An overview of genetic stock identification of salmon captured in Alaska groundfish fisheries

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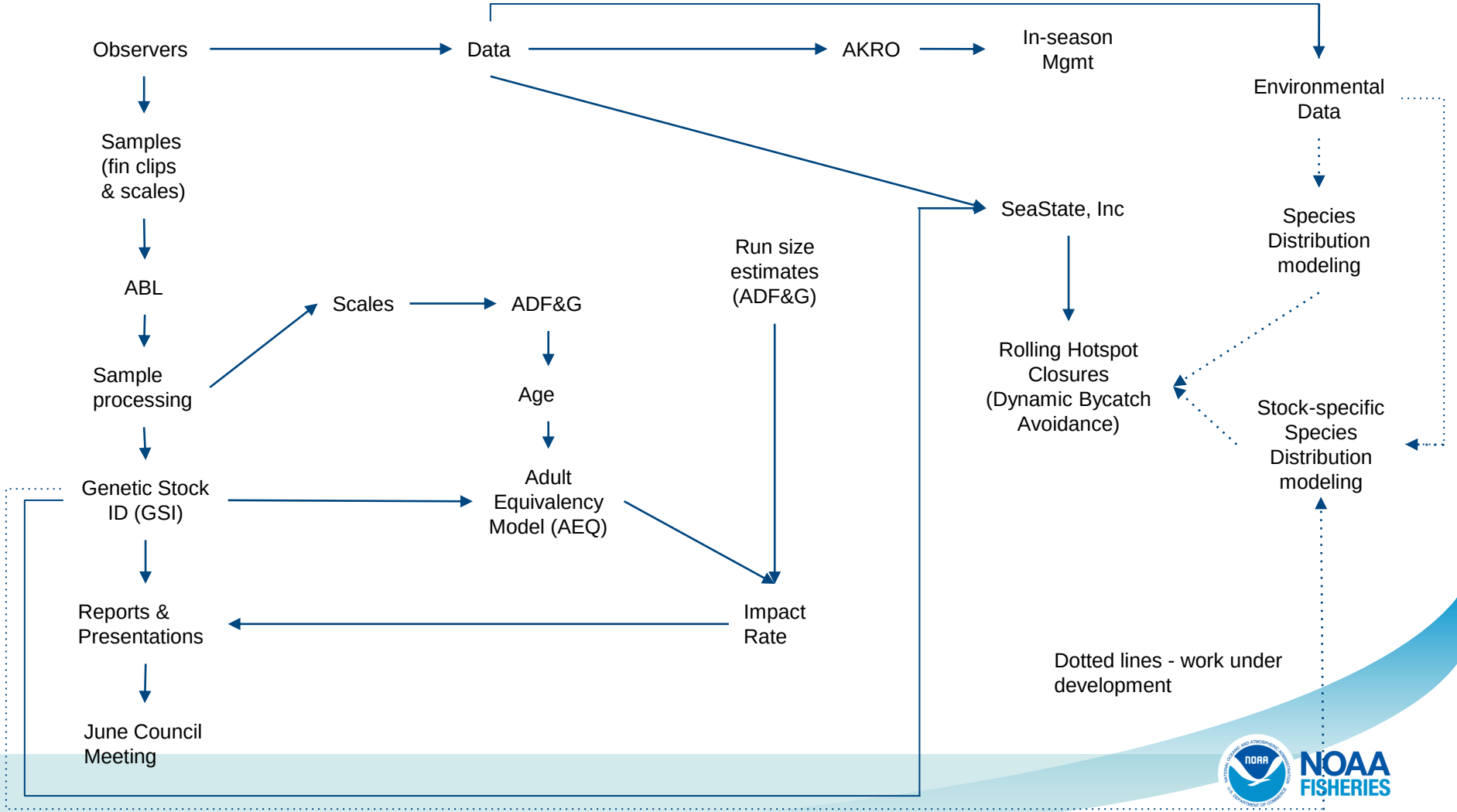
Goals of salmon bycatch stock identification

- Primary goals
  - (1) Determine the geographic origin of salmon caught in federally managed groundfish fisheries to determine stock-specific impacts (current)
  - (2) Merge stock ID with other data to predict stock-specific distributions and potentially avoid certain stocks (future)
- Today
  - Overview of the program
  - Higher level results from Chinook Salmon & Chum Salmon

Genetic sampling from the observer program

- BSAI pollock: Systematic random sampling
  - All salmon counted
  - Chinook - 1 in 10 sampled
  - Chum - 1 in 30 with further subset analyzed for genetics (½ to ¼ of samples depending on number)
- GOA pollock: Simple random sampling with respect to trip (few chum caught)
- Data collected for each sampled salmon
  - Basic information (length and sex)
  - Scale samples for aging
  - Genetic Samples


Observers
Data
AKRO
In-season Mgmt
Environmental Data
Samples (fin clips & scales)
SeaState, Inc
Species Distribution modeling
ABL
Scales
ADF&G
Run size estimates (ADF&G)
Sample processing
Age
Rolling Hotspot Closures (Dynamic Bycatch Avoidance)
Stock-specific Species Distribution modeling
Genetic Stock ID (GSI)
Adult Equivalency Model (AEQ)
Reports & Presentations
Impact Rate
June Council Meeting
Dotted lines - work under development

Genetic Methods - Genetic stock identification (GSI)

- Objective: Estimate the proportion of the bycatch that is from different regional groups

- Method: Compare genetic composition of bycatch (**mixture**) to known spawning aggregations (**baseline**)

Genetic stock identification: a visual

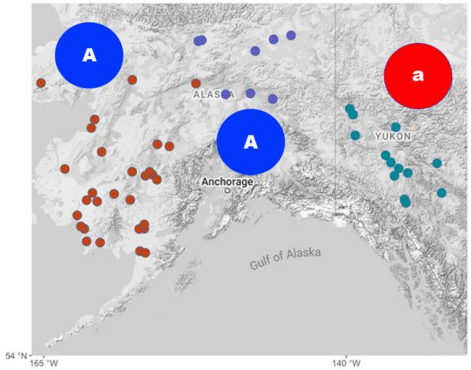
Bycatch Mixture -
Genetically sample salmon

What proportion comes from major drainages?

Think about the individual

Genotype = AA

Baseline -
3 Reporting Groups
Fixed for genetic marker



Compare to known spawning populations.

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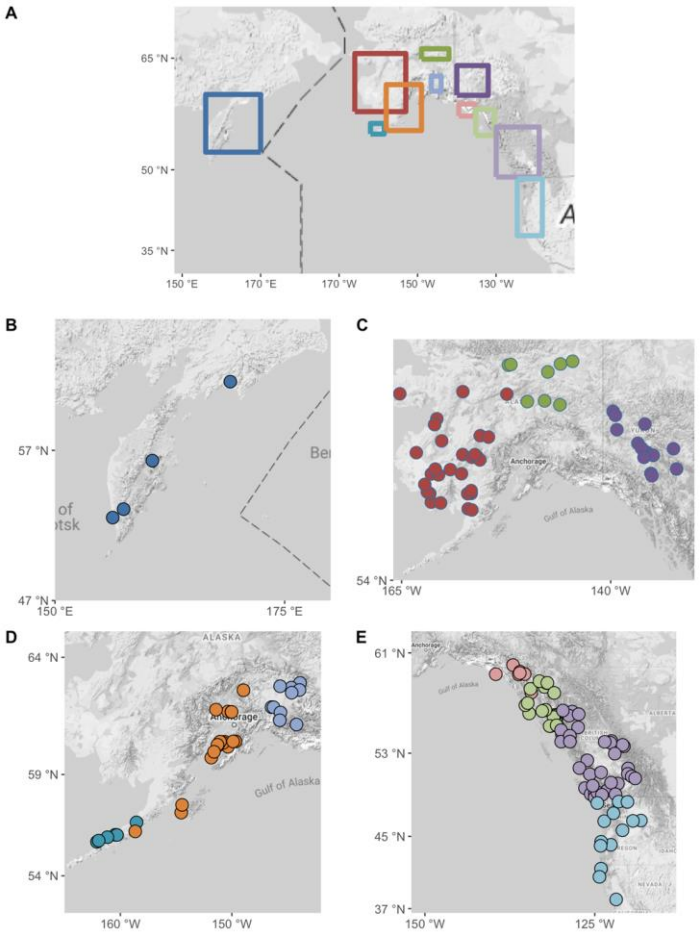
Baseline - Chinook Salmon

11 reporting groups

b. Russia
c. Coastal Western Alaska, Middle Yukon, Upper Yukon
d. North Alaska Peninsula, NW Gulf of Alaska, Copper, NE Gulf of Alaska,
e. Southeast Alaska,British Columbia, West coast US



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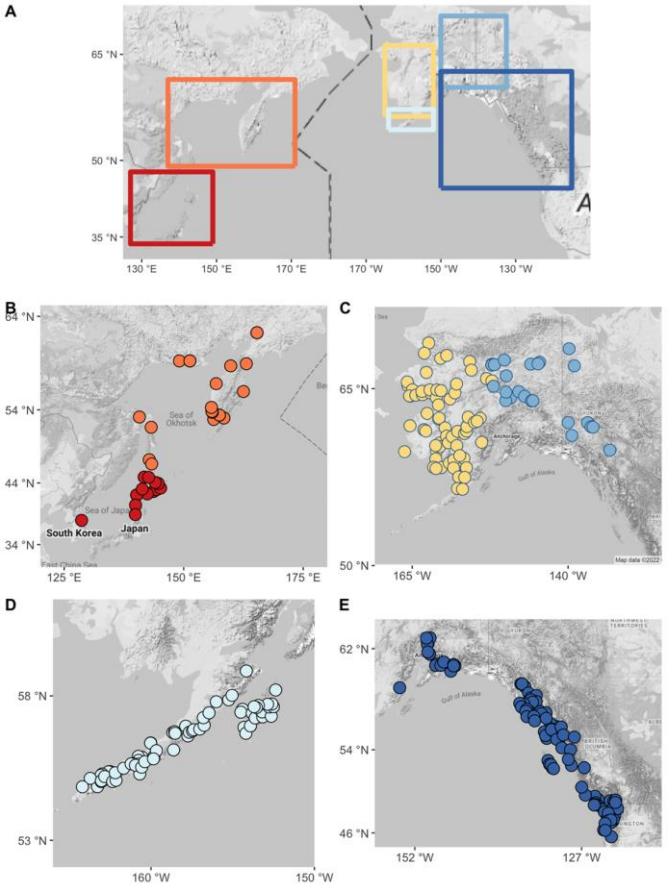
Baseline - Chum Salmon

6 reporting groups:

b. SE Asia & NE Asia
c. Upper/Middle Yukon, Western Alaska,
d. Southwest Alaska
e. Gulf of Alaska / Pacific Northwest



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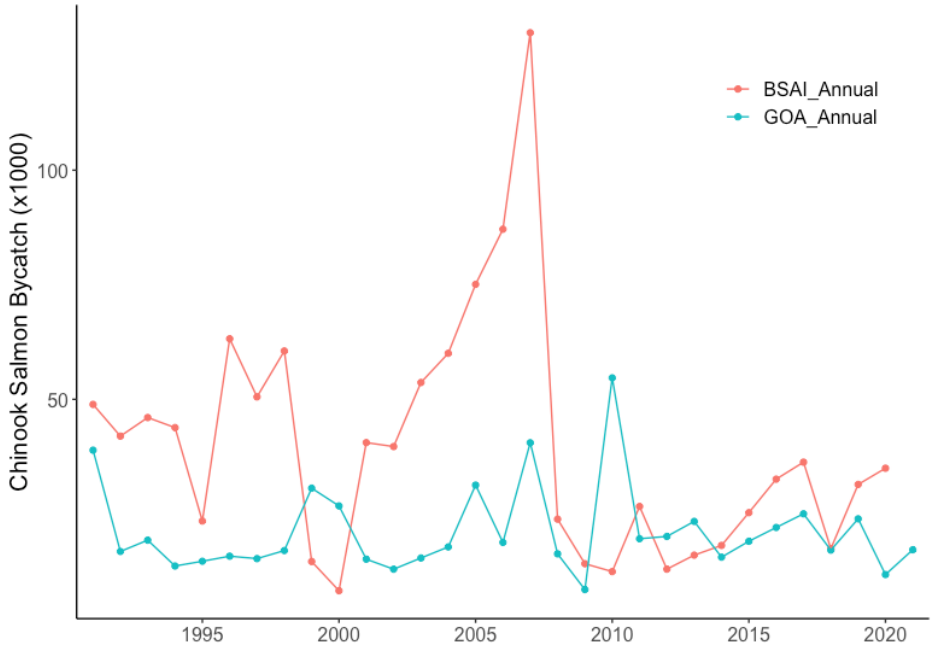
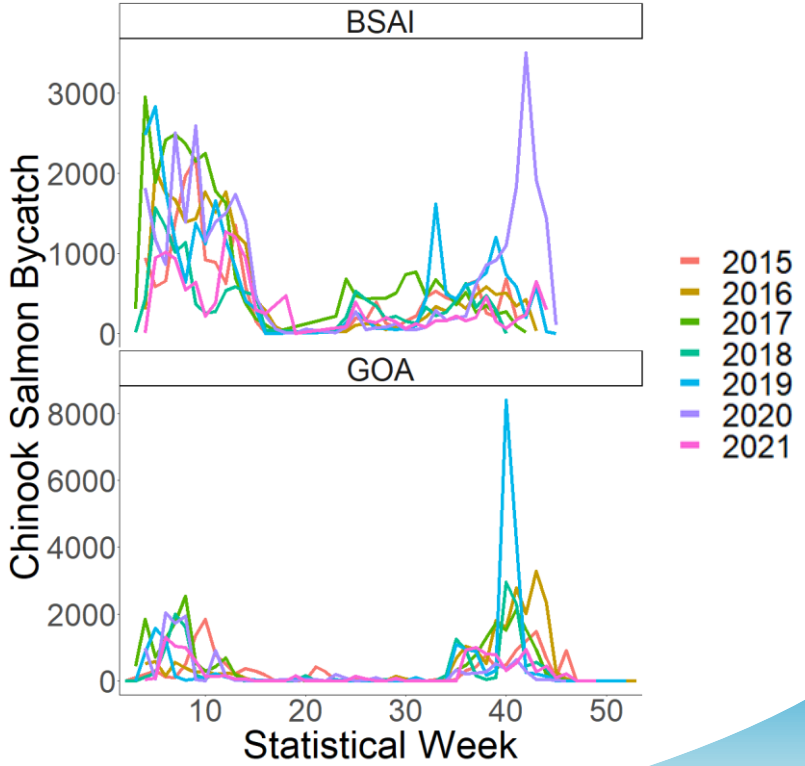
Trends in Chinook Salmon Bycatch





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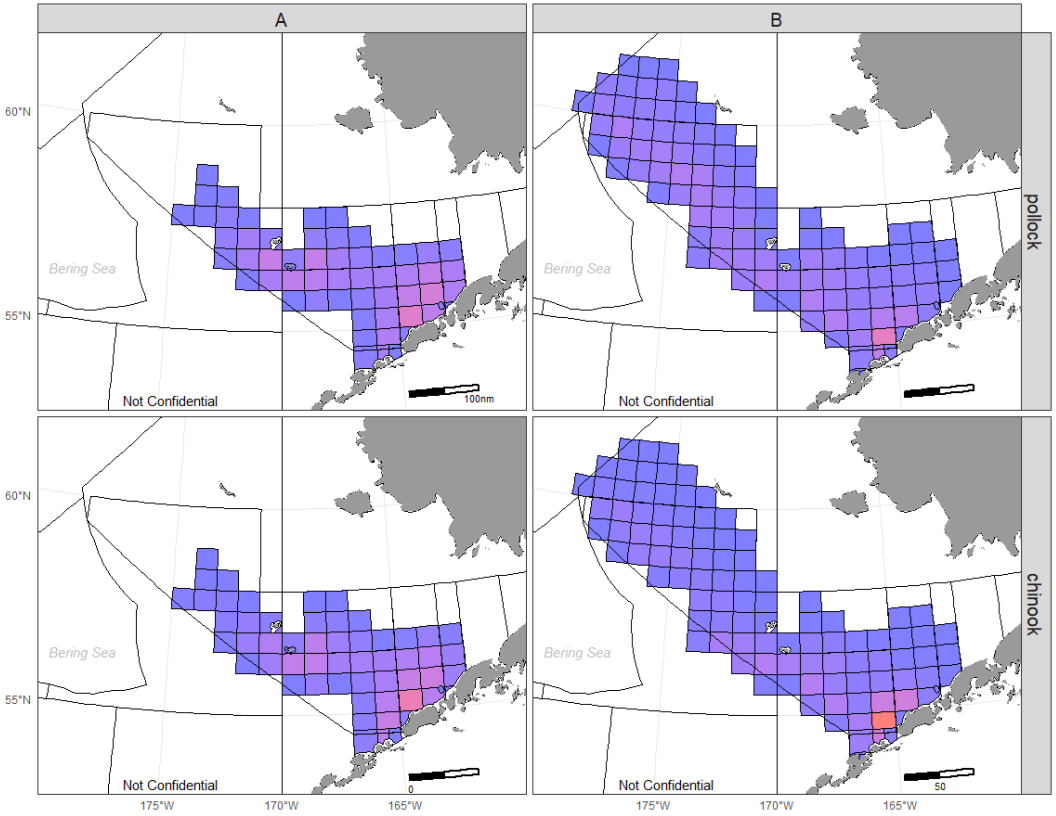
Trends in Chinook Salmon Catch



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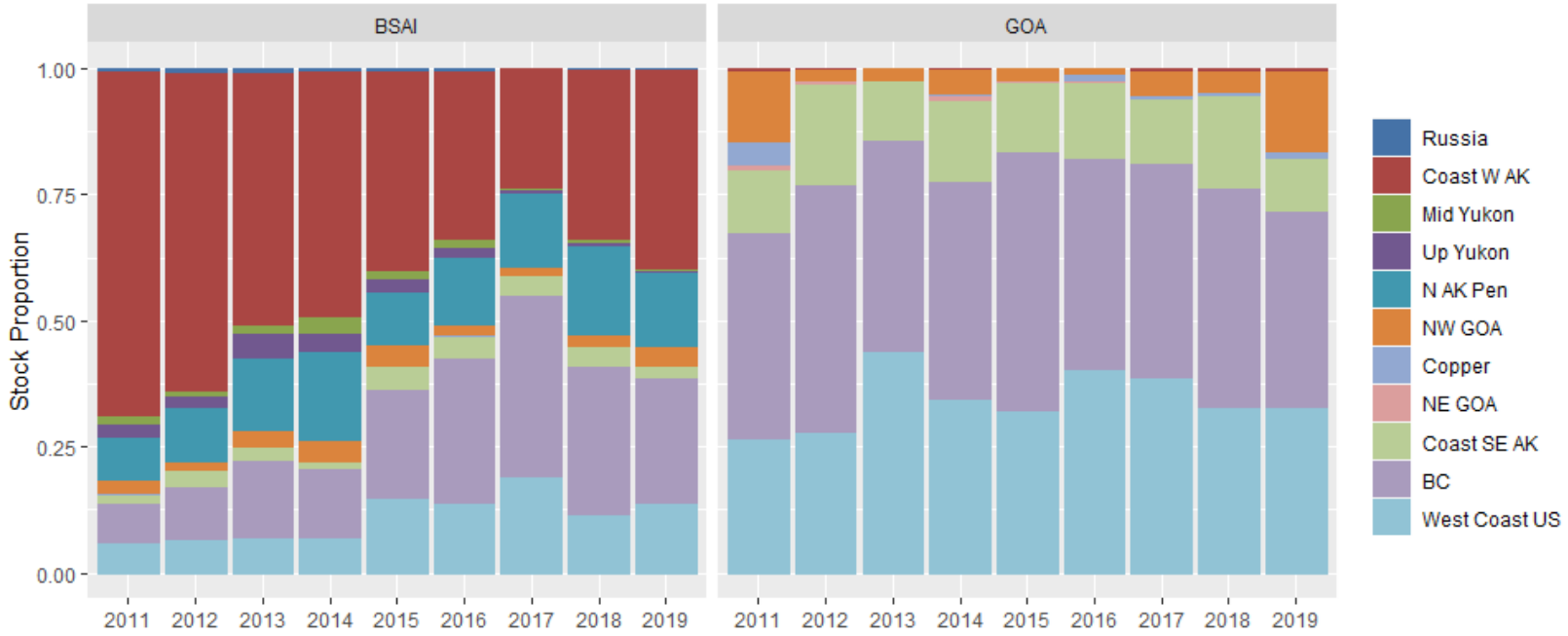
Trends in Chinook Salmon Stock Composition



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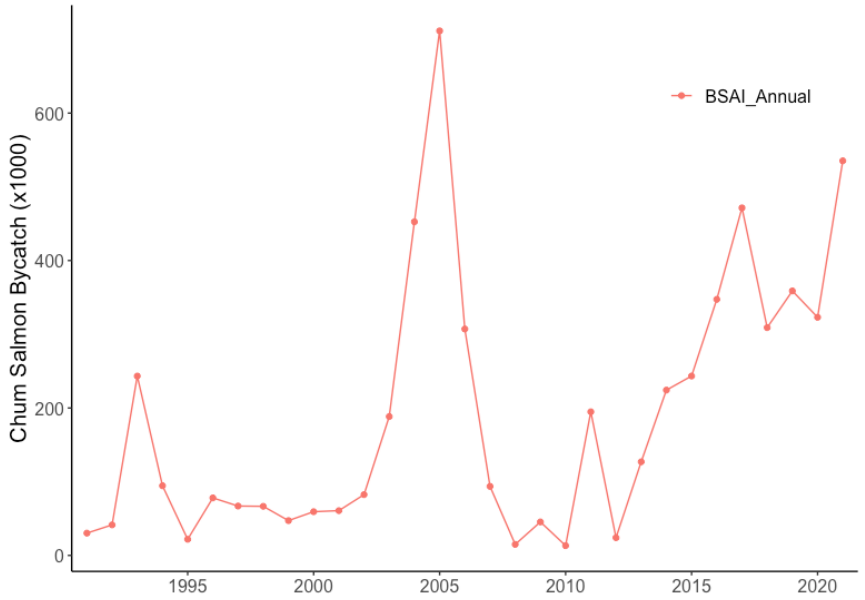
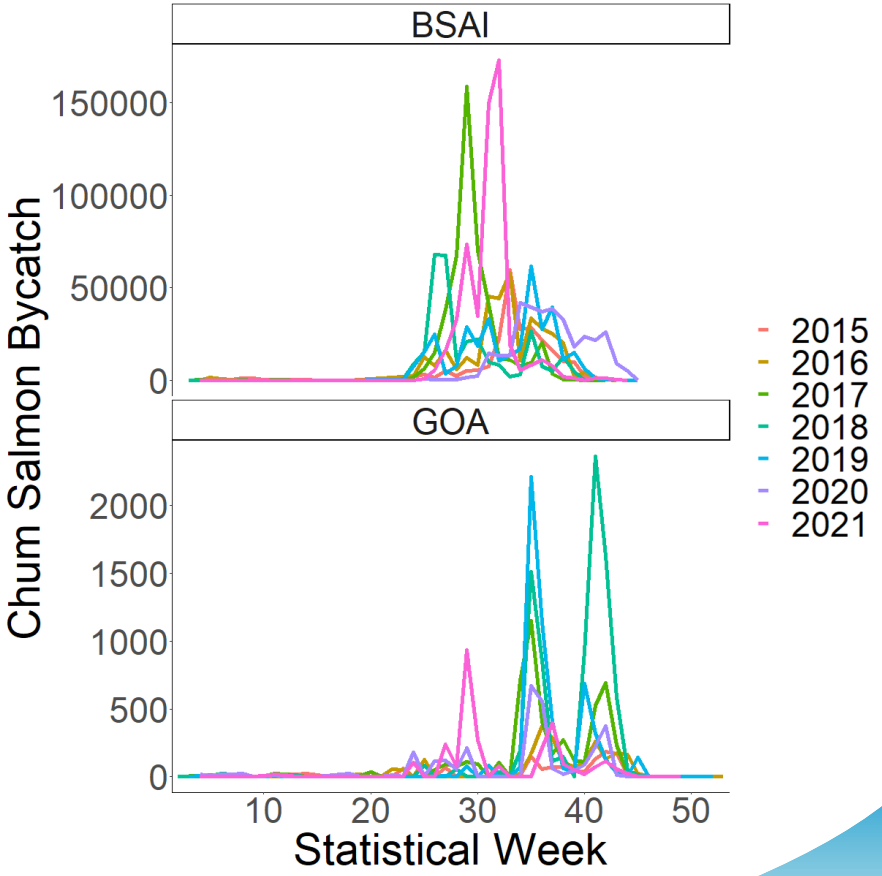
Trends in Chum Salmon



GOA bycatch small



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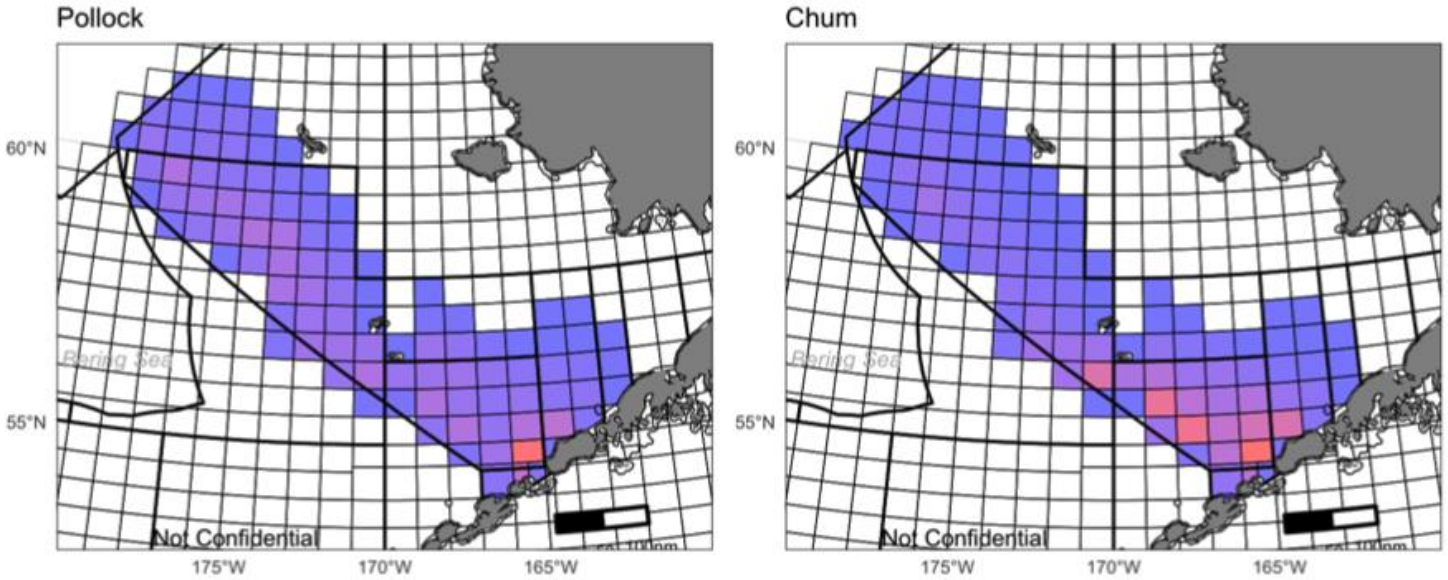
Trends in Chum Salmon



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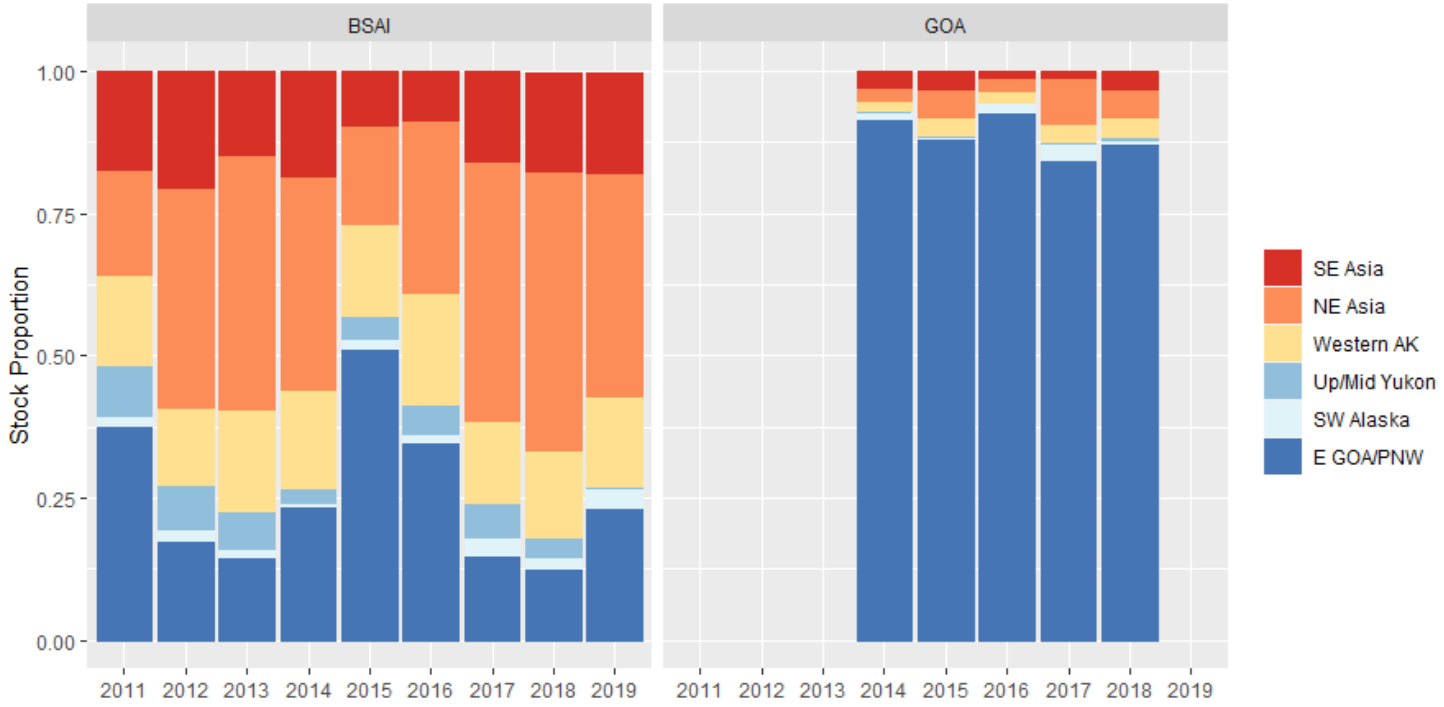
Trends in Chum Salmon Stock Composition - BSAI



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Future Directions: updating workflow

- New genotyping chemistry and analysis method
- Ages for all samples
- Database integration
- Collaboration with quantitative ecologists
- Automated workflow

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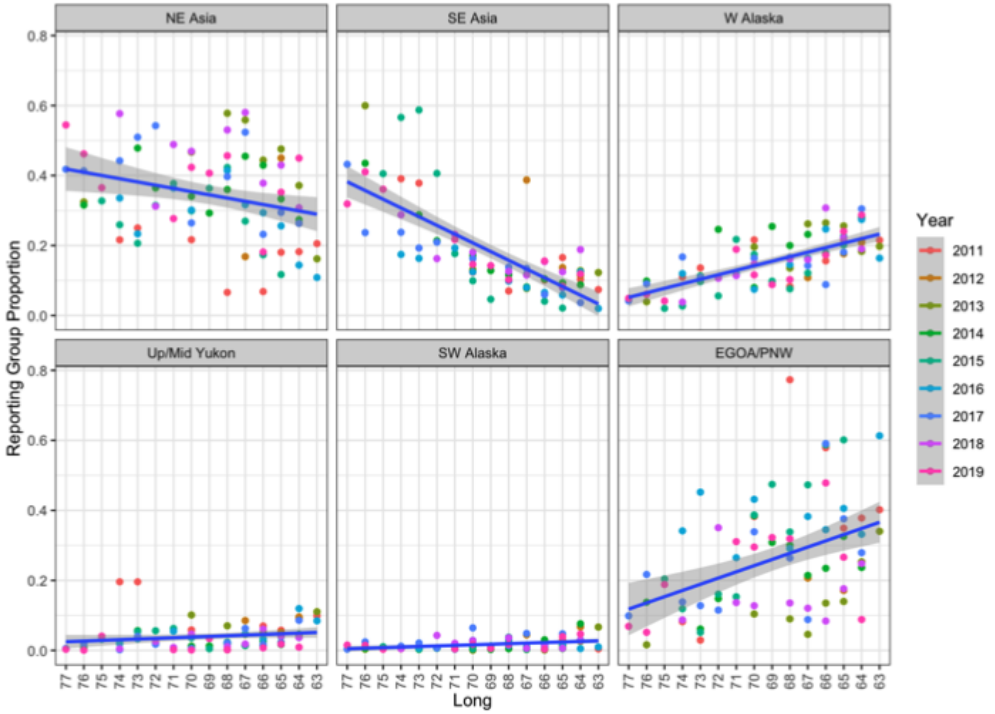
Future Directions: benefits of increased efficiency

- Reduce turnaround by a year for chum
- Leverage new database capabilities
- Retrospective analyses
- Distribution modeling
  - Stock proportions, ages, environmental covariates
  - Goal: better avoid certain stocks



As you move west, proportion of Asian stocks increase and WAK and southern stocks decrease

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Collaborative Research

- *AFSC ABL* - C. Guthrie, C. Kondzela, J. Whittle, K. Karpan, Hv. T. Nguyen, E. Yasumiishi, K. D'Amelio, J. Watson, P. Barry
- *AFSC REFM* - J. Ianelli
- *AFSC FMA* - M. Concepcion, B. Mason, J. Cahalan, and a village
- *AKFIN* - C. Kohler, R. Ames, R. Ryznar, M. Callahan
- *ADFG GCL* - C. Habicht, K. Shedd, C. Jalbert, E. Lee
- *ADFG MTAL* - J. Neil, D. Oxman, B. Agler, T. Frawley
- Funding-PCCRC, NOAA, additional proposals in progress (AYKSSI)

Questions

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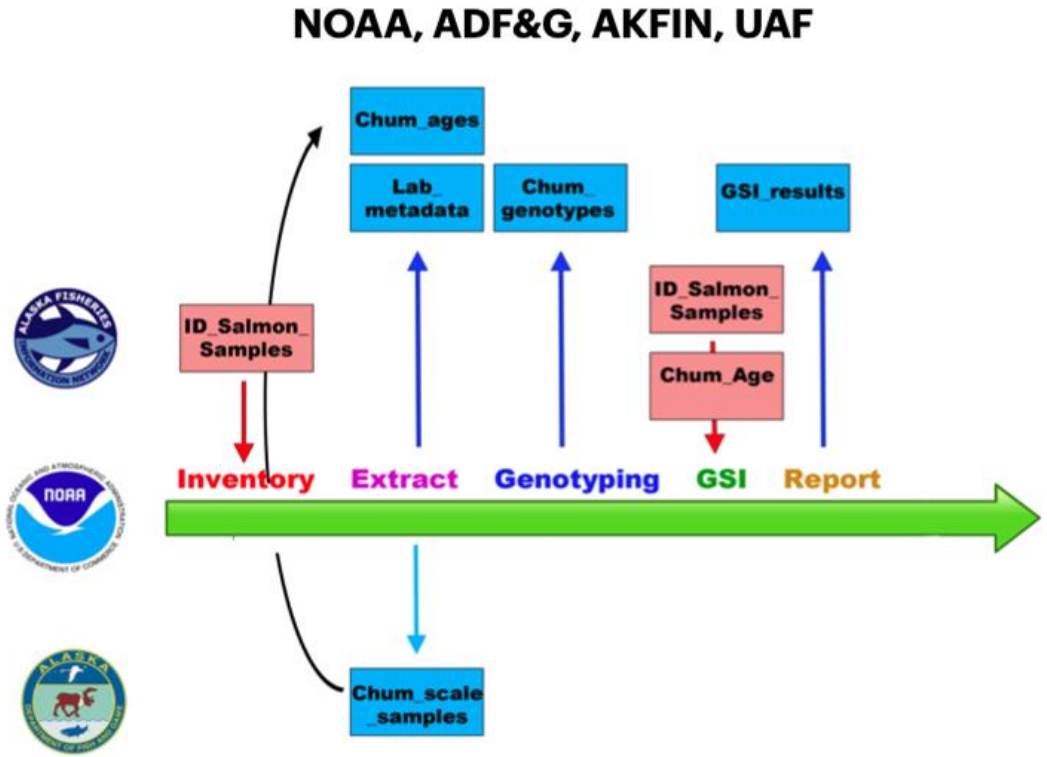
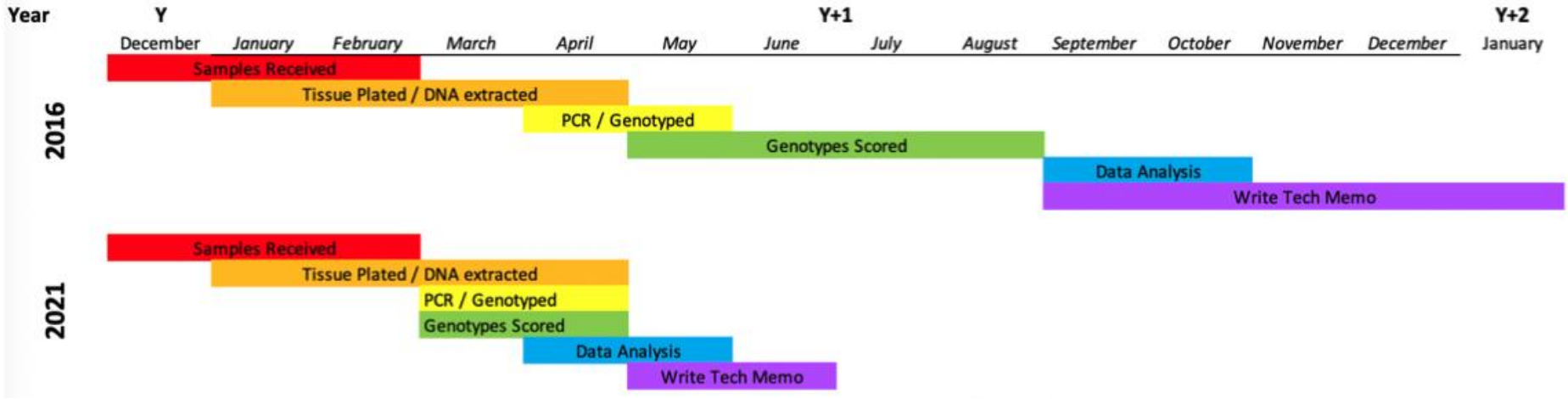
Pipeline Development



Accelerated GSI timelines



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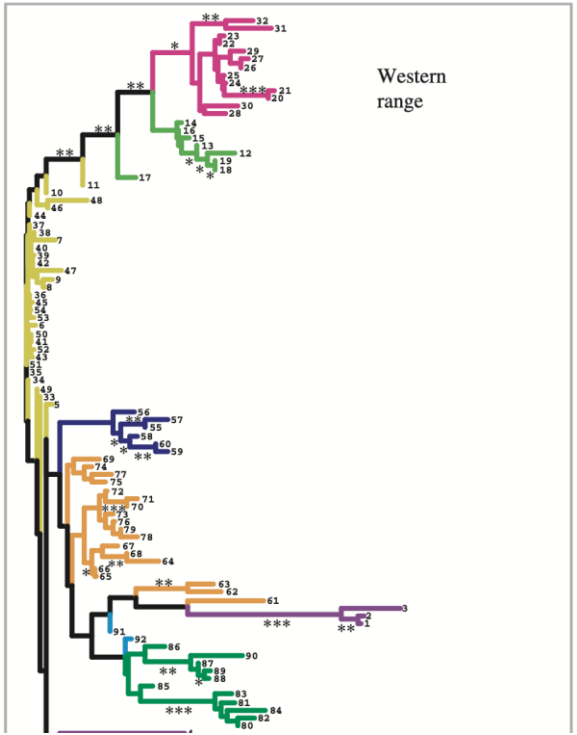
Genetic Differentiation of Yukon



- Russia (1–4)
- Coastal West Alaska (1–11, 33–54)
- Middle Yukon (12–19)
- Upper Yukon (20–32)
- North Alaska Peninsula (55–60)
- Northwest Gulf of Alaska (61–79)
- Copper River (80–90)
- Northeast Gulf of Alaska (91–97)
- Coastal Southeast Alaska (98–122)
- British Columbia (123–158)
- West Coast U.S. (159–172)

Templin et al. 2011

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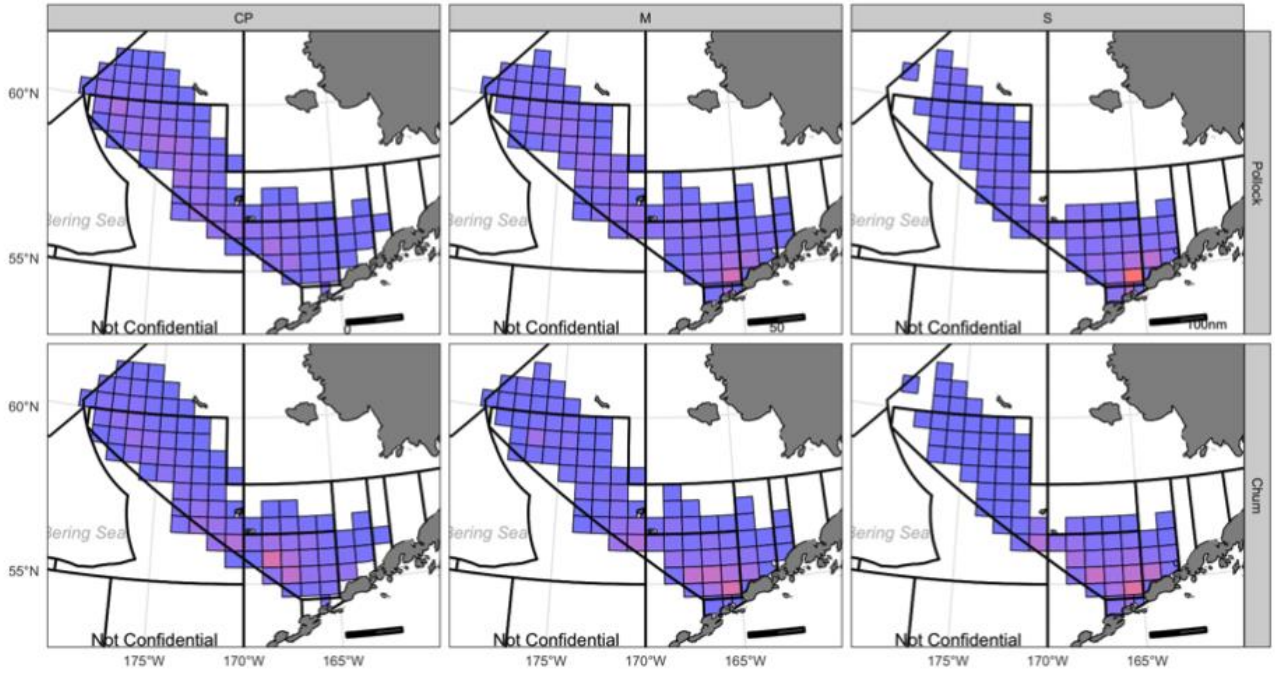
Chum Catch By Sector



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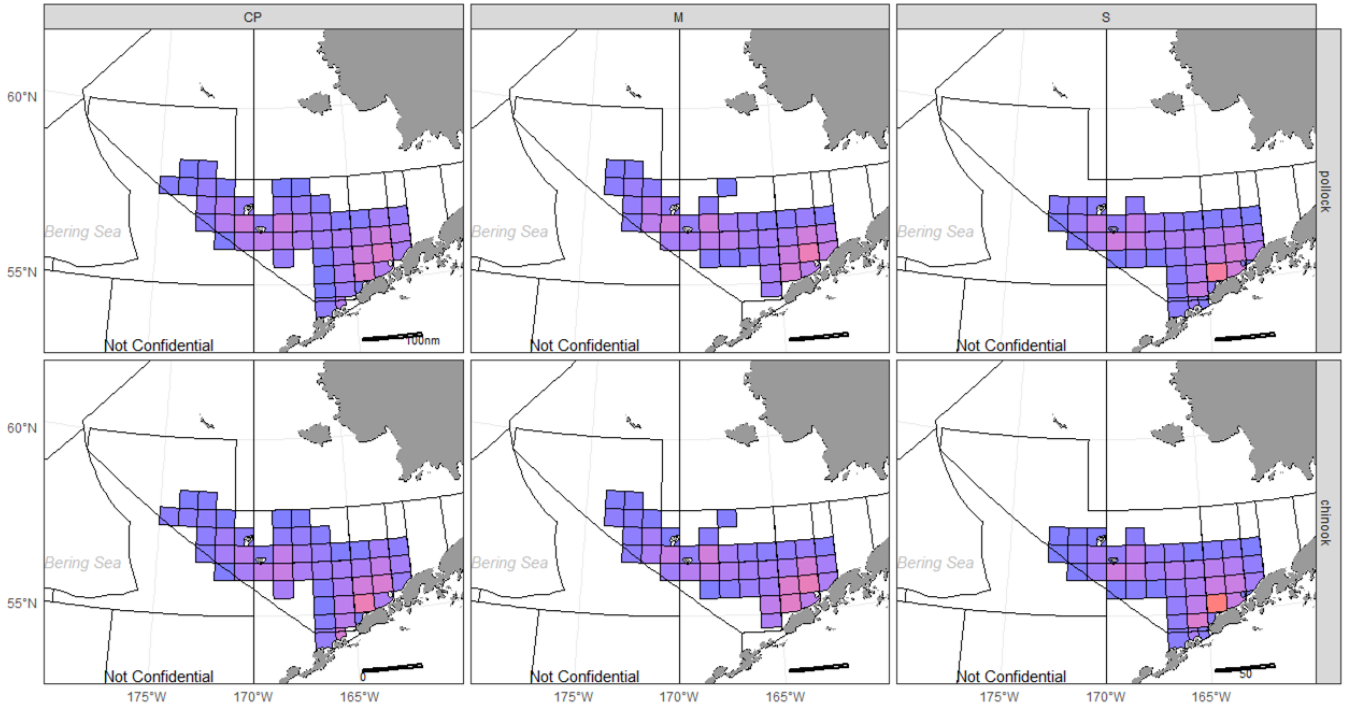
Chinook Catch By Sector A Season



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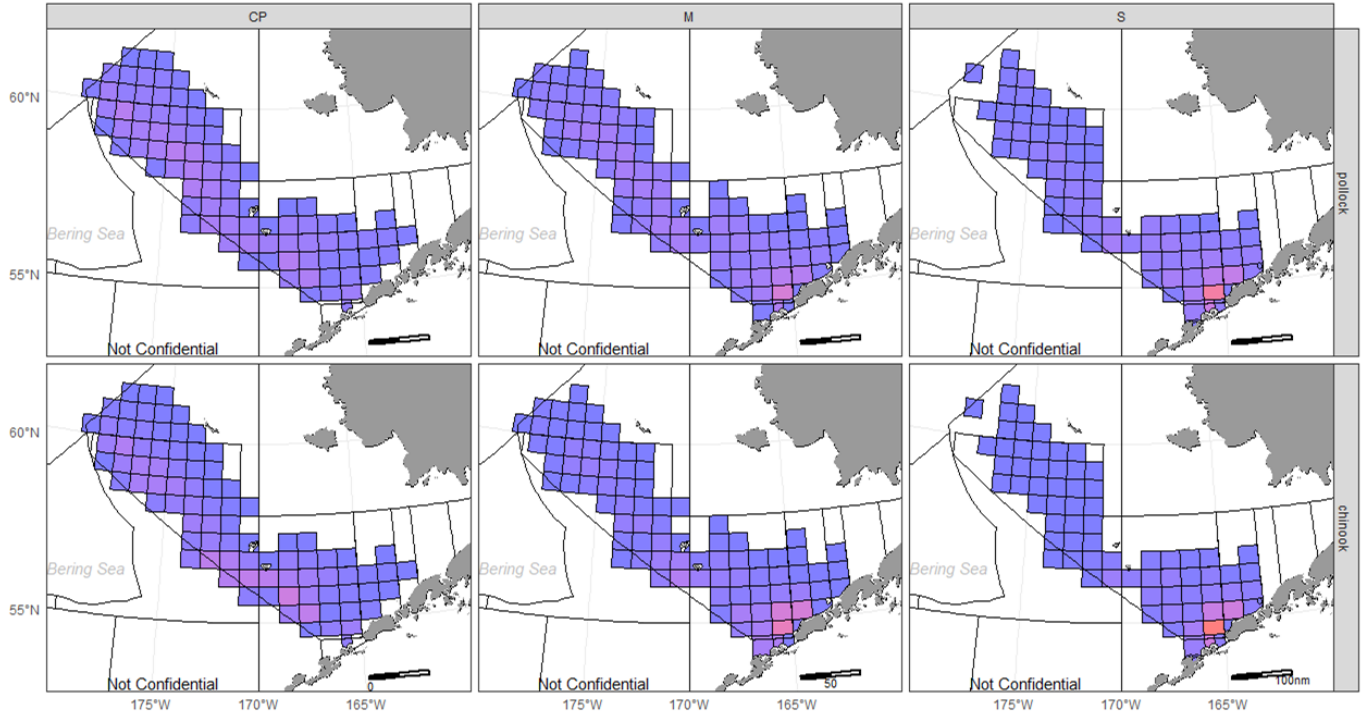
Chinook Catch By Sector B Season



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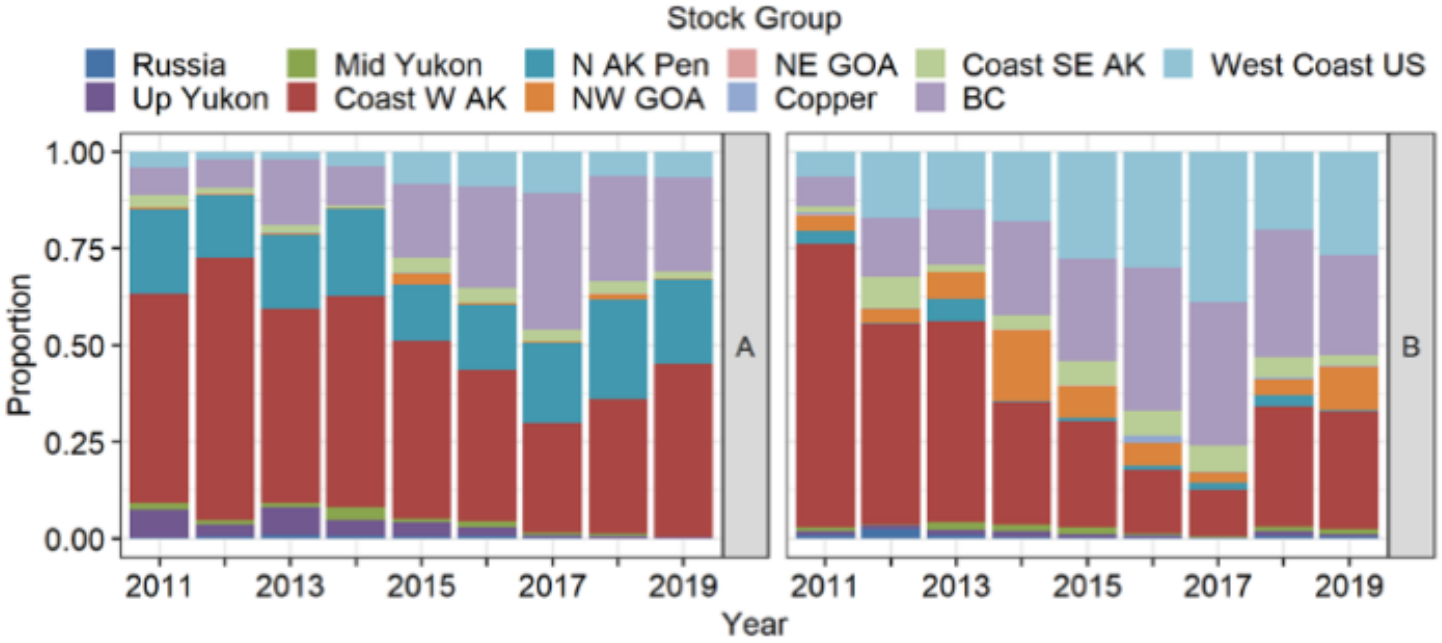
Chinook: A vs B season



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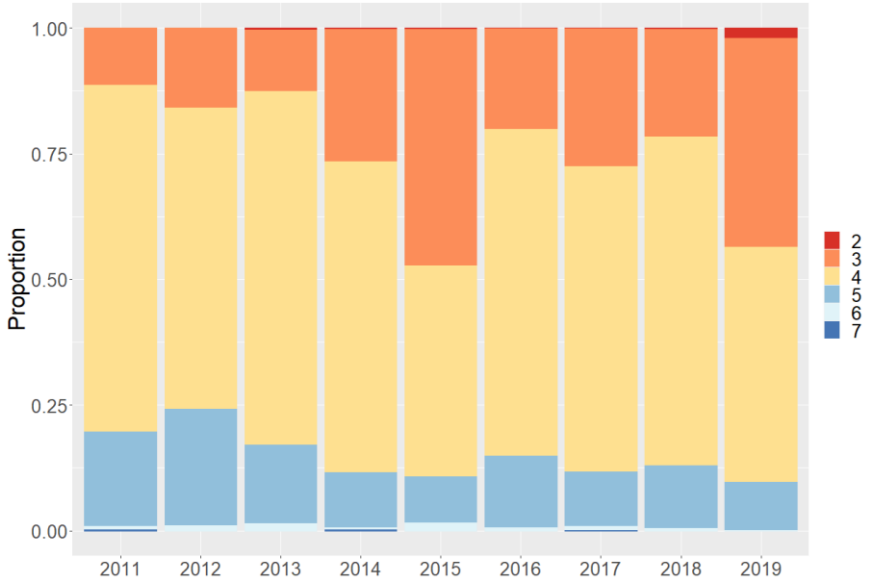
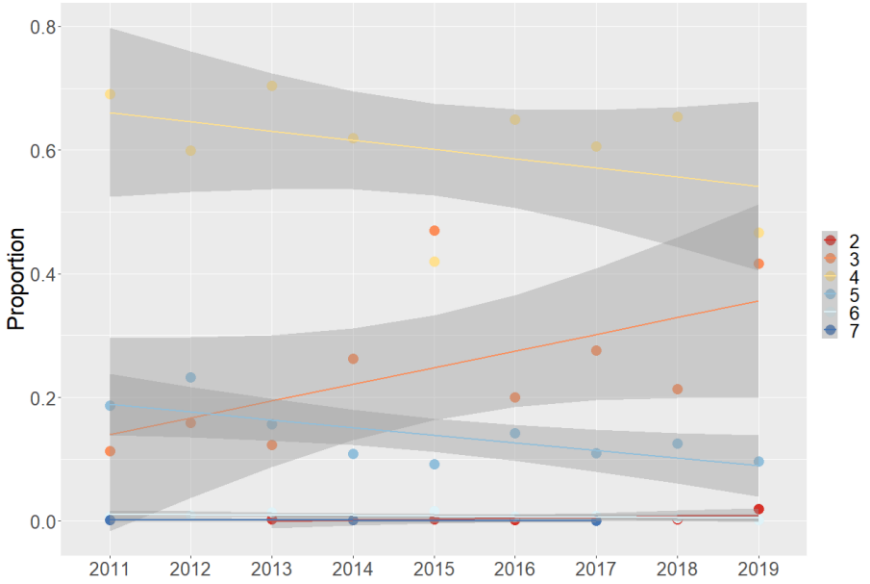
Changes in Chum Age Distribution





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Genetic Marker & Baseline Development - Chum Salmon

- 1994-1996(?)
  - 20 Protein (Allozymes) markers
  - 4-5 regional reporting groups
- 2005 - 2019
  - 11 DNA (microsatellite) markers
  - Baseline development DFO
  - 6 regional reporting groups
- 2020
  - 84 DNA (single nucleotide polymorphims) markers
  - WASSIP panel development ADFG
- Existing larger panels require baseline development