REGIONAL COMMITTEE ON MARKING AND TAGGING
46TH MEETING

DAY 2

APRIL 20, 2023

PSMFC, Portland, Oregon

REGIONAL MARK PROCESSING CENTER
A FISHERIES DATA PROJECT OF
THE PACIFIC STATES MARINE FISHERIES COMMISSION

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Day 2: MS Teams Tips

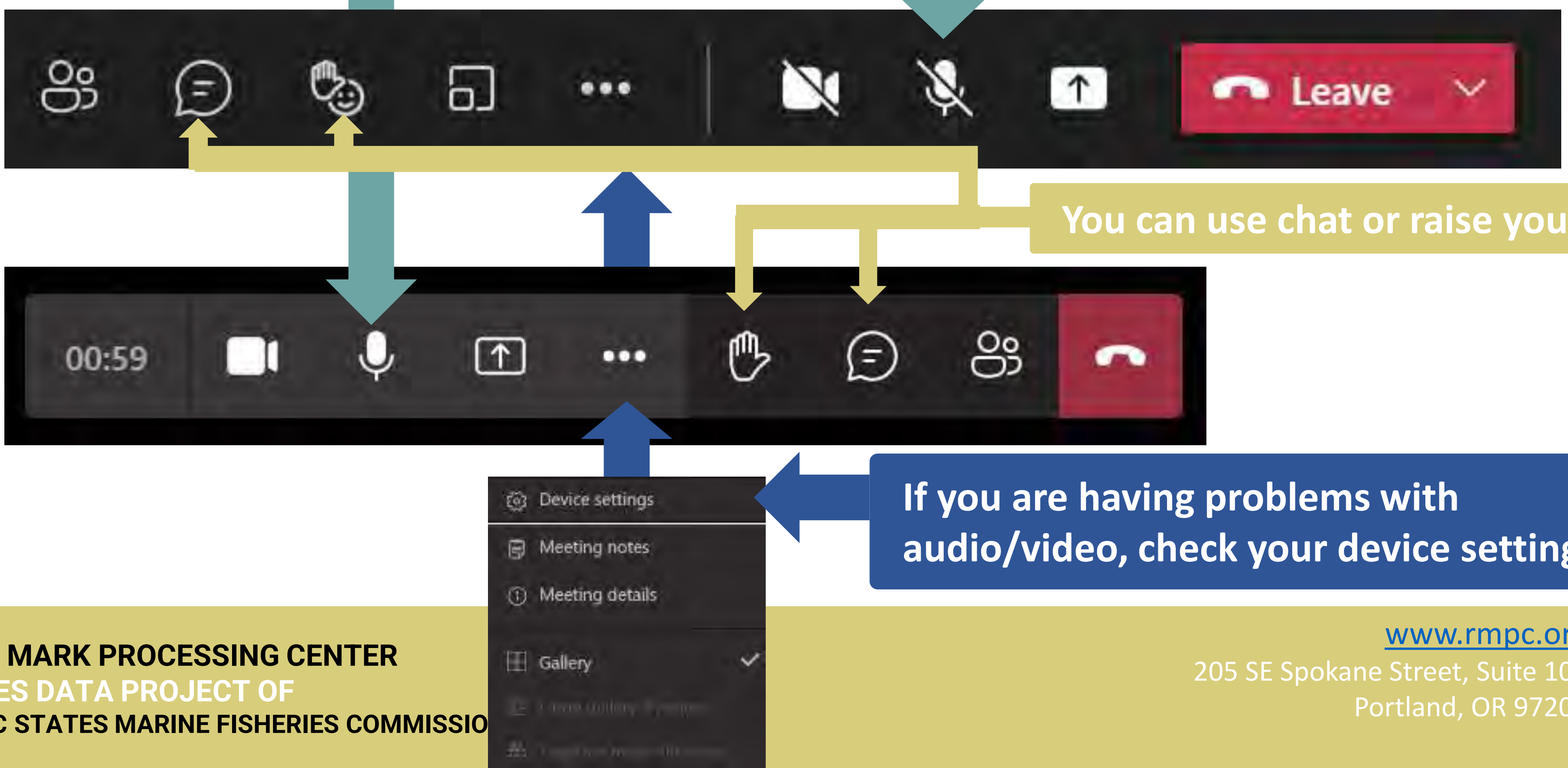
Please mute yourself when not speaking.

Use *6 to mute phone audio.

Use the microphone icon on the control bar to mute computer audio.

Desktop view

Browser view



You can use chat or raise your hand

If you are having problems with audio/video, check your device settings.

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Day 2: Welcome and Introductions

- For those not present on Day 1:
  - RCMT members
    - in-person
    - virtual, please keep camera on as feasible
  - Other attendees and guest presenters
    - in-person
    - virtual, please use the CHAT (name & affiliation) and leave camera off unless speaking

Westport WA boats, Stan Allen

File:
ITEM-07-2011_Regional_Agreements-proposedEdits-11April2023

Updating Regional Coordination and Agreements on Marking and Tagging Pacific Coast Salmonids

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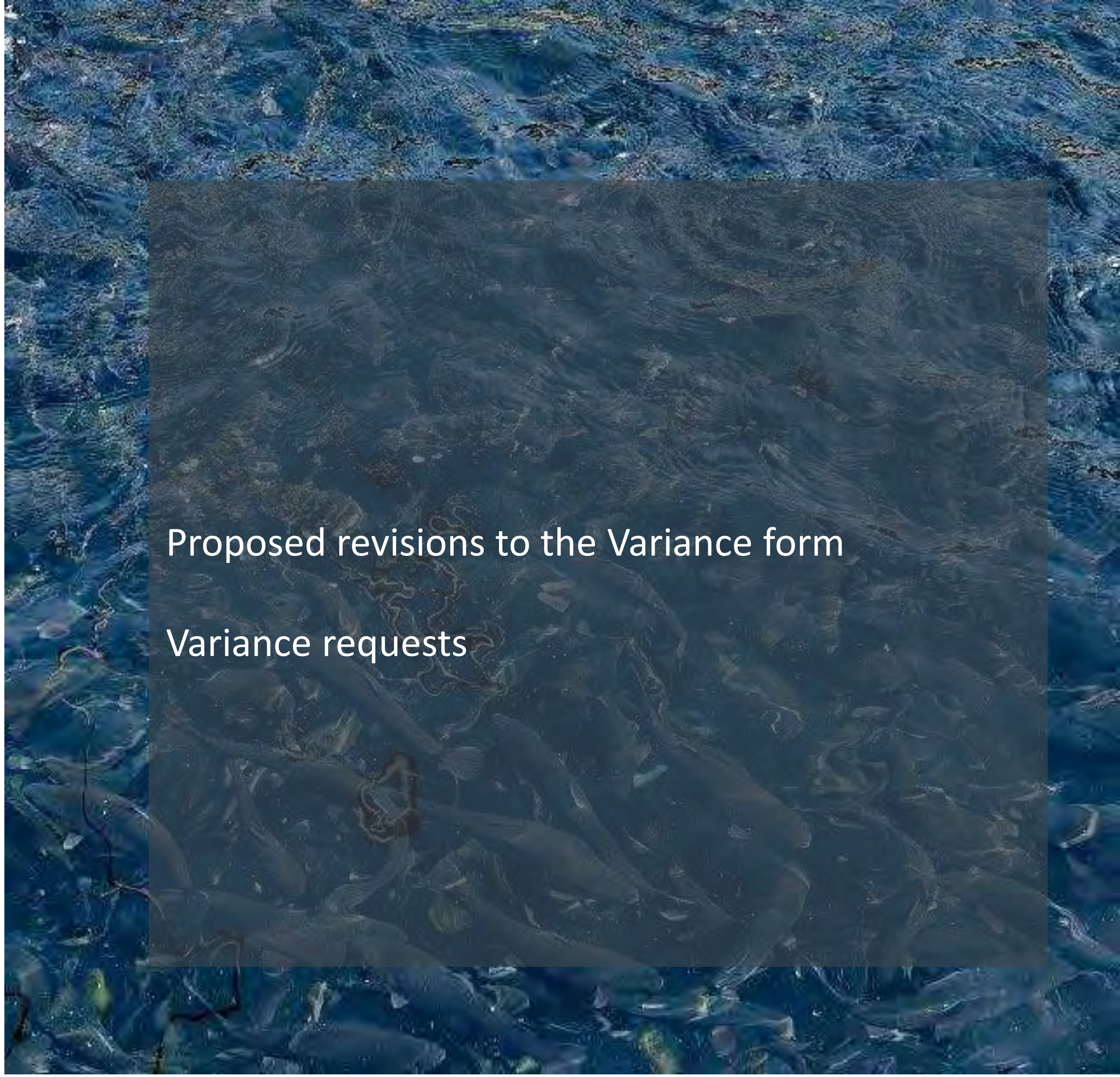
Confederated Tribes of the Umatilla Indian Reservation as New Data Coordinator in RCMT

Rob Hogg, Assistant Project Leader

Travis Olsen, Project Leader

The Walla Walla Hatchery sits next to the South Fork Walla Walla River 9 miles southwest of Milton-Freewater, Oregon.

Special Marking Requests & Announcements for 2022 and 2023



Proposed revisions to the Variance form

Variance requests

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Proposed revisions to the Variance Form

File:
ITEM-09-Mark-Committee-Workgroup-on-Marking-Variances-16April2023draft

Recommendation from the Mark Committee Work Group on the Marking Variance Form

Work Group Task: Review and possibly clarify the language describing when the RCMT "Request for Marking Variances" form is required.

Background: A decision to change the RCMT *Mass Marking* form to a *Request for Marking Variance* form was agreed to at the 2001 Mark Meeting. For the past several Mark Meetings the issue of Variance Requests is one of the last items on the agenda. We generally receive a few official requests or announcements for the use of agency wire or the use of an adipose clip. This item often raises the question about what type of marking or/tagging requires this Request, but a clear and comprehensive definition seems to be lacking. The RCMT Agreements on marking and tagging clearly state that this Variance form is required for use of blank or agency-only wire, but does not specifically address ad-marking of chum & sockeye:

> Section III.3:
> *Blank wire or agency only tag use requires a proposal (Request for a Marking Variance) to the Mark Committee. The proposal will be reviewed for its impact on the regional CWT recovery programs.*

At the 2022 meeting Ron Olson volunteered to look at editing the language in our Regional Agreements to clarify when a Variance Request is required. A workgroup was formed with the following volunteers: Ron Olson, Jim Longwill, Dion Oxman, Eric Keller, Jillian Cady, and Kathy Fraser.

In reviewing the Minutes from the past 21 mark meetings (2001-2022), Variance Requests were submitted, or announced, for all years except for the 2017-2019 years. These requests included the following types of marking:

Any variance requests from members?

Pacific Salmon Commission Calendar Year Exploitation Rate Work Group

Rob Houtman, DFO

Recommended Transition Plan for
Estimating Calendar Year Exploitation Rates for Chinook Salmon Escapement Indicator Stocks Impacted by Mark-Selective Fisheries

Presentation by Rob Houtman to RCMT, April 19/20, 2023

Terminology:

- Catch = kept and released catch. This differs from CTC language, where "catch" refers to kept catch only. Note that catch by this definition does not mean dead fish, since releases mostly survive.
- Drop-offs = fish that encountered the gear, but did not get to the boat. If they die due to that encounter, they are 'drop-off mortalities'. Fish taken from the gear, or *depredated*, by predators are included in drop-offs.
- Encounters = *gear* encounters, i.e. catch plus drop-offs.
- IM= Incidental Mortality = Release mortality *+ Drop-off mortality*
- Release mortality = # released X release mortality *rate*
- Drop-off mortality = Catch X drop-off mortality rate
- Cohort = For a SIT stock, marked tagged members of an indicator stock group at age, and *inferred* unmarked *virtually*-tagged fish.
- DIT: double index tag. DIT indicator pairs include two tagged release groups, one marked and one unmarked. DIT analytical methods use information on recoveries of each of the two groups.
- SIT: single index tag. SIT indicator stocks are a typical marked and tagged release group. SIT analytical methods rely on recovery information from marked and tagged fish, and can be applied to DIT indicator stocks by ignoring the DIT recovery information.
- Lambda: used to account for differential impacts on marked vs unmarked fish of a stock group of interest, through MSFs as impacts act cumulatively over time. For DIT tagged stocks, the ratio Unmarked tags: Marked tags. For SIT tagged stocks, the models still use lambda to account for the relative impacts on unmarked fish over fisheries. Note in a mixed stock fishery, lambda is about the stock of interest; avoid referring to 'fishery lambda', and use 'fishery mark rate' instead.
- MRE = 'mark recognition error' (we've inherited this; should be 'mark release rate').
- URE = unmark retention error (we've inherited this; should be 'unmark retention rate').

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The Problem: MSFs Intentionally Break the "Gorilla Assumption"

We rely on the "gorilla assumption" to infer that exploitation rates estimated using CWT recoveries on indicator stocks are the same as those on associated unmarked wild stocks.

"Gorilla Assumption": wild stocks associated with exploitation rate indicator stocks experience the same pattern of fishing impacts at age as the indicator stocks.

But MSFs cause (mostly) retention mortality on marked indicator stocks and (mostly) release mortality on unmarked associated wild stocks, thus ERs are definitely different.

Ignoring this would cause ERs to be too high for wild stocks (they'd be fine for marked indicator stocks).

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The Answer: Develop Analytical Methods to Calculate Unbiased ERs on Wild stocks Experiencing MSFs

The Candidate Methods:

Table 1. Description of alternative methods to estimate exploitation rates (by cohort reconstruction) on unmarked Chinook salmon in the presence of the mark-selective fisheries. λ is the ratio of unmarked to marked fish. All methods assume that marked and unmarked Chinook salmon have the same migratory pattern and maturation rates.

SIT 0 estimate ER on the SIT group without any MSF adjustments
SIT 2 λ set at escapement work backward
SIT 4 λ set at release work forward
SIT 7 The SIT method described in chapter 5 of the CTC's annual exploitation rate analysis report. Briefly, SIT 7 is the SIT 4 method with pre-terminal MSF fish survivors accruing to the terminal run.
DIT 0 estimate ER on the DIT group without any MSF adjustments
DIT 1 DIT with equal marine survival method to estimate preterminal mortality in pre-terminal MSF; uses SIT 2 for terminal MSF.
DIT 2 DIT with paired ratio method applied to pre-terminal and terminal MSF.

Evaluating the Methods

Simulation using the “DGM” which stochastically simulates natural and hatchery production of Chinook salmon, natural processes such as mortality and maturation, fisheries, and sampling for CWTs over multiple time periods, fisheries, and years.

We simulated over 20 ‘scenarios’/’worlds’ which differed in:

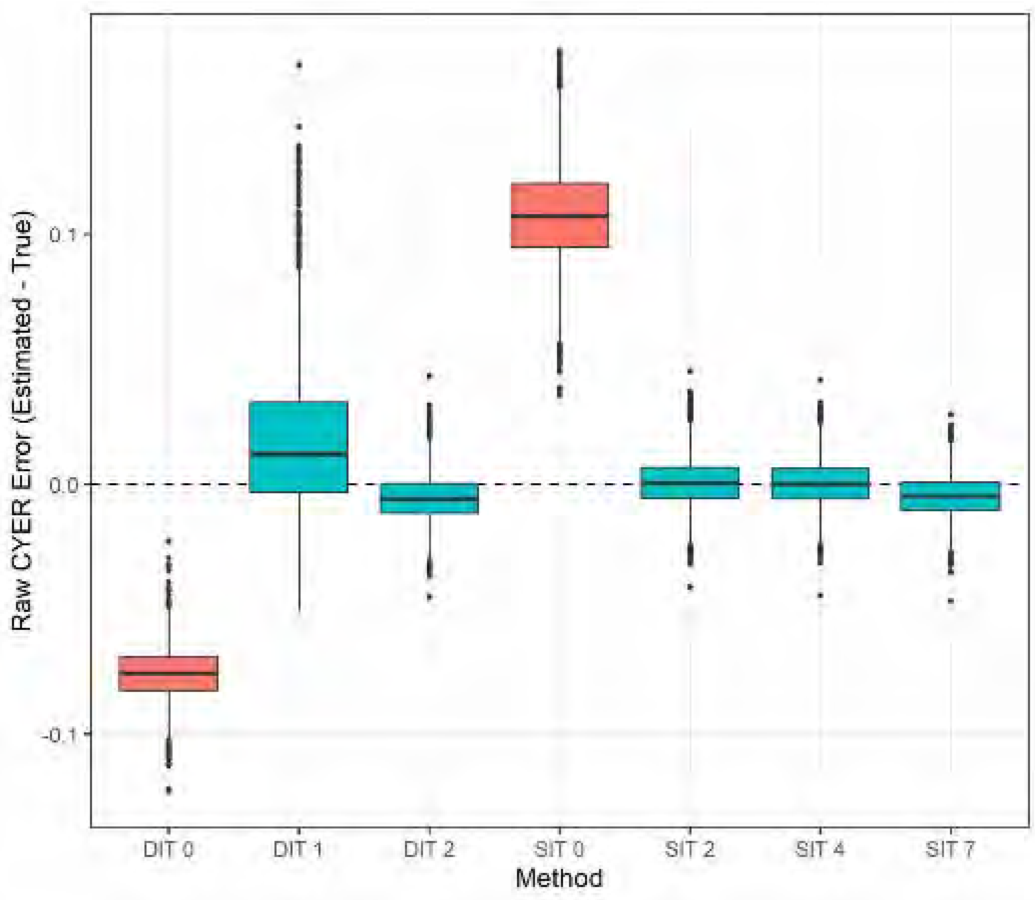
-MSF location (preterminal vs terminal fishery)
-MSF intensity
-number of MSFs (preterm, term, both)
-migration through preterminal fisheries (single pool or “pipeline”)
-fishery sampling rates for CWTs (100% vs)

We know what the actual “real” ER on unmarked fish was in each simulated run.

We estimated unmarked ERs using the candidate methods, from CWT recovery samples ‘observed’ in the simulation.

This allows comparison of “real” and “estimated” ERs.

Performance of Candidate Methods



(This figure is for one of the most complex simulated scenarios, but the pattern is general)

Conclusion:

Recommendation 2.1. Estimate CYERs using SIT 2 or SIT 4.
These methods provided estimates of CYERs with minimal bias and the highest precision over the range of simulations evaluated.

An additional advantage is that implementation can occur with the existing CWT indicator stock tagging and fishery monitoring programs, although tagging and sampling rates may need to be increased in some fisheries (Anderson and Reid 2020) to match the 20% sample rate used in the simulations.

Since SIT 2 and SIT 4 had similar performance in the simulation, the CYER WG proposes to select one of the two methods for application to CWT indicator stocks after discussions with the CTC regarding the relative ease of implementing each method in the cohort analysis program among other factors.

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Recommendation 2.2. Ensure technical review.

Enhancing the Analytical Methods to Accounting for Imperfect MSFs:

Three mechanisms leading to 'imperfect' MSFs

-pure MSFs with MRE and URE

-mixed bag MSFs

-mixed fishery strata with MSF and non-MSF regulations that can't be divided

To account for these, we developed an analytical adjustment called the

"Mixed Fishery Adjustment" or MFA

This approach does not deal with analysis of mark and size mixed bag fisheries.

Requirements to Implement the Mixed Fishery Adjustment

Total legal-sized catch in a fishery stratum, by disposition and mark status. (Not by stock, just total catch)

Fishery Catch		
	Marked	***Unmarked***
Kept		
Released		
Catch		

Recommendations Directed to Agencies

Recommendation 3.1. ***Monitor releases and retention by clip status in MSFs***. Encourage management entities to monitor and report the number of Chinook salmon kept and released by clip status to improve estimates of CYERs.

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Protecting Against Bias in the Implemented MSF Method

The accuracy of any analytical method (SIT and DIT) to estimate ERs is affected by (at least):

-accuracy of CWT fishery recovery estimates, that depend on accuracy of both the CWT composition sample (e.g., SHRP) and the kept catch estimates.
-accuracy of assumptions of migration patterns through fisheries and maturity in MSFs
-accuracy of assumed release and drop-off mortality rates

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-accuracy of assumptions of migration patterns through fisheries and maturity in MSFs
-accuracy of assumed release and drop-off mortality rates

Use "DIT Networks" as an **"Uber Audit"**

1. Release DIT pairs from subset of indicator hatcheries.
2. Determine escapement lambda accurately.
*** Does not require fishery sampling for unmarked DITs.
3. Compare escapement lambda observed to that predicted by the MSF analytical method that accounts for fishery impacts.

Recommendations Directed to Agencies

***Recommendation 3.1*. *Monitor releases and retention by clip status in MSFs*.** Encourage management entities to monitor and report the number of Chinook salmon kept and released by clip status to improve estimates of CYERs.

***Recommendation 3.2*. *DIT indicator network*.** Modify the existing DIT indicator network and consider adding stocks in new geographic areas that are impacted by MSFs to provide an ongoing assessment of the performance of SIT methods.

The network would have a lower density of CWT indicator stock coverage than required by Chapter 3 of the PST but would facilitate an assessment of the escapement rates estimated by a SIT method relative to the empirical estimates provided by the marked and unmarked components of the DIT groups.

This would not require fishery sampling of unclipped and tagged Chinook salmon.

Consideration of DIT stocks for the network, should be informed by the feasibility of implementation, the expected quality with which the marked and unmarked CWT escapement can be estimated, and the intensity and pattern (e.g., terminal versus preterminal) of the MSFs projected to be applied to the CWT indicator stock.

Recommendations Directed to PSC Committees

Recommendation 4.1. Update CTC cohort analysis (CTC task).

Recommendation 4.2. Review terminal fishery designations and fishery aggregation used in CTC cohort analysis (CTC task).

Recommendation 4.3. Revise post-season information management process (SFEC task).

Recommendation 4.4**. **Establish reporting protocols for MSF regulations and fishery data (Data Sharing Committee task).

*** Obligations to report post-season MSF catches and impact analyses to SFEC will be adjusted.

Recommendation 4.5. Task CYER WG with coordinating implementation of Recommendations 4.1-4.4.

Recommendation 4.6. Adaptively manage CYER estimation (CTC and management entity tasks).

Developing a Multi-agency Coastwide Salmon Fishery Regulations Database

Derek Dapp, WDFW

Tyler Garber, WDFW

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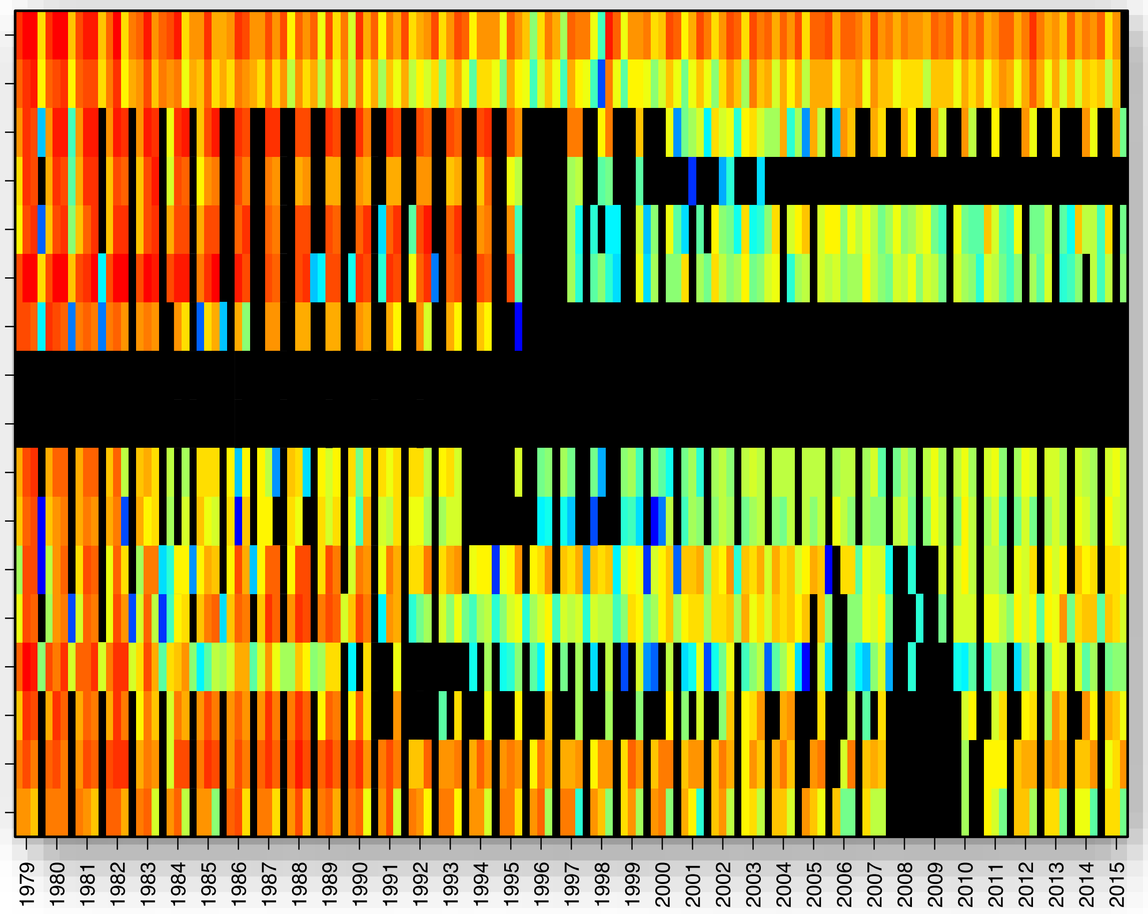
Integrated models for Chinook salmon in the ocean: methods for using multiple data types simultaneously



Ole Shelton, NWFSC

Integrated models for Chinook salmon in the ocean: methods for using multiple data types simultaneously.

(CWT, GSI, climate, fleets, effort and more)

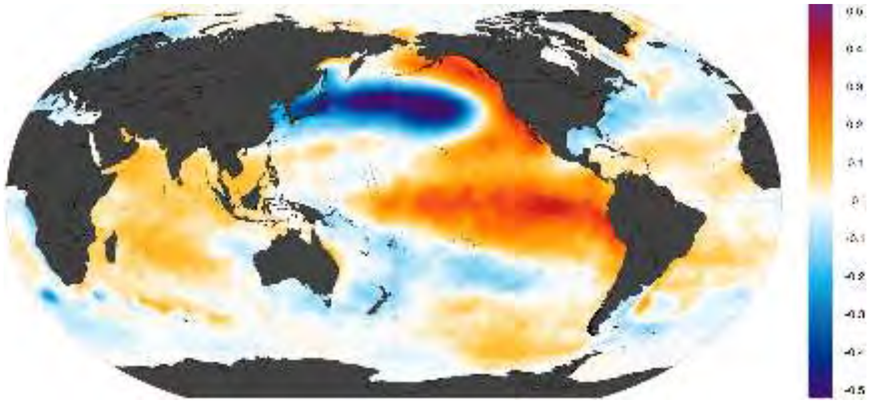
Ole Shelton (NWFSC)

Collaborators:
Will Satterthwaite (SWFSC)
Eric Ward (NWFSC)
Blake Feist (NWFSC)
Jordan Watson (AFSC)
Kayleigh Somers (NWFSC)
Vanessa Tuttle (NWFSC)
Genoa Sullaway (UAF)
Eric Anderson (SWFSC)

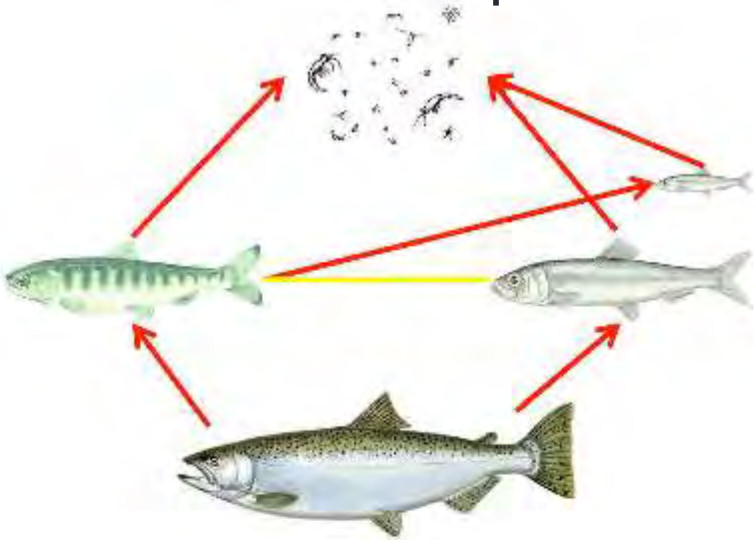
Salmon are central to riverine and coastal ecosystems

Fisheries

Climate

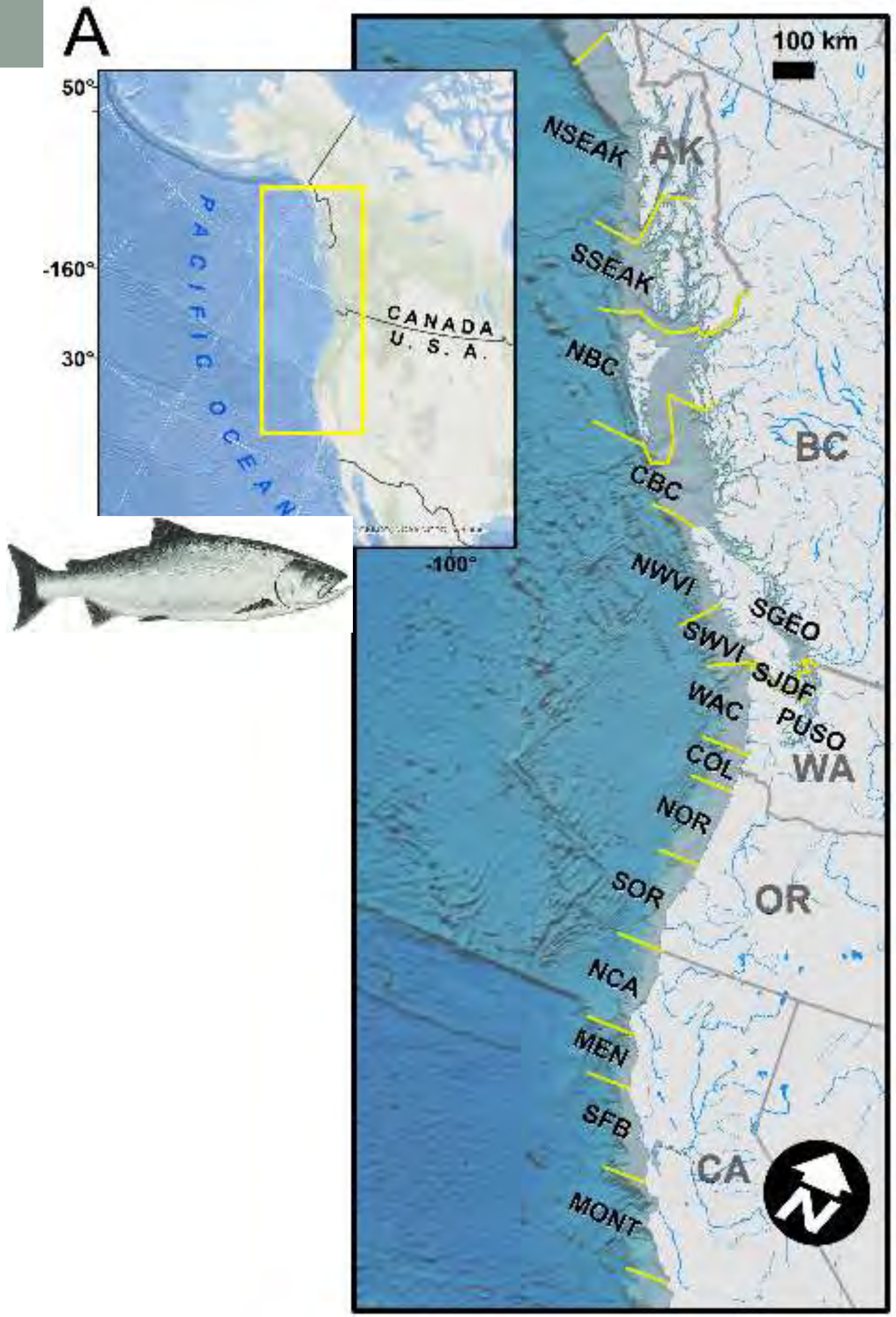


Predators & Competitors



Prey

Chinook salmon



Support major Fisheries
- ~3000km of coast
- Multiple gear types

Complex management
- 2 Countries
- 5 States / Provinces
- Tribal and First Nations

Threatened / Endangered

Prey for marine mammals
(killer whales, seals, sea lions)

Huge, diverse data sets:
- Coded Wire Tags
- Genetic Sampling (GSI, PBT)
- River escapement
- Age-structure
- PIT tag data
- …

Motivating Biological Questions:

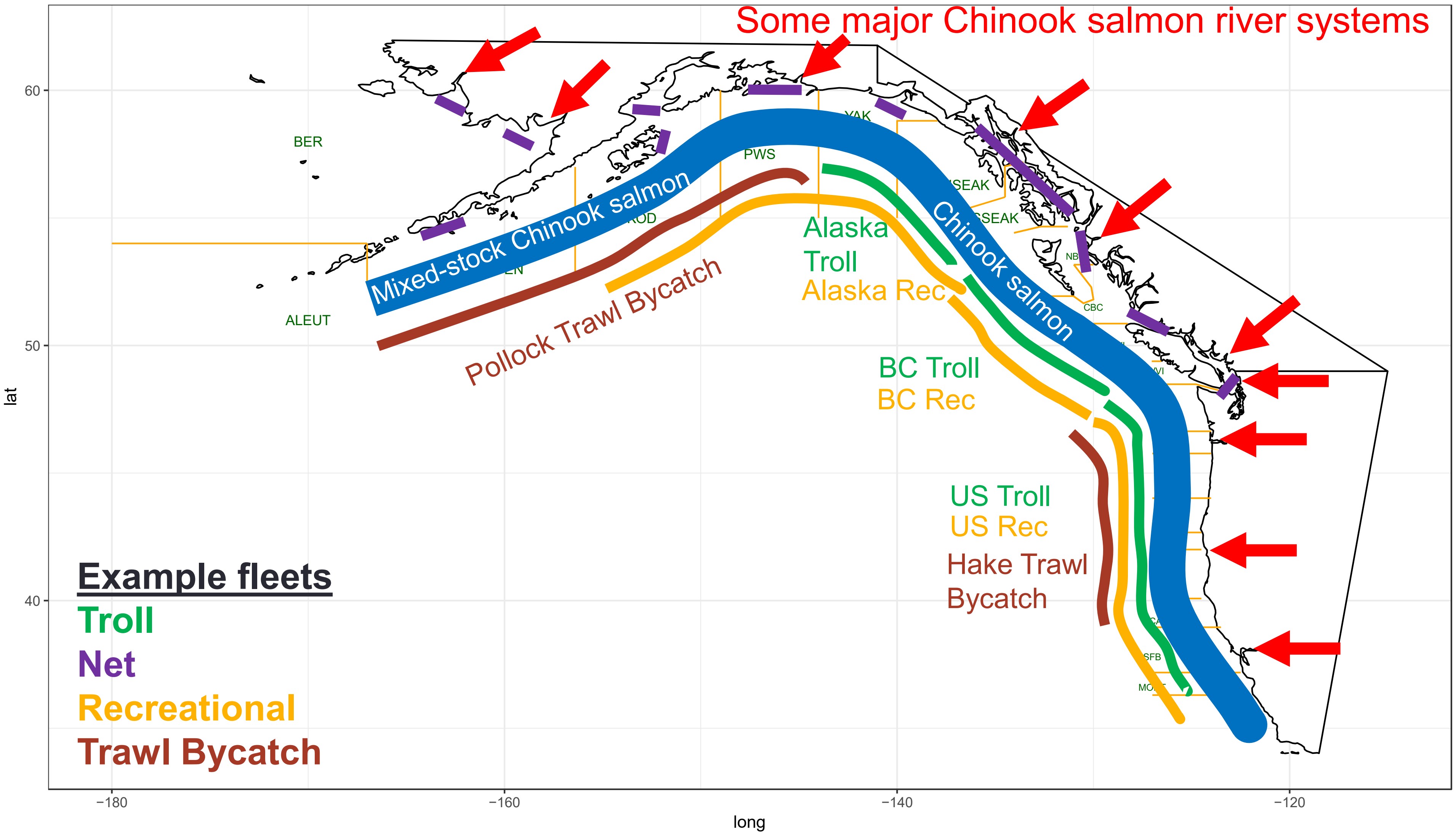
Where are Chinook salmon in the ocean?

- by run type, origin, and season

How do distribution change with shifts in climate?

What does this mean for availability along the coast in the future?

Chinook Salmon



Fleet

Recovery Locations for
Columbia River CWT Fish

High Seas

Troll

1980-1999

2000-2016

Observed catch ≠ Actual distribution

Need to integrate across all information:
Which fish were tagged?
Where did fishing occur?
Which fleets were sampled?

Different fleets, time periods provide different apparent answers

Model Structure

Develop a flexible model structure:

Ability to integrate different data types under one roof

- Multiple fleets, CWT, Catch, Escapement, GSI, etc.

Acknowledge stochasticity

Acknowledge uncertainty of observations

- Differentiate between missing data and zeros.
- Provide estimates of uncertainty for all parameters

Maintain clear delineation between data and parameters

Model Structure

Why we should use all available information

a) Spatio-temporal variation in what is available.

b) Efficiency
   a) Data is expensive to collect.
   b) Can inform value and cost for different kinds of data going forward

c) Identifying conflicts between data sources reveal limitations in our understanding.

Existing models for Chinook salmon tend to be relatively siloed:

Multi-stock models

Pacific Salmon Commission's CTC model:
- Coded Wire Tags
- River escapement
- CPUE

Pacific Fisheries Management Council FRAM:
- Coded Wire Tags
- River escapement
- Productivity Forecasts
- Effort

Stock specific Models:

Columbia Basin Spring-Summer:
- Genetic Sampling (PBT)
- River escapement
- PIT tag data

Sacramento Harvest Model
- River escapement
- Harvest

Today:

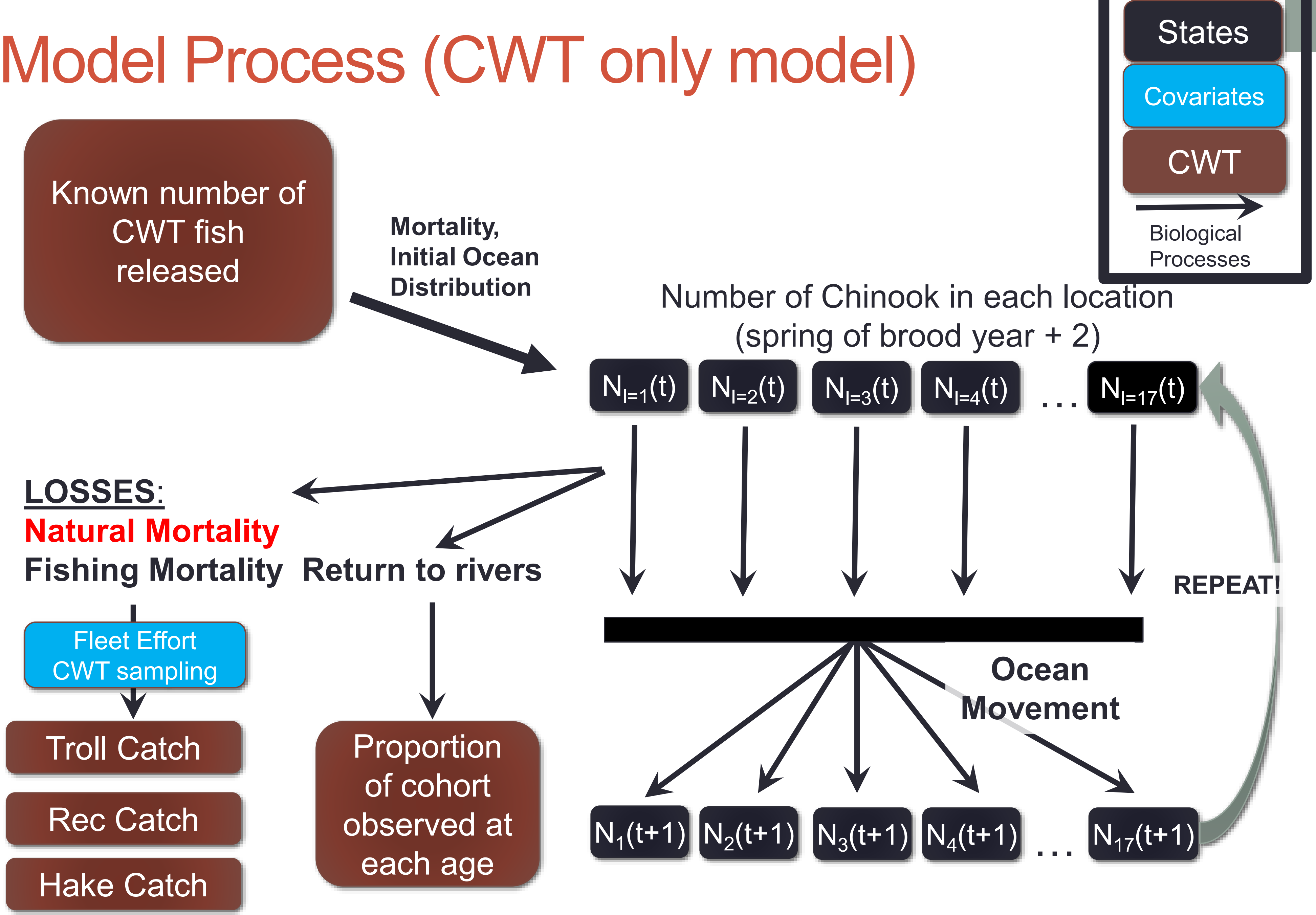
Integrated Models

1. CWT-based
    - Data
    - Application to fall-run stocks

2. CWT and GSI
    - Data
    - Application to sparsely tagged fall-run stocks

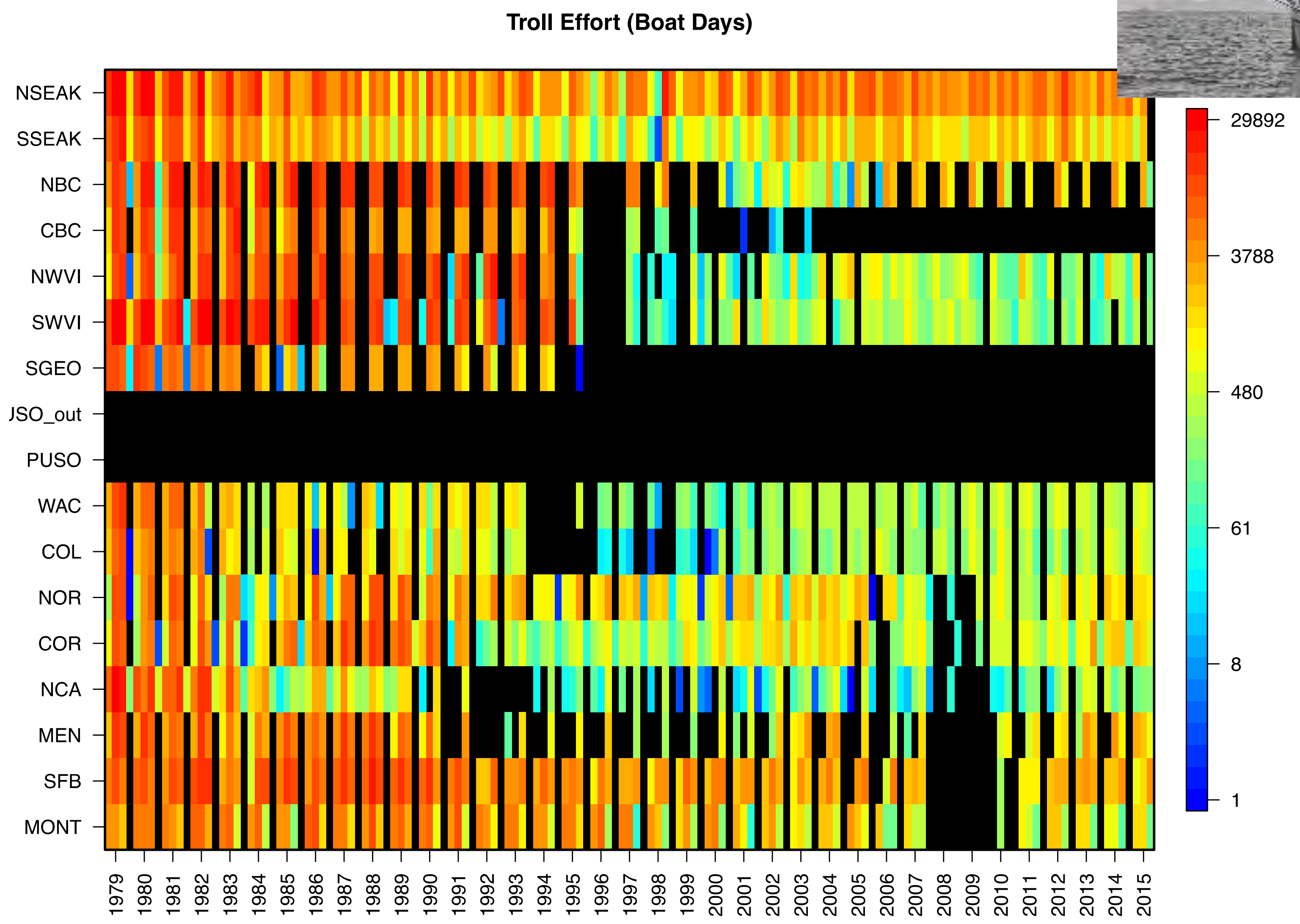
3. CWT, GSI, PIT, and beyond.
    - Ongoing

Model Process (CWT only model)



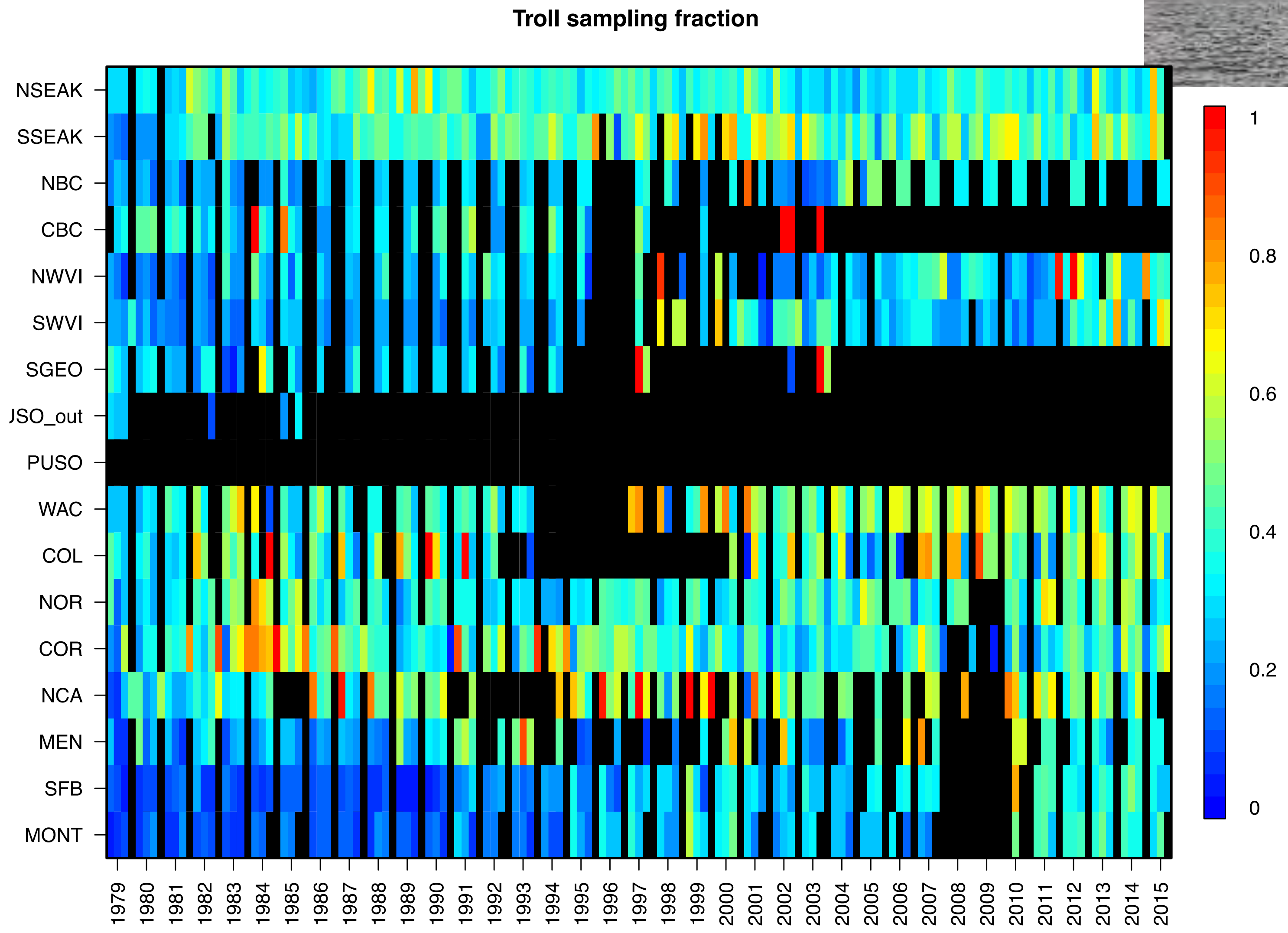
Data: Fisheries Effort

Chinook targeted troll fishery



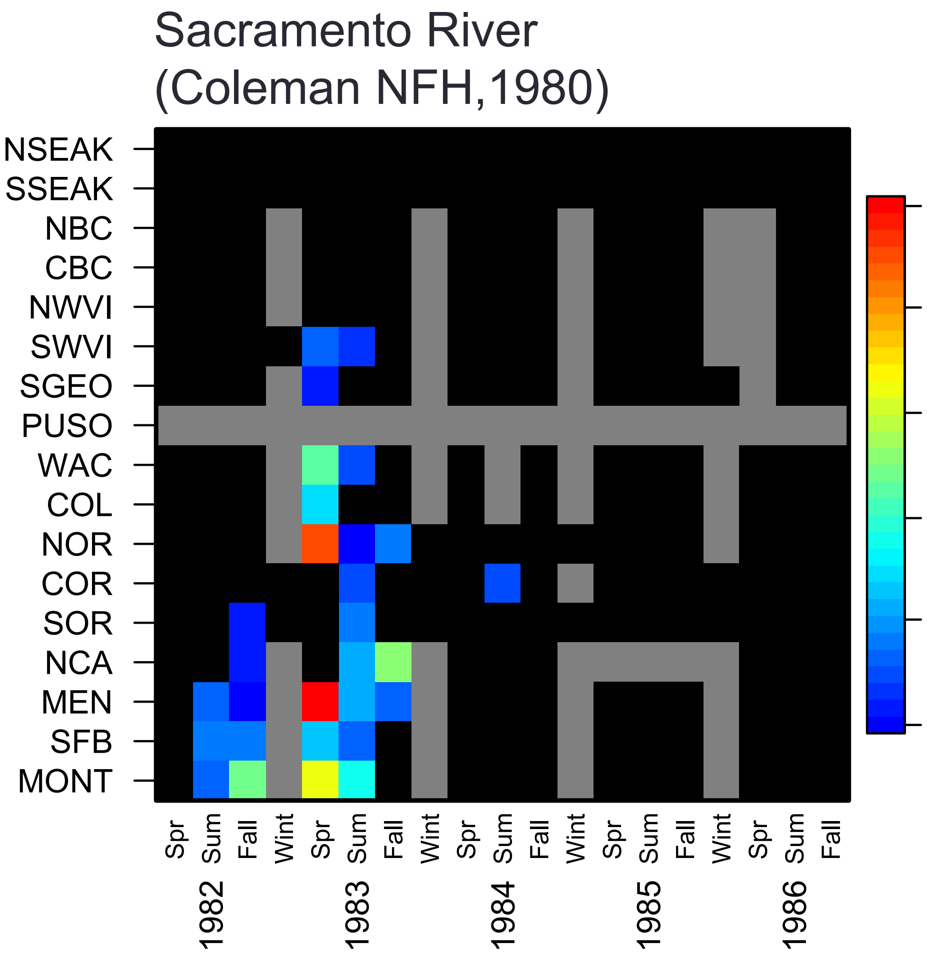
Data: Fisheries Sampling

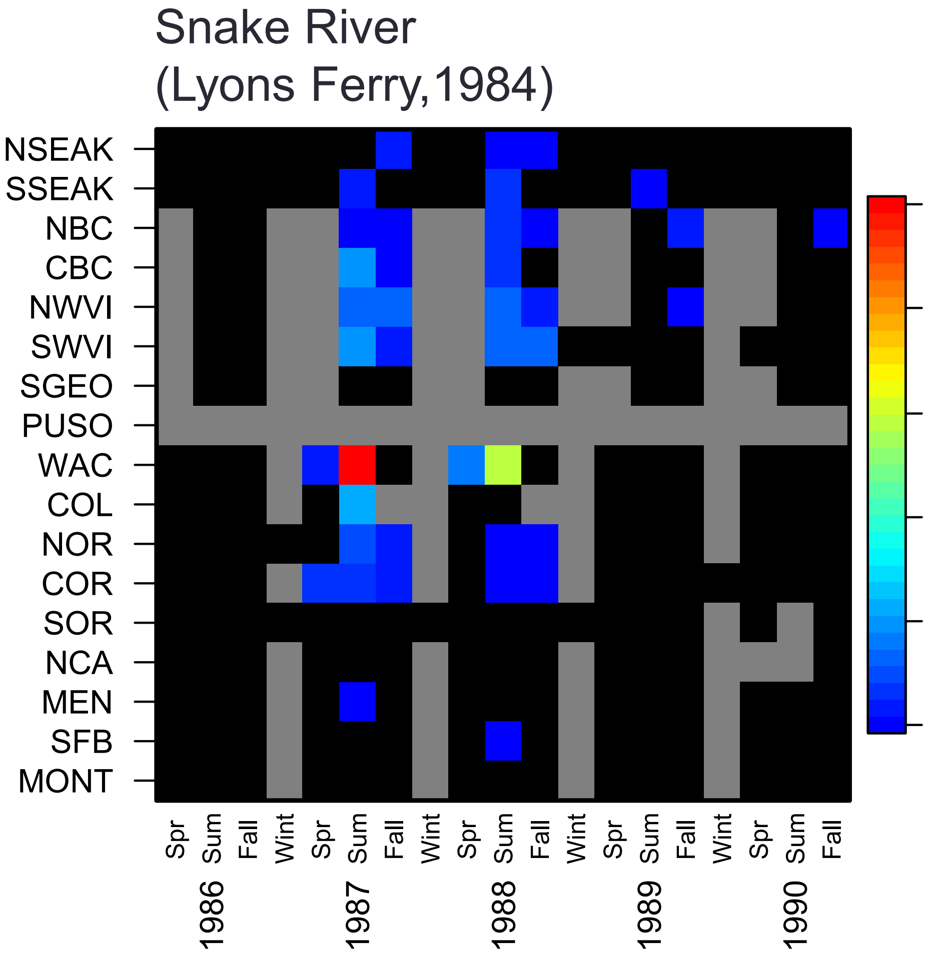
Chinook targeted troll fishery



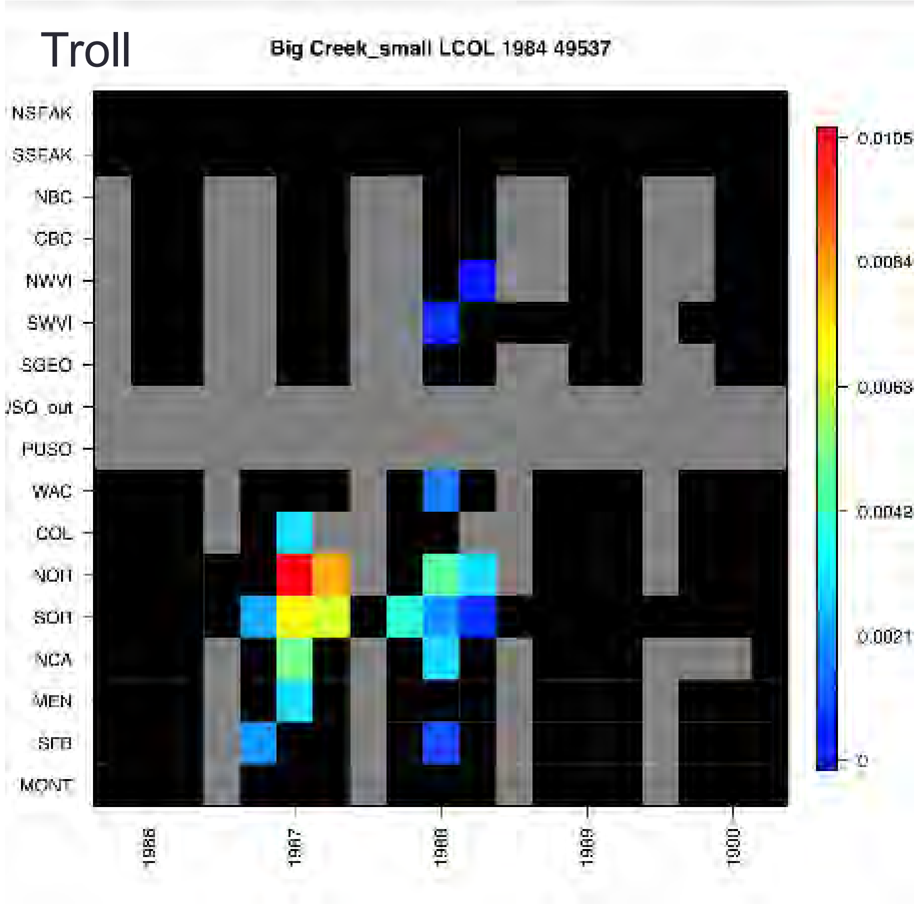
Data: Marine Recoveries

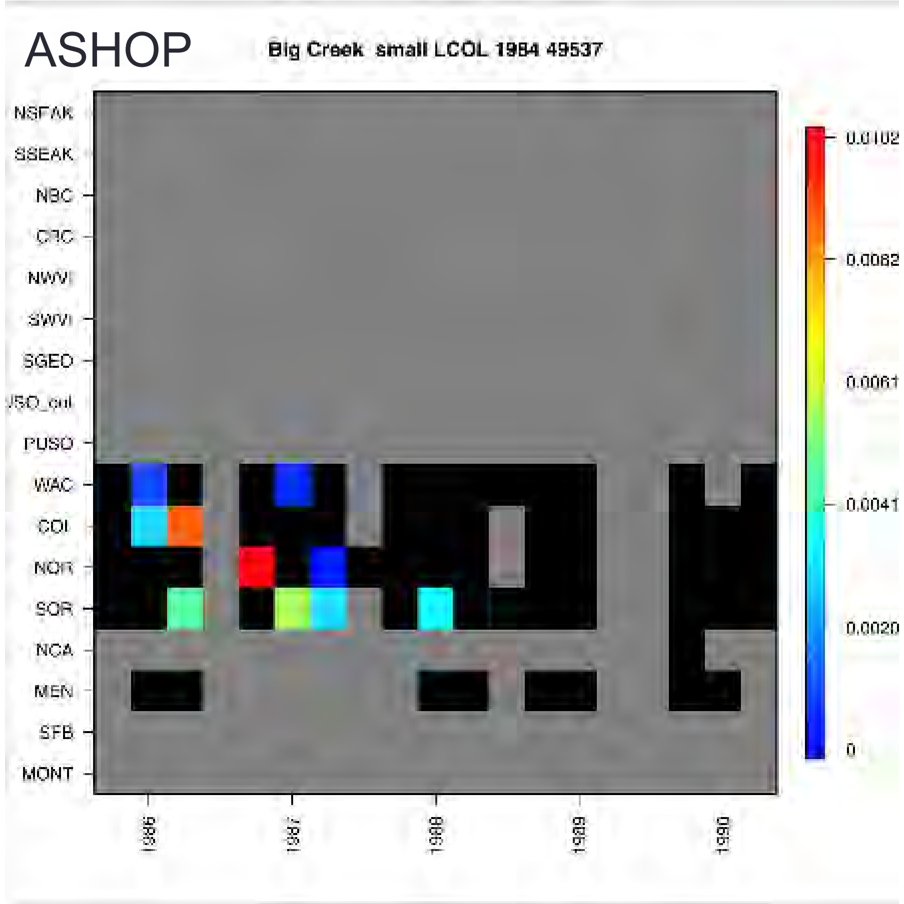
(commercial troll CPUE)





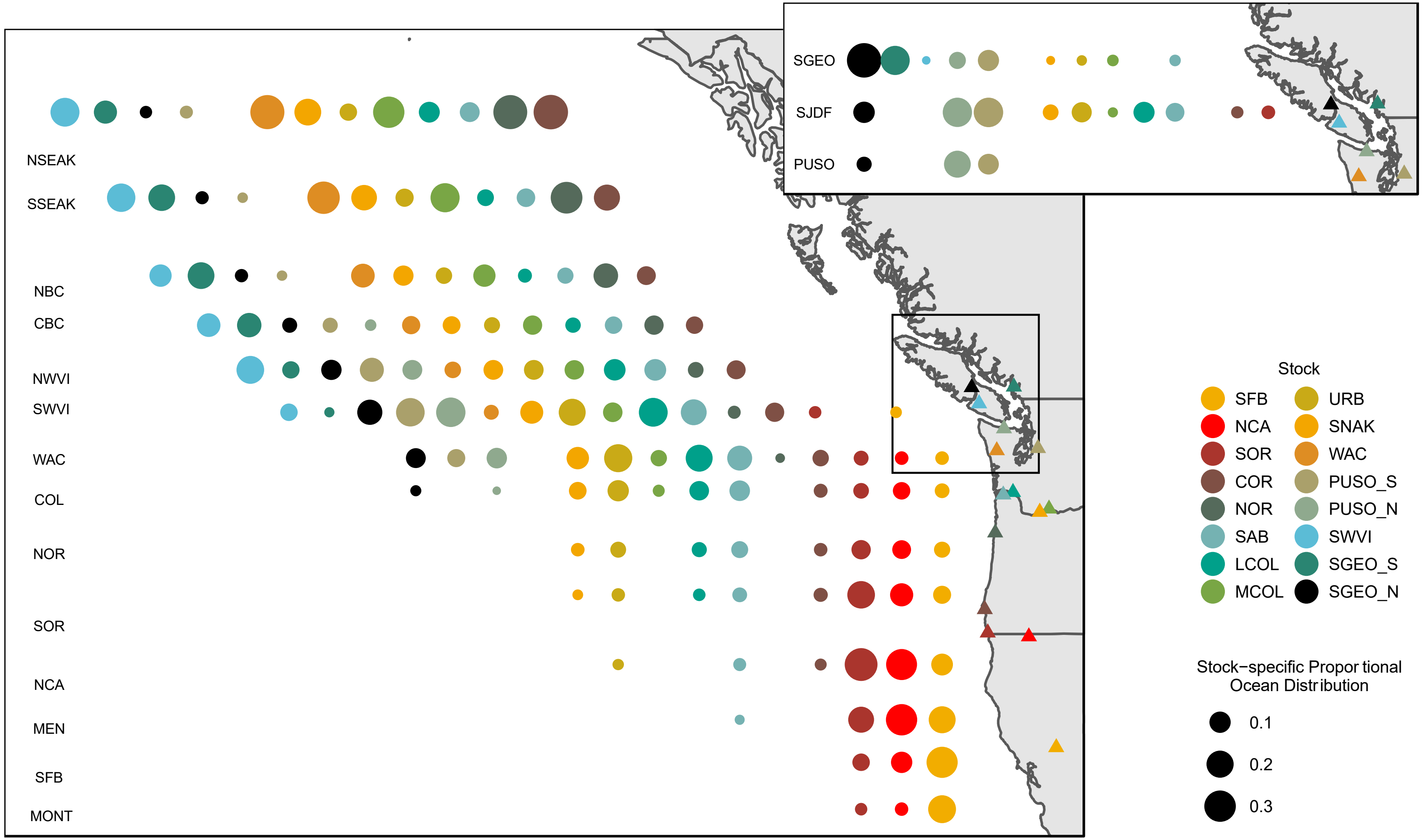
Data: Marine Recoveries
(commercial Troll CPUE vs. Trawl CPUE)





Application to fall run Chinook salmon

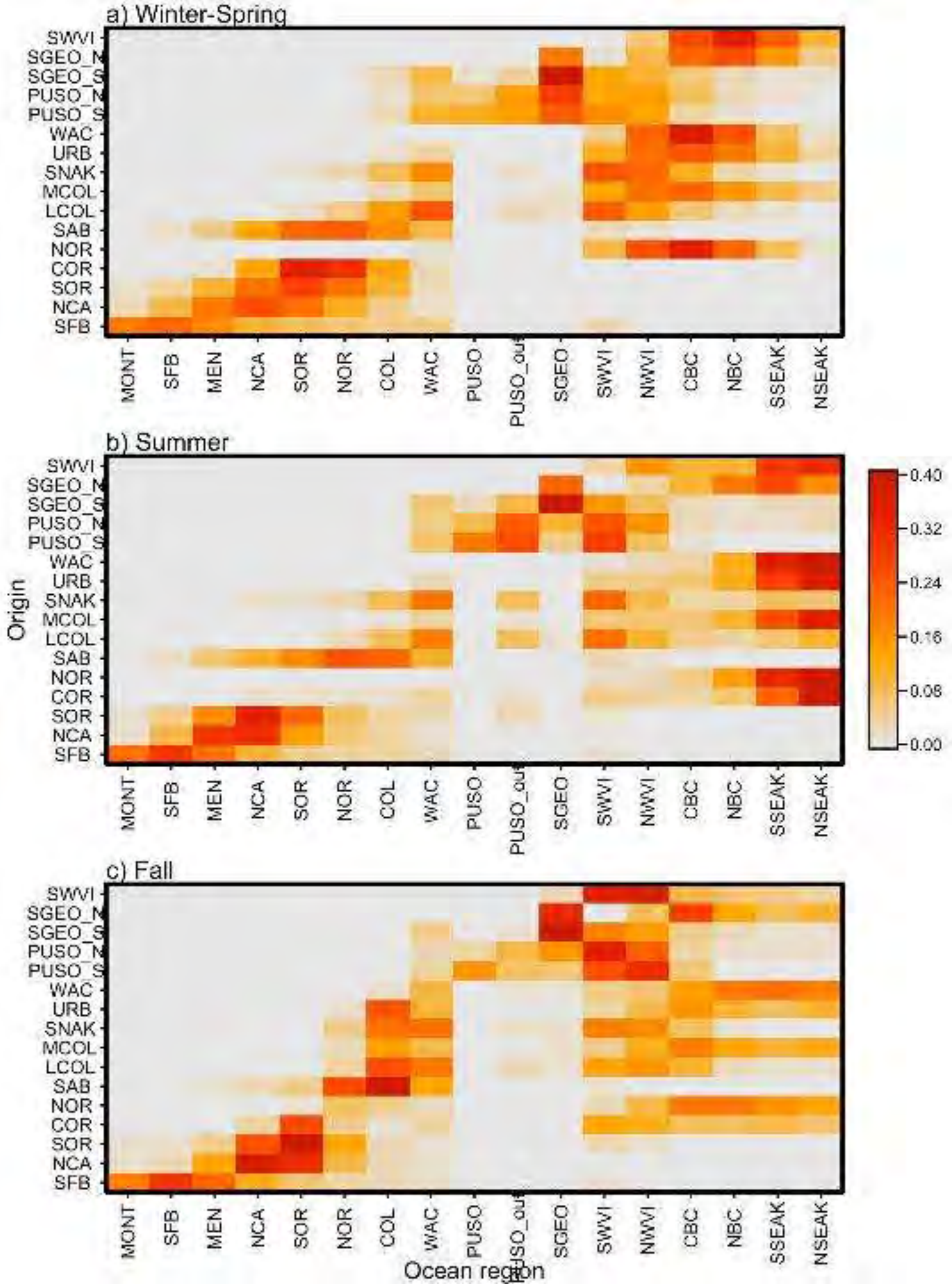
Average ocean distribution for all stocks (Summer)



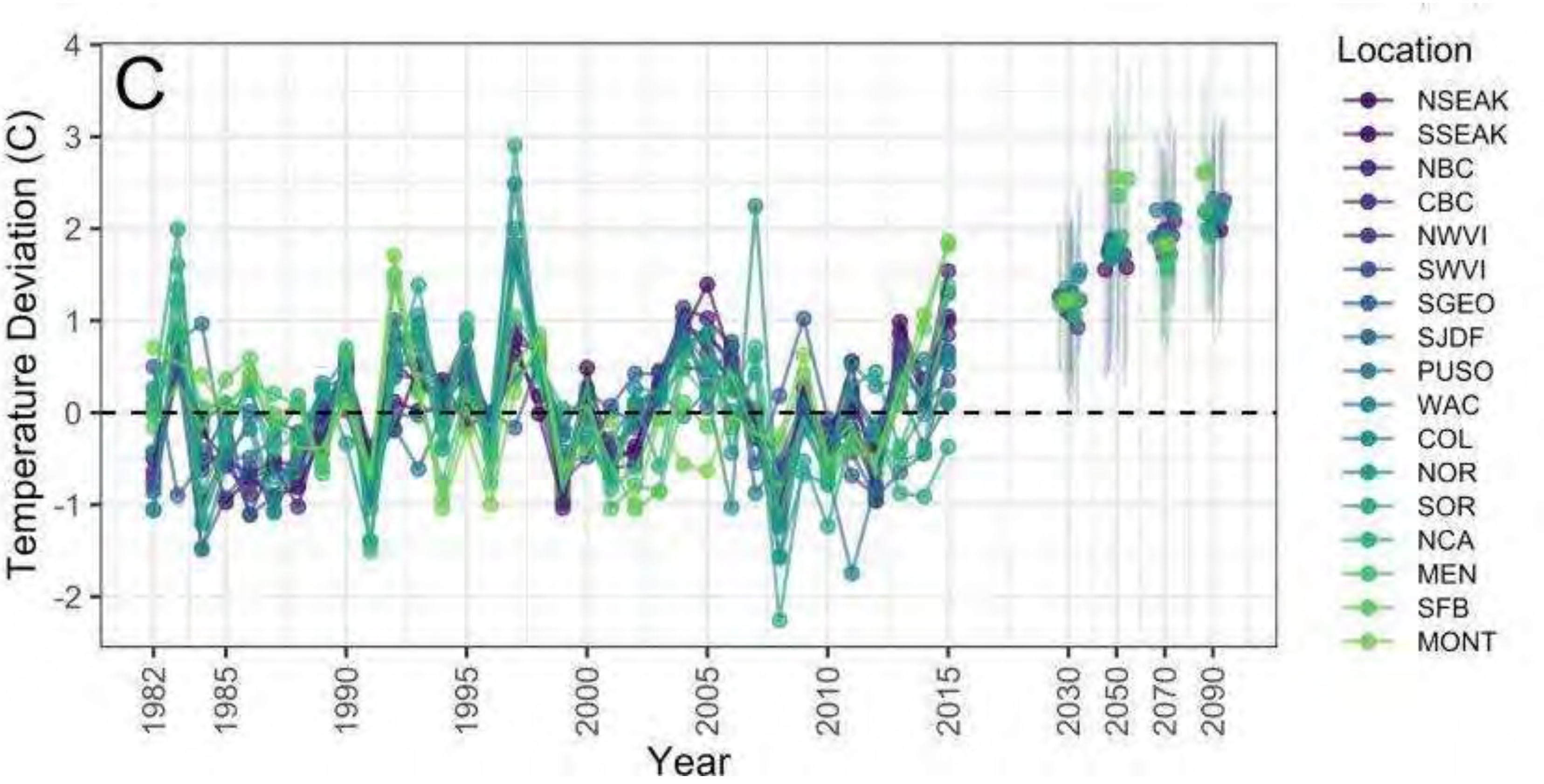
Sullaway et al. 2022

Application to fall run Chinook salmon

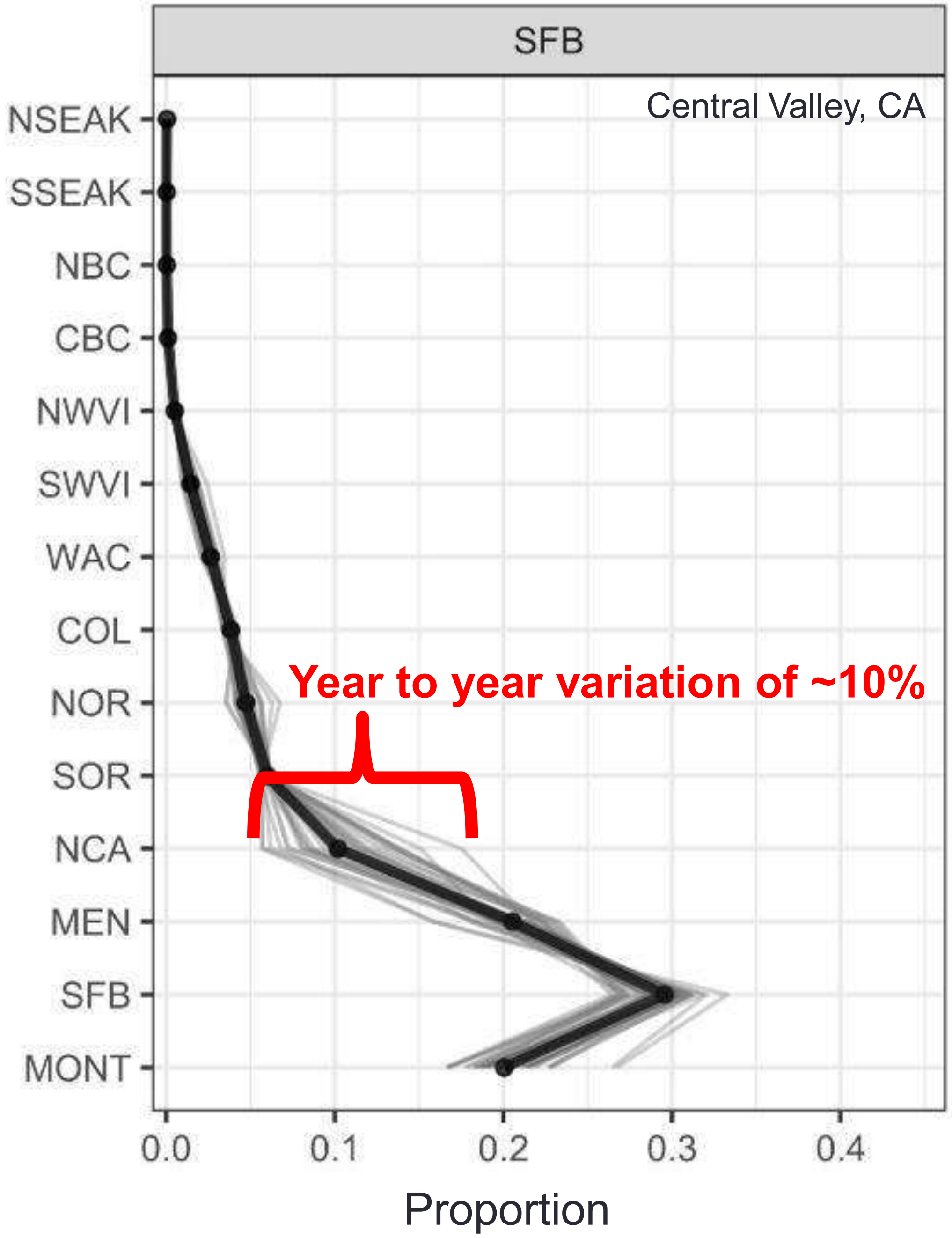
Average ocean distribution for all stocks (all seasons)



Temperature-Dependent ocean distribution



Future is warmer
Future is within the observed range of temperatures
Room for considering other GCMs, other scenarios

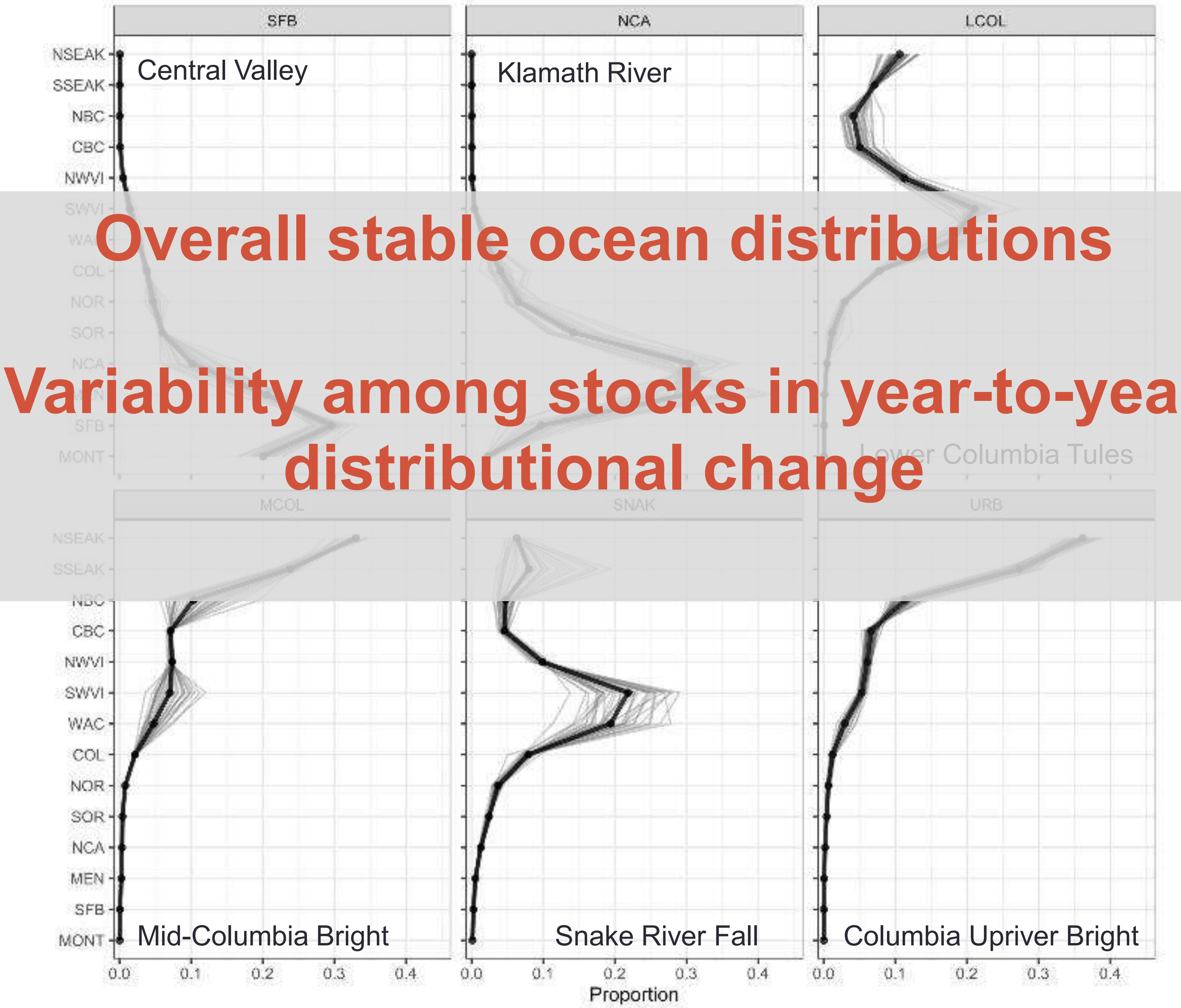


Proportional distribution
(sums to 1)

Based on 37 years of data
(1979-2015)

Overall stable ocean distributions

Variability among stocks in year-to-year distributional change



Today:

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1. CWT-based
   - Data
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2. **CWT and GSI**
   - **Data**
   - **Application to sparsely tagged fall-run stocks**

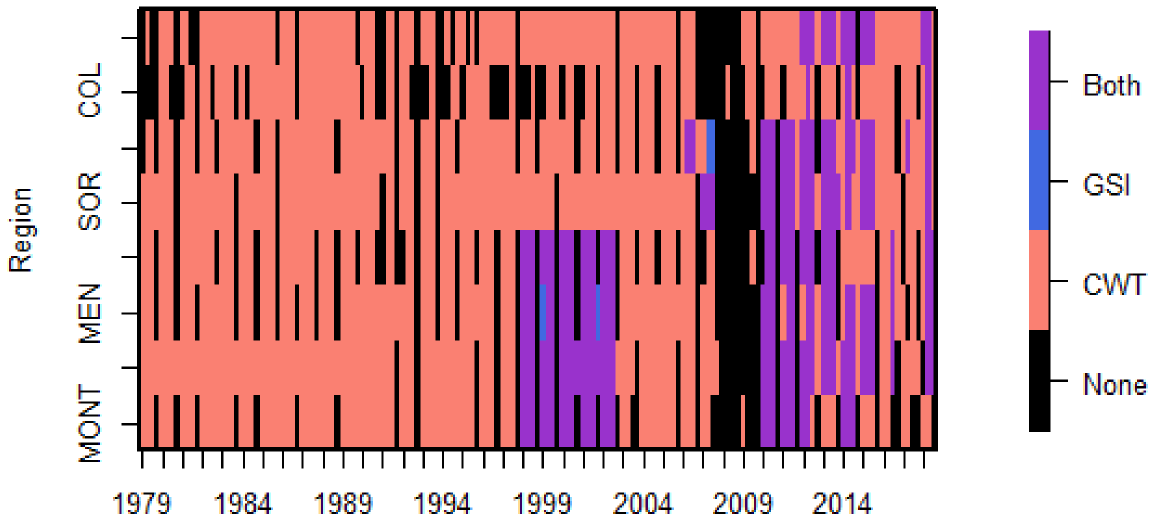
3. CWT, GSI, PIT, and beyond.
   - Ongoing

Why CWT and GSI:

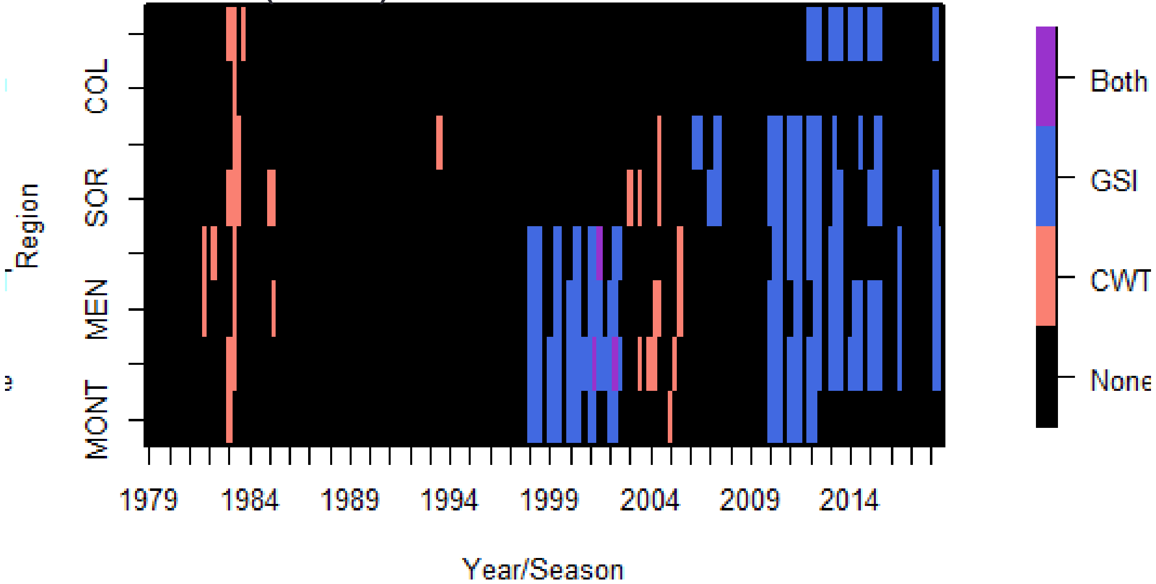
1. Some stocks are not CWT tagged
2. Most CWT are hatchery raised.
3. Tagging and recovery are hard.

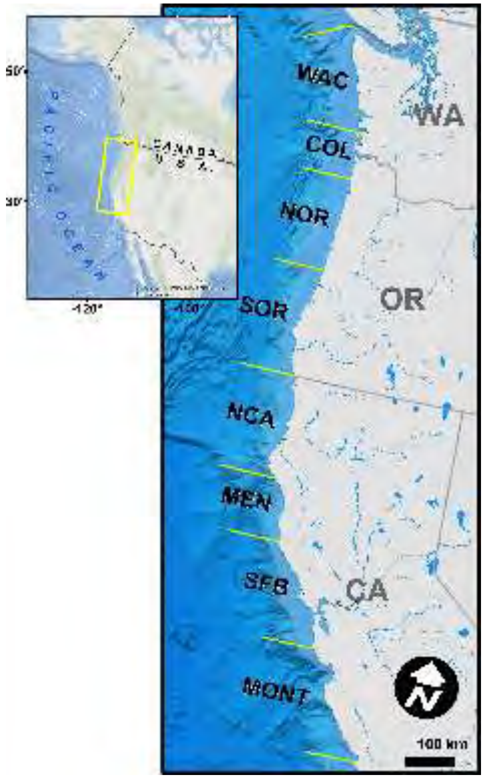
Adding GSI to the model (California)

Central valley fall (SFB)

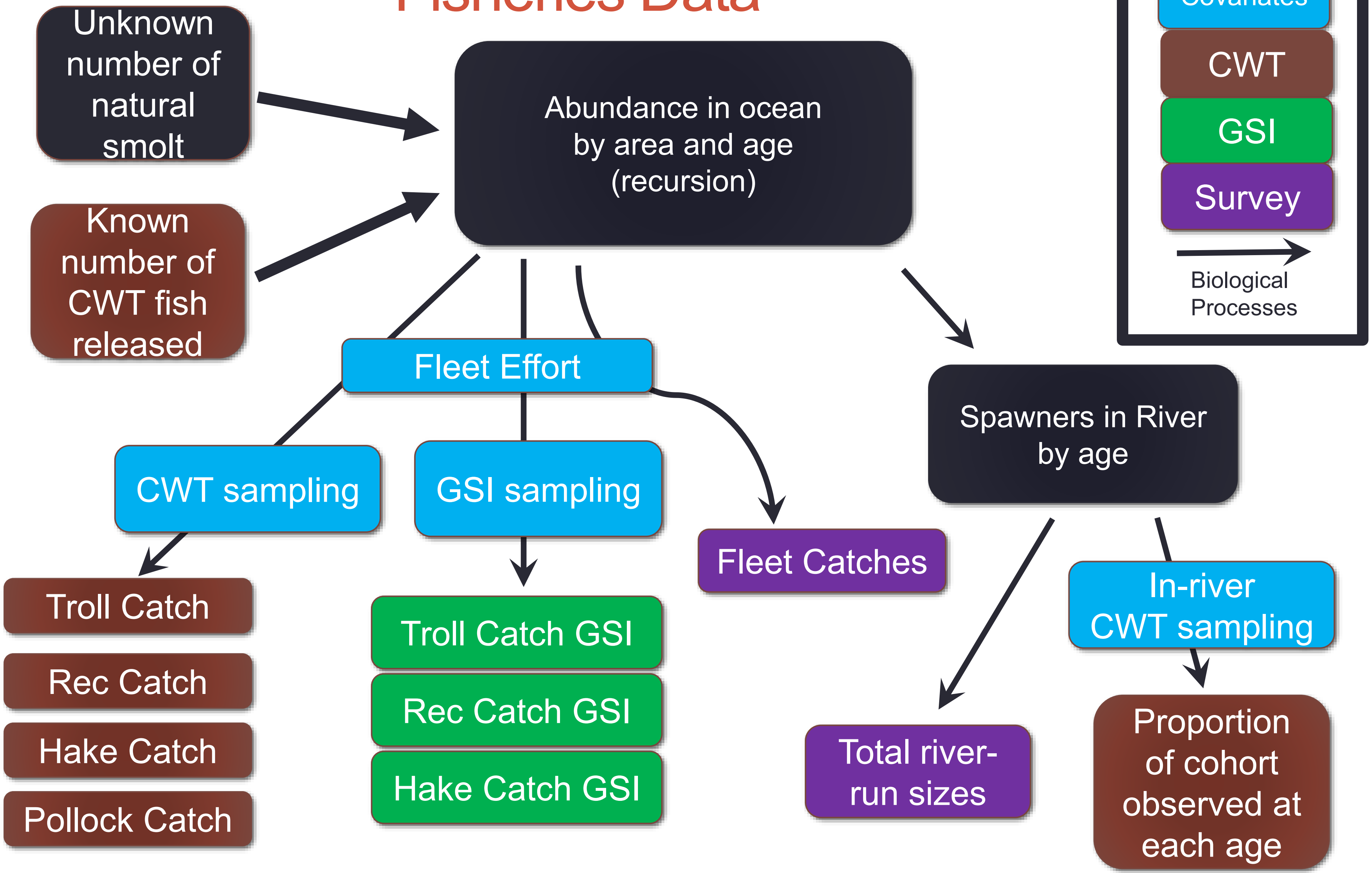


California Coast (CAC)

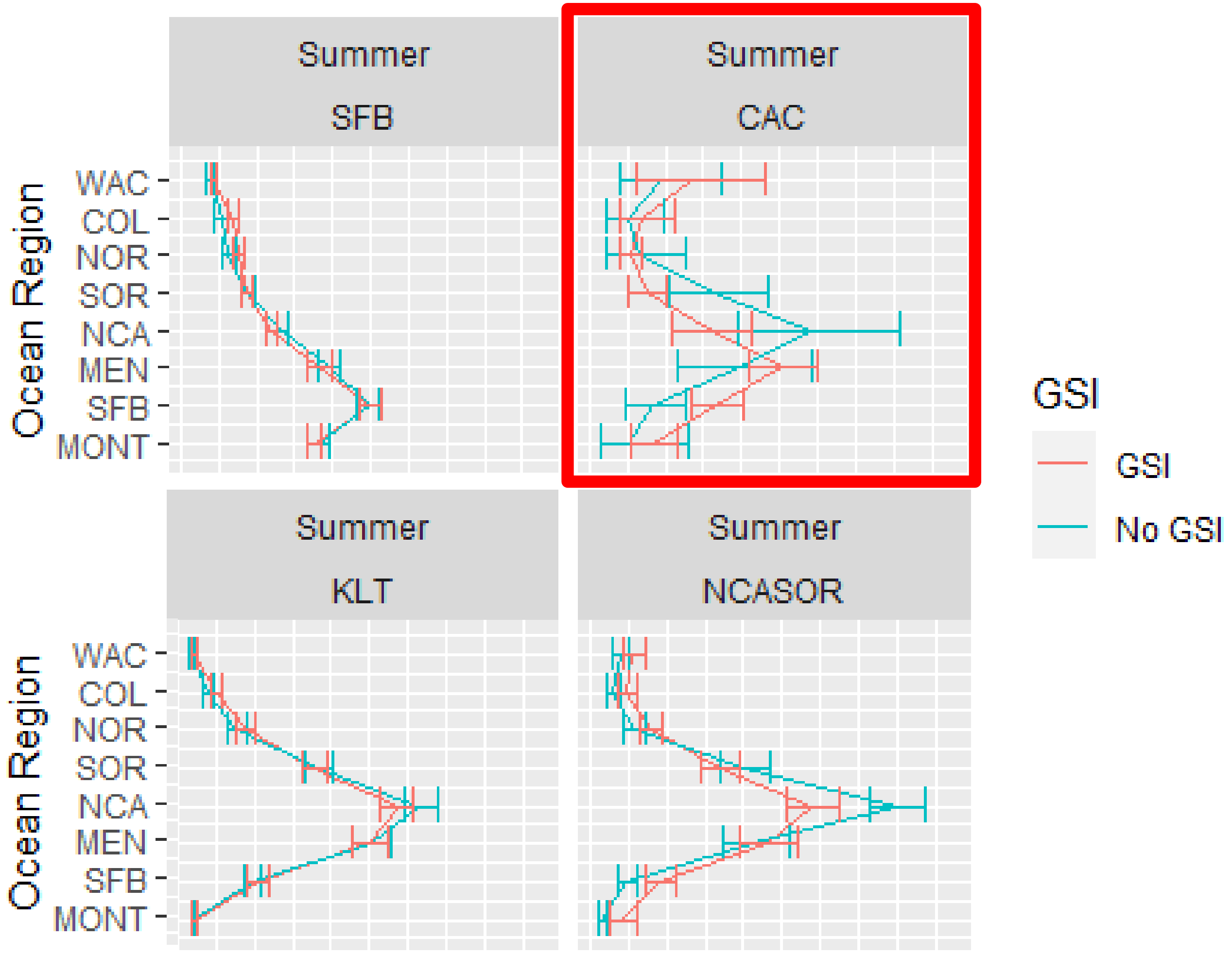




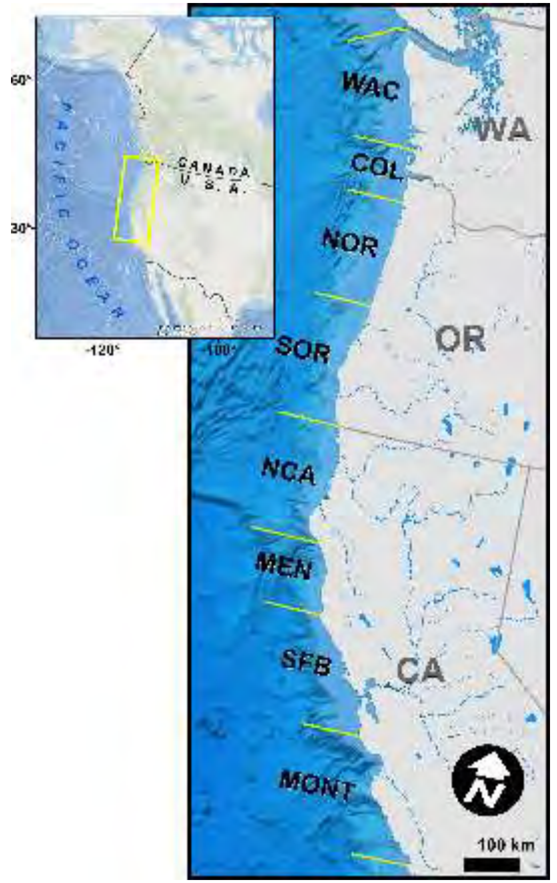
Model Process with CWT, GSI, and Fisheries Data



Add GSI data to estimate distribution for non-CWT runs.

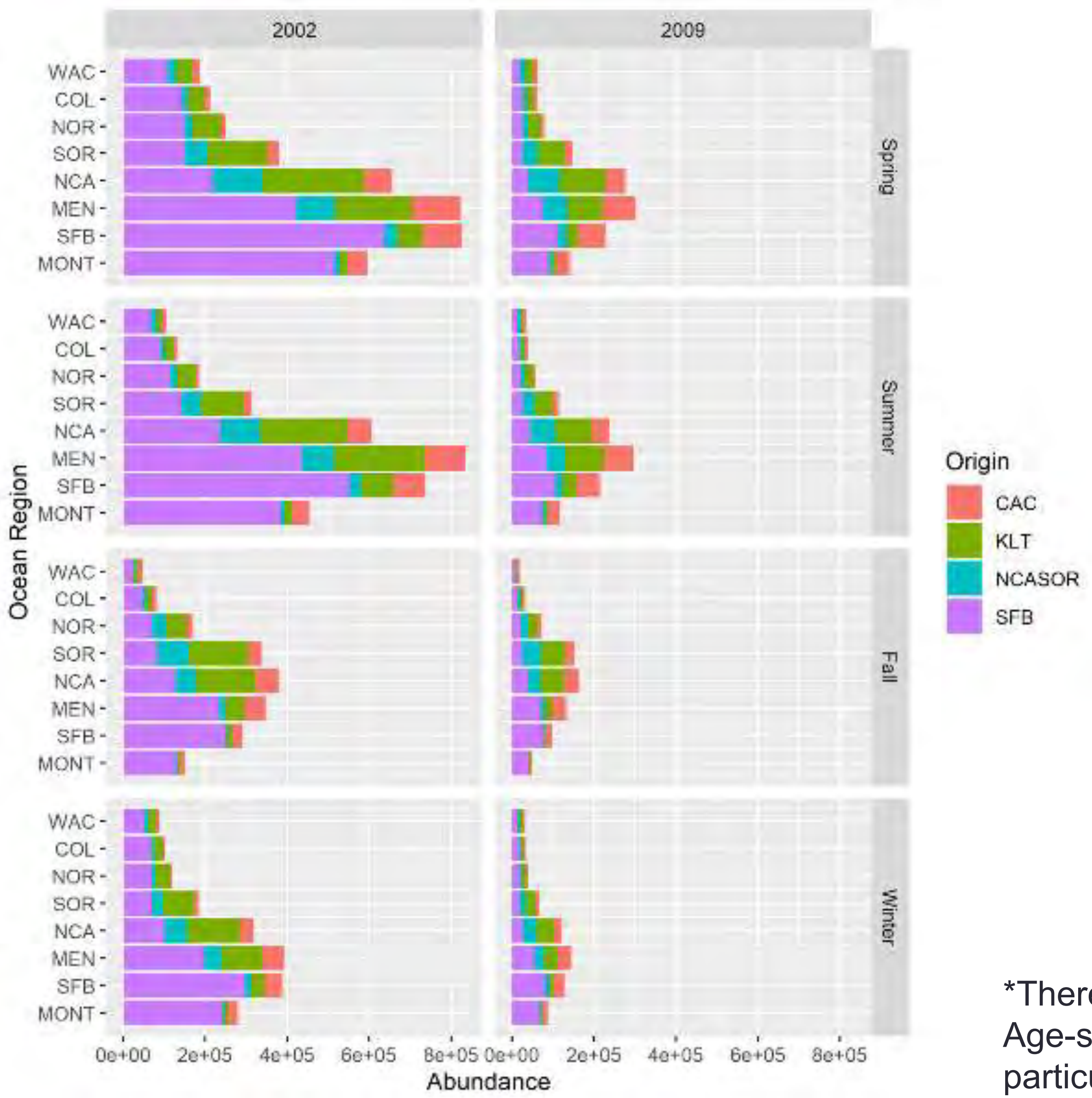


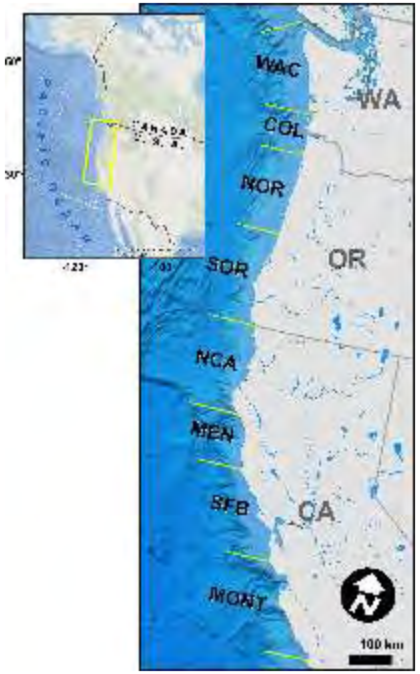
SFB = Central valley fall
CAC = California Coast
KLT = Klamath
NCASOR = North California/ South Oregon Coast



Jensen et al. 2023

You can estimate total abundance in the ocean*





*There are some important limitations. Age-structure information for GSI is particularly important.

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   - Data
   - Application to sparsely tagged fall-run stocks

3. **CWT, GSI, PIT, and beyond.**
   - **Ongoing**

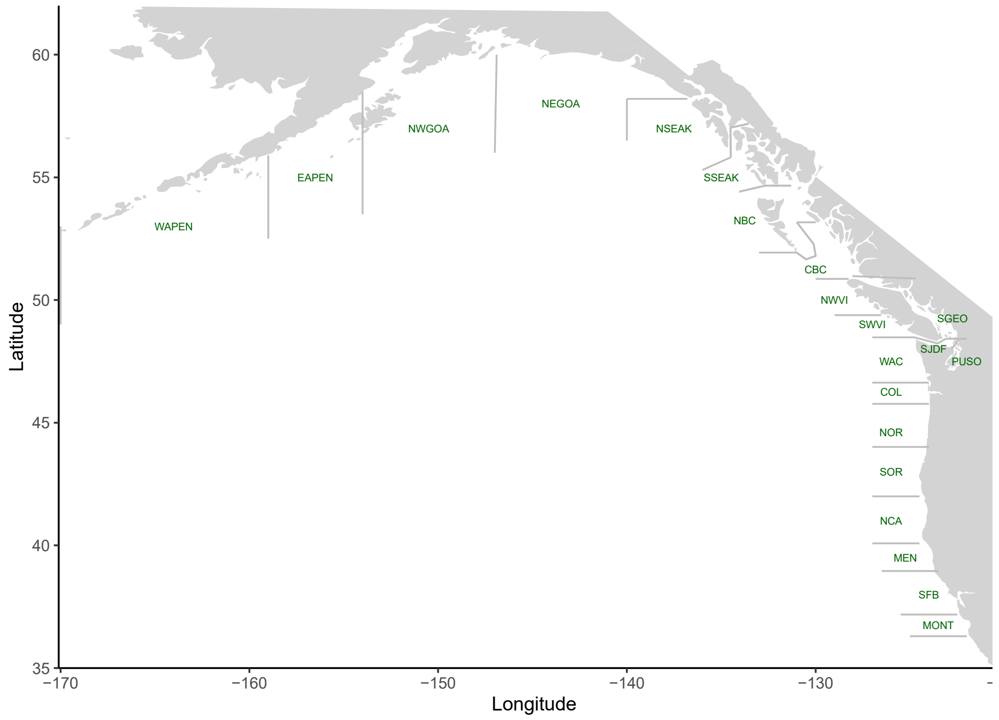
Why additional data sources?

1. Some stocks are not observed frequently in fisheries.

2. Some rivers have awesome, unusual data.

Chinook salmon

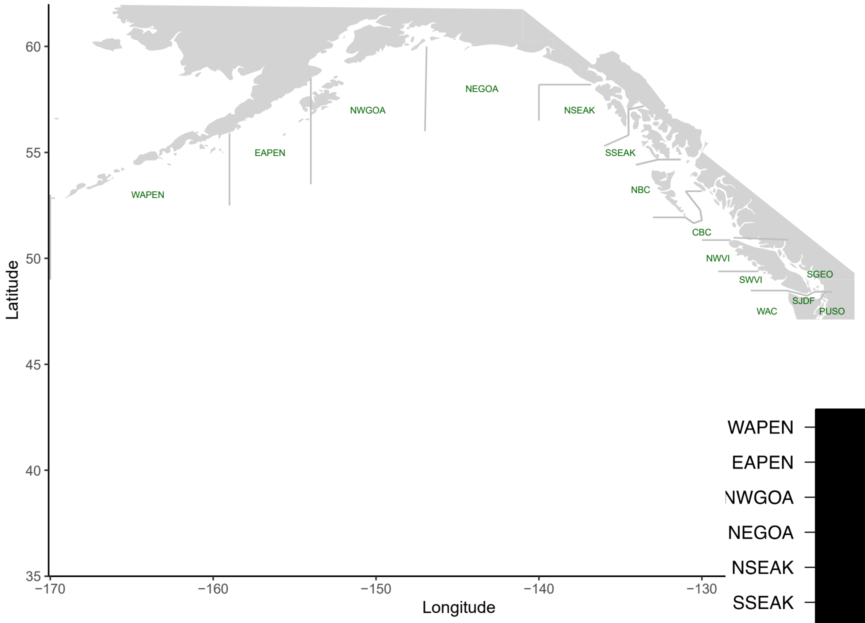
Winter, Spring and Summer Run.



Pollock and rockfish bycatch are the only data for central and western Alaska

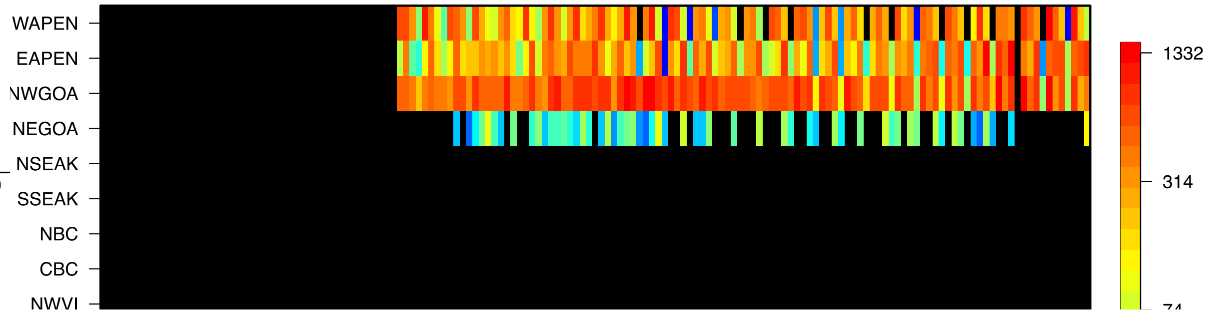
Some spring stocks disappear in the ocean

Chinook salmon
Winter, Spring and Summer Run.

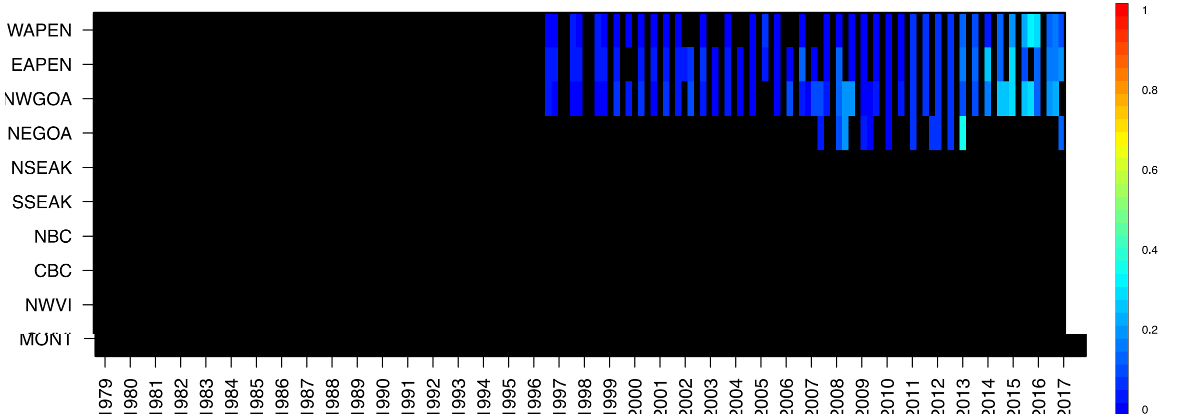


Pollock and rockfish bycatch are the only data for central and western Alaska

Pollock Shoreside Trawl effort (boat days proxy)

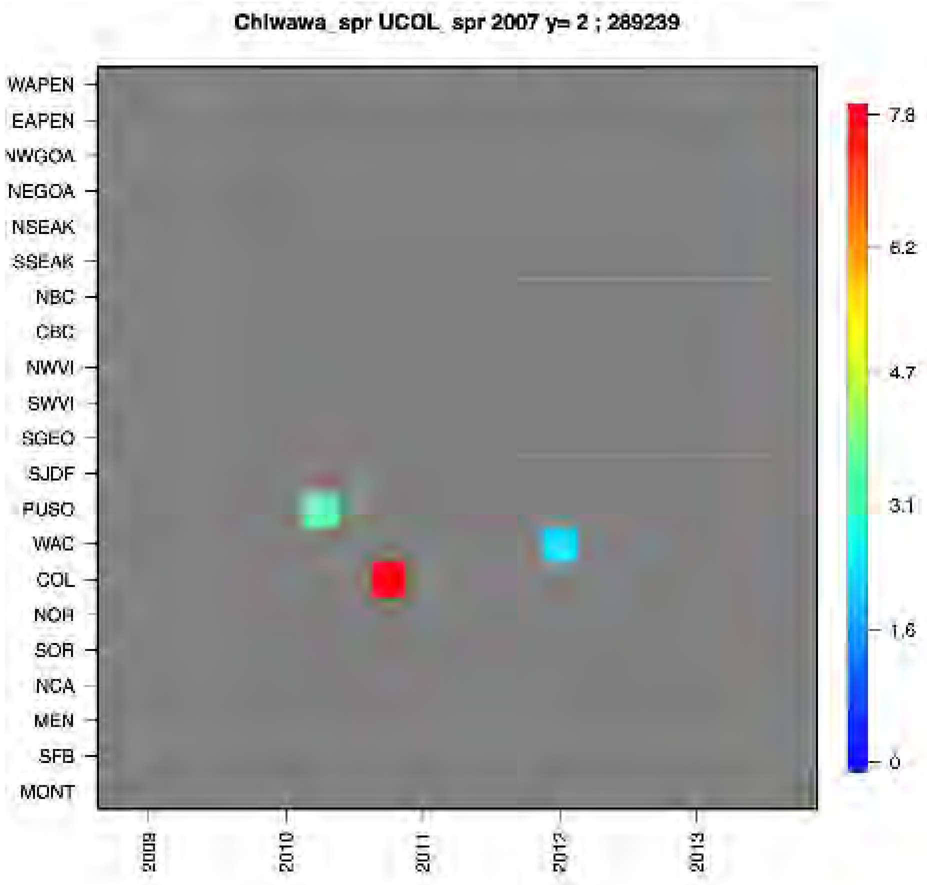


Pollock GOA Shoreside sampling fraction

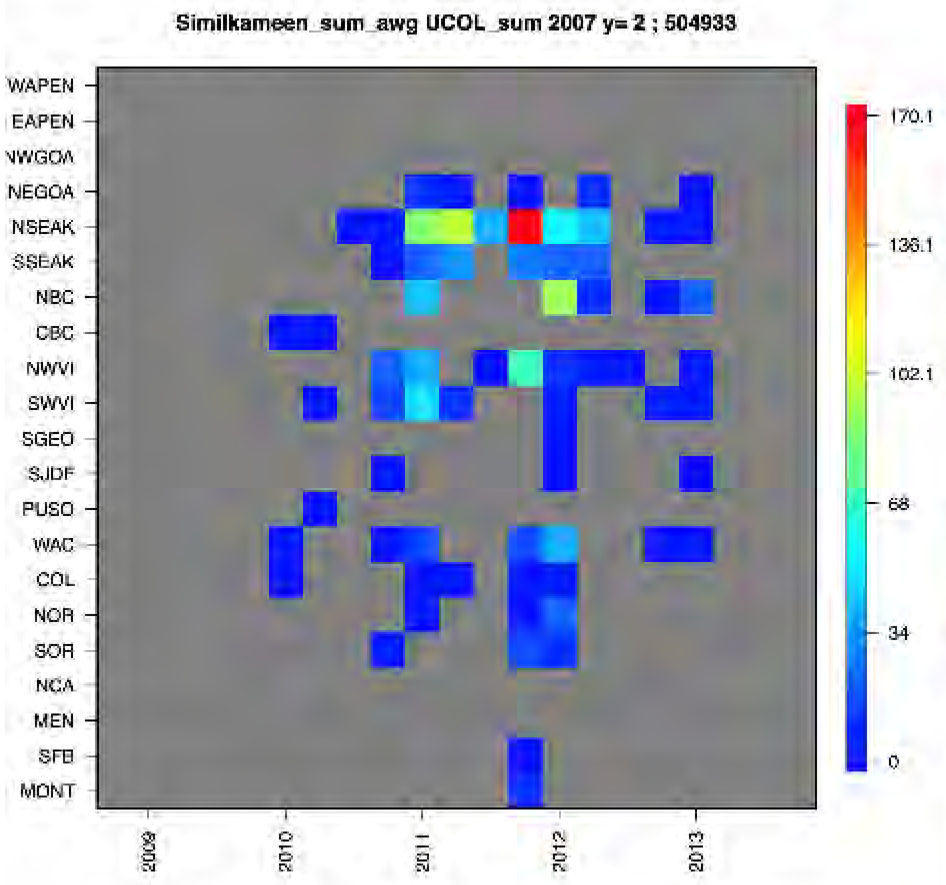


Some spring stocks disappear in the ocean

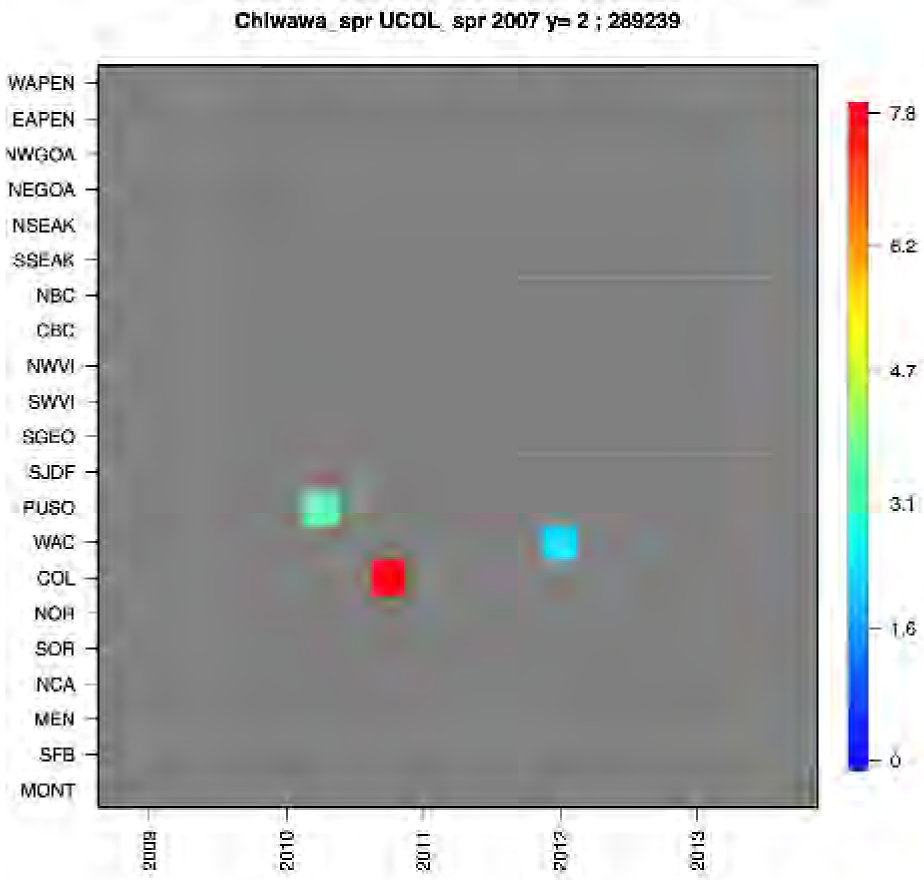
Upper Columbia Spring-run



Upper Columbia Fall/Summer-run



Upper Columbia Spring-run



Chinook are not observed in the ocean…

But they show up in the river.

Need to add an "offshore" or "deep" or "unobserved" area in the ocean to account for this.

Requires more and different data.

- Need to add more in-river data to make ocean distributions work.

Thanks

B. Burke, B. Chasco, L. Weitkamp, M. Ford, J. Carlile, G. Pess, J. Anderson, J. Samhouri, N. Mantua, T. Garrison, C. Wor, C. Freshwater, R. Kope, G. Johnson, H. Leon,

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Adjourn!

See you all in Juneau, Alaska.