Coastal salmon surveys in Alaska and their use in pre-season harvest guidance

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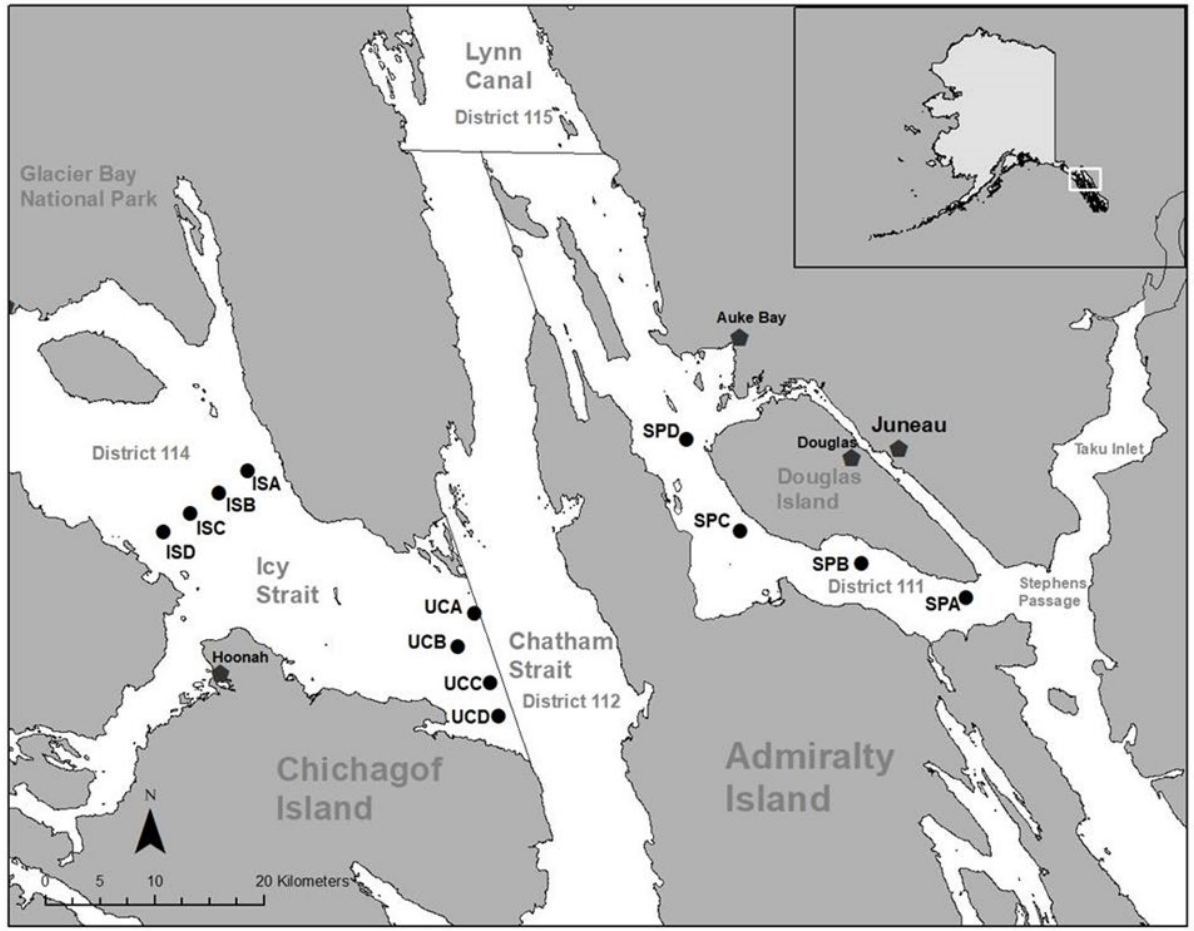
Coastal surveys in Alaska that provide pre-season salmon harvest guidance

Southeast Alaska Coastal Monitoring (SECM) Survey

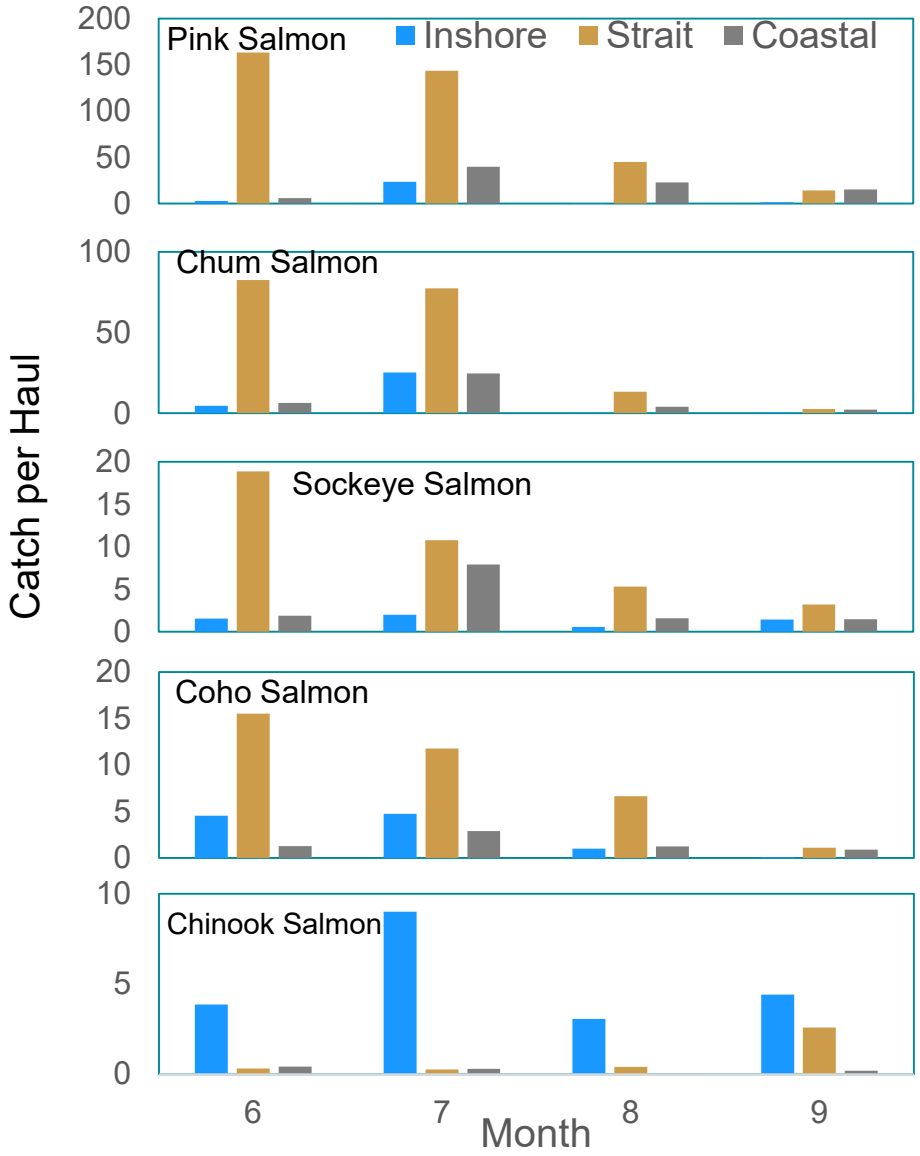
- SECM started in 1997 and has occurred annually through 2020
- Eight stations in Icy Strait provide the core monitoring stations for SECM. Additional stations have been sampled in the past (e.g. Icy Point stations), and new stations were added in Stephens Passage during 2018.
- Stations are sampled monthly (May: oceanography, June-Aug: oceanography and surface trawl). August surveys will be discontinued in 2021 to support an expanded July survey.
- Sampling gear includes surface trawl, bongo net, and CTD operations



SECM Juvenile Salmon Research

- **Assessment**
  - Distribution and abundance: Surface trawl catch rates (CPUE).
  - Origin: (Coded-wire tags, otolith thermal marks, microsatellite genetic stock ID)
  - Juvenile habitat: Icy Strait Temperature Index (ISTI).
- **Ecology**
  - Size and growth
  - Diet and feeding ecology
  - Salmon condition and ecosystem consideration

Seasonal Distribution of Juvenile Salmon in SECM Surveys



SECM Forecast Model for Southeast Pink Salmon Harvest

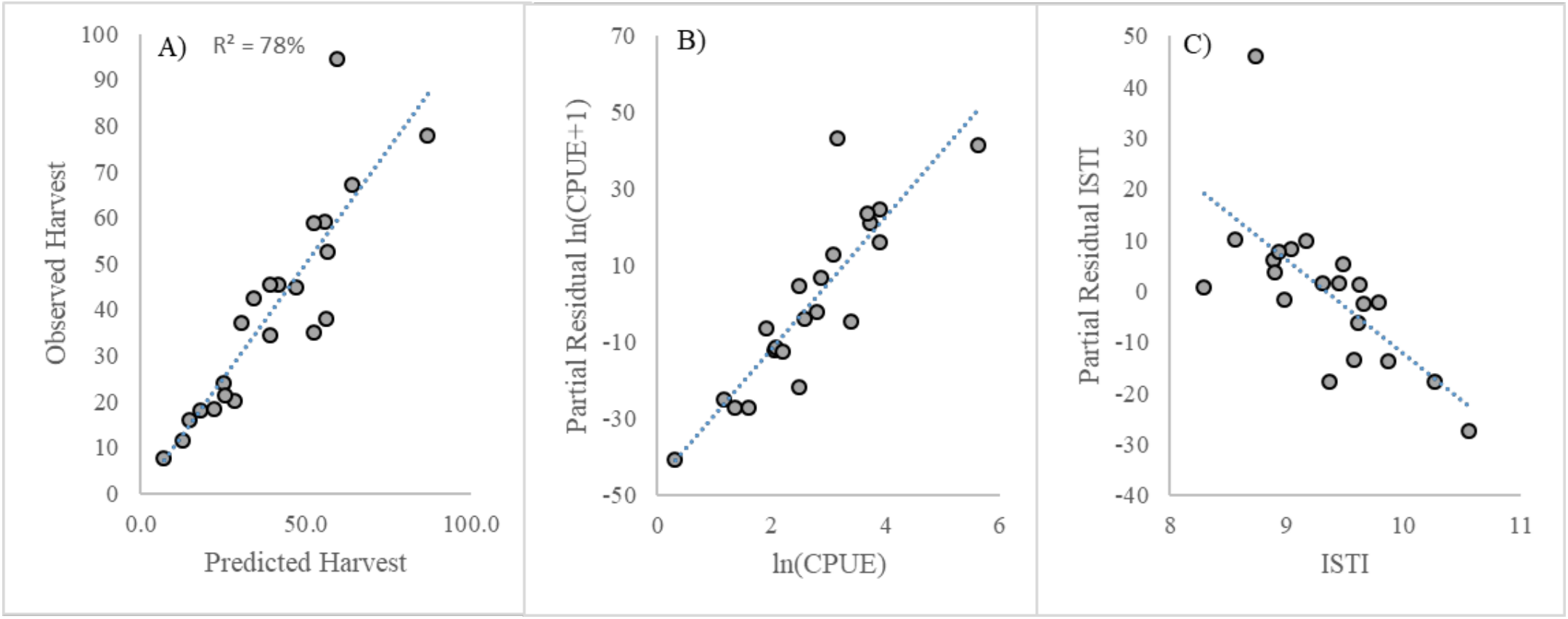
- Juvenile Abundance Index: Peak CPUE in June or July. Vessel-specific fishing power coefficients are used to standardize CPUE over time.

- Icy Strait Temperature Index (ISTI). Average May, June, and July temperatures within the upper 20m of the water column at the Icy Strait and Upper Chatham stations.

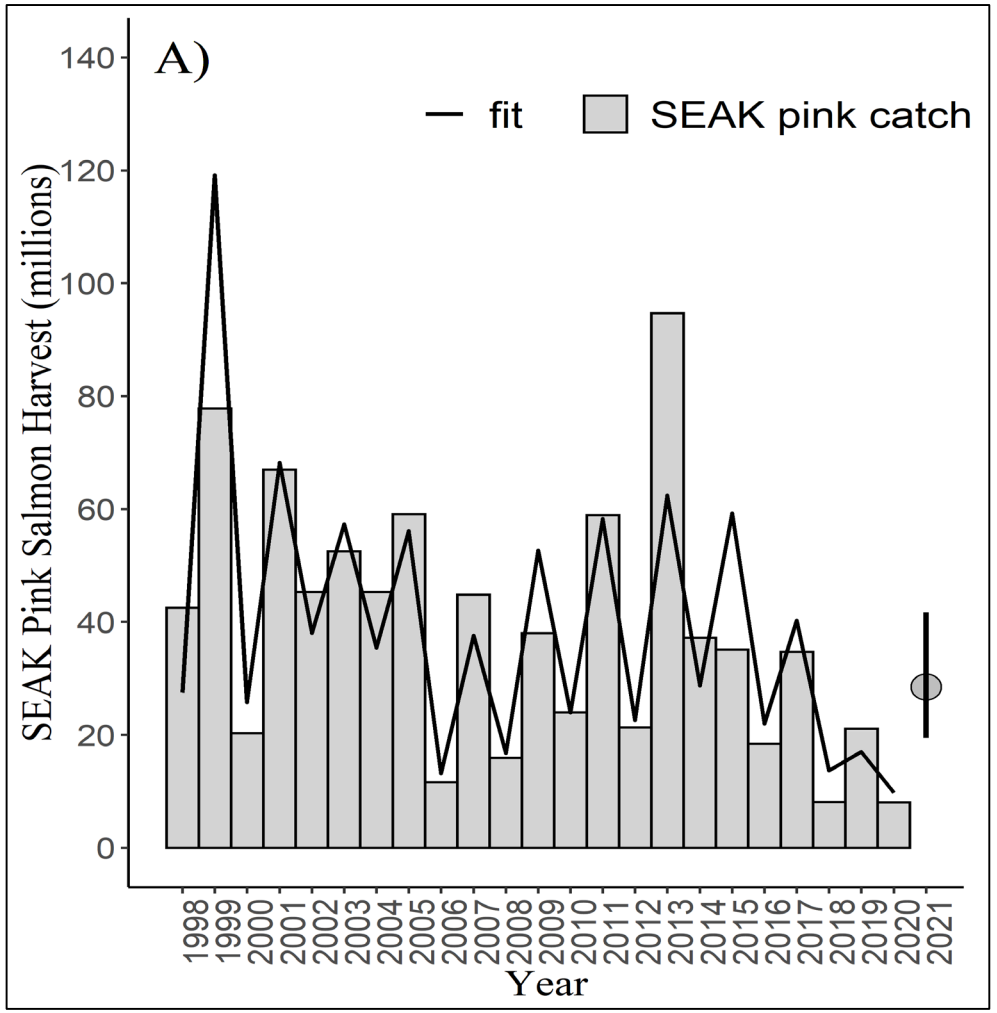
- $\ln(\text{Harvest}_{i+1}) = \alpha + \beta_1 \ln(\text{CPUE}_i) + \beta_2 \text{ISTI}_i + e_I$

- An 80% bootstrap confidence interval is used to define the range of harvest values.

SECM Southeast Alaska Pink Salmon Harvest Forecast Model and Partial Residuals

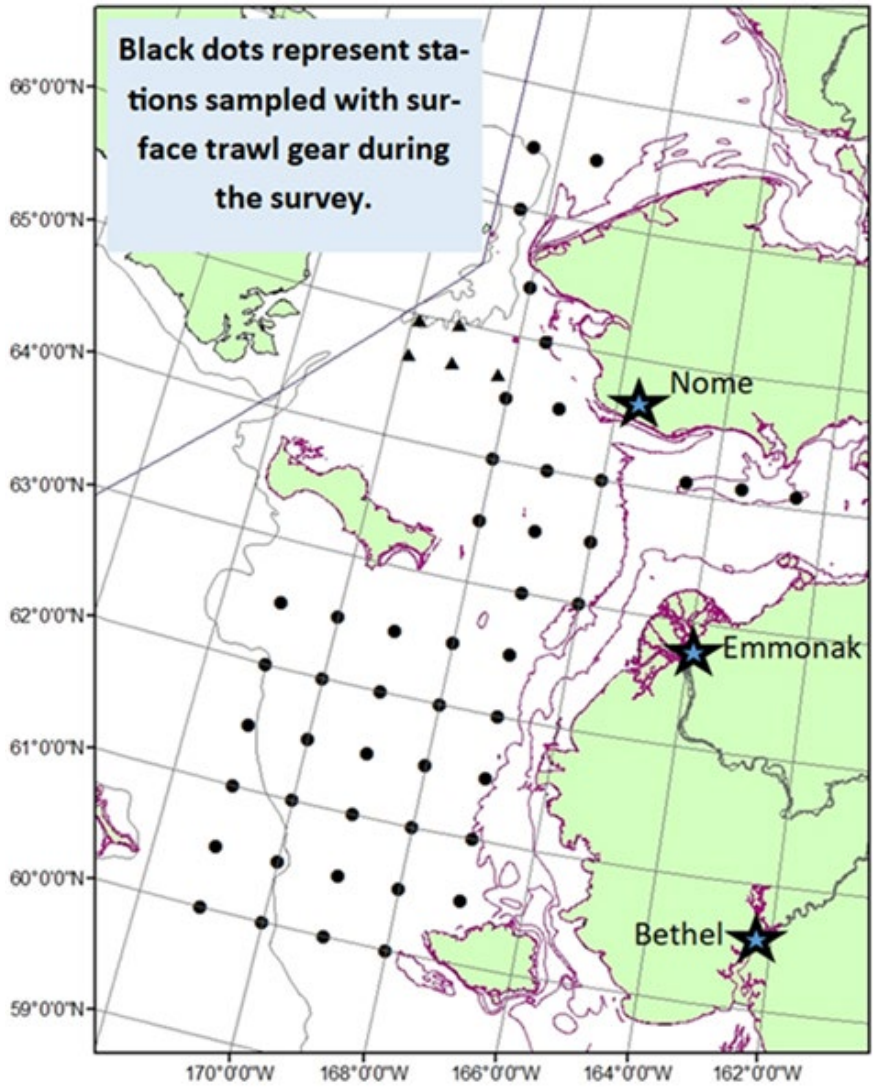


SECM Southeast Alaska Pink Salmon Harvest Guidance, 2021



Northern Bering Sea surface trawl and ecosystem survey

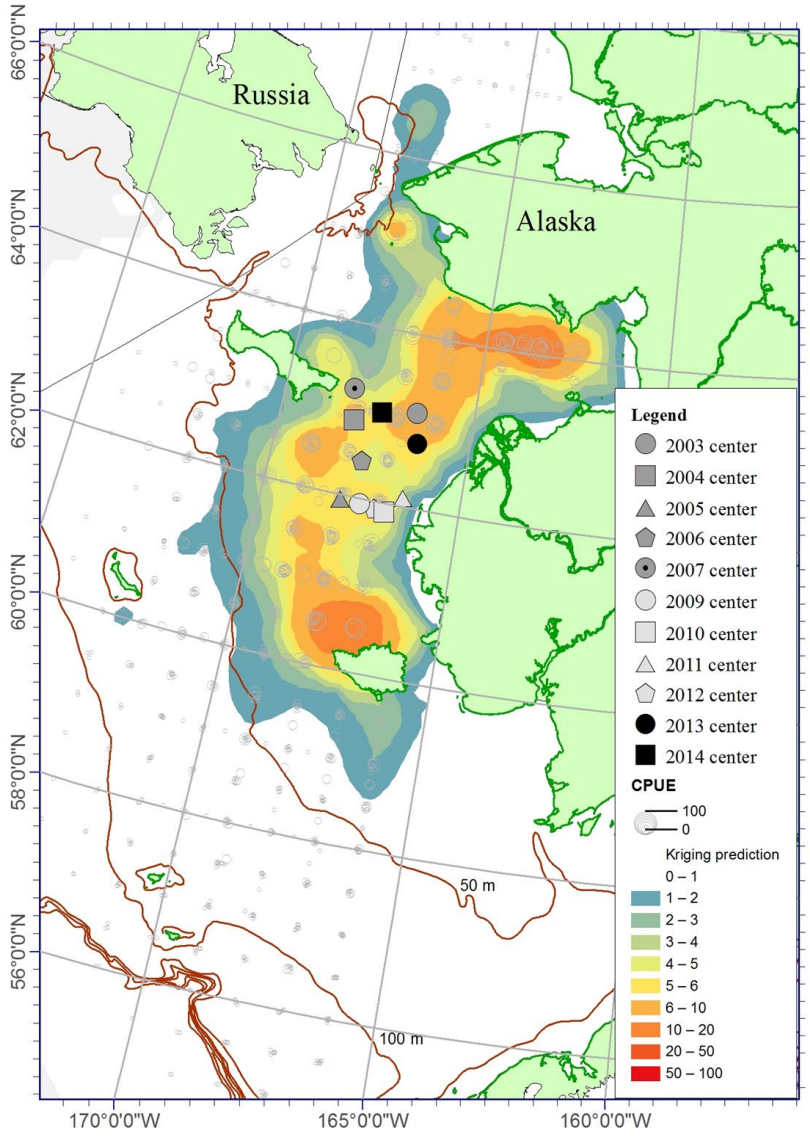
- NBS survey started in 2002 as part of NPAFC BASIS research and has continued annually through 2019 (no survey in 2008 and 2020)
- A different trawl design was used in 2002; and therefore, the 2002 juvenile salmon data are typically not included in annual summaries
- The survey typically occurs during September, after juvenile salmon have spent approximately 2-3 months in the ocean.
- Survey operations include surface trawl, zooplankton tows, and CTD cast. Will add beam trawls and benthic grabs in 2021.



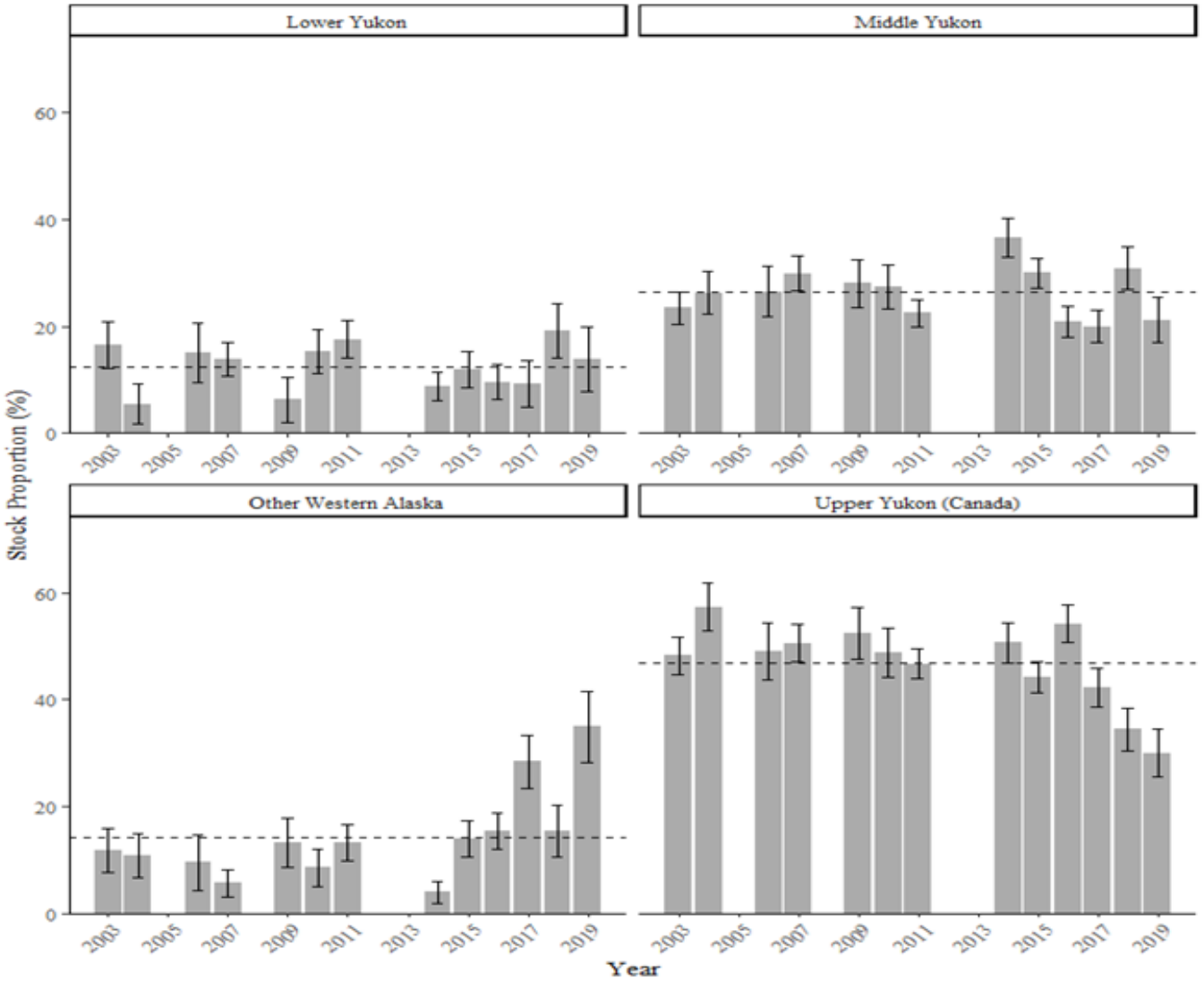
Juvenile Salmon Research in the Northern Bering Sea

- **Juvenile assessment**
  - Distribution and abundance: surface trawl catch and effort data
  - Juvenile habitat: Mixed-layer depth is part of the definition of juvenile habitat
  - Juvenile Origin: Single nucleotide polymorphism (SNP) genetic stock ID
- **Juvenile ecology**
  - Size, age, and growth
  - Diet and feeding ecology
  - Salmon condition and ecosystem status

Juvenile Chinook Distribution in the Northern Bering Sea

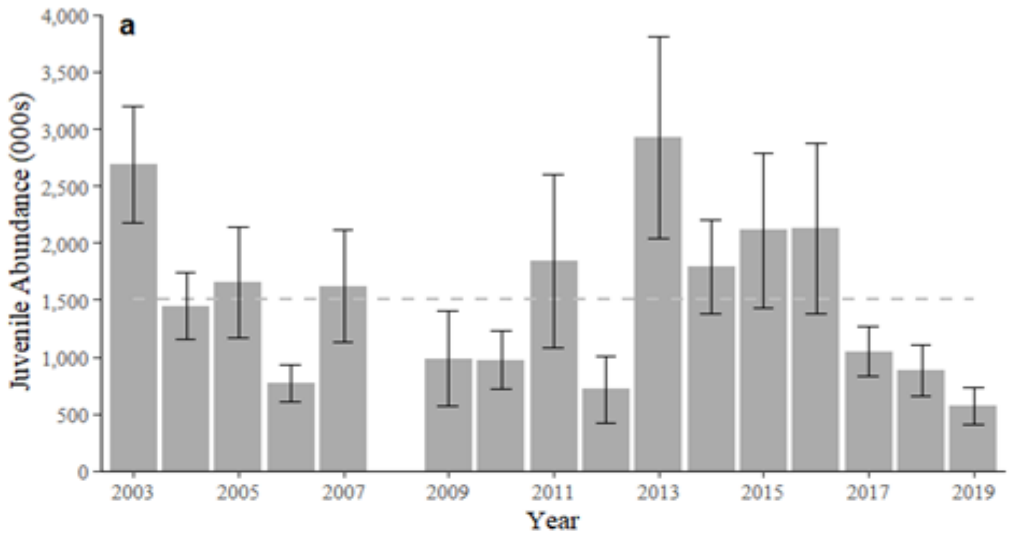


Juvenile Chinook salmon stock composition estimates in the northern Bering Sea, 2003-2019.

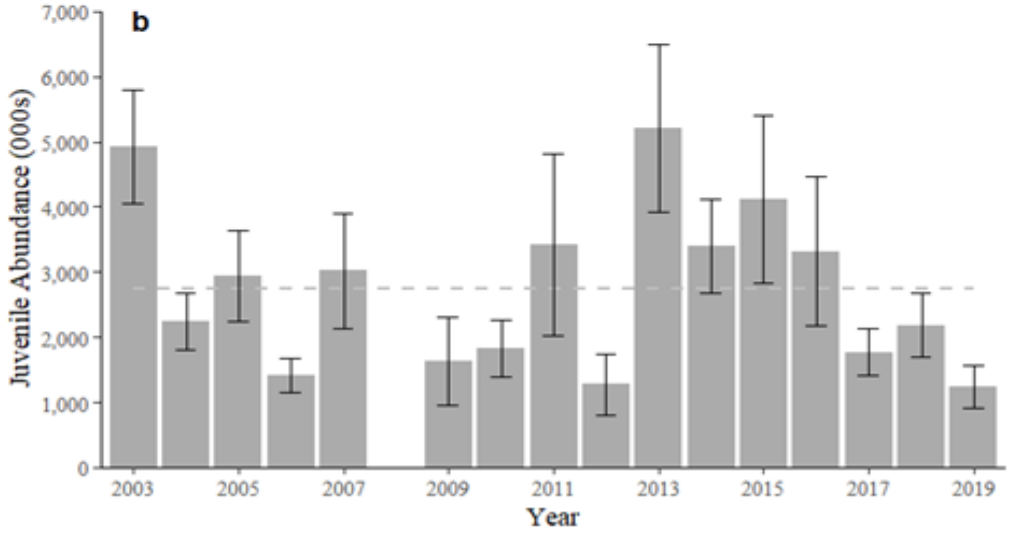


Stock-Specific Juvenile Chinook Salmon Abundance

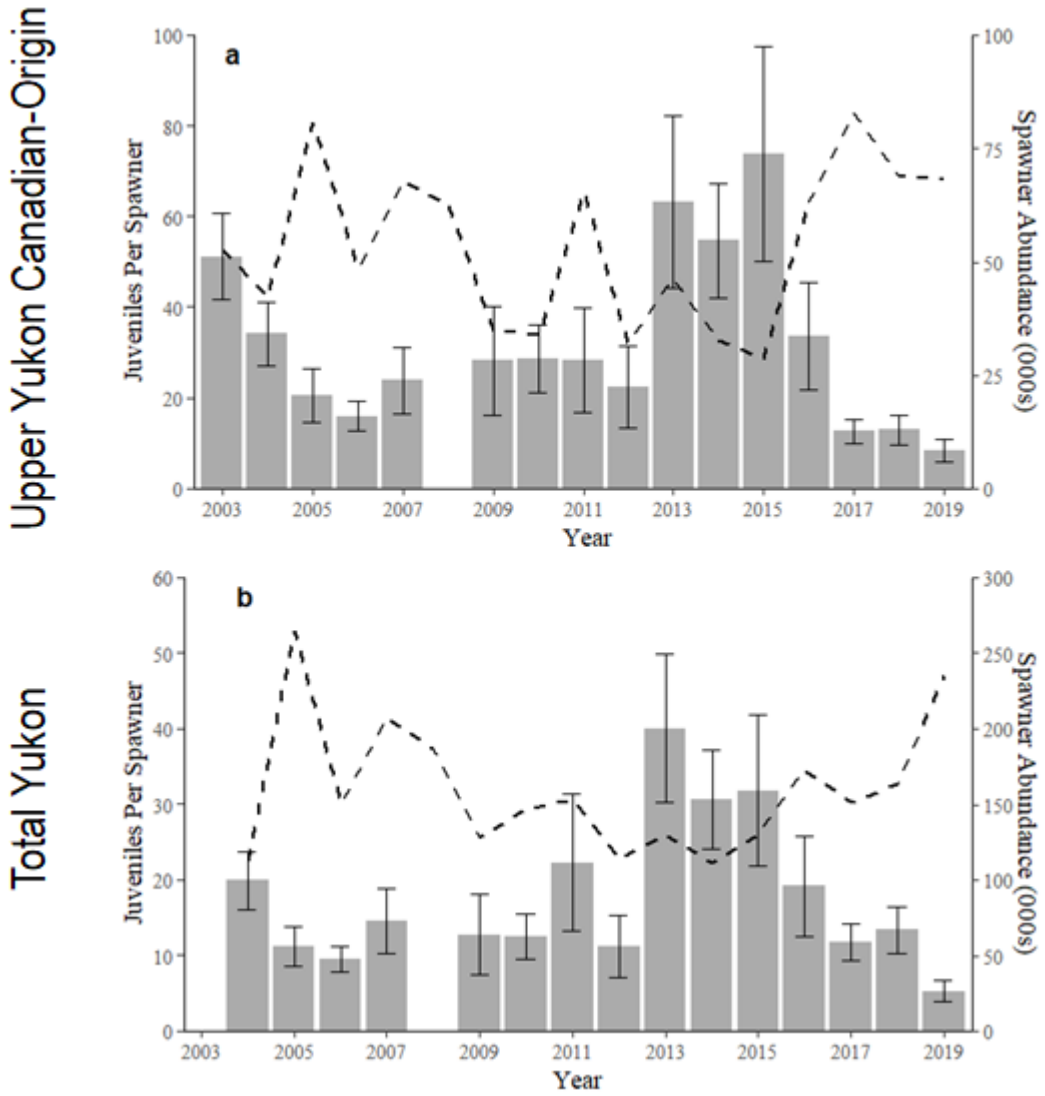
Upper Yukon Canadian-Origin



Total Yukon

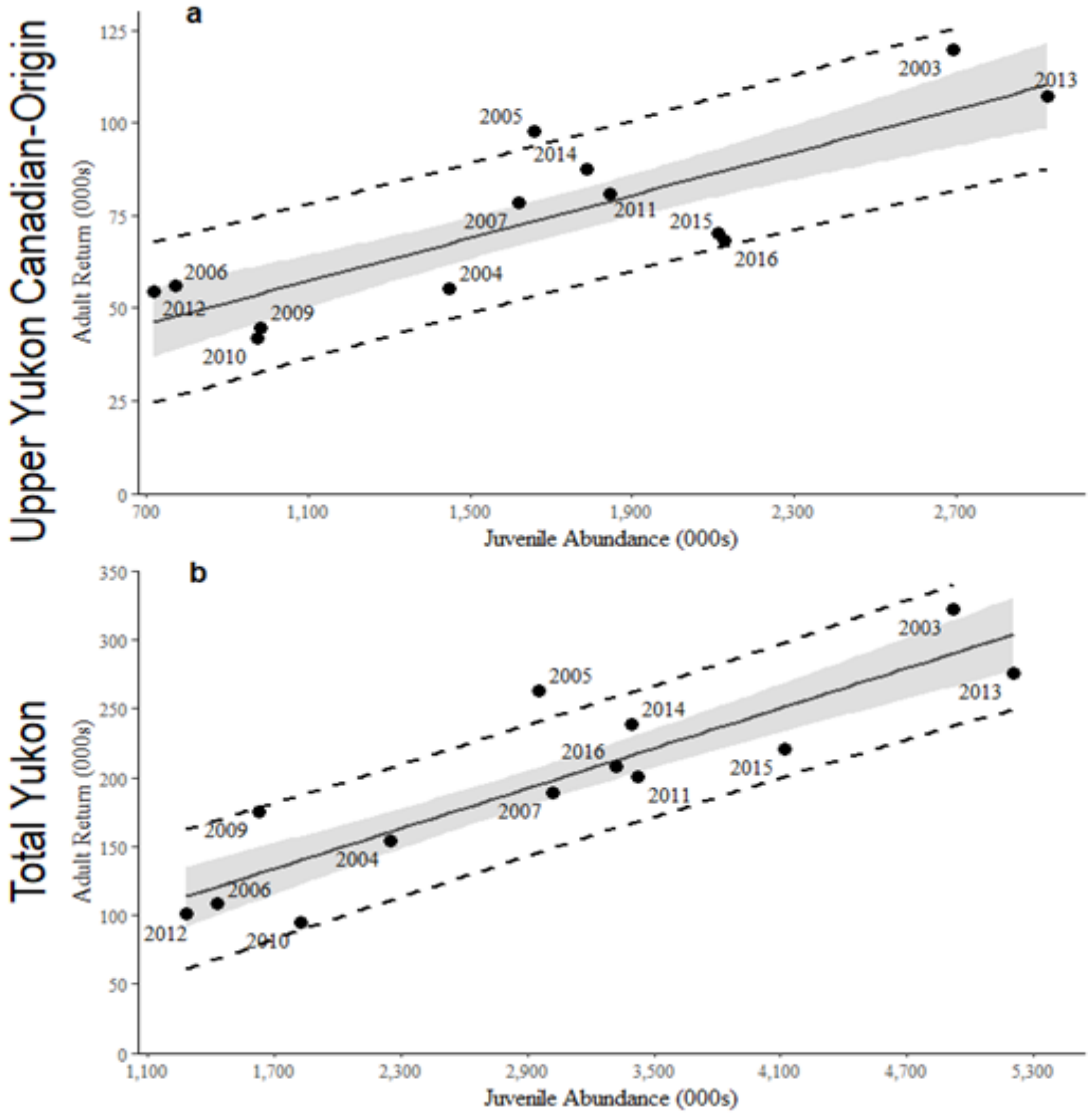


Chinook Salmon Juveniles-Per-Spawner



Yukon River Chinook salmon return projections

- A robust linear model of juvenile and adult abundance is used to project future returns.
- The 80% prediction interval of the regression model is used to define the projected range of future returns.
- Average stock proportions are used in years without genetic data (2005, 2012, and 2013).
- Estimates of Chinook salmon returns are converted to run-size with the three-year average maturity rate.



Yukon River Chinook Salmon Run Size Outlook, 2021-2022

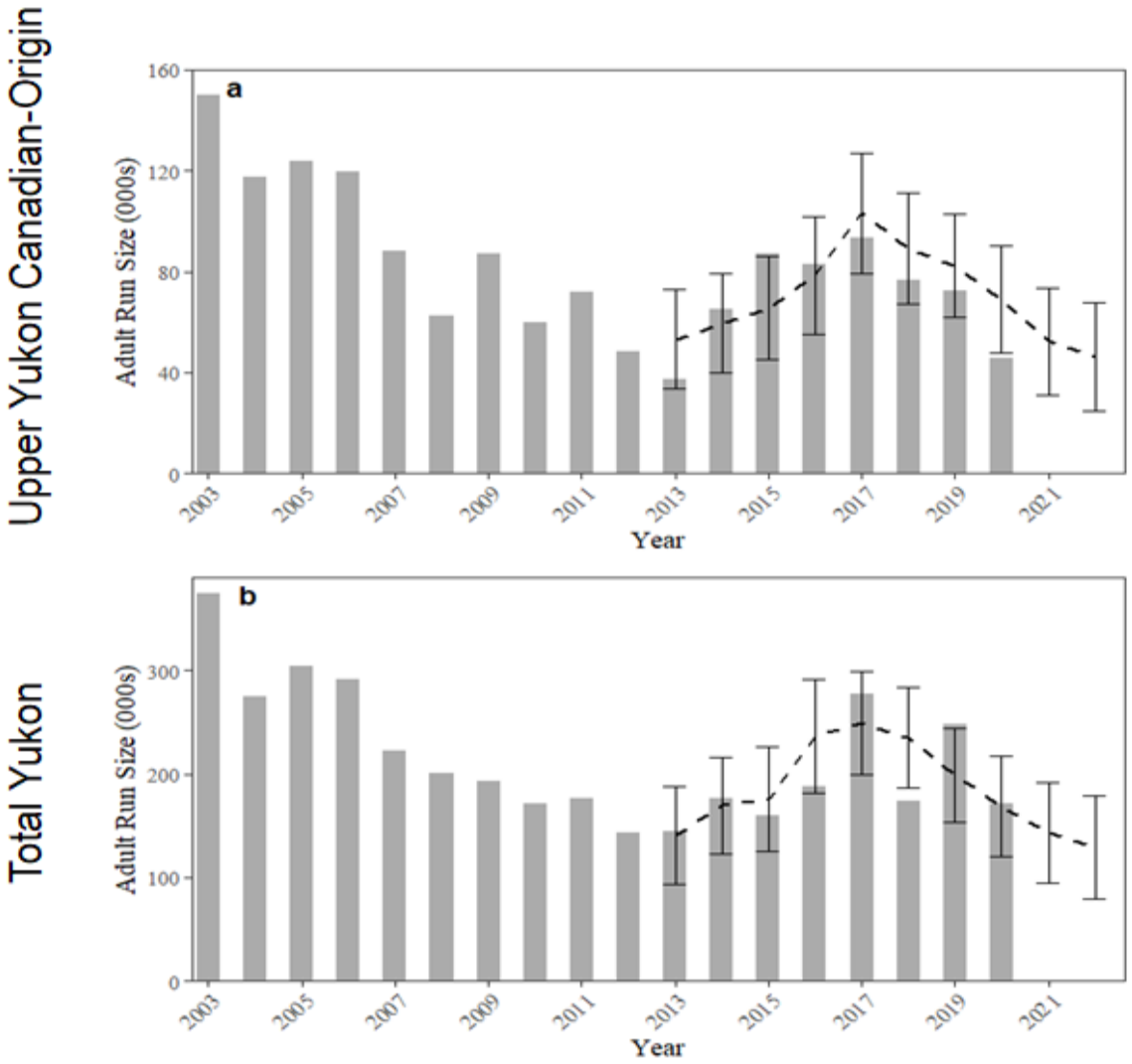
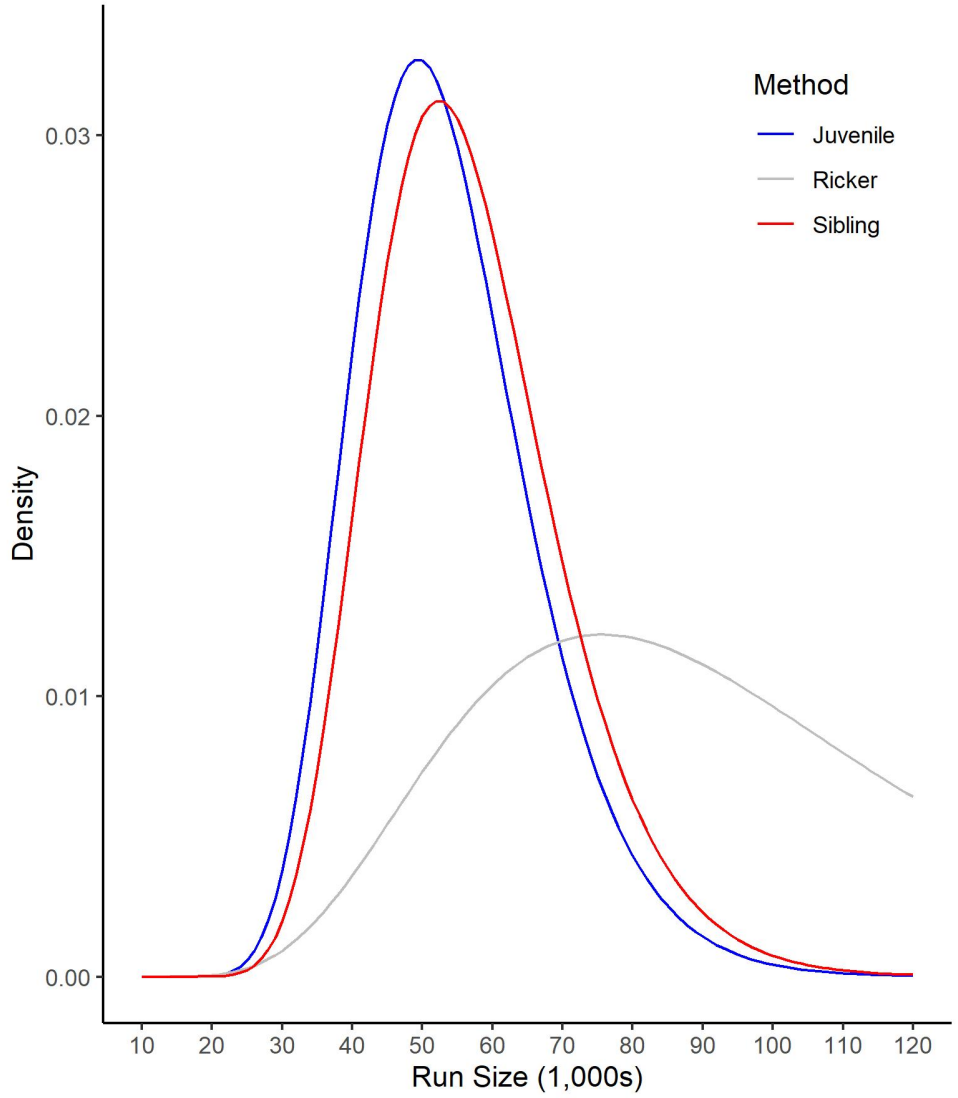
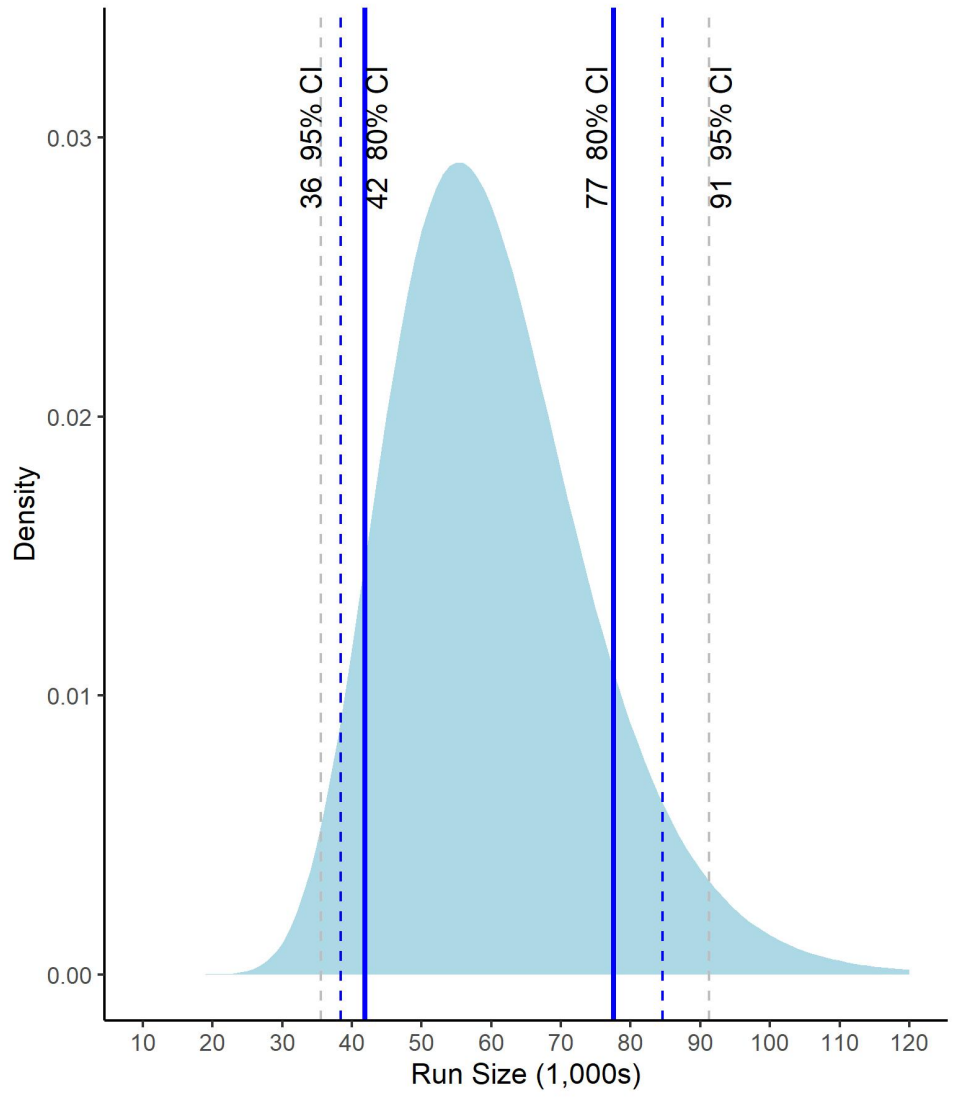


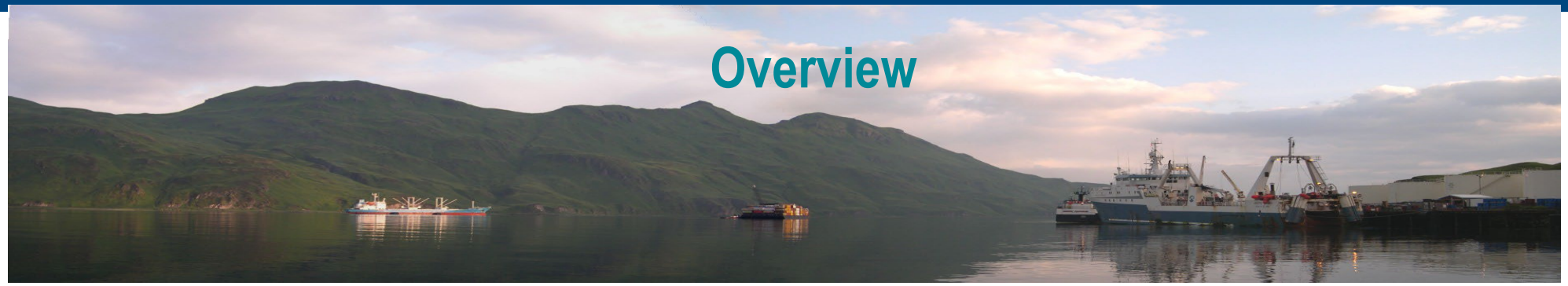
Photo by Caroline Brown, ADF&G

Pre-season run size forecasts for Upper Yukon River (Canadian-origin) Chinook salmon, 2021 (US/Canada Yukon River Joint Technical Committee)





Overview



- Coastal salmon surveys in Alaska provide harvest guidance for Chinook salmon fisheries in the Yukon River and pink salmon fisheries in Southeast Alaska. Forecast models have been developed for other species, but have not yet been applied to harvest guidance.

- The coastal surveys were established by NOAA Fisheries, but are now cooperative surveys by ADF&G and NOAA due to their application to salmon harvest and run-size forecasts. Salmon forecast models have been instrumental in securing annual funding support for these surveys.

- Forecast model characteristics:
  - Based on juvenile abundance estimates and include information on juvenile habitat (CTD data) to account for changes in juvenile distribution and survey catchability,
  - are reviewed by both state and federal biologist before their use in harvest guidance,
  - and include information on juvenile ecology and ecosystem considerations, to support precautionary approaches to harvest guidance.