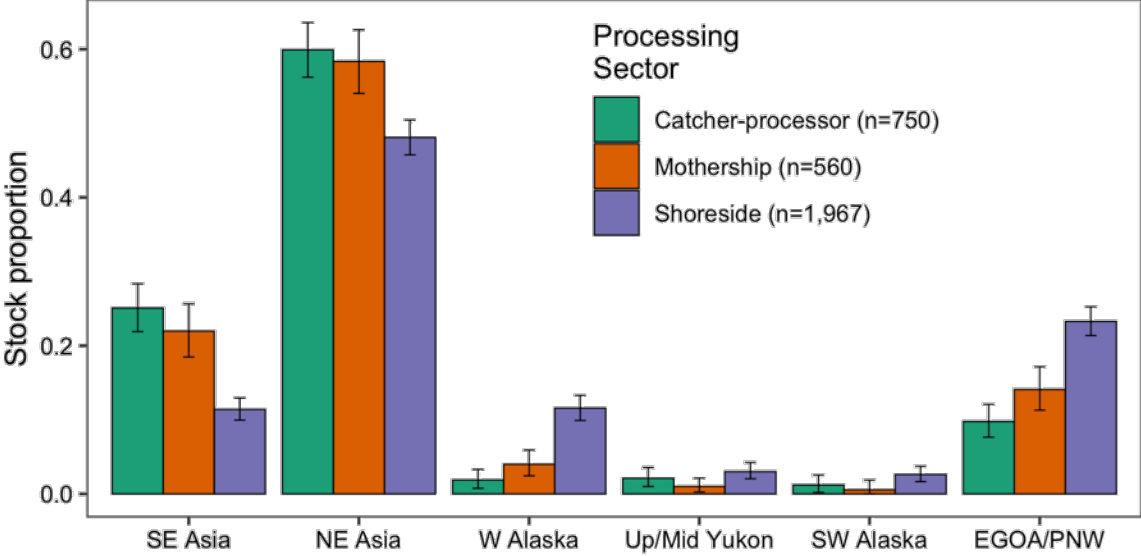
Spatiotemporal variation (2011-2023) - W Alaska component



Fishing sectors - 2023 chum bycatch

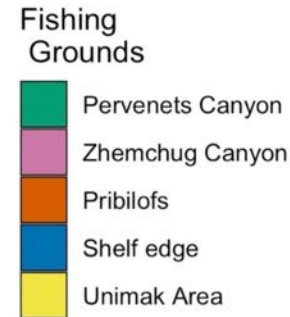
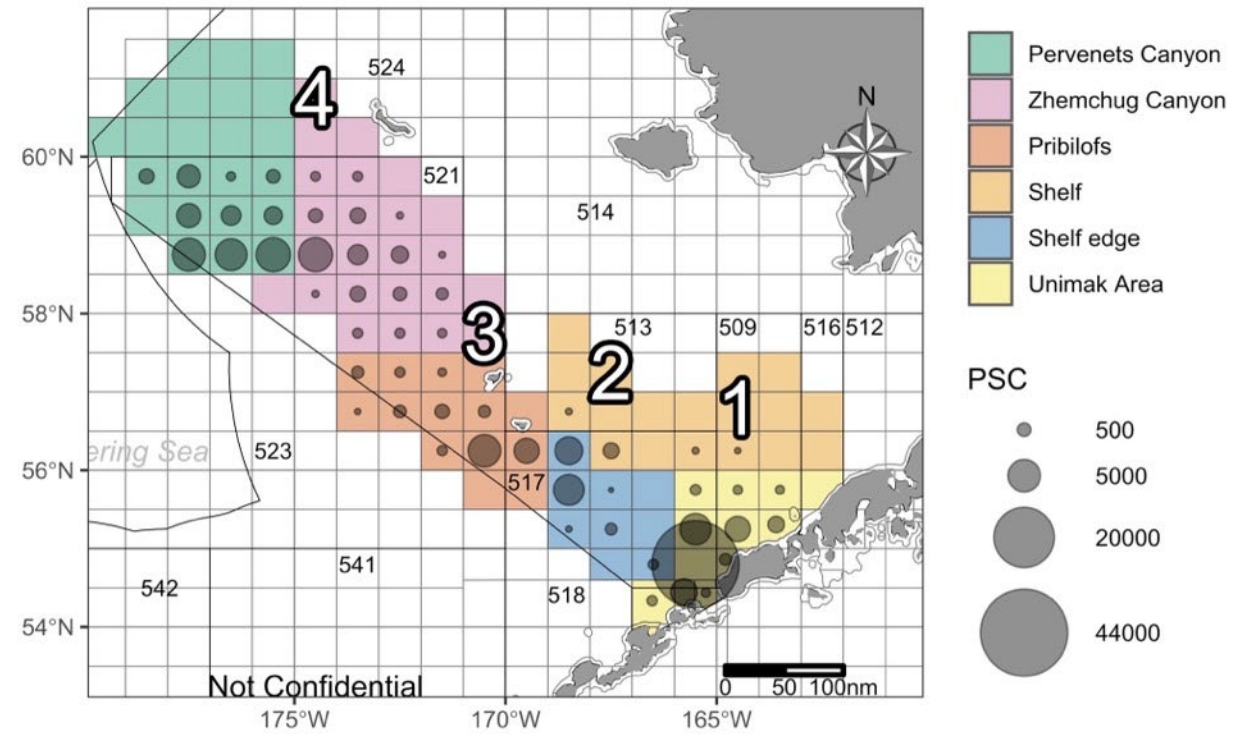
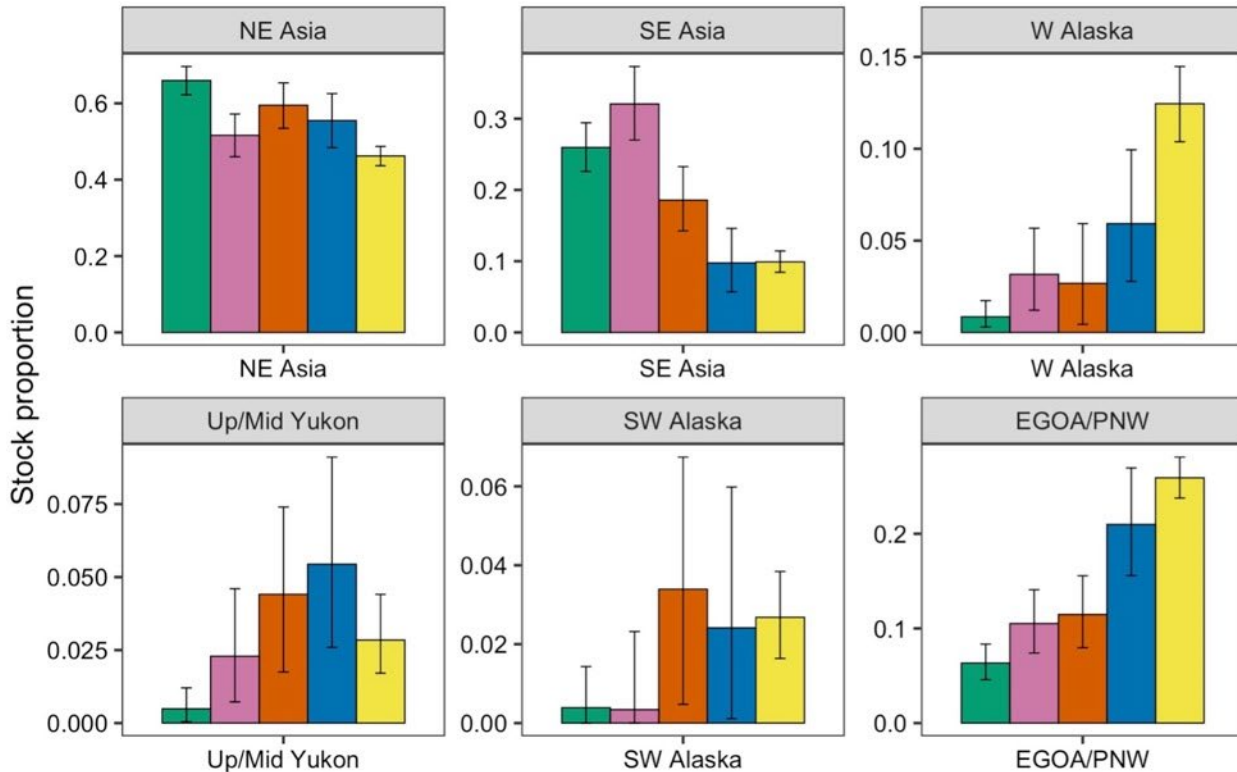


Processing Sector ● CP ● M ● S



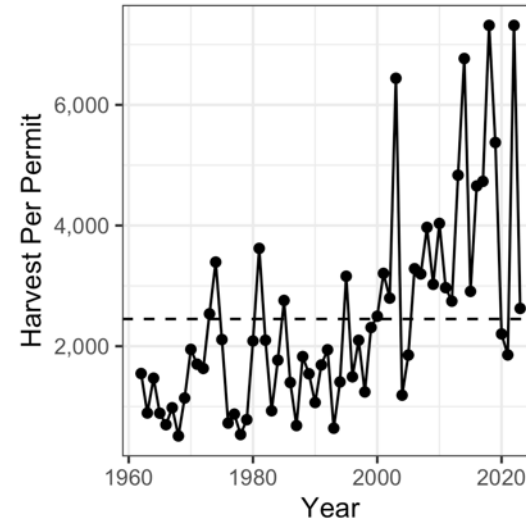
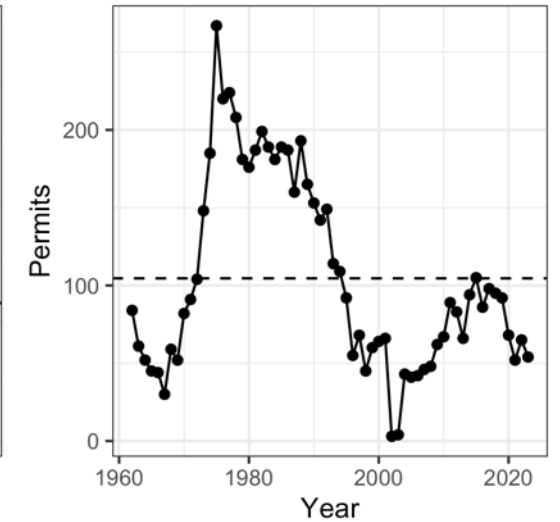
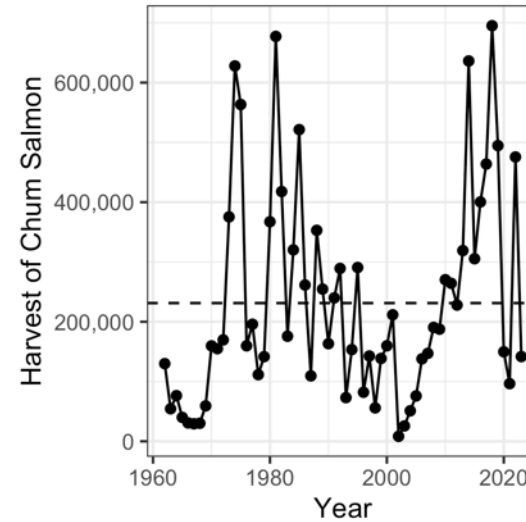
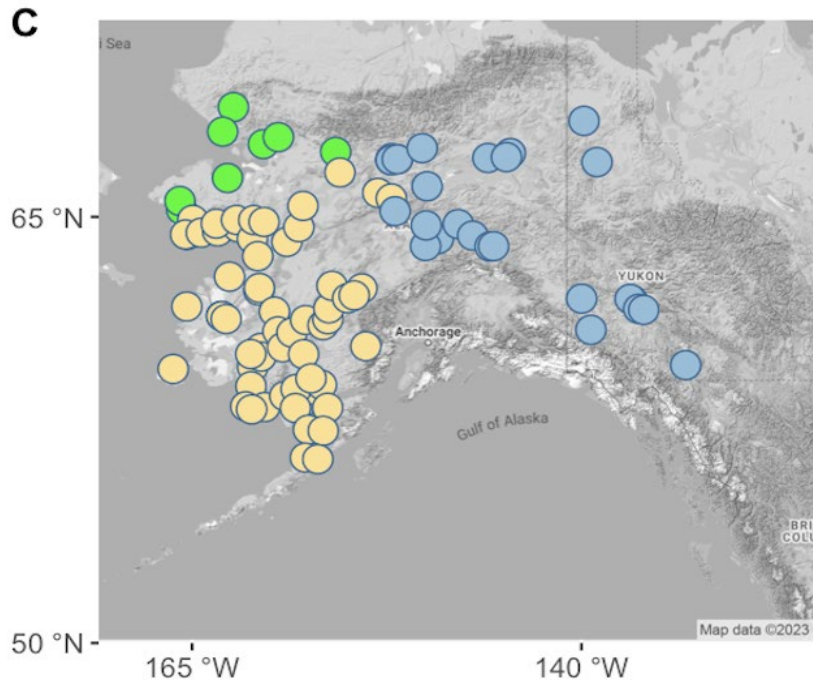
Fishing grounds - 2023 chum bycatch

*Note different scales



Kotzebue Sound analysis- chum salmon

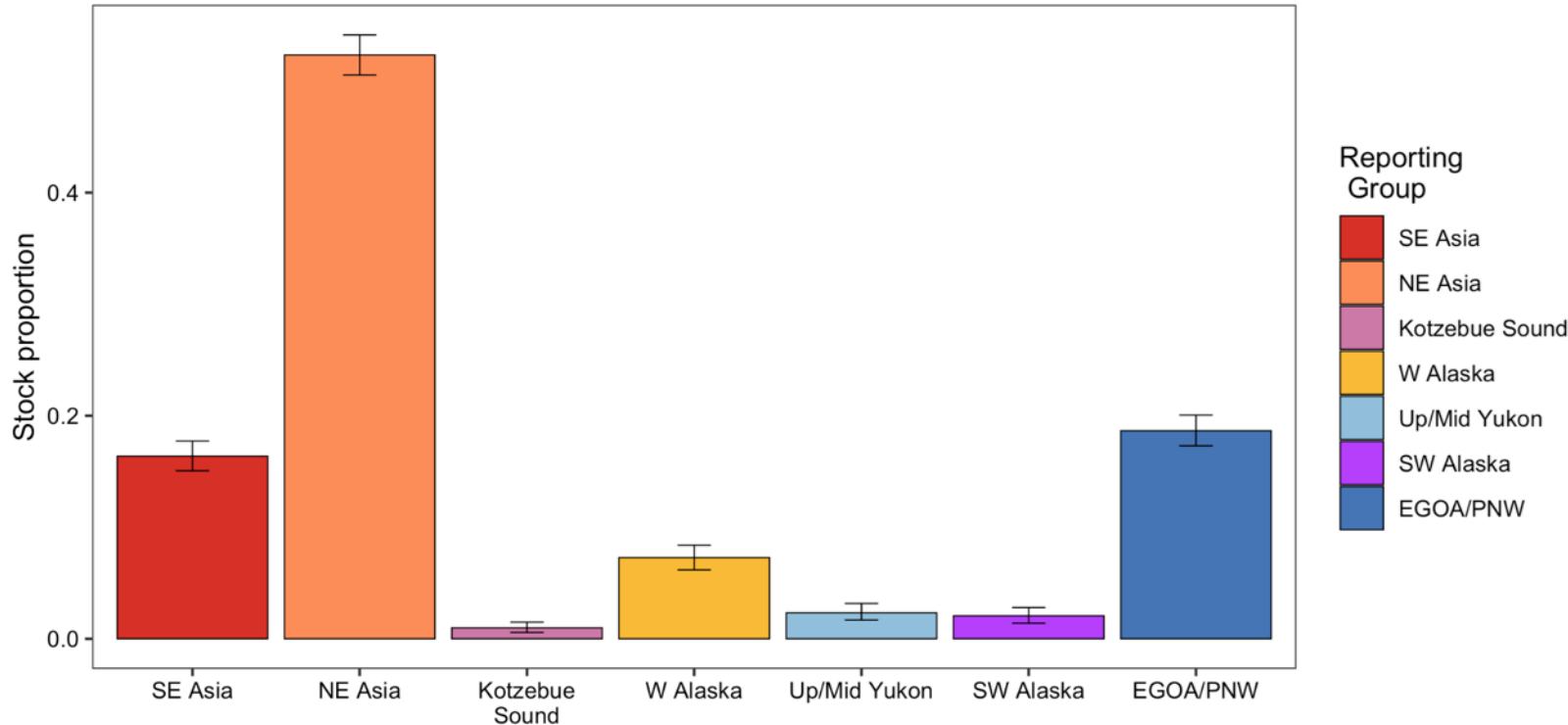
Kotzebue Sound reporting
group (*Green*):



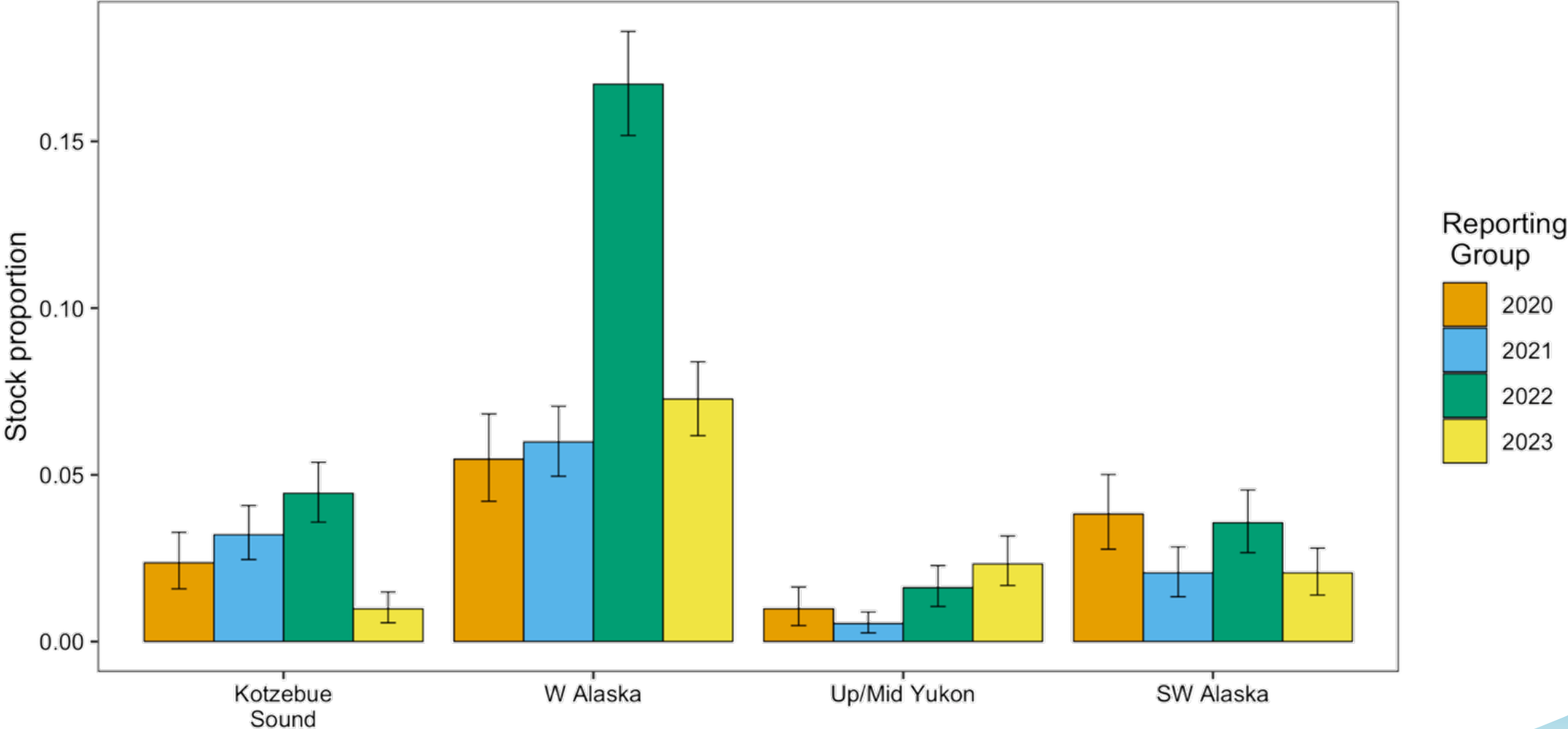
Commercial
fishing
information

Kotzebue Sound B-season - chum bycatch

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.



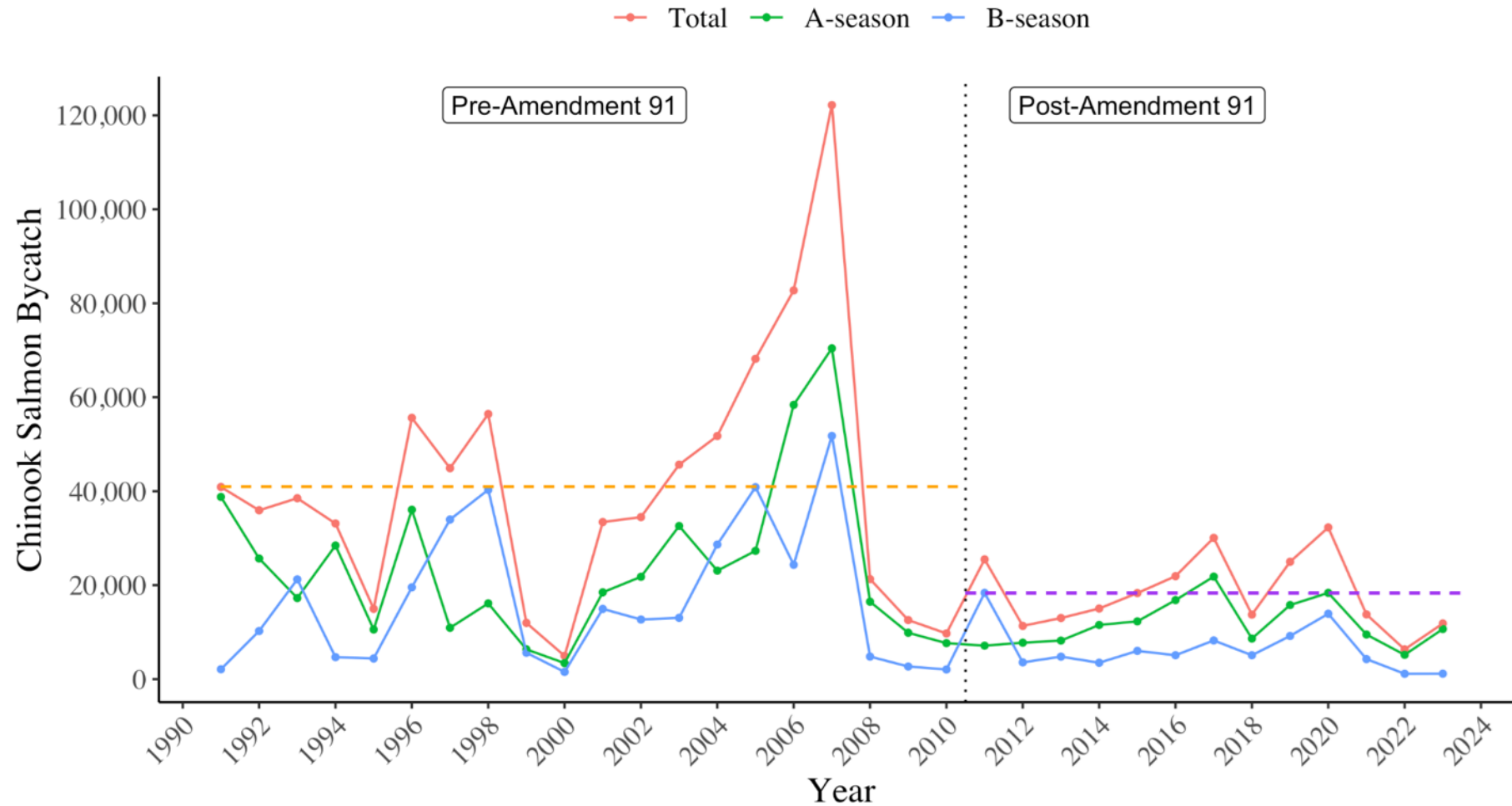
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Chinook salmon

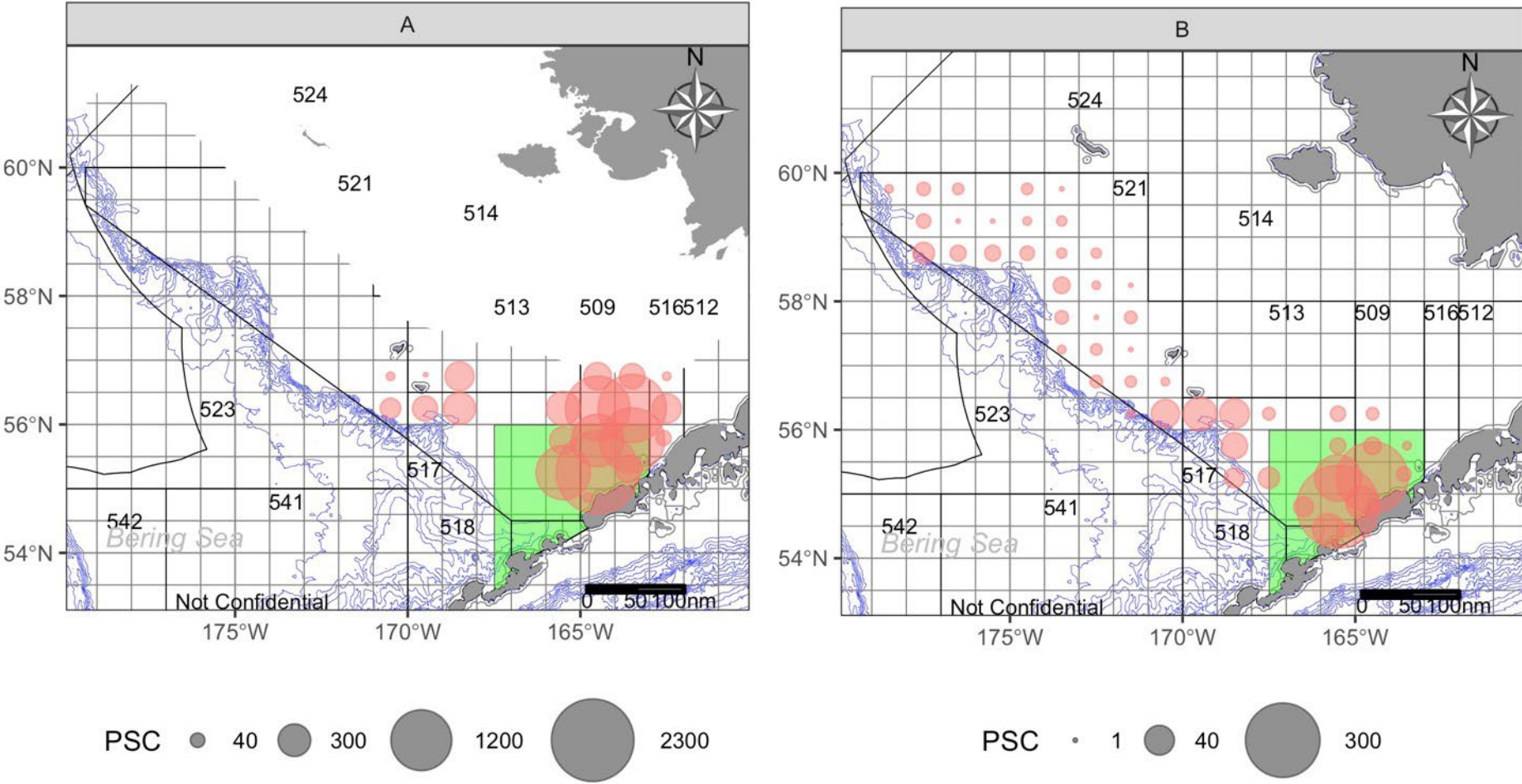


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Chinook Salmon Prohibited Species Catch



Spatial distribution of the Chinook salmon bycatch



Chinook salmon genetic baseline

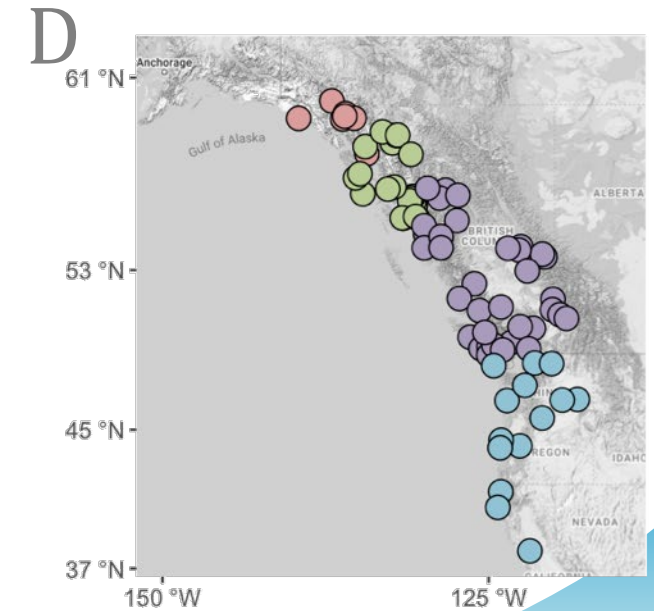
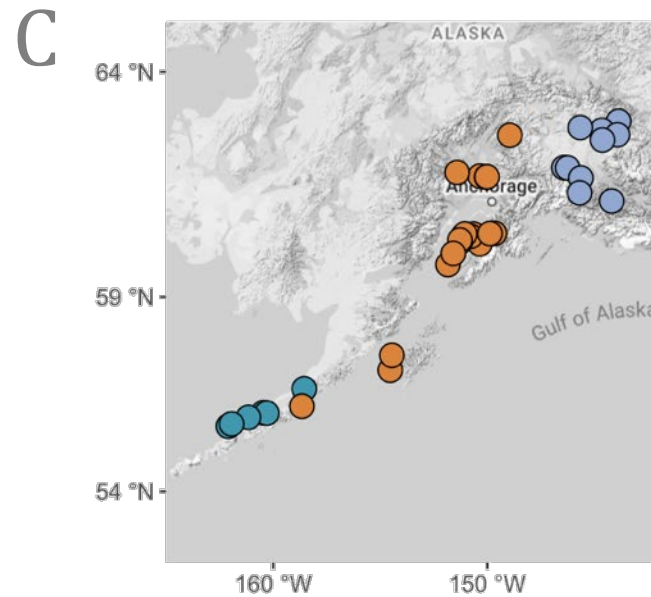
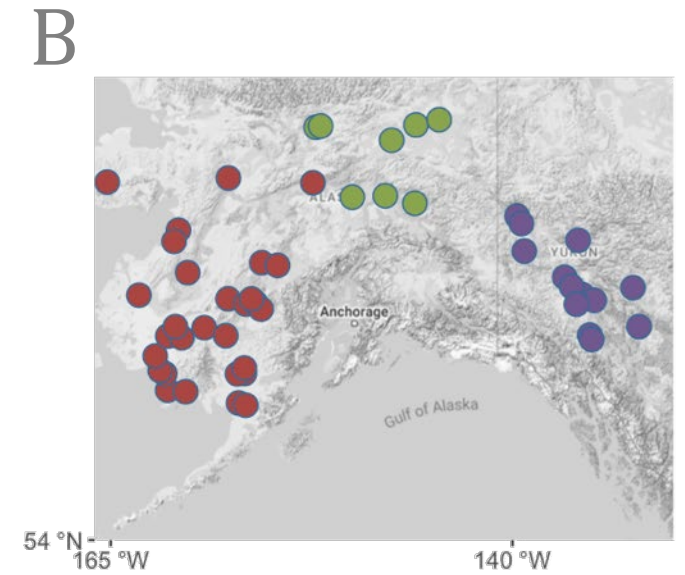
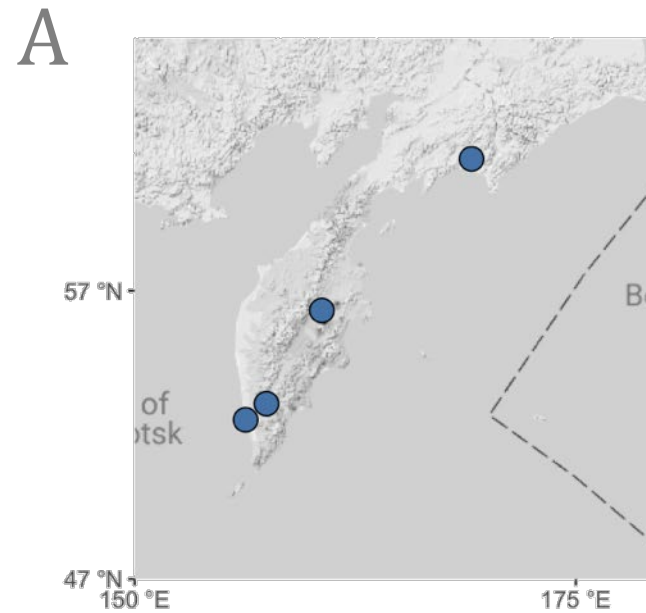
11 reporting groups

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)

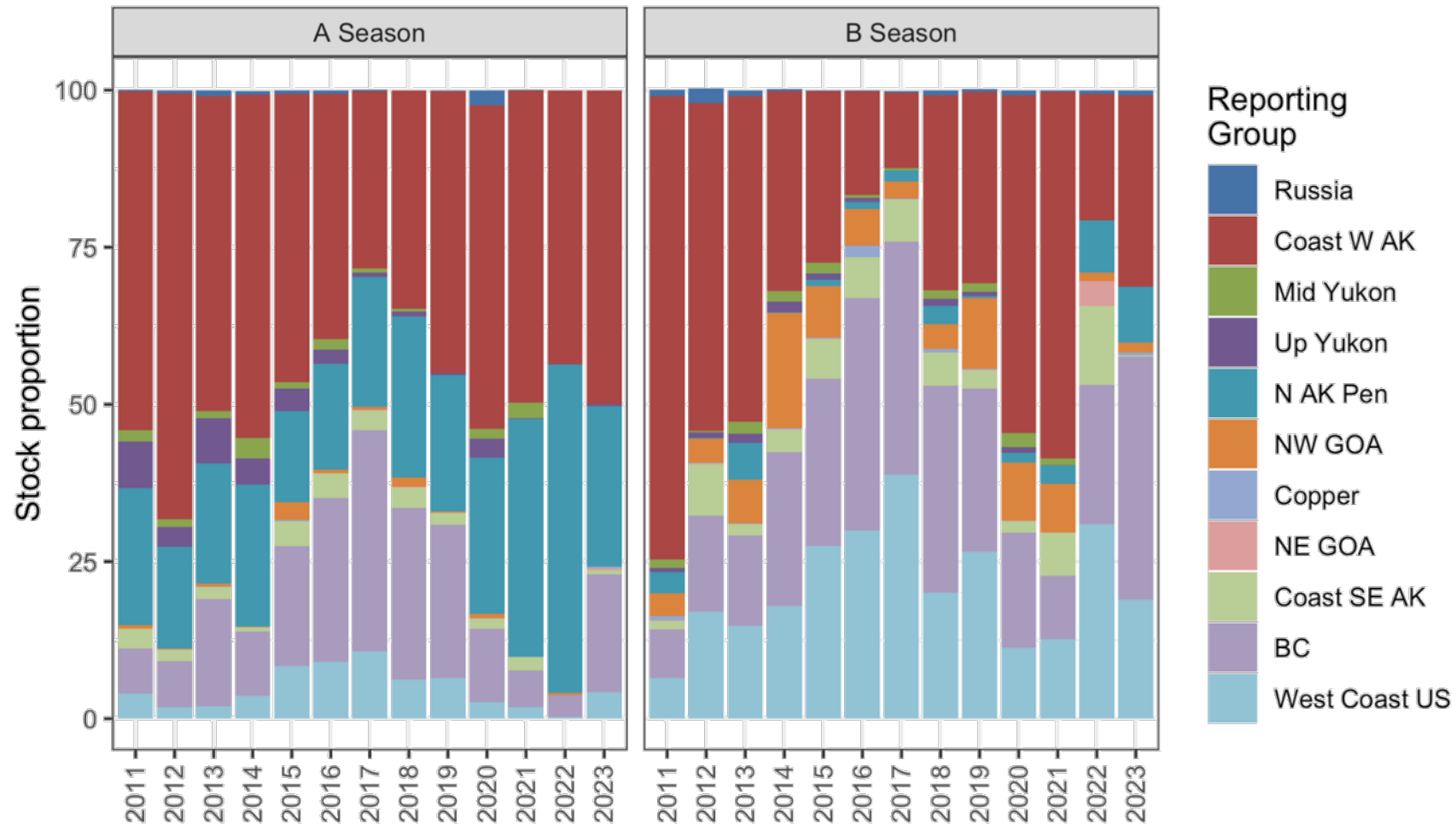
Region	Est. num.	Est. CI	Mean	2.5%	97.5%	P=0	SF
Russia	0	0-11	0.000	0.000	0.001	0.84	1.00
Coast W AK	5,302	4,917-5,689	0.500	0.464	0.536	0.00	1.00
Mid Yukon	0	0-31	0.000	0.000	0.003	0.81	1.00
Up Yukon	27	8-79	0.003	0.001	0.007	0.00	1.00
N AK Pen	2,710	2,369-3,065	0.256	0.223	0.289	0.00	1.00
NW GOA	0	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.

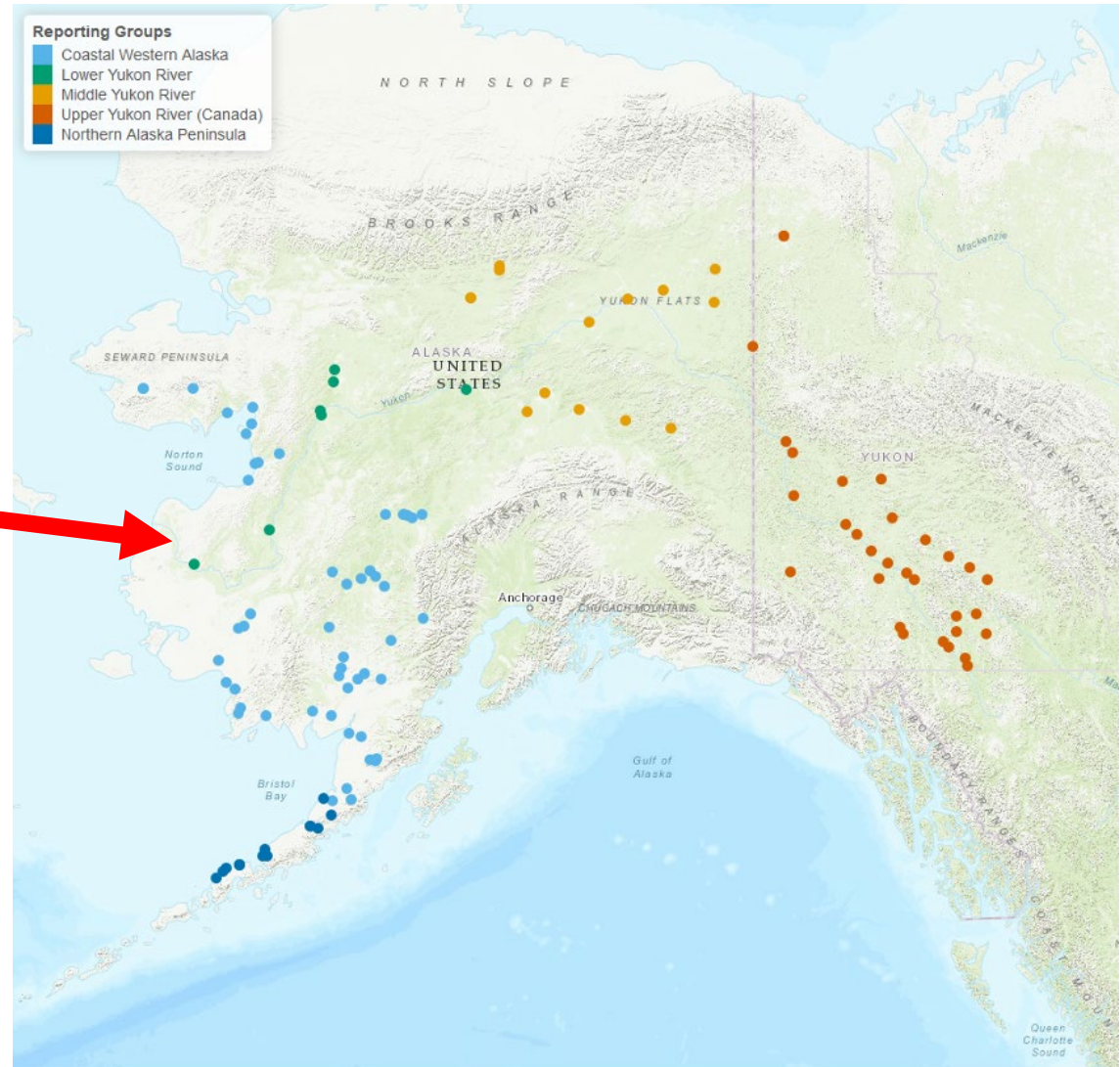
New Chinook Baseline - Coming 2024

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

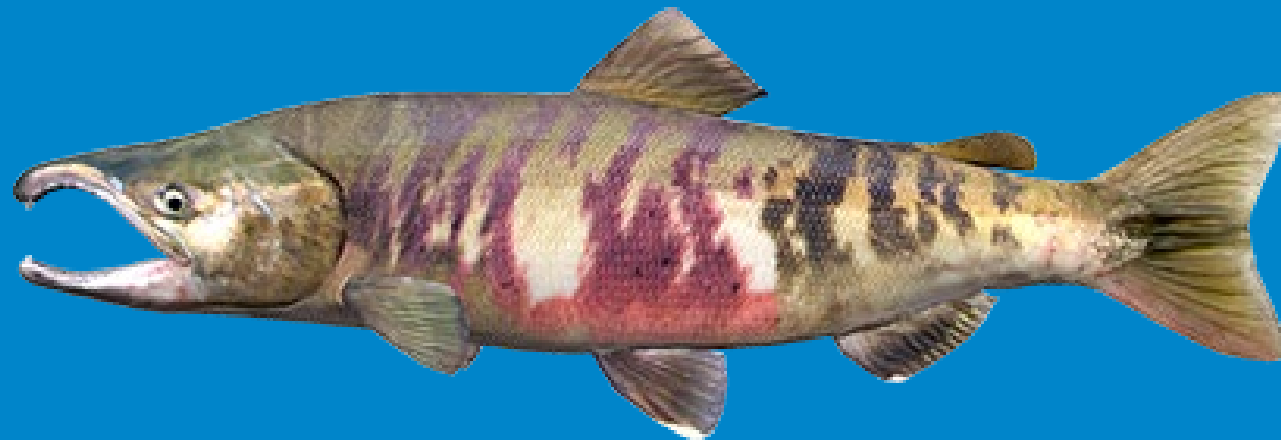
Prior Years Tech Memos:

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

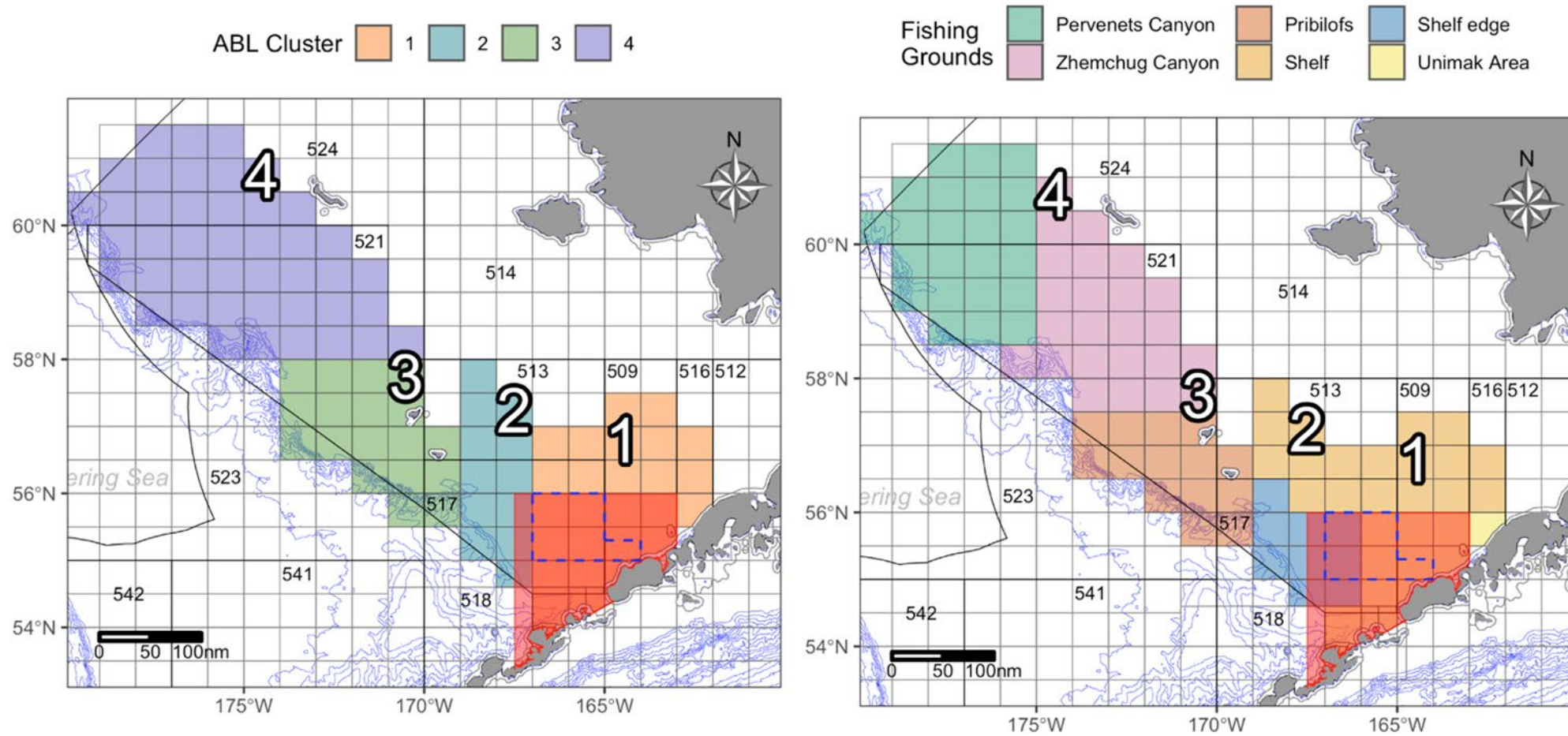


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Chum salmon - Extra Slides



Comparison of Spatial Strata

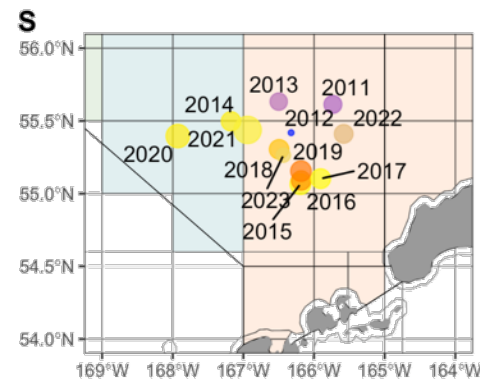
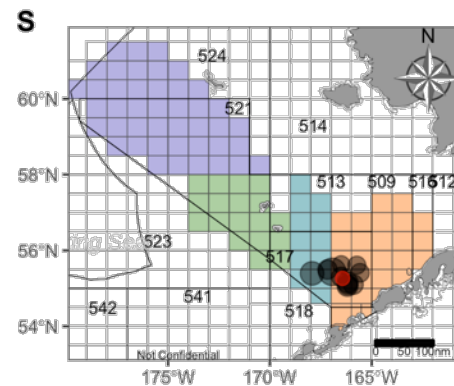
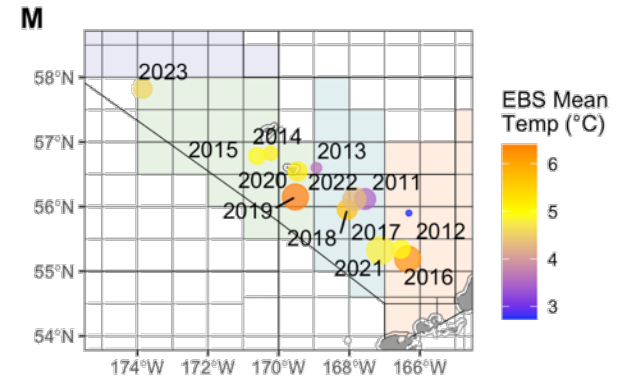
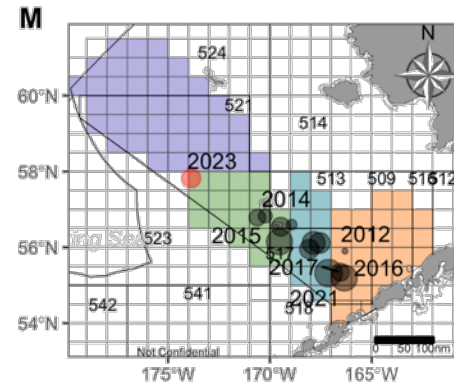
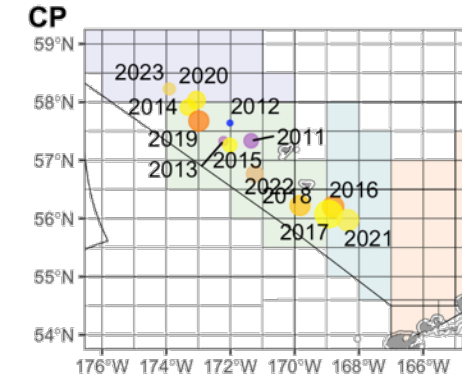
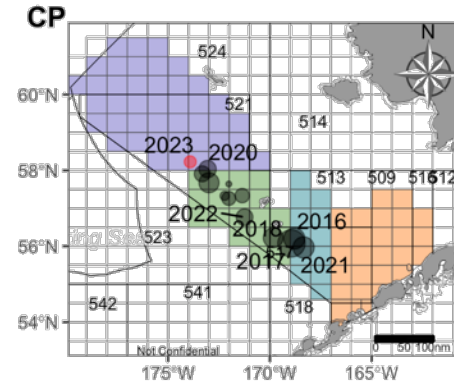


Distribution of Bycatch

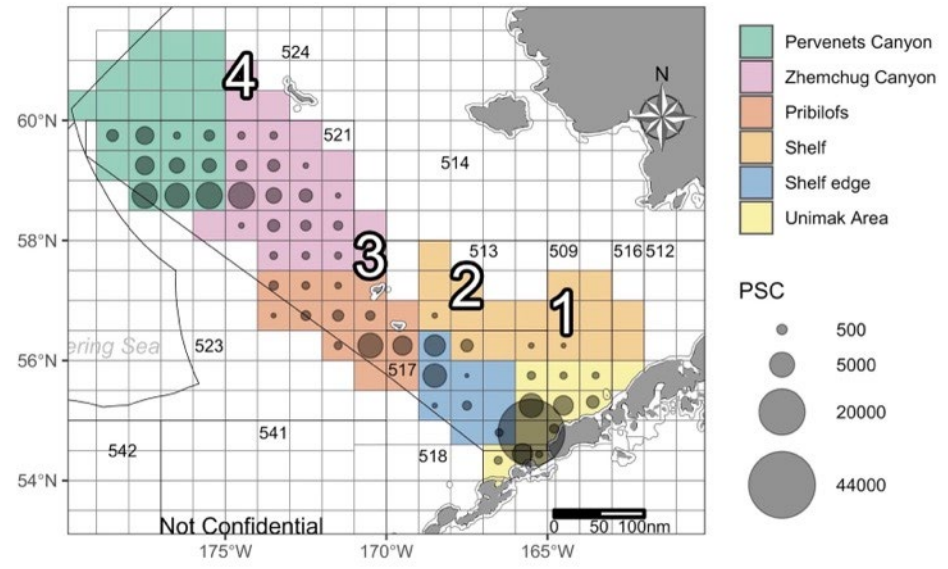
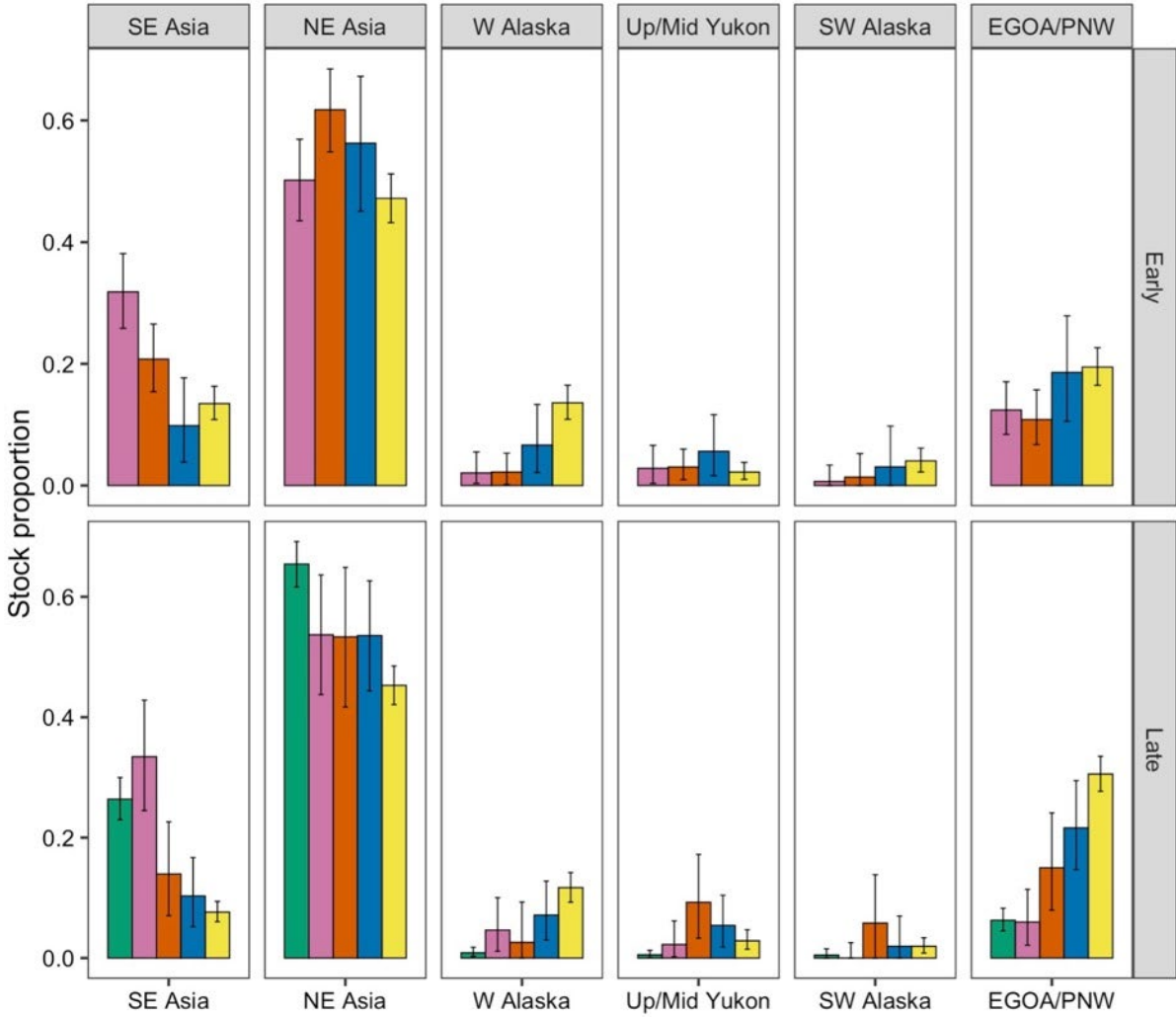
2023

CP & M further west than any other year

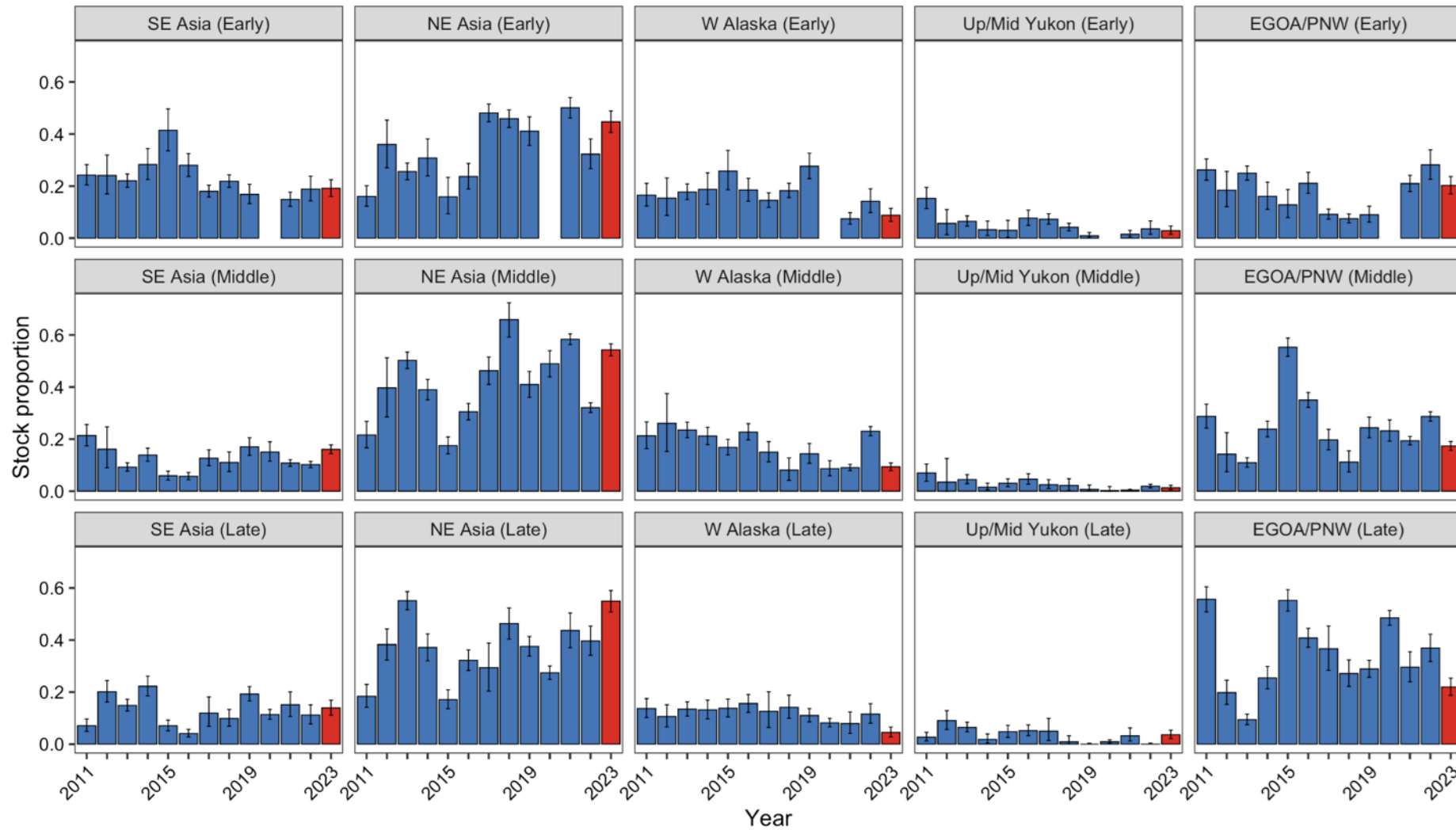
Cooler years further on shelf for S and M



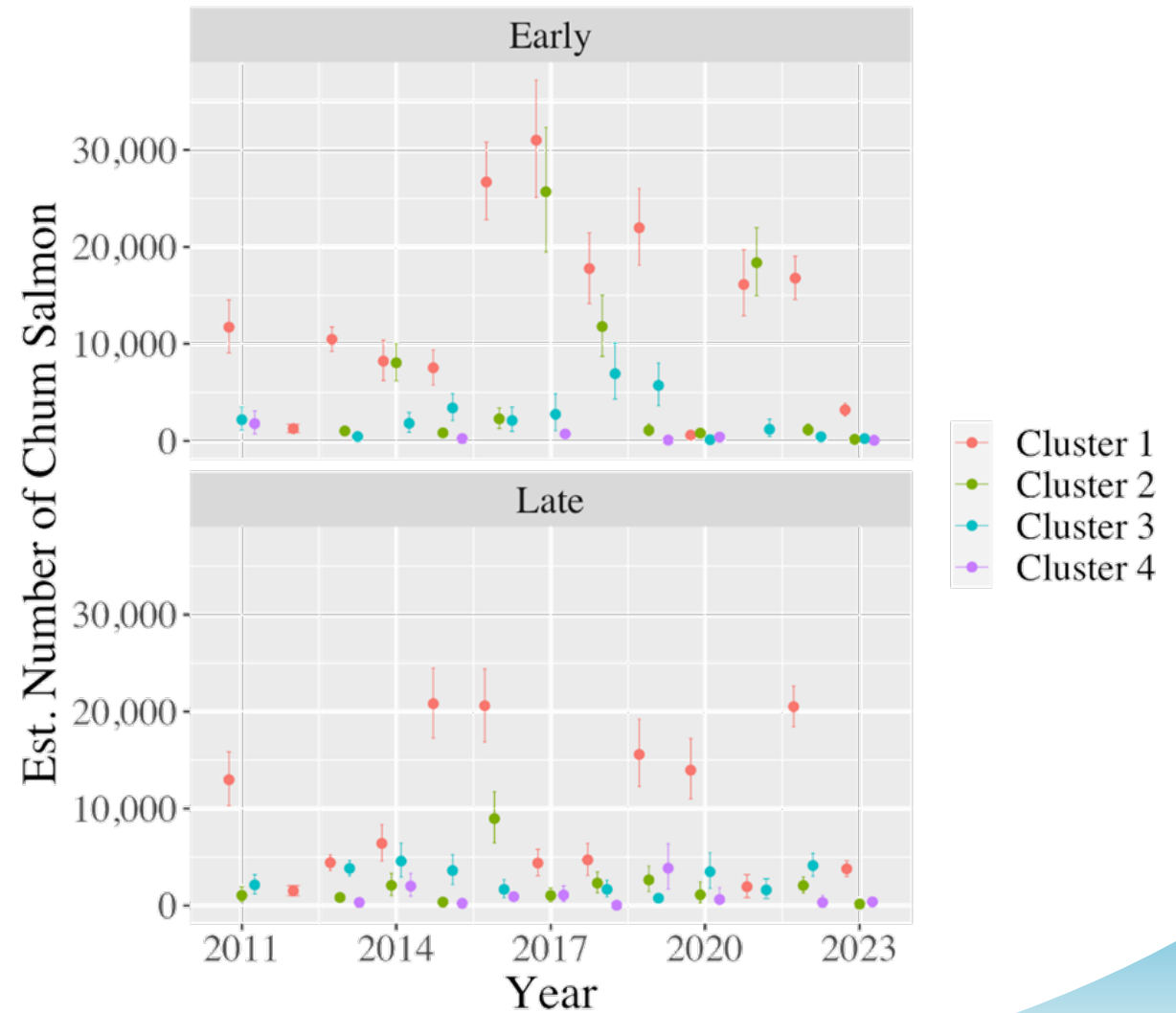
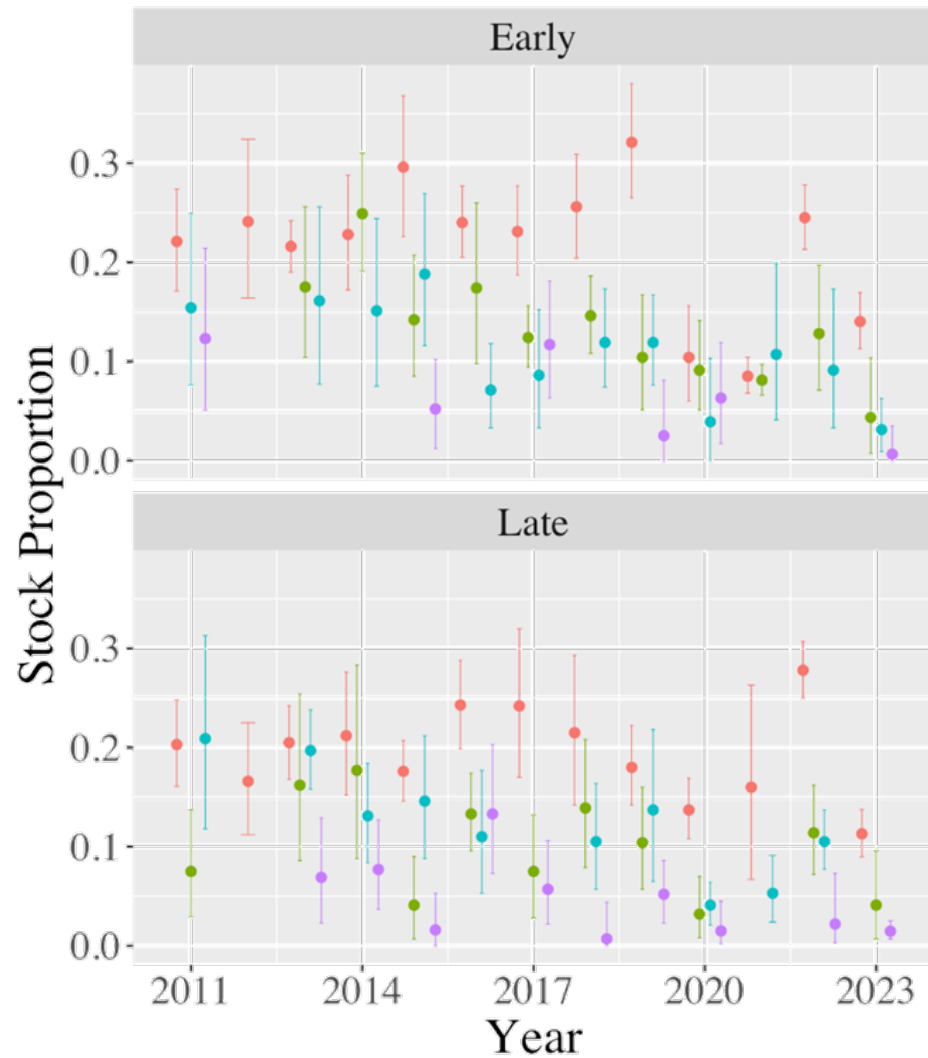
Fishing Grounds Temporal



Early, Middle, Late

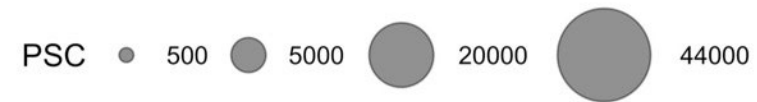
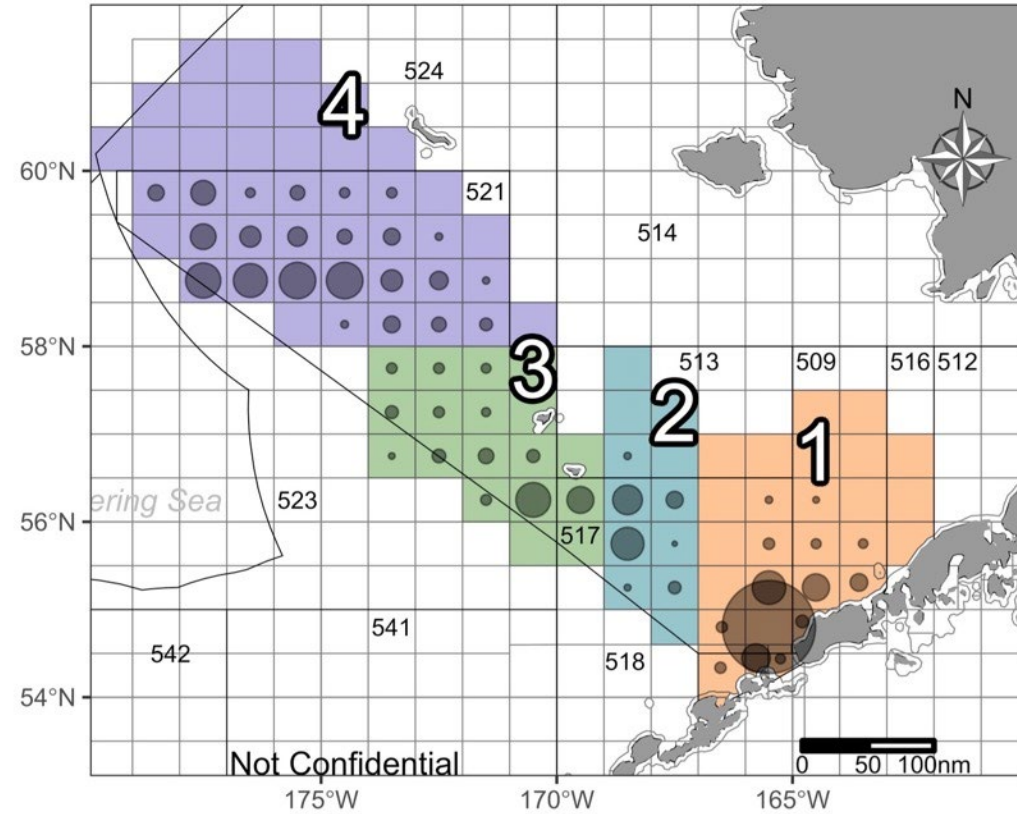
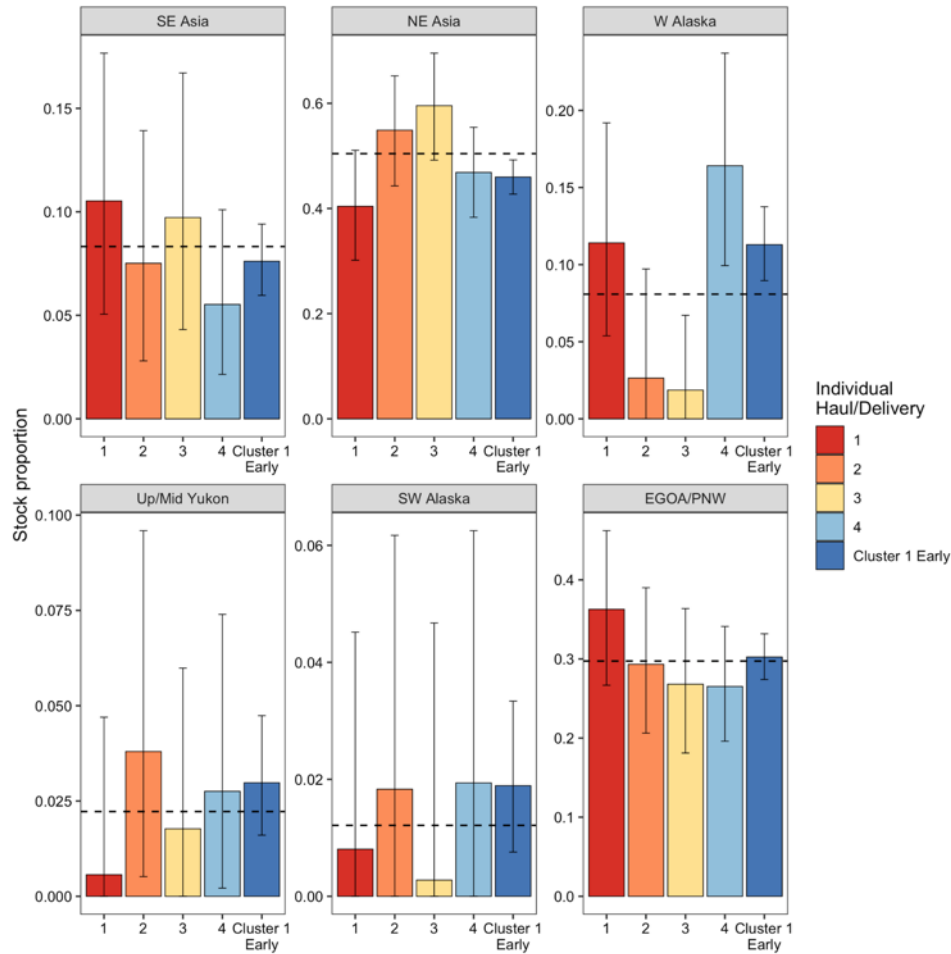


Spatiotemporal variation W Alaska (2011-2023)



- Cluster 1
- Cluster 2
- Cluster 3
- Cluster 4

Individual Hauls



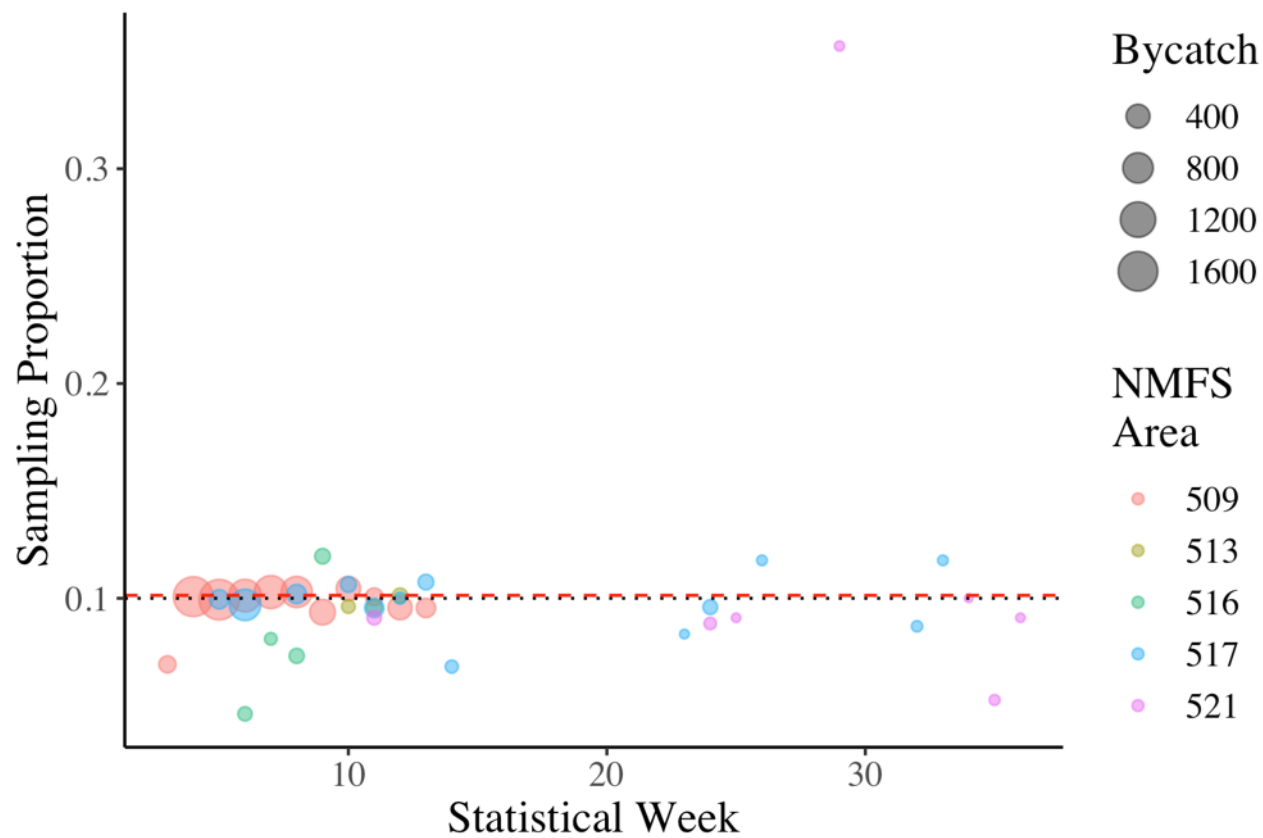


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Chinook salmon - Extra Slides



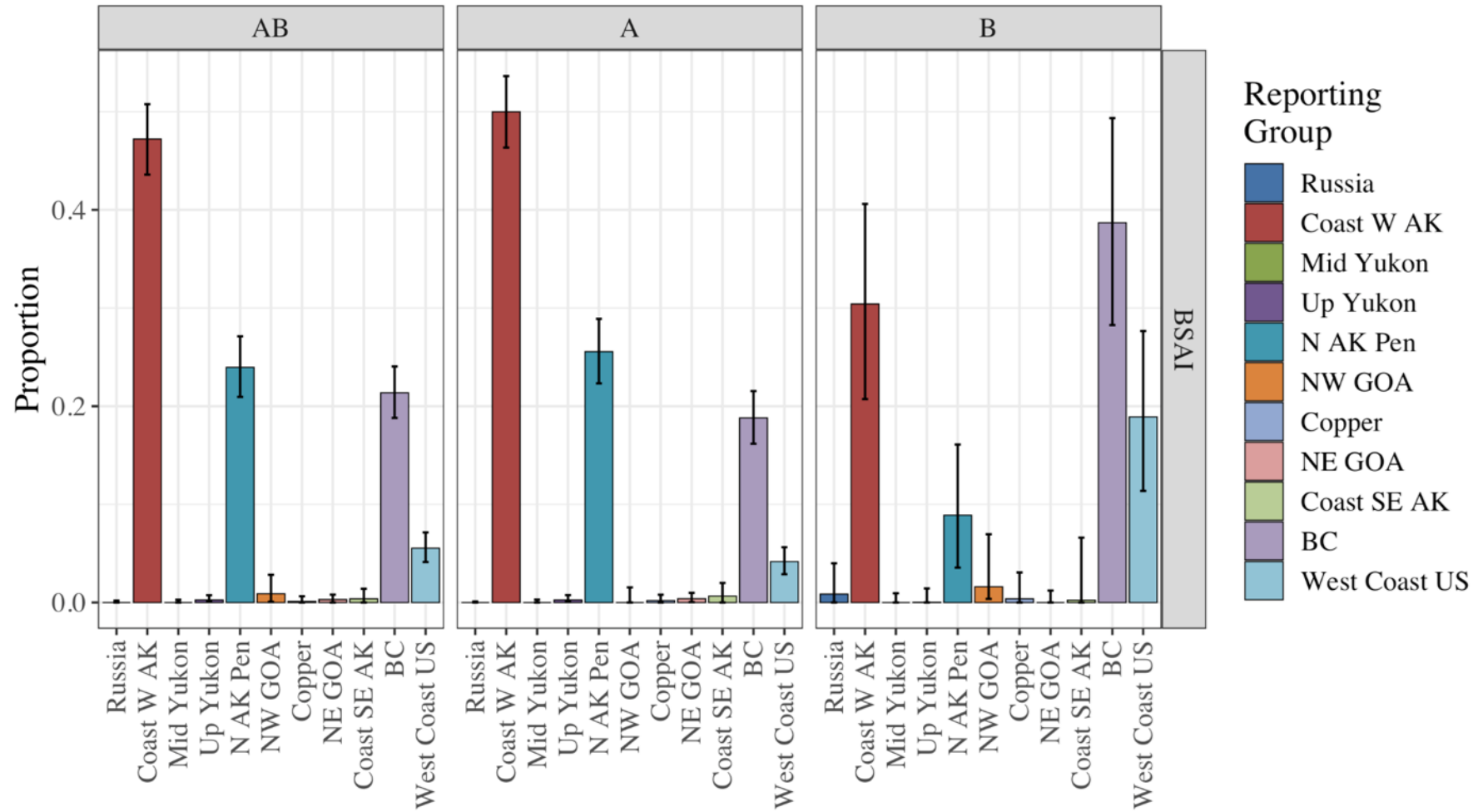
BSAI genetic sampling of Chinook salmon by week and NMFS area



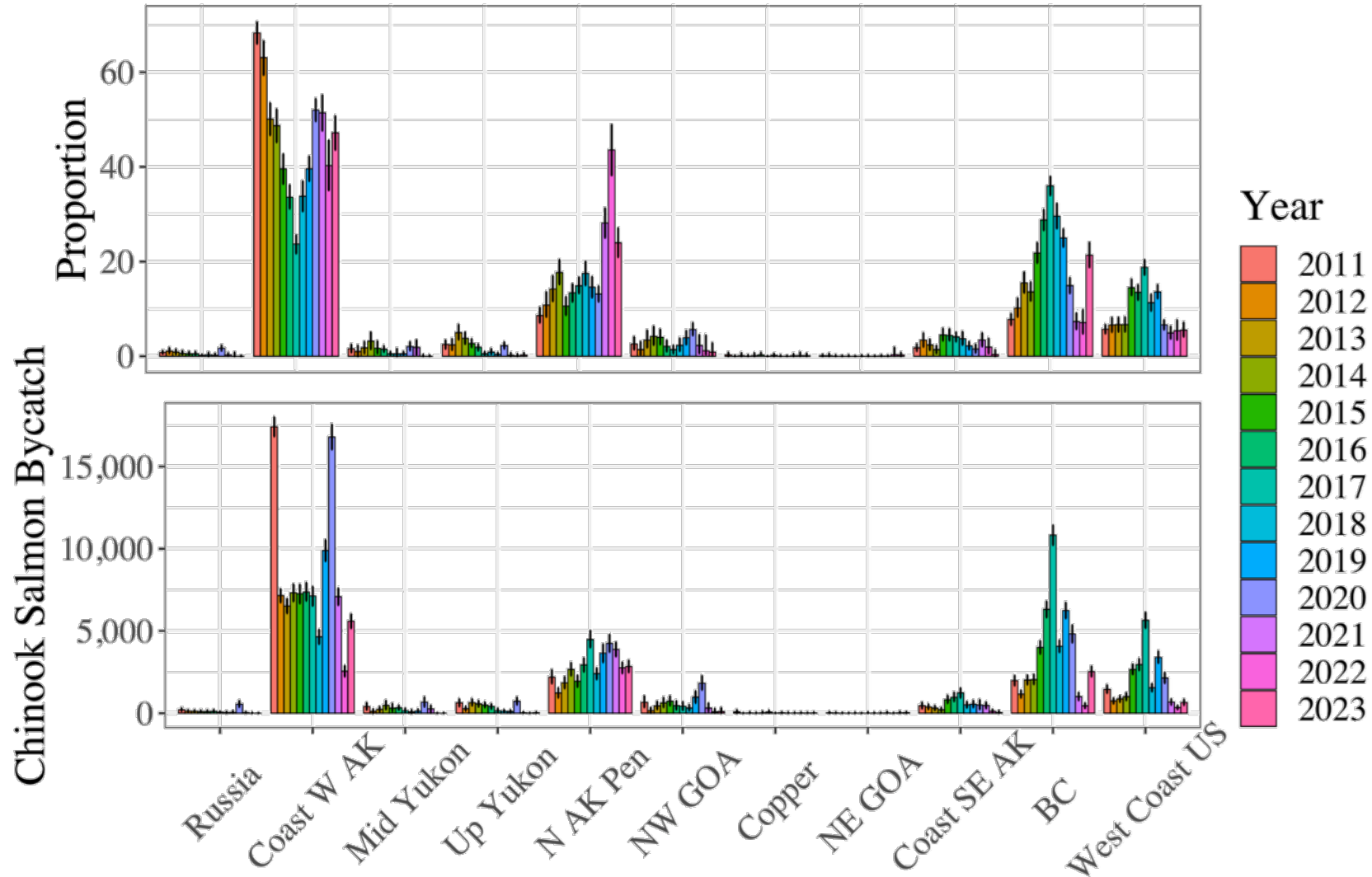
Black dot line = 1 in 10 goal

Red dash line ~ 1 in 10 realized average sampling

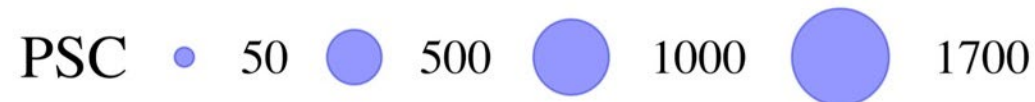
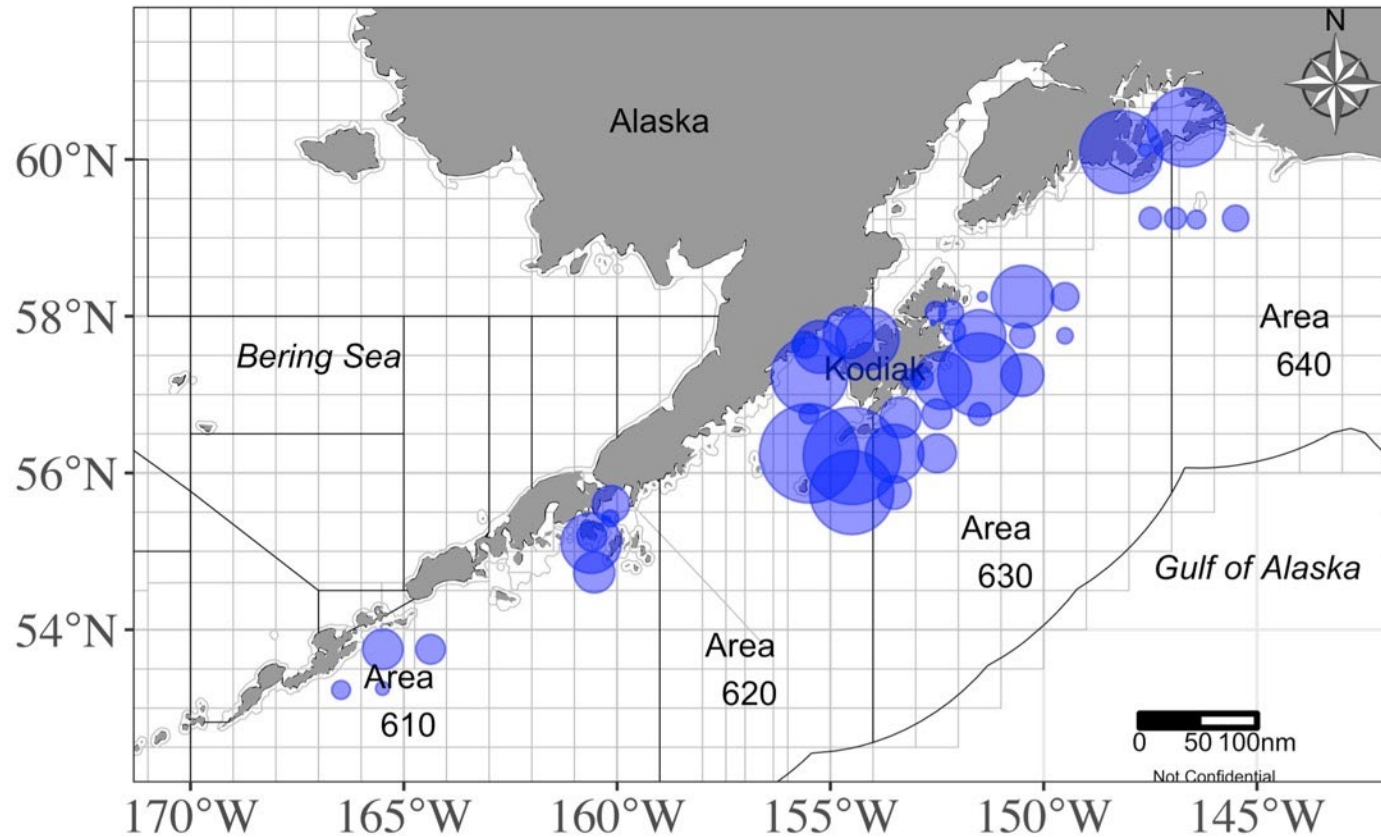
A and B seasons Chinook salmon



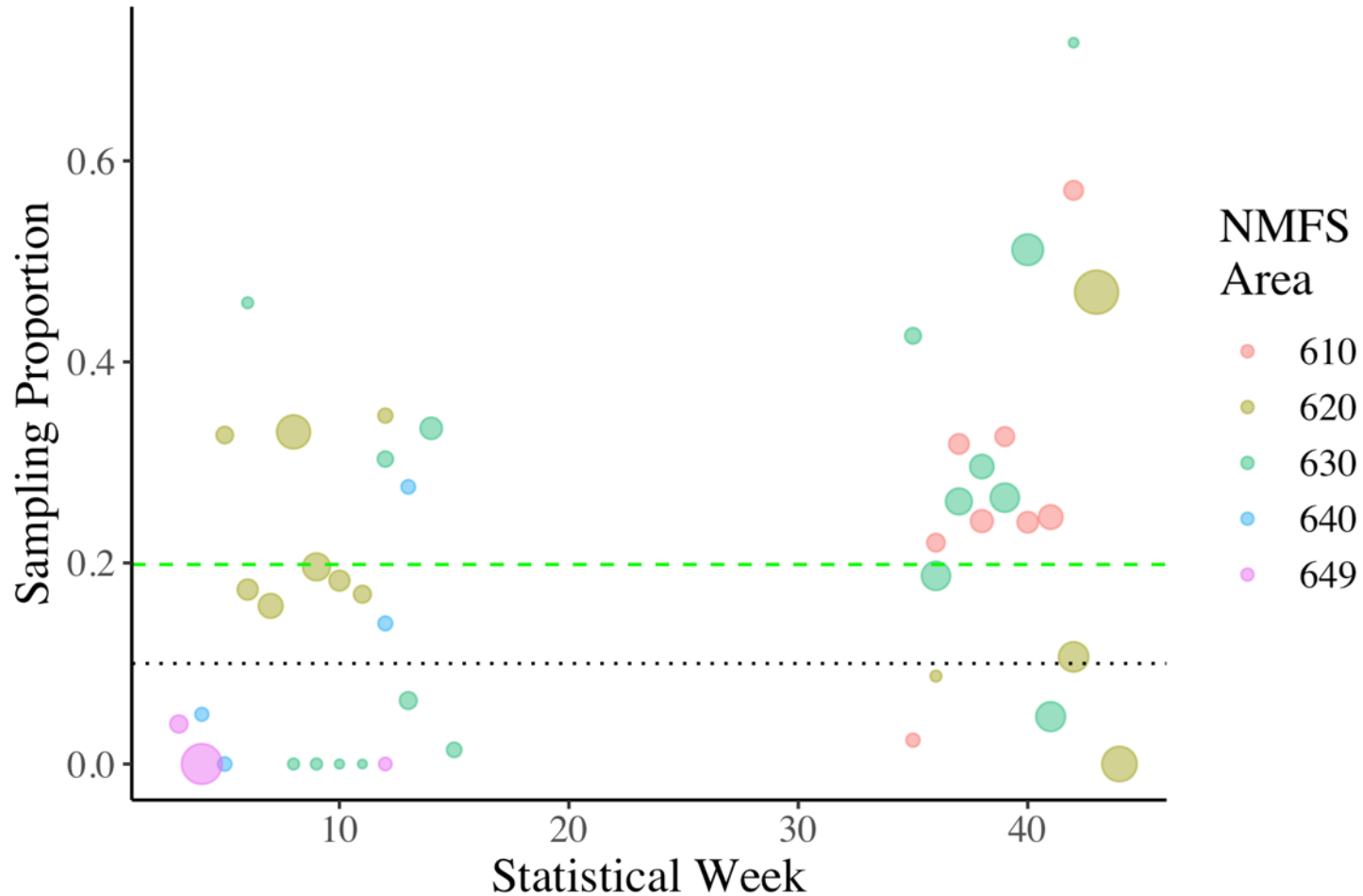
BSAI A/B season



GOA Chinook salmon bycatch distribution



GOA sampling Chinook Salmon

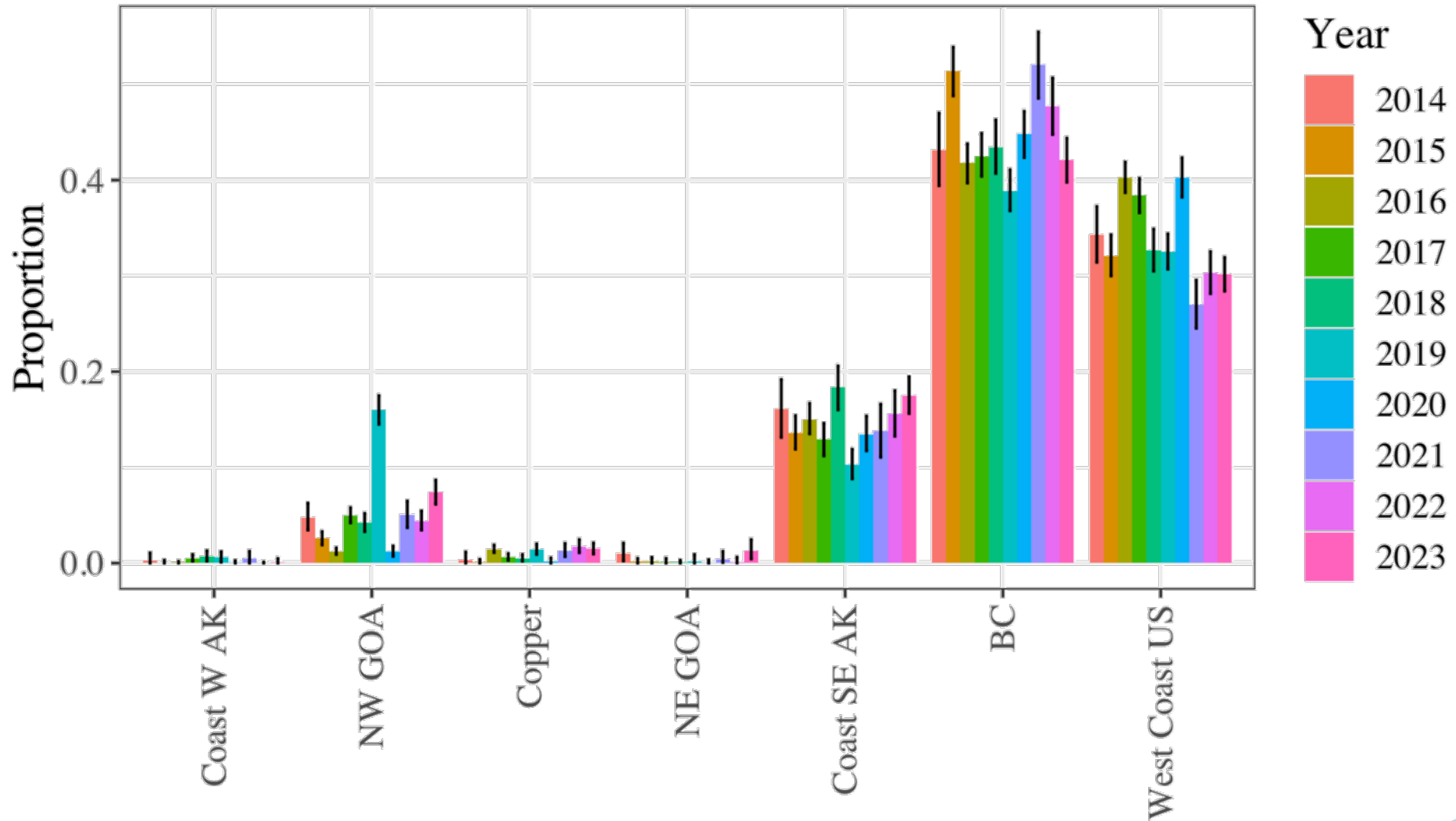


Not atypical

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